GOLDEN

MATHEMATICS

COMMON CORE PROGRAMME

B7 (JHS1)

KWAKU OKYERE

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CHAPTER 1 MODELLING NUMBER QUANTITIES

STRAND 1: NUMBER

SUB-STRAND 1: Number and Numeration Systems

CONTENT STANDARD: B7.1.1.1 Demonstrate understanding and the use of place value for expressing quantities recorded as base ten numerals as well as rounding these to given decimal places and significant figures.

INDICATOR B7.1.1.1.1 Model number quantities more than 1,000,000,000 using graph sheets, isometric papers and multi-base blocks.

1.1 1.1 Using Multi-Base Materials or Graph Sheets to Model Number Quantities

In this lesson, we shall learn about how to use multi-base materials to represent numbers up to 1,000,000,000 (one billion)

Let a cube represent 100,000

 = 100,000

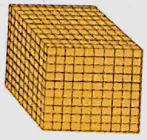
Let a rod (ten cubes) represents 1,000,000

 = 1,000,000

Let a flat (ten rods) represents 10,000,000

 = 10,000,000

A block (ten flats) represents 100,000,000

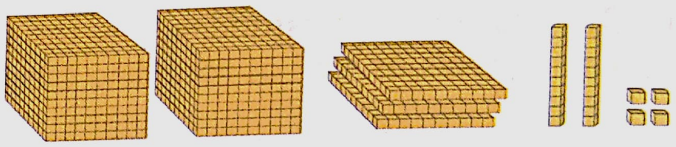
 = 100,000,000

Example 1: Model the number 232,400,000

Solution: We can expand this number as:

(2 × 100,000,000) + (3 × 10,000,000) + (2 × 1,000,000) + (4 × 100,000)

We need 2 blocks, 3 flats, 2 rods and 4 cubes.

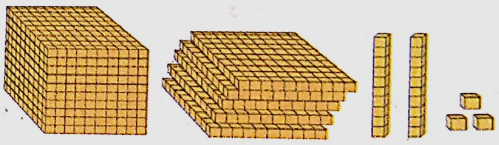


Example 2: Use multi-base materials to represent 152,300,000

Solution: Expand the number.

(1 × 100,000,000) + (5 × 10,000,000) + (2 × 1,000,000) + (3 × 100,000)

1 block + 5 flats + 2 rods + 3 cubes.



Exercise: 1

Use multi-base materials to represent the numbers.

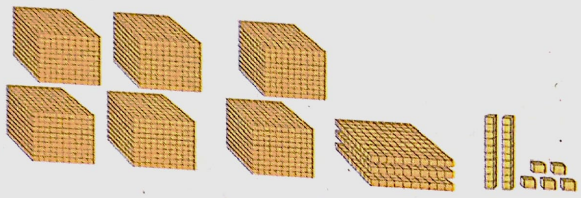
1. 422,500,000
2. 38,400,000
3. 161,200,000
4. 21,800,000
5. 9,200,000
6. 800,000
7. 586,200,000
8. 523,700,000
9. 327,200,000
10. 489,300,000

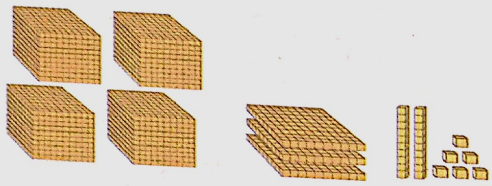
Exercise: 2

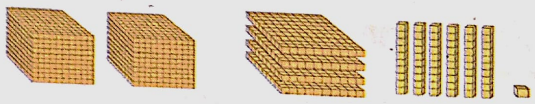
What number is represented in each of the following?

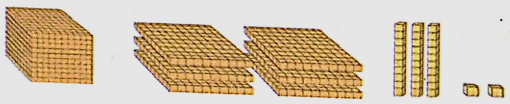
= 100,000; = 1,000,000;

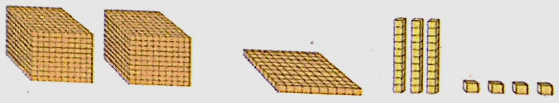
= 10,000,000 = 100,000,000

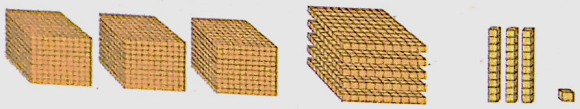
1. 

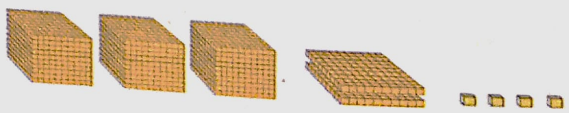
2. 

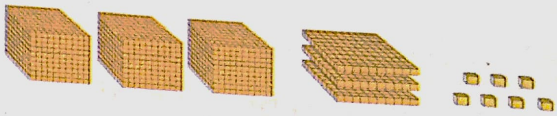
3. 

4. 

5. 

6. 

7. 

8. 

Modelling Using Graph Sheet

Let us continue to look at how a number could be represented on graph sheets.

= 1,000,000; = 10,000,000;

= 100,000,000

The drawing of the cube, rod and flat could be made easier as shown below.

is shown as

is shown as

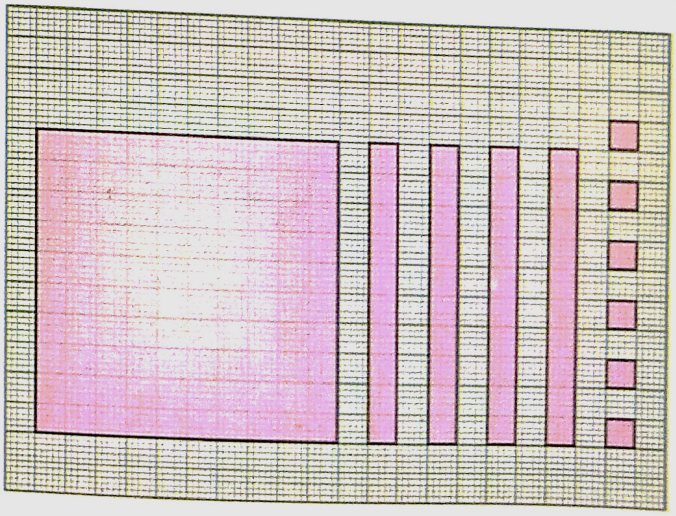
is shown as

Example 1: Represent 146000000 on a graph sheet.

Solution: Expand 146,000,000

(1 × 100,000,000) + (4 × 10,000,000) + (6 × 1,000,000)

1 flat + 4 rods + 6 cubes.



1.2 Using Multiples of 10s, 50s, 100s and 200s to Represent Numbers

Example 1: Use multiples of 10s, 50s, 100s and 200s. Represent 3,640 in different ways.

Solution: $3,640 = 10 \times \underline{200} + 10 \times \underline{100} + 12 \times \underline{50} + 4 \times \underline{10}$

OR

$=15 \times \underline{200} + 5 \times \underline{100} + 2 \times \underline{50} + 4 \times \underline{10}$

OR

$= 10 \times \underline{200} + 8 \times \underline{100} + 10 \times \underline{50} + 34 \times \underline{10}$

Example 2: Represent 5,560 in multiples of ways.

Solution:

$5,560 = 20 \times 200 + 10 \times 100 + 11 \times 50 + 1 \times 10$

OR

$= 15 \times 200 + 20 \times 100 + 10 \times 50 + 6 \times 10$

OR

$= 25 \times 200 + 5 \times 100 + 1 \times 50 + 1 \times 10$

Exercise: 5

Use multiples of 10s, 50s, 100s and 200s to represent these numbers in at least three different ways.

1. 8,420
2. 6,390
3. 2,120
4. 6,550
5. 8,370
6. 5,390
7. 1,480
8. 3,520
9. 4,730
10. 9,570

Exercise: 6

Represent the given numbers in multiples of ways using 10s, 50s, 100s and 200s.

1. 6,390
2. 2,990
3. 4,860
4. 5,110
5. 2,910
6. 8,750
7. 6,330
8. 7,960
9. 10,200
10. 21,640

Using Token (GH¢ 20, GH¢ 50, GH¢ 100 and GH¢ 200) To Model Amounts

In this lesson, we shall look at how to model a given amount using paper made currency notes.

The notes are differentiated by colour as seen below.

Example 1: Determine the combinations of GH¢ 50, GH¢ 100 or GH¢ 200 notes that make GH¢ 1,000,000.00

Solution: Expand the amount and use the denominations to represent the numbers.

GH¢ 1,000,000 = GH¢ 800,000 + GH¢ 100,000 + GH¢ 60,000+ GH¢ 40,000

= 4,000 × GH¢ 200 + 1,000 × GH¢ 100 + 1,200 × GH¢ 50 + 2,000 × GH¢ 20

Thus, to model GH¢ 1,000,000, you need 4000 notes of the GH¢ 200

denominations, 1,000 notes of GH¢ 100 denomination, 1,200 notes of GH¢ 50 denomination and 2,000 notes of GH¢ 20 denomination.

The number of notes of a denomination depends on how the amount is expanded. For Example, the same amount of GH¢ 1,000,000 when expanded differently results in different amounts of denominations required to model it.

GH¢ 1000,000 = GH¢ 500,000 + GH¢ 300,000, + GH¢ 150,000 + GH¢ 50,000 = 2,500 × GH¢ 200 + 3,000 × GH¢ 100 + 3,000 + GH¢ 50 + 2,500 × GH¢ 20

To model GH¢ 1,000,000, you need 2,500 notes or pieces of GH¢ 200, 3,000 notes of GH¢ 100, 3000 notes of GH¢ 50 and 2,500 notes of GH¢ 20.

Exercise: 7

Determine the combination of notes required to make the given amounts. Give three different ways.

1. GH¢ 1,400,000.00
2. GH¢ 6,300,000.00
3. GH¢ 2,460,000.00
4. GH¢ 7800,000.00
5. GH¢ 900,000.00
6. GH¢ 1200,000.00
7. GH¢ 3,240,000.00
8. GH¢ 4,000,000.00
9. GH¢ 1,500,000.00
10. GH¢ 5,000,000.00

Example 2: Work out how many GH¢ 200 will make GH¢ 1,540,620,000.00

Solution: Let us first read the amount as one billion, five hundred and forty million, six hundred and twenty thousand cedis.

Expand the amount.

GH¢ 1,540,620,000.00 = 1,000,000,000 + 500,000,000 + 40,000,000 + 600,000 + 20,000

Now, find how many GH¢ 200 notes will make each by dividing each of the expanded number by 200. Add all the results together.

For GH¢ 1,000,000,000, GH¢ 200 goes in it 5,000,000 times so you need 5,000,000 notes of GH¢ 200 to get GH¢ 1,000,000,000.00

For GH¢ 500,000,000.00, GH¢ 200 goes into it 2,500,000 times so you need 2,500,000 notes of GH¢ 200 to get GH¢ 500,000,000.00

For GH¢ 40,000,000.00, GH¢ 200 goes into it 200,000 times so you need 200,000 notes or pieces of GH¢ 200 to get GH¢ 40,000,000.00

For GH¢ 600,000, GH¢ 200 goes into it 3,000 times so you need 3000 notes or pieces of GH¢ 200 to get GH¢ 600,000.00

For GH¢ 20,000.00, GH¢ 200 goes into it 100 times so you need 100 notes of GH¢ 200 to get GH¢ 20,000.00

Add all the number of GH¢ 200 notes required in each together.

= 5,000,000 + 2,500,000 + 200,000 + 3000 + 100 = 7,703,100

CHAPTER 2 COMPARING AND ORDERING WHOLE NUMBERS

STRAND 1: NUMBER

SUB-STRAND 1: Number and Numeration Systems

CONTENT STANDARD: B7.1.1.1 Demonstrate understanding and the use of place value for expressing quantities recorded as base ten numerals as well as rounding these to given decimal places and significant figures.

INDICATOR B7.1.1.1.2 Compare and order whole numbers more than1,000,000,000 and represent the comparison using ">, <, or =".

2.1 Skip Counting Forward and Backwards in 25s, 50s and 250s

In this lesson, we shall learn about skip counting.

Skip Counting Forward By 25s

In skip counting forward in 25s, numbers increase by 25. To get the next number, add 25.

Example 1: Beginning from 1,000, skip count forward by 25s to the seventh count.

Solution: We are going to repeatedly add 25 each time begining from 1000 until we reach the 7th count.

1st. 1000

2nd. Add 25 to 1,000 to get the next count. 1,000 + 25 = 1,025

3rd. Add 25 to 1,025 to get the next count. 1,025 + 25 = 1,050

4th. Add 25 to 1,050 to get the next count. 1,050 + 25 = 1,075

5th. Add 25 to 1075 to get the next count. 1,075 + 25 = 1,100

6th. Add 25 to 1100 to get the next count. 1,100 + 25 = 1125

7th. Add 25 to 1125 to get the next count 1125 + 25 = 1150

(1000, 1025, 1050, 1075, 1100, 1125 1150)

Skip Counting Backwards by 25s

In skip counting backwards, numbers keep decreasing. If we are skip counting backwards by 25s, the numbers keep decreasing by 25.

Activity:

Mention a number, say 1000.

Skip count backwards in 25s to include the sixth count.

Keep subtracting 25 to get the next number.

Subtract 25 from 1000

1,000 – 25 = 975

Subtract 25 from 975

975 – 25 = 950
Subtract 25 from 950
950 – 25 = 925
Subtract 25 from 925
925 – 25 = 900
Subtract 25 from 900
900 – 25 = 875
= 1,000, 975, 950, 925, 900, 875

Exercise: 1

Skip count forward by 25s

1. 1,200, _____, _____, _____, _____, _____
2. 1,100, _____, _____, _____, _____, _____
3. 1,315, _____, _____, _____, _____, _____
4. 1,810, _____, _____, _____, _____, _____
5. 1,550, _____, _____, _____, _____, _____
6. 1,900, _____, _____, _____, _____, _____
7. 2,450, _____, _____, _____, _____, _____
8. 1,475, _____, _____, _____, _____, _____
9. 2,010, _____, _____, _____, _____, _____
10. 1,660, _____, _____, _____, _____, _____

Exercise: 2

Fill in the skip count backwards in 25s

1. 500, _____, _____, 425, _____, 375
2. 825, _____, 775, _____, _____, 700
3. 1100, _____, _____, _____, 1000, _____
4. 1520, _____, 1470, _____, _____, _____
5. 3500, _____, _____, 3425, _____, _____
6. 4000, 3975, _____, _____, _____, _____
7. 900, _____, _____, 825, _____, _____
8. 1500, _____, _____, _____, 1400, _____
9. 6000, _____, _____, 5925, _____, _____
10. 12000, _____, _____, _____, 11,900, _____

Exercise: 3

Skip count backwards in 25s

1. 1,200, _____, _____, _____, _____
2. 700, _____, _____, _____, _____
3. 475, _____, _____, _____, _____
4. 3,200, _____, _____, _____, _____
5. 2,500, _____, _____, _____, _____
6. 1,850, _____, _____, _____, _____
7. 3,300, _____, _____, _____, _____
8. 1,110, _____, _____, _____, _____
9. 4,050, _____, _____, _____, _____
10. 5,000, _____, _____, _____, _____

Skip Counting Forward in 50s

In skip counting forward in 50s, numbers increase by 50. Add 50 to get the next number.

Example: Skip count forward in 50s to the sixth count starting from 1,000

Solution: add 50 to 1,000

1,000 + 50 = 1,050

Add 50 to 1,050

1,050 + 50 = 1,100

Add 50 to 1,100

1,100 + 50 = 1,150

Add 50 to 1,150

1,150 + 50 = 1,200

Add 50 to 1,200

1,200 + 50 = 1,250

The skip count in 50s forward starting from 1,000 is 1000, 1050, 1100, 1150, 1200, 1250 ...

Skip Counting Backwards in 50s

To skip count backwards in 50s subtract 50 from a number to get the next number.

Example: Starting from 1,000, skip count backwards in 50s to the sixth count.

Solution: Subtract 50 from 1000

1,000 – 50 = 950

Subtract 50 from 950

950 – 50 = 900

Subtract 50 from 900

900 – 50 = 850

Subtract 50 from 850

850 – 50 = 800

Subtract 50 from 800

800 – 50 = 750

Starting from 1,000, skip counting in 50s backwards is 1000, 950, 900, 850, 800, 750.

Skip Counting Forward in 250s

To skip count forward in 250s, add 250 to get the next number.

Example: Start from 1,500, skip count forward in 250s to the sixth count.

Solution: Add 250 to 1,500

1,500 + 250 = 1,750

Add 250 to 1,750

1,750 + 250 = 2000

Add 250 to 2,000

2,000 + 250 = 2,250

Add 250 to 2250

2,250 + 250 = 2,500

Add 250 to 2,500

2,500 + 250 = 2,750

Skip counting forward in 250s starting from 1500 is 1500, 1750, 2000, 2250, 2500, 2750

Skip Counting Backwards in 250s

In skip counting backwards in 25 numbers decrease by 250. Subtr 250 to get the next count.

Example: Skip count backwards in 2 to the sixth count starting from 3,0

Solution: Subtract 250 from 3,000

3,000 – 250 = 2,750

Subtract 250 from 2,750

2,750 – 250 = 2,500

Subtract 250 from 2,500

2,500 – 250 = 2,250

Subtract 250 from 2,250

2,250- 250 = 2,000

Subtract 250 from 2,000

2,000 – 250 = 1,750

Skip counting backwards in 2 starting from 3,000 results in 3,(2,750, 2,500, 2,250, 2000, 1,750...

Exercise: 6

Skip count forward in 250s

1. 1,000, _____, _____, _____, _____, _____
2. 1,030, _____, _____, _____, _____, _____
3. 2,100, _____, _____, _____, _____, _____
4. 1,800, _____, _____, _____, _____, _____
5. 1,700, _____, _____, _____, _____, _____
6. 3,000, _____, _____, _____, _____, _____
7. 4,500, _____, _____, _____, _____, _____
8. 2,430, _____, _____, _____, _____, _____
9. 1,720, _____, _____, _____, _____, _____
10. 3,750, _____, _____, _____, _____, _____

2.2 Numbers 500,000 More or Less Than Given 8-Digit or 9-Digit Numb

Before we look at 8-digit and 9-digit numbers that are 500,000 more or l than a number, let us revise the place value of numbers.

Look at the place value chart below.

The number represented is 2,368, 437, 945

It is read as two billion, three hundred and sixty-eight million, four hundred thirty-seven thousand, nine hundred and forty-five.

B	HM	TM	M	HT	TTh	Th	H	T	O
2	3	6	8	4	3	7	9	4	5

The value of each digit depends on its position in the number.

From the extreme left:

The place of the first digit, 2, is Billions. Its place value is 2 × 1,000,000,000 = 2,000,000,000

The place of the next digit, 3 is hundred millions.

Its place value is 3 × 100,000,000 = 300,000,000

The place of the next digit, 6, is Ten millions.

Its place value is 6 × 10,000,000 = 60,000,000

The place of the next digit, 8, is millions.

Its place value is 8 × 1,000,000 = 8,000,000

The place of the next digit, 4, is Hundred thousands.

Its place value is 4 × 100,000 = 400,000

The place of the next digit, 3, is Ten Thousands.

Its place value is 3 × 10,000 = 30,0

The place of the next digit, 7, Thousands.

Its place value is 7 × 1,000 = 7,000

The place of the next digit, 9, Hundreds.

Its place value is 9 × 100 = 900

The place of the next digit, 4 is Tens

Its place value is 4 × 10 = 40

The place of the last digit, 5 is One

Its place value is 5 × 1 = 5

Exercise: 9

Underline the digit in the millions pl

1. 63,490,831
2. 311,563,297
3. 421,532,983
4. 2,731,153,298
5. 600,831,572
6. 2,115,390,860
7. 439,873,291
8. 4,387,321
9. 36,293,481

Exercise: 10

Write the place value of the underlined digit.

Example: 4632,3<u>8</u>7,241

Solution: The underlined digit is 8. Its place is Ten thousand. Its place value is $8 \times 10{,}000 = 80{,}000$

1. 247,<u>3</u>28,291 ⟶ _____
2. 116380<u>2</u>94 ⟶ _____
3. 25,328,61<u>3</u> ⟶ _____
4. 4<u>2</u>9,600,173 ⟶ _____
5. <u>2</u>,865,324,958 ⟶ _____
6. <u>2</u>54,321,783 ⟶ _____
7. 3,4<u>2</u>9,632 ⟶ _____
8. 8,<u>7</u>63290 ⟶ _____
9. 2<u>1</u>1,538,973 ⟶ _____
10. 1,546,387,<u>2</u>93 ⟶ _____

Numbers that are 100,000 More or Less

To find a number that is 100,000, more than a given number, identify the digit in the Hundred thousands place.

Add 1 to the digit in the hundred thousands place.

Maintain all the other digits.

Example: What number is 100,000 more than 26,348,125?

Solution: Put the digits in a place value chart to identify the digit in the hundred thousands place.

TM	M	HTh	Tth	Th	H	T	O
2	6	3	4	8	1	2	5

The digit in the Hundred thousands place is 3.

Add 1 to 3 (1 + 3 = 4).

Rewrite the number by changing only the digit in the Hundred thousands place.

26,448,125 is 100,000 more than 2,634,125.

Exercise: 11

Write the number that is 100,000 more

1. 23,431,261 ⟶ _____
2. 4,342,616 ⟶ _____
3. 89264301 ⟶ _____
4. 43,841,156 ⟶ _____
5. 311,263,604 ⟶ _____
6. 243,147,419 ⟶ _____
7. 382,630,115 ⟶ _____
8. 86,139,235 ⟶ _____
9. 430,321,987 ⟶ _____
10. 9,232,487,308 ⟶ _____

100,000 Less

To find the number that is 100,000 less than a given number;

Identify the digit in the hundred thousand place.

Subtract 1 from the digit.

Maintain all the other digits in the number.

Example: What number is 100,000 less than 26348125?

Solution:

Tm	M	HTh	TTh	Th	H	T	O
2	6	3	4	8	1	2	5

The digit in the hundred thousands place is 3.

Subtract 1 from 3 to get 2.

Rewrite the number by changing 3 to 2 and maintain all the other digits.

26,248,125 is 100,000 less than 26,348,125.

Exercise: 12

What number is 100,000 less than the given number?

1. 28,427,308
2. 100,087,291
3. 4,321,116,721
4. 51,329,764
5. 638,749,210
6. 21,067,892
7. 311,586,329;
8. 114,326,528
9. 437,920,863
10. 43,286,398

Numbers 500,000 More Than or Less than a Given 8-digit or 9-digit Numbe

Example: Find the number that is 500,000 more than 1,295,200,000 and t number that is 500,000 less than 1,295,200,000.

Solution: Add 5 to the digit that is in the hundred thousands place to get t number that is 500,000 more than.

The digit in the hundred thousands place is 2. Add 5 to 2 to get 7.

Rewrite the number by maintaining all the digits. Change the 2 in the hundr thousands place to 7.

1,295,700,000 is 500,000 more than 1295,200,000.

Subtract 5 from the digit in the hundred thousands place. The digit there is 2.

(2-5) Since 2 is less than 5, borrow 1 from the digit next to its left.

The 2 now becomes 12. Subtract 5 from 12 to get 7. Because 1 was taken awa from 5, it is now 4. Therefore, 1,294,700,000 is 500,000 less than 1295,200,000

2.3 Comparing Whole Numbers

In this lesson, we shall use phrases such as "is equal to", "is greater than" and "is less than" and their respective symbols, "=", ">" and "<" to compare any two numbers.

Study the symbols and their meanings

"=" means "is equal to"

"<" means "less than" or smaller than.

">" means "greater than" or bigger than.

For < and > symbols, the arms are always open towards the greater number.

For Example, 9 > 5 or 5 < 9. In both cases, the arm of the symbols are open towards the bigger number, 9.

Exercise: 15

Circle the bigger number.

1. 28 < 35
2. 431 > 169
3. 212 < 414
4. 1293 < 3649
5. 38 < 84
6. 29 > 14
7. 63 < 97
8. 6 > 2

Comparing Numbers with Different Number of Digits

In comparing two numbers that have different number of digits, the number which has more digits is greater.

Example: 2,328,437,219 and 20,298,639

2,328,437,219 is a 10-digit number.

20,298,639 is an 8-digit number.

2,328,437,219 is greater than 20,298,639

2,328,437,219 > 20,298,639

This also means that 20,298,639 is lesser than 2,328,437,219.

When two numbers are equal, it means they are the same.

Example: 36,292,438,600 and 36,292,438600.

36,292,438,600 is equal to 36,292,438,600

36,292,438,600 = 36,292,438,600

Exercise: 16

Use the appropriate phrase ("less than", "is equal to" and "greater than") to compare the numbers.

1. 1,364,866,208 _____ 932,866,404
2. 38,211,498 _____ 122,300,115
3. 45,600,200 _____ 45,600,200
4. 3,286,432,200 _____ 28,997,698
5. 200,439,000 _____ 1,286,300
6. 115900,212 _____ 115,900,212
7. 2,428,115,306 _____ 37,115,293,208
8. 1,367,287 _____ 425,872,900
9. 40,000,186 _____ 40,000,186
10. 372,900,800 _____ 13,952,700

Exercise: 17

Insert the correct symbol (<, = and >) to compare the numbers

1. 631,400,291 _____ 68,296,334
2. 4,900,270,063 _____ 34,867,213
3. 592,800 _____ 4,632,946,004
4. 43,950,067 _____ 43,950,067
5. 21,286,000 _____ 2,128,600
6. 596,314,276 _____ 64,008,379
7. 4,938,004 _____ 39,683,427
8. 5,293,400 _____ 46,315,300

Comparing Numbers That Have the Same Number of Digits

If the numbers to be compared contain the same number of digits, compare them digit by digit. Start from the extreme left.

Example 1: Compare 43,875,069 and 61,394,570.

Solution: Both numbers are 8-digit numbers. They contain the same number of digits.

Put the numbers in a place value chart to identify the place and place value of each digit.

TM	M	HTh	TTh	Th	H	T	O
4	3	8	7	5	0	6	9

40,000,000

TM	M	HTh	TTh	Th	H	T	O
6	1	3	9	4	5	7	0

60,000,000

Compare the digit in the Ten million Place of both numbers. The number which has a bigger digit or value is the greater number. From the place value charts above, 4 and 6 are the digits found in the Ten Million place.

60,000,000 is bigger than 40,000,000. Therefore, 61,394,570 is greater than 43,875,069. This also means that 43,875,069 is less than 61,394,570.

61,394,570 > 43,875,069

43,875,069 < 61,394,570

Example 2: Which is less? 839,116,278 and 924,642,156?

Solution: Both are 9-digit numbers

Expand them and compare the value of the digits in the extreme left (Hundred millions place).

839,116,278 = 800,000,000 + 30,000,000 + 9,000,000 + 100,000 + 10,000 + 6,000 + 200 + 70 + 8

924,642,156 = 900,000,000 + 20,000,000 + 4,000,000 + 600,000 + 40,000 + 2,000 + 100 + 50 + 6.

Comparing the value of the first digits in the extreme left, 900,000,000 is bigger than 800,000,000. Therefore, 924,642,156 is greater than 839,116,278

This also means that 839,116,278 is less than 924,642,156.

839,116,278 < 924,642,156

A number is equal to another if the number is the same as the other number.

For example, 291,280,400 is equal to 291,280,400. Both are the same.

Exercise: 18

Use "less than", "is equal to" and "greater than" to compare the numbers.

1. 367,283,112 _____ 438,115,362
2. 42,118,117 _____ 21,346,998
3. 54,138,496 _____ 73,158,922
4. 24,367,291 _____ 24,367,291
5. 127,286,113 _____ 343,211,864
6. 42,318,963 _____ 32,115,989
7. 213,426,943 _____ 615,272,438
8. 923,118,247 _____ 812,443,981
9. 43,489,315 _____ 55,631,149
10. 33,864,325 _____ 21,432,861
11. 423,195,321 _____ 423,195,321
12. 729,419,247 _____ 835,351,982

Exercise: 19

Put in '<','>' or = to compare the given numbers.

1. 43,286,314 _____ 28,111,420
2. 66,315293 _____ 42,143,927
3. 38,411,545 _____ 93,428,956
4. 24,314,571 _____ 63,213,921
5. 83,215,619 _____ 96,243,156
6. 425,397,141 _____ 321,381,525
7. 211,514,384 _____ 343,863,712
8. 51,385,418 _____ 43,415,634
9. 11,506,324 _____ 11,506,324
10. 414,396,400 _____ 139,861,292

If the digits in the extreme left a the same move to the next digits a compare them.

Example 1: Which is less?

26,392,154 and 29,428,015

Solution: In 26,392,154, the digit in t extreme left which is the Ten milli place is 2.

In 29,428,015, the digit in the extrem left which is Ten millions place is also They are the same.

Move to the next digit and compa them.

2 6 392154
2 9 428015

The next digits are 6 and 9.

9 is greater than 6. This means th 29,428,015 is greater than 26,392,15

29,428,015 > 16,392,154

Exercise: 20

Use the symbols <, > to compare th numbers.

1. 42,963,841 _____ 48,115,630
2. 935,391,406 _____ 815,419,32
3. 158,639,201 _____ 134,931,43
4. 386,781,421 _____ 313,925,13
5. 661,393,021 _____ 604,324,21
6. 71,223,814 _____ 79,439,861
7. 213,847,600 _____ 243,286,11
8. 552,312,814 _____ 501,263,42
9. 26,321,598 _____ 26,728,341
10. 921,328,745 _____ 921,417,87

2.4 2.4 Identifying, Reading and Writing Numbers in Given Positions

Let us revise number words 0-19, multiples of 10 up to 90, multiples of 100 up to 900, multiples of 1000 up to 9000 and so on.

Activity:

Read and write them.

Number	Number word
0	zero
1	one
2	two
3	three
4	four
5	five
6	six
7	seven
8	eight
9	nine

Number	Number word
10	ten
11	eleven
12	twelve
13	thirteen
14	fourteen
15	fifteen
16	sixteen
17	seventeen
18	eighteen
19	nineteen

Number	Number word
10	ten
20	twenty
30	thirty
40	forty
50	fifty
60	sixty
70	seventy
80	eighty
90	ninety

Number	Number word
100	one hundred
200	two hundred
300	three hundred
400	four hundred
500	five hundred
600	six hundred
700	seven hundred
800	eight hundred
900	nine hundred

Number	Number word
1000	one thousand
2000	two thousand
3000	three thousand
4000	four thousand
5000	five thousand
6000	six thousand
7000	seven thousand
8000	eight thousand
9000	nine thousand

Number	Number word
1000000	one million
2000000	two million
3000000	three million
4000000	four million
5000000	five million
6000000	six million
7000000	seven million
8000000	eight million
9000000	nine million

Exercise: 21

Write the number word for each.

1. 300 _____
2. 50 _____
3. 3,000 _____
4. 60,000 _____
5. 90,000 _____
6. 2,000,000 _____
7. 3,000,000,000 _____
8. 18 _____
9. 300,000 _____
10. 70,000,000,000 _____

Note: To read and write numbers, start from the extreme left.

Activity:

Read and write say eight-digit numbers by breaking it down.

Example 1: 24,382,940. This number is broken down into three 'parts' using commas (,) to separate them.

Start from the extreme left, read and write it as:

Twenty-four million, three hundred and eighty-two thousand, nine hundred and forty.

Example 2: 63,008,641

It is written as sixty-three million, eight thousand, six hundred and forty-one.

Example 3: 4,239,624,718

It is four billion, two hundred and thirty-nine million, six hundred and twenty-four thousand, seven hundred and eighteen.

Exercise: 22

Write these numbers in words.

1. 2,342,637
2. 127,384,267
3. 20,000,000
4. 420,863,914
5. 32,243,316
6. 5,362,8
7. 908,264
8. 143126
9. 40,083,
10. 32,436,

Exercise: 23

Write these number words in figur

1. Six hundred and forty-
thousand, two hundred and ten. _____
2. Two billion, eight hundred
twelve million, three hundred and six
three thousand, five hundred. _____
3. Thirty-six million. _____
4. Sixteen thousand, four hundr
and seventy-five. _____
5. Fifty-nine million, three hundr
and eighty thousand. _____
6. Nineteen thousand, thre
hundred and eleven. _____

Identifying Numbers Around a Given Number in a Number Chart

Use the number chart below to identify the numbers around 2,348,200.

27,115,300	98,721,340	51,539,280	2,386,432310
292,348	2,348,200	63,432,830	14,373,800
429630	363,516	1,153,216,380	31,350,670

The number above 2,348,200 is 98,721,340. It is written as ninety-eight million, seven hundred and twenty-one thousand, three hundred and forty.

The number below 2,348,200 is 363,516. It is written as Three hundred and sixty-three thousand, five hundred and sixteen.

The number to the right of 2,348,200 is 63,432,830. It is written as sixty-three million, four hundred and thirty-two thousand, eight hundred and thirty.

The number on the left of 2,348,200 is 292,348.

It is written as two hundred and ninety-two thousand, three hundred and forty-eight.

Exercise: 24

Write the number around 21,163,906 in words.

20,014,313	15392700	115,392,600	6,310,729
138,121	42,327,110	21,163,906	206,300
414,300,263	1315,163,921	313,928,060	24,321,117

Exercise: 25

Skip count backwards in 50s.

1. 1,600, _____, _____, _____, _____
2. 1150, _____, _____, _____, _____
3. 2650, _____, _____, _____, _____
4. 3950, _____, _____, _____, _____
5. 13600, _____, _____, _____, _____
6. 349,000, _____, _____, _____, _____
7. 215,300, _____, _____, _____, _____
8. 1500, _____, _____, _____, _____
9. 1000, _____, _____, _____, _____
10. 600, _____, _____, _____, _____

CHAPTER 3 ROUNDING OFF WHOLE NUMBERS

STRAND 1: NUMBER

SUB-STRAND 1: Number and Numeration Systems

CONTENT STANDARD: B7.1.1.1 Demonstrate understanding and the use of place value for expressing quantities recorded as base ten numerals as well as rounding these to given decimal places and significant figures.

INDICATOR B7.1.1.1.3 Round (off, up, down) whole numbers more than 1,000,000,000 to the nearest hundred-thousand, ten-thousands, thousands, hundreds and tens.

3.1 Rounding off Whole Numbers Up To 1,000,000,000.

To be able to round off whole numbers, you need to identify the place of each digit in the number.

Example: 3,426,879,105

Let us put the number on the place value chart to help us find the place and place value of each digit. The value of a digit depends on its place on the chart.

Billions	Hundred millions	Ten millions	Millions	Hundred thousands	Ten thousands	Thousands	Hundreds	Tens	Ones
3	4	2	6	8	7	9	1	0	5

From the chart, the place of the digit, 6 is millions. Its place value is 6,000,000 or six million. The place of the digit, 3 is billions. Its place value is 3,000,000,000 or 3 billion.

What is the place of the rest of the digits?

Exercise: 1

Write the place and place value of the underlined digit.

1. 1,639,086
2. 5,347,8618
3. 14,893,817
4. 26,498,257,384
5. 432,986,500
6. 708,427
7. 2,664,532
8. 19,426,375,140

Rounding to the nearest Hundred Thousand

To round off a whole number to the nearest hundred thousand, check the digit in the Ten thousands place. If the digit there is less than 5, write the number by replacing each digit in the Ten thousands, thousands, hundreds, tens and Ones places each with 0 (zero).

Example 1: Round 4,812,5 3 9,764 to the nearest hundred thousand.

B	HM	TM	M	HTh	TTh	Th	H	T	O
4	8	1	2	5	3	9	7	6	4

The digit in the Ten thousand place is 3. We know that 3 is less than 5. Replace the digits 3, 9, 7, 6, 4 each with 0 and maintain the other digits.
So 4,812,539,764 to the nearest hundred thousand is 4,812,500,000.

Exercise: 2

Round to the nearest hundred thousand.

1. 2,436,142,380
2. 638,103,765
3. 10,289,816,421
4. 5,117,325,009
5. 4,218,901,531
6. 8,429,335,260
7. 71,867,325,144
8. 116,338,346,628
9. 1,327,415,320
10. 7,488,307,455

If the digit in the Ten thousands place is 5 or more, add 1 to the digit in the Hundred thousands place. Replace each digit in the Ten thousands, thousands, hundreds, tens and Ones with 0.

Example 2: Round 391,284,567 to the nearest hundred thousand.

Identify the digit in the Ten thousands place.
391,2⑧4,567
The digit in the Ten thousands place is 8.
8 is greater than 5. Add 1 to the digit in the Hundred thousands place and replace the digits in the ten thousands, thousands, hundreds, tens and ones places each with 0.
The digit in the hundred thousands place is 2 and 2 + 1 = 3.
391,284,567 to the nearest hundred thousand is 391,300,000.

Exercise: 3

Round to the nearest hundred thousa

1. 2,641,866,230
2. 34,928,151,281
3. 527,364,489
4. 7,341,886,308
5. 2,261,591,267
6. 40,473,269
7. 28,331,490,6
8. 17,291,364,1
9. 31,361,284,1
10. 366,461,320

Example 3: Round 1,126,357,948 to t nearest hundred thousand.
The digit in the Ten thousand place 5 so add 1 to the digit in the hundr thousands place.
3 + 1 = 4. Replace digits from T thousands to Ones places each with 1,126,357,948 to the nearest hundr thousand is 1,126,400,000.

Exercise: 4

Round to the nearest hundred.

1. 2,486,354,211
2. 17,294,251,366
3. 10,116,856,420
4. 3,225,255,375
5. 8,438,754,280
6. 5,364,451,3
7. 341,950,075
8. 1,957,305,0
9. 2,212,458,9
10. 126,458,36

Exercise: 5

Round to the nearest hundred thousan

1. 41,364,586,214
2. 1,215,363,115
3. 28,365,206,430
4. 7,532,318,411
5. 21,364,857,410
6. 34,321,537,21
7. 2,128,399,420
8. 60,043,234,26
9. 627,422,128
10. 114,159,367

Rounding to the Nearest Ten thousand

We have learnt about how to find the place of digits in a number. We have also learnt about how to round off whole numbers to the nearest hundred thousand.

Let us now learn how to round off whole numbers to the nearest ten thousand.

To round off a whole number to the nearest ten thousand, check the digit in the thousands place.

If the digit in the thousands place is less than 5, replace each digit in the thousands, hundreds, tens and Ones place with 0.

Example: Round 4,364,824,265, to the nearest ten thousand.

In 4,36 4,82 ④ ,265, the digit in the thousand place is 4 which is less than 5. Rewrite the number by replacing the thousands, hundreds, tens and ones digits (4,265) each with 0.

4,364,824,265 to the nearest ten thousand is 4,364,820,000.

Exercise: 6

Round to the nearest ten thousand.

1. 2,426,392,140
2. 34,165,114,300
3. 16,385,210,365
4. 532,863,524
5. 5,440,341,263
6. 500,861,230
7. 4,662,733,469
8. 9,287,244,216
9. 6,315,811,421
10. 37,365,422,399

If the digit in the thousands place is 5 or more, add 1 to the digit in the Ten thousand place. Replace the digits in the thousands, hundreds, tens and ones places each with 0.

Example: Round 4,396,127,420 to the nearest ten thousand.

The digit in the thousands place is 7 which is greater than 5. Add 1 to the digit in the digit in the Ten thousands place. 2 + 1 = 3.

Replace 7420 each with 0.

4,396,127,420 becomes 4,396130,000 to the nearest ten thousand.

Exercise: 7

Round the following to the nearest ten thousand.

1. 5,298,639,508
2. 16,115,758,312
3. 58,725,366,419
4. 7,225,435,280
5. 6,647,347,215
6. 540,256,385
7. 475,937,210
8. 5,632,115,610
9. 2,865,438,115
10. 92,995,467,435

Exercise: 8

Round to the nearest ten thousand.

1. 2,639,275,433
2. 1,467,380,075
3. 2,516,672,998
4. 44,117,200,831
5. 3,642,479,900
6. 4,111,736,428
7. 3,265,487,395
8. 141,367,283
9. 357,286,329
10. 364,113,236,309

Rounding Whole Numbers to the Nearest Thousands

To round off a whole number to the nearest thousands, check the digit in the hundreds place.

If the digit in the hundreds place is less than 5, replace the digits in the hundreds, tens and ones places each with 0. Maintain the rest of the digits.

Example: Round 6,348,267,254 to the nearest thousand.

The digit the hundreds place is 2 and it is less than 5. Replace 254 each with 0

and maintain the rest of the digits.
6,348,267,254 becomes 6348,267,000 to the nearest thousand.

Exercise: 9

Round to the nearest thousand.

1. 631,427,380
2. 5,247,419,187
3. 37,286,319,300
4. 151,263,435
5. 4,128,395,087
6. 2,395,631,340
7. 21,314,247,115
8. 67,237,408
9. 300,267
10. 493,367,429

If the digit in the hundreds place is 5 or more, increase the digit in the thousands place by 1, replace the hundreds, tens and ones digit each with 0. Maintain any other digit.

Example: Round 5,387,267,935 to the nearest thousand.

The digit in the hundreds place is 9 and it is greater than 5.
Add 1 to the digit in the thousands place (7 + 1 = 8).
5,387,267,935 becomes 5,387,268,000 to the nearest thousand.

Exercise: 10

Round to the nearest thousand.

1. 2,463,815
2. 63,911,421,730
3. 51,063,145,560
4. 129,328,635
5. 4,286,154,930
6. 2,111,463,844
7. 334,429,645
8. 9,312,806,942
9. 4,987,123,721
10. 63,485,560

Rounding to the nearest Hundred

To round a whole number to the nearest hundred, check the digit in the Tens place. If the digit in the Tens place is less than 5, replace it with 0. Replace the digits in the Ones place too with 0. Maintain the rest of the digits.

Example: Round 42,863,512 to th nearest hundred.

The digit in the Tens place is 1. It is le than 5.
Replace the Tens and Ones digits eac with 0.
42,863,512 to the nearest hundred 42863500.

Exercise: 11

Round the following to the neare hundred.

1. 315,863,942
2. 315,347,511
3. 6,394,225
4. 1,493,831
5. 541,723,915
6. 483,432
7. 5,157,320
8. 275,153,820
9. 41,139,607
10. 831,972,643

If the digit in the Tens place is 5 or mor add 1 to the digit in the hundreds plac Replace the digits in Tens and On place each with 0. Maintain the rest the digits.

Example: Round 26,311,537 to th nearest hundreds.

In 26,311,537 the digit in the Tens plac is 3. It is less than 5.
26,311,537 to the nearest hundreds 26311500.

Exercise: 12

Round to the nearest hundreds.

1. 20,063,742
2. 38,115,311
3. 249,873,514
4. 1,156,324,731
5. 4,211,638,114
6. 27,428,745
7. 1,153,916,715
8. 4,463,158,127
9. 3,312,896,341
10. 487,650,708

Look at this number; 4,638,425,702.
It is 4,638,400,000 to the nearest hundred thousand.
It is 4,638,430,000 to the nearest ten thousands. It is 4638426000 to the nearest thousand.

Exercise: 13

Complete the table.

Number	To the nearest hundred thousands	To the nearest ten thousands	To the nearest thousands	To the nearest hundreds
43,863,847				
206,384,294				
52,911,386,741				
328,634,908				
152,474,193				
1,863,945,721				
42,652,238,115				
3,723,834,996				

3.2 Difference Between 'Round Up' and 'Round down' Concepts

'Round down'

Let us use a number like 64,325 as Example. Round it to the nearest thousand.
64325 is rounded down to nearest thousand as 64,000.
64000 is less or smaller than 64, 325 and we say it is rounded down to the nearest thousand. It may be applicable in situations such as finding how many people can fit in a bus. If half of a person fits but not the other half, then the whole person does not fit.
For Example, if the space in a bus can take 54.5 passengers. It is rounded down to 54 passengers.

'Round up'

64 325 is rounded up to the nearest thousand as 65000.
65000 is greater than 64325 so we say it is rounded up to the nearest thousand.
In real life, when you are paying for an item, it is usually rounded up.
For Example, a book which costs GH¢6.99 may be rounded up to GH¢7.00.
Study the table below about round up and round down.

2,846,655	Round up	Round down	Round off
To the nearest thousand	2,847,000	2846,000	2847000
To the nearest ten thousand	2,850,000	2840,000	2850,000
To the nearest hundred thousand	2,900,000	2800,000	2800,000

Exercise: 14

In each of the following, indicate whether the number is rounded down o rounded up to the nearest ten thousand.

1. 42,936,580 → 42,940,000
2. 61,639,920 → 61,630,000
3. 147,286 → 150,000
4. 53,928,308 → 53,920,000
5. 439,874,132 → 439,870,000
6. 361,817,210 → 361,820,000
7. 514,786,329 → 514,780,000
8. 4,318,564 → 4,310,000
9. 212,247,419 → 212,250,000
10. 3,005,863,921 → 3,005,870,0

Exercise: 15

Complete the table below.

236,428,632	Round down	Round up	Round off
To the nearest hundred			
To the nearest thousand			
To the nearest ten thousand			
To the nearest hundred thousand			

3.3 Expressing Whole Numbers in Significant Figures

When a number is expressed in significant figures, it is rounded to the mo important figure in the number. For Example, a city with a population of 21,3 could be said to have a population of about 20,000.

Thus, the city's population is rounded to one significant figure.

To round a whole number to say 2 significant figures, look at the second no zero digit.

Check the digit after second non-zero digit. If it is 5 or more, increase th second non-zero digit by 1.

If it is less than 4, keep the second and first non-zero digit the same.

Replace any other digit each with 0.

Example: Round 42,768 to 1,2,3 and 4 significant figures.

④ ,2768 to 1 significant figure is 40,000.

4 ② 768 to 2 significant figures is 43,000.

42 ⑦ 68 to 3 significant figures is 42,800

427 ⑥ 8 to 4 significant figures is 42,770

Exercise: 16

Complete the table.

	To 5 significant figures	To 4 significant figures	To 3 significant figures	To 2 significant figures
6,321,146				
9,317,864				
24,215,875				
33,446,617				
857,265,321				

CHAPTER 4 DECIMALS

STRAND 1: NUMBER

SUB-STRAND 1: Number and Numeration Systems

CONTENT STANDARD: B7.1.1.1 Demonstrate understanding and the use of place value for expressing quantities recorded as base ten numerals as well as rounding these to given decimal places and significant figures.

INDICATOR B7.1.1.1.4 Round decimals to the nearest tenth, hundredth, thousandths, etc. E.g.1 Round (off, up and down) decimals to the nearest tenths, hundredths, thousandths.

In the previous chapter, we learnt about how to round off whole numbers.

In this Chapter, we shall continue to learn about rounding decimals to the nearest tenths, hundredths, thousandths.

4.1 The Place Value of Digits in a Decimal Number

Study the place value chart below.

The actual value of a digit depends on its position in the number.

Millions	Hundred thousands	Ten thousandths	Thousands	Hundreds	Tens	Ones	Tenths	Hundredths	Thousandths	Ten thousandths	Hundred thousandths	Millionths
M	HTh	TTh	Th	H	T	O	t	h	th	tth	hth	m
4	2	6	9	3	2	5	3	2	9	1	4	7

The number is read as four million, two hundred and sixty-nine thousand, three hundred and twenty five point three two nine one four seven.

Note that after the decimal point, the digits are read separately.

Let us look at the value of each digit in the number 4,269,325.329147.

The place of the first digit from left, 4 is millions.

Its place value $4 \times 1{,}000{,}000 = 4{,}000{,}000$.

The place of the next digit, 2 is Hundred Thousands.

Its place value is $2 \times 100{,}000 = 200{,}000$

The place of 6 is Ten thousands. Its place value is $6 \times 10000 = 60{,}000$

The place of 9 is Thousands. Its place value is $9 \times 1000 = 9000$

Example 2: Row "8"

It tells you that when 8 is multiplied by 1, you get 8, by 2 you get 16, by 3 you get 24, by 4 you get 32, etc.

This row can be used to generate the 8 Times table as shown below.

Its place is tenths. Its place value is

$$3 \times \frac{1}{10} = \frac{3 \times 1}{10} = \frac{3}{10} = 10\overline{)30}\ 0.3$$

$$-\ \frac{30}{00}$$

$$= 0.3$$

Alternatively, $\frac{1}{10} = 0.1$

Multiply 3 by 0.1

$$3 \times 0.1 = 0.3$$

The place of 2 is hundredths.

$$2 \times \frac{1}{100} = 2 \times 0.01 = 0.02$$

The place of 9 is thousandths.

Its place value $= 9 \times \frac{1}{1000} = 9 \times 0.001 = 0.0009$

The place of 1 is ten thousandths.

The place value is $1 \times \frac{1}{10,000} = 1 \times 0.0001 = 0.0001$

The place of 4 is hundred thousandths.

Its place value is $4 \times \frac{1}{100,000} = 4 \times 0.00001 = 0.00004$

The place of 7 is millionths.

Its place value is $7 \times \frac{1}{1,000,000} = 7 \times 0.000001 = 0.000007$

In this unit, our focus is on the decimal part of the place value chart.

Exercise: 1

Underline the hundredths in the following numbers.

1. 0.6384
2. 3.4217
3. 866.4399
4. 2.3344
5. 810.3667
6. 4.21158
7. 0.6985
8. 0.1421
9. 0.3215
10. 0.88667

Exercise: 2

Write the place value of the underlined digits.

1. 2.<u>5</u>63
2. 3.411<u>6</u>
3. 0.06<u>7</u>2
4. 0.8529<u>5</u>
5. 0.1<u>1</u>56
6. <u>3</u>7.415<u>6</u>
7. 20.8066<u>7</u>
8. 11<u>4</u>.3215
9. 100.<u>6</u>329
10. 154.217<u>8</u>

Exercise: 3

Underline the thousandths.

1. 2467.2831
2. 3294.3294
3. 0.83351
4. 24.63221
5. 9.3415
6. 0.8315
7. 0.2729
8. 0.3134
9. 0.4221
10. 16.1616

4.2 Rounding Off, Up and Down Decimals To the Nearest tenths, hundredths

To the Nearest tenths.

To round a decimal number to the nearest tenths, check the digit in the hundredths place.

If the digit in the hundredths place is between 0 and 4 that is less than 5, replace the hundredths, thousandths etc each with a 0 or ignore all these digits. Write the number up to the tenths place.

Note that the decimal point does not move.

Example: Round these numbers to the nearest tenth.

a. 61.237
b. 0.8446

Solution:

a. 61.237. The digit in the hundredths place is 3. We know that 3 less than 5 so write all the digits on the left up to the tenths place digit and ignore the rest.

61.237 to the nearest tenths is 61.2

b. 0.8446 to the nearest tenths. The digit in the hundredths place is 4.
But 4 is less than 5.

0.8446 to the nearest tenth is 0.8.

Exercise: 4

Round the decimal numbers to the nearest tenths.

1. 0.3115
2. 65.143
3. 891.6205
4. 115.3378
5. 110.123
6. 78.4115
7. 101.24
8. 66.4215
9. 44.444
10. 200.8145

However, in rounding off decimals to the nearest tenths, if the digit in the hundredths place is 5 or more, add 1 to the digit in the tenths place.

Example: Round to the nearest tenths

a. 42.486 b. 360.256

Solution:

a. 42.486. The digit in the hundredths place is 8. 8 is greater than 5 so add 1 to the digit in the tenth place (4 + 1 = 5).

Change the 4 to 5.

42.486 to the nearest tenths is 42.5.

b. 360.256. The digit in the hundredths place is 5.

5 is equal to 5. Add 1 to the digit in the tenths place (2 + 1 = 3).

Change the 2 to 3.

360.256 to the nearest tenths is 360.3

Exercise: 5

Round these numbers to the nearest tenths.

1. 64.172
2. 0.896
3. 0.072
4. 32.153
5. 89.664
6. 52.277
7. 108.481
8. 2114.691
9. 423.650
10. 53.177

To the nearest hundredths

To round a decimal number to the nearest hundredths, check the digit in the thousandths place. If the digit is less than 5, maintain the digits up to the hundredths place. If the digit in the thousandths place is greater than or equal to 5, add 1 to the digit in the hundredths place.

Example: Round to the nearest hundredths.

a. 46.1438

b. 24.7267

c. 300.1256

Solution:

a. In 46.1438, the digit in the thousandth place is 3 which is less than 5. Write the number by maintaining up to the hundredths digit and ignore the rest.

46.1438 to the nearest hundredths is 46.14

b. In 24.7267, the digit in the thousandths place is 6 which is greater than 5. Add 1 to the digit in the hundredths place (2 + 1 = 3).

Change the digit in the hundredths place from 2 to 3.

24.7267 to the nearest hundredth is 24.73

c. In 300.1256, the digit in the thousandths place is 5 which is equal to 5.

Add 1 to the digit in the hundredths place (2 + 1 = 3)

300.1256 to the nearest hundredths is 300.13

Exercise: 6

Round the following decimal numbers to the nearest hundredths.

1. 46.001
2. 0.5639
3. 0.1169
4. 0.2195
5. 508.7293
6. 4.2738
7. 8.4115
8. 200.06781
9. 5050.8585
10. 16.3989
11. 24.9758
12. 11.1158

To the nearest thousandths

To round a decimal number to the nearest thousandths, check the digit in the ten thousandth place.

If it is between 0 and 4, maintain all the digits in the number up to the thousandth and ignore the rest.

If the digit in the ten thousandths place is 5 or more, add 1 to the digit in the thousandths place.

Example: Round these numbers to the nearest thousandths.

a. 0.32723

b. 4.21651

c. 87.3248

Solution:

a. In 0.32723, the digit in the ten thousandths place is 2.

2 is less than 5. Write the number up to the thousandths place and ignore the rest of the digits.

0.32723 to the nearest thousandth is 0.327

b. In 4.21651, the digit in the ten thousandths place is 5 so add 1 to the digi
in thousandths place (6 + 1 = 7). Replace the 6 in the thousandths place with
4.21651 to the nearest thousandth is 4.217

c. 87.3248, the digit in the ten thousandth place is 8 which is greater than
so add 1 to 4 in the thousandths place (4 + 1 = 5). Change the 4 in thousandt
place with 5. Therefore, 87.3248 to the nearest thousandths is 87.325

Exercise: 7

Round the numbers to the nearest thousandths.

1. 0.8370
2. 4.26315
3. 0.8894
4. 0.1597
5. 0.0085
6. 0.2445
7. 0.8159
8. 24.7213
9. 371.4166
10. 0.8815

Exercise: 8

Complete the table by rounding to the nearest tenths, hundredths ar
thousandths.

Number	Nearest tenths	Nearest hundredths	Nearest thousandths
0.060536			
2.411120			
510.16670			
0.99996			
0.25161			
0.1457			
0.88163			
24.32321			
50.1159			
101.9217			
102.5315			
108.6637			

Difference Between Rounding Down and Rounding Up

Example: Round 0.82 to the nearest tenth.

Solution: The digit in the hundredths place is 2 which is less than 5.

Write the number up to the tenth place and ignore the rest or replace the 2 with 0.

0.82 to the nearest tenth is 0.80

0.82 is said to be rounded down to the nearest tenth which is 0.80

Example: Round 0.86 to the nearest tenth.

Solution: The digit in the hundredths place is 6. We know that 6 is more than 5 so add 1 to the digit in the tenths place (8 + 1 = 9). Replace the 6 with 0.

0.86 to the nearest tenths is 0.9

0.86 is said to be rounded up to the nearest tenth which is 0.90

0.25813	Round Down	Round Off	Round Up
nearest tenth			
nearest hundredths			
nearest thousandths			

4.3 Expressing Decimal Numerals to Given Significant and Decimal Places

Significant figures are the most important or interesting digits in a number. Study the basic rules for determining significant figures.

1. All non-zero digits in a number are significant.

For example, 38 has two significant figures (3 and 8), while 38.62 has four significant figures (3, 8, 6 and 2).

2. Zeros appearing between two non-zero digits (trapped zeros) are significant. For example, 403.73 has five significant figures.

7.021 has four significant figures because the zero is between two non-zero (significant) figures, 7 and 2.

3. All zeroes which are both to the right of the decimal point and to the right of all non-zero significant digits are themselves significant.

Example: Round 63.25 to 3 significant figures (s. f).

The 3 significant figures in 63.25 is 6, 3 and 2.

Consider the next significant figure. It is 5 so add 1 to 2 (2 + 1 = 3).

63.25 to 3.s.f. is 63.3

Example: 0.032 to 1.s.f.

Solution: Only 3 and 2 are significant. The second significant figure 2 is less than 5 so ignore it and write the number up to the 3. 0.32 is 0.03 to 1.s.f.

Example: Round 632,286 to 4s.f, 3s.f, 2s.f

632,286 is 632300 to 4s.f

632,286 is 632000 to 3s.f

632,286 is 630,000 to 2s.f

Example: Round 7.021 to 3s.f.

Solution: Here the 0 is significant because it is between two significant figures 7 and 2.

7.02 1. The next digit after the 3rd significant figure is 1 which is less than 5 so ignore it.

7.021 is 7.02 to 3s.f.

Exercise: 9

Complete the table.

Number	Correct to 3s.f	Correct to 2s.f	Correct to 1s.f
0.0023167			
0.815296			
273625			
1894290			
6632438			
7.015635			
28.40637			
18.81230			

Expressing a decimal number to a given number of decimal places (d.p) is a way of approximating the number.

The digits in a number after the decimal point shows the number of decimal places. Look at the decimal places of the digits in the number, 0.63217.

In 0.6 3 2 1 7

1st d.p 2nd d.p 3rd d.p 4th d.p 5th d.p

We can round a number to a given number of decimal places.

1. Find the place value digit that is required.
2. Check the next digit to the right, if it is 5 or more, increase the previous digit by 1.

If it is between 0 and 4, keep the previous digit the same.

3. Write the number up to the required place value and remove any number to the right of the place value digit.

Example: Express 745.9674 correct to

a. 3 decimal places

b. 2 decimal places

c. 1 decimal place

Solution:

a. 745.96⑦4 to three decimal places.

The digit in the 3rd decimal place is 7.

The next digit to its right 4 which is less than 5.

Write the number and ignore or remove the 4.

745.9674 = 745.967 (correct to 3d.p)

b. In 745.9⑥74, the digit in 2nd decimal place is 6. The next digit to its right side is 7. 7 is greater than 5 so add 1 to the 6 (6 + 1 = 7).

Change 6 to 7 and ignore the rest of the digits to the right.

745.9674 = 745.97 (correct to 2d.p)

c. In 745.⑨674, the digit in 1st decimal place is 9. The next digit to its right is 6. 6 is greater than 5 so add 1 to 9. (9 + 1 =10)

Carry 1 to the 5 in the Ones place (5 + 1 = 6) leave the 0.

745.9674 = 746.0 (correct to 1 decimal place).

Example: Correct 0.6413 to 2d.p.

Solution: 0.6 4 13 = 0.64 correct to 2d.p.

Exercise: 10

Complete the table by correcting the numbers to the given number of decimal places.

Number	1 decimal place	2 decimal place	3 decimal place	4 decimal place
0.42738				
0.22331				
0.75469				
18.27238				
24.71152				
60.83194				
408.43567				
0.92987				
0.15392				
0.55672				
0.08516				
0.97915				

Problems on Correcting Numbers to Given Number of Decimal Places and Significant Figures

1. Musa measured the length of his teacher's table and corrected to 2 decimal places as 0.76m.

State the possible actual reading.

Solution: We are required to write possible measurements that could be corrected to 2decimal places to give 0.76m.

Possible readings where the digit in the 3rd decimal place is between 0 and 4.

0.760m, 0.761m, 0.762m, 0.763m and 0.764m.

Each of the digits in the 3rd decimal place is less than 5 so they would be removed.

Possible reading where the digit in the 3rd decimal place is 5 or more (that is between 5 and 9).

0.755m, 0.756m, 0.757m, 0.758m and 0.759m.

In each case, the digit in the 2nd place, which is 5 would be increased by 1 to become 6 because the third place digits, 5, 6, 7, 8 and 9 are either equal to or greater than 5.

For example 0.755m correct to 2d.p is 0.76m.

Exercise: 11

Solve the following.

1. Find the perimeter of a rectang measuring 4.1263cm long a 2.8315cm wide. Correct the answer 3d.p and 3.s.f.

2. It took 6.351minutes correct to 3.dp to finish a test.

Write 4 possible actual time it took finish the test.

3. Cocoa beans in a sack has mass of 12.1073kg.

The buyer corrected it to 2 decim places. What would be the mass of t cocoa beans?

4. The temperature of a melt metal in 243.874°C.

Correct it to 1d.p and 1s.f

5. What is the length of a cloth 3d.p and 3.s.f if it measures 6.4715 long?

CHAPTER 5

MULTIPLICATION

STRAND 1: NUMBER

SUB-STRAND 2: Number Operations

CONTENT STANDARD: B7.1.2.1 Apply mental mathematics strategies and number properties used to solve problems.

INDICATOR B7.1.2.1.1 Multiply and divide given numbers by multiples of 10 including decimals and benchmark fractions.
B7.1.2.1.2 Apply mental mathematics strategies and number properties used to do calculation.

5.1 Multiplication facts up to 144

Study the multiplication chart below.

×	1	2	3	4	5	6	7	8	9	10	11	12
1	1	2	3	4	5	6	7	8	9	10	11	12
2	2	4	6	8	10	12	14	16	18	20	22	24
3	3	6	9	12	15	18	21	24	27	30	33	36
4	4	8	12	16	20	24	28	32	36	40	44	48
5	5	10	15	20	25	30	35	40	45	50	55	60
6	6	12	18	24	30	36	42	48	54	60	66	72
7	7	14	21	28	35	42	49	56	63	70	77	84
8	8	16	24	32	40	48	56	64	72	80	88	96
9	9	18	27	36	45	54	63	72	81	90	99	108
10	10	20	30	40	50	60	70	80	90	100	110	120
11	11	22	33	44	55	66	77	88	99	110	121	132
12	12	24	36	48	60	72	84	96	108	120	132	144

Each row in a multiplication chart is a times table for a number.
The row gives what the number is when it is multiplied by other numbers.

Example 1: Row "7"
It tells you that when 7 is multiplied by 1, you get 7, by 2 you get 14, by 3 you get 21, by 4 you get 28, etc.

This row can be used to generate the 7 times table as shown below.

$7 \times 1 = 7$
$7 \times 2 = 14$
$7 \times 3 = 21$
$7 \times 4 = 28$
$7 \times 5 = 35$
$7 \times 6 = 42$
$7 \times 7 = 49$
$7 \times 8 = 56$
$7 \times 9 = 63$
$7 \times 10 = 70$
$7 \times 11 = 77$
$7 \times 12 = 84$

Example 2: Row "8"

It tells you that when 8 is multiplied by 1, you get 8, by 2 you get 16, by 3 you get 24, by 4 you get 32, etc.

This row can be used to generate the 8 Times table as shown below.

$8 \times 1 = 8$
$8 \times 2 = 16$
$8 \times 3 = 24$
$8 \times 4 = 32$
$8 \times 5 = 40$
$8 \times 6 = 48$
$8 \times 7 = 56$
$8 \times 8 = 64$
$8 \times 9 = 72$
$8 \times 10 = 80$
$8 \times 11 = 88$
$8 \times 12 = 96$

Exercise: 1

Generate the times table for each of these numbers using the multiplication chart.

1. 5
$5 \times 1 = 5$

2. 6
$6 \times 1 = 6$

3. 7
$7 \times 1 = 7$

4. 9
$9 \times 1 = 9$

5. 11
$11 \times 1 = 11$

6. 12
$12 \times 1 = 12$

Exercise: 2

Complete the following.

1. $3 \times 7 =$
2. $3 \times 12 =$
3. $4 \times 8 =$
4. $4 \times 11 =$
5. $4 \times 12 =$
6. $10 \times 2 =$
7. $2 \times 12 =$
8. $3 \times 6 =$
9. $9 \times 4 =$
10. $8 \times 7 =$
11. $10 \times 7 =$
12. $6 \times 8 =$
13. $11 \times 12 =$
14. $11 \times 9 =$
15. $5 \times 11 =$
16. $10 \times 10 =$
17. $7 \times 9 =$
18. $10 \times 12 =$
19. $12 \times 8 =$
20. $12 \times 12 =$

DIVISION AS INVERSE MULTIPLICATION

Every division sentence has a related multiplication sentence.

We are going to learn to use multiplication as a strategy to solve division problems.

For instance, if we have $24 \div 4 =$ what? Its inverse relation in the form of multiplication will be $4 \times$ what? $= 24$. This means that we have to look for a number that could be multiplied by 4 to give 24.

From the multiplication chart,

$4 \times 6 = 24$.

Therefore, $24 \div 4 = 6$.

Let us use the multiplication chart to solve some division sentences.

Example 1

Solve $56 \div 7 = \square$

Solution

$56 \div 7 = \square \longrightarrow 7 \times \square = 56$

From the multiplication chart,

$7 \times 8 = 56$

Therefore, $56 \div 7 = \boxed{8}$

Example 2

Find the missing numbers.

a. $108 \div 9 = \square$

b. $96 \div 8 = \square \longrightarrow 8 \times \square = 96$

c. $110 \div 11 = \square \longrightarrow \square \times 11 = 110$

Solution

a. $108 \div 9 = \square \longrightarrow 9 \times \square = 108$

Since $9 \times \boxed{12} = 108$

Then $108 \div 9 = \boxed{12}$

b. From the multiplication chart,

$96 \div 8 = \square \longrightarrow 8 \times \square = 96$

$8 \times 12 = 96$

Therefore, $96 \div 8 = \boxed{12}$

c. From the chart,

So, $110 \div 11 = \square \longrightarrow \square \times 11 = 110$

$= \boxed{10} \times 11 = 110$

Exercise: 3

Find the missing numbers.

1. $45 \div 5 = \square \longrightarrow 5 \times \square = 45$
2. $54 \div 9 = \square \longrightarrow 9 \times \square = 54$
3. $56 \div 7 = \square \longrightarrow 7 \times \square = 56$
4. $63 \div 9 = \square \longrightarrow 9 \times \square = 63$
5. $100 \div 10 = \square \longrightarrow \square \times 10 = 100$
6. $88 \div 8 = \square \longrightarrow \square \times 8 = 88$
7. $84 \div 7 = \square \longrightarrow \square \times 7 = 84$
8. $96 \div 8 = \square \longrightarrow \square \times 8 = 96$
9. $121 \div 11 = \square \longrightarrow \square \times 11 = 121$
10. $132 \div 12 = \square \longrightarrow \square \times 12 = 132$

Exercise: 4

Divide the following.

1. $45 \div 9 =$ ☐
2. $88 \div 11 =$ ☐
3. $72 \div 6 =$ ☐
4. $24 \div 4 =$ ☐
5. $36 \div 3 =$ ☐
6. $27 \div 9 =$ ☐
7. $54 \div 9 =$ ☐
8. $120 \div 12 =$ ☐
9. $15 \div 5 =$ ☐
10. $68 \div 4 =$ ☐

Exercise: 5

Convert each multiplication into two division sentences.

Example: $4 \times 8 = 32 \longrightarrow \frac{32 \div 4 = 8}{32 \div 8 = 4}$

1. $8 \times 6 = 48 \longrightarrow$ _____
2. $6 \times 10 = 60$ _____
3. $9 \times 3 = 27$ _____
4. $8 \times 11 = 88$ _____
5. $12 \times 6 = 72$ _____
6. $12 \times 8 = 96$ _____
7. $9 \times 11 = 99$ _____
8. $12 \times 7 = 84$ _____
9. $10 \times 11 = 110$ _____
10. $12 \times 12 = 144$ _____

5.2 Decimal Names Of Given Benchmark Fractions

a. Converting Common Fractions to Percentages

We understand that decimals are another way of writing fractions as percentages. It is important to be able to interchange between fractions and decimals. We learnt about this conversion in B5 and B6.

However, let us revise them thoroughly.

To convert a given fraction to percentage, multiply the numerator by 100 and then divide by the denominator or convert the fraction into decimal and move the decimal point 2 places to the right.

Example 1

Convert the following common fractions to percentages.

1. $\frac{2}{5}$
2. $\frac{3}{4}$
3. $\frac{3}{10}$

Solution

a. Changing $\frac{2}{5}$ to percentage.

Multiply the numerator by 100 and then divide by the numerator.

$$\frac{2 \times 100}{5} = \frac{200}{5} = 40$$

Add %

So $\frac{2}{5} = 40\%$

OR

To change $\frac{2}{5}$ to decimals, divide the numerator by the denominator. Use long division method.

Put the numerator in the long division sign and the denominator outside.

$$\frac{2}{5} = 5\overline{)\begin{array}{l}0.4\\20\\20\\0\end{array}}$$

$\frac{2}{5} = 0.4$

So $\frac{2}{5} = 0.4 = 40\%$

b. $\frac{3}{4}$

Multiply the numerator 3 by 100 and then divide all by 4.

$$\frac{3 \times 100}{4} = \frac{300}{4} = 75$$

$\frac{3}{4} = 75\%$

OR

Change the fraction to decimal.

$$\frac{3}{4} \rightarrow 4\overline{)\begin{array}{l}0.75\\30\\28\\20\\20\\0\end{array}}$$

$\frac{3}{4} = 0.75 = 75\%$

c. $\frac{3}{10}$

Multiply the numerator by 100 and divide

$$\frac{3}{10} = \frac{3 \times 100}{10} = \frac{30}{1}$$

$\frac{3}{10} = 30\%$

OR

Change the fraction to decimal.

$\frac{3}{10} = 0.3$

$$10\overline{)\begin{array}{l}0.3\\30\\30\\0\end{array}}$$

$\frac{3}{10} = 0.3 = 30\%$

b. Converting Percentages to Common Fractions

A percent is a special way of expressing a fraction as a number out of 100.

To convert a given percentage to common fraction, write down the percent divided by 100 and then simplify the fraction.

Example

Convert the following percentages into common fractions.

i. 40%

ii. 75%

iii. 80%

Solution

i. Given 40%

Write down the percent divided by 100.

So, $\frac{40}{100}$

Simplify the fraction.

$\frac{40}{100} = \frac{4}{10} = \frac{2}{5}$

$40\% = \frac{2}{5}$

ii. To convert 75% to a common fraction,

write 75 divided by 100.

So, $\frac{75}{100}$

Now, simplify the fraction

$\frac{75}{100} = \frac{3}{4}$

Therefore, 75% $\longrightarrow \frac{3}{4}$

ii 80% to common fraction.

$\frac{80}{100} = \frac{8}{10} = \frac{4}{5}$

80% $= \frac{4}{5}$

Exercise: 6

Answer these questions.

Convert each of these fractions to percentages and decimal numbers.

1. $\frac{1}{2}$
2. $\frac{3}{5}$
3. $\frac{7}{10}$
4. $\frac{3}{8}$
5. $\frac{6}{25}$
6. $\frac{5}{8}$

Exercise: 7

2. Convert each of the following percentages to common fractions and decimal numbers.

1. 15%
2. 25%
3. 28%
4. 50%
5. 95%
6. 20%

c. Converting Common Fractions to Decimals

To convert a given common fraction to a decimal, follow the steps below.

1. Find a number that you can multiply by the denominator of the fraction to make it 10 or 100, or 1000, etc.
2. Multiply both the numerator and denominator by that number.
3. Write only the numerator and put the decimal point in one space from the right hand side for every zero in the denominator.

The long division can be used to convert a given common fraction to decimal.

Example

Convert each of the following common fractions to decimal.

i. $\frac{3}{4}$ ii. $\frac{2}{5}$ iii. $\frac{5}{8}$

Solution

i. Given $\frac{3}{4}$,

Find the number that can multiply by to make 100.

$4 \times ? = 100$

The number $= \frac{100}{4}$

$= 25$

The number that can multiply 4 to give 100 is 25.

Now, multiply both the numerator and denominator by 25.

$\frac{3 \times 25}{4 \times 25} = \frac{75}{100} = 75$

Since there are 2 zeroes in the denominator, write the numerator and put the decimal point 2 places from the right hand side to left.

$75 \longrightarrow 0.75$

$\frac{3}{4} = 0.75$

Use the long division to divide the fraction to change it to decimal numbers.

$$\begin{array}{r|l} & 0.75 \\ 4 & 30 \\ & 28 \\ \hline & 20 \\ & 20 \\ \hline & 0 \end{array}$$

$\frac{3}{4} = 75\% = 0.75$

ii. $\frac{2}{5}$

Find the number that can multiply by 5 to make 10.

$\frac{10}{5} = 2$

The number is 2 so multiply both the numerator and the denominator by 2.

$\frac{2 \times 2}{5 \times 2} = \frac{4}{10}$

Since there is one zero in the denominator, write the numerator and put the decimal point one place from the right hand side to the left.

$4 \longrightarrow 0.4$

$\frac{2}{5} = 0.4$

Using the long division to change the fraction to decimals.

$\frac{2}{5} \longrightarrow 5\overline{)\begin{array}{r}0.4\\20\\\underline{20}\\0\end{array}}$

$\frac{2}{5} \longrightarrow 0.4$

iii. $\frac{5}{8}$

Find the number that can multiply by 8 to make 1000.

$125 \times 8 = 1000$

So the number is 125.

Now, multiply both the numerator and the denominator by 125.

$\frac{5 \times 125}{8 \times 125} = \frac{625}{1000}$

Because there are three zeroes in the denominator, write the numerator and put the decimal point 3 places from the right hand side to the left.

$625 \longrightarrow 0.625$

Therefore, $\frac{5}{8} \longrightarrow 0.625$

Using the long division to change $\frac{5}{8}$ to decimal number.

$\frac{5}{8} \rightarrow 8\overline{)\begin{array}{r}0.625\\50\\\underline{48}\\20\\\underline{16}\\40\\\underline{40}\\0\end{array}}$

$\frac{5}{8} = 0.625$

d. Converting Decimals to Common Fractions

To convert a given decimal to a common fraction, follow the steps below.

1. Write down the decimal divided by 1.
2. Multiply both top and bottom by 10 for every number after the decimal point.

Thus, if the number of digits after the decimal point is 1, then use 10, if they are 2, use 100, if they are 3, then use 1000, etc.

3. Simplify the fraction.

Example

Convert the following decimals to common fractions.

i. 0.4 ii. 0.75 iii. 0.625

Solution

i. 0.4

Write the decimal divided by 1

$\frac{0.4}{1}$

Since there is only one digit after the decimal point, multiply both the top and bottom by 10.

$\frac{0.4 \times 10}{1 \times 10}$

To multiply 0.4 by 10, move the decimal point one place to the right.

So, $\frac{0.4 \times 10}{1 \times 10} = \frac{4}{10}$

Simplify the fraction.

$\frac{4}{10} = \frac{2}{5}$

$0.4 = \frac{2}{5}$

ii. 0.75

Write the decimal divided by 1.

$\frac{0.75}{1}$

Since there are two digits after the decimal point, multiply both top and bottom by 100.

$\frac{0.75 \times 100}{1 \times 100} = \frac{75}{100} = \frac{3}{4}$

$0.75 = \frac{3}{4}$

iii. 0.625

Now, $\frac{0.625}{1}$

Since there are three digits after the decimal point, multiply both top and bottom by 1000.

$\frac{0.625 \times 1000}{1 \times 1000} = \frac{625}{1000}$

Simplify the fraction.

$\frac{625}{1000} = \frac{25}{40} = \frac{5}{8}$

$0.625 = \frac{5}{8}$

Exercise: 8

Answer all questions.

1. Convert the following common fractions to decimals.

i. $\frac{1}{4}$ iv. $\frac{6}{25}$

ii. $\frac{3}{5}$ v. $\frac{1}{8}$

iii. $\frac{7}{20}$ vi. $\frac{8}{25}$

2. Convert each of these decimal to common fractions.

i. 0.2 iv. 0.12

ii. 0.8 v. 0.05

iii. 0.15 vi. 0.375

5.3 Multiplying Decimals by 10, 100, 1000, $\frac{1}{10}$, $\frac{1}{100}$, etc.

It is easier to work with powers o multiples of 10.

To multiply a decimal by powers of 1 such as 10, 100, 1000, etc; move th decimal point to the right the sam number of places as there are zeroe in the power of 10.

In multiplying a decimal by powers of 10 such as $\frac{1}{10}$ or 0.1, $\frac{1}{100}$ or 0.01, $\frac{1}{1000}$ or 0.001, etc; move the decimal point to the left the same number o places as there are decimal places i the power of 10.

Example

Find the product of each of the following.

i. 24.7×100

ii. $24.7 \times \frac{1}{100}$

iii. 105.25×1000

iv $105.25 \times \frac{1}{1000}$

Solution

i. 24.7×100

Since there are two zeroes in the whole number of 100, we move the decimal point two places to the right.

Therefore, $24.7 \times 100 = 2470$

ii. $24.7 \times \frac{1}{100}$

Note that $\frac{1}{100} = 0.01$

So $24.7 \times \frac{1}{100} = 24.7 \times 0.01$

Since there are two zeroes, we move the decimal point two places to the left.

$24.7 \times 0.01 = 0.247$

$24.7 \times \frac{1}{100} = 0.247$

iii. 105.25×1000

Because there are three zeroes in the whole number of 1000, we move the decimal point three places to the right.

So, $105.25 \times 1000 = 105250$

iv. $105.25 \times \frac{1}{1000}$

$\frac{1}{1000} = 0.001$

Since there are three zeroes, we move the decimal point three places to the left.

$105.25 \times 0.001 = 0.10525$

$105.25 \times \frac{1}{1000} = 0.10525$

Exercise: 9

Find the product of each of the following.

1. 0.49×10
2. 0.7×10
3. 6.32×100
4. $9.14 \times \frac{1}{10}$
5. $80.46 \times \frac{1}{100}$
6. $2.563 \times \frac{1}{1000}$
7. 0.4502×10000
8. 546.015×1000
9. $304.6 \times \frac{1}{100}$
10. $0.5000 \times \frac{1}{1000}$

5.4 Applying Halving and Doubling to Multiply Two Numbers

In this strategy, one of the numbers being multiplied is doubled while the other number is halved

Example

Apply halving and doubling to solve the following.

a. 22×2

b. 28×5

c. 125×4

d. 25×6

Solution

a. 22×2

Think of $11 \times 4 = 44$

Here 22 is halved. One-half of 22 is 11.

2 is doubled $2 \times 2 = 4$.

b. 28×5

Think of $14 \times 10 = 140$

c. 125×4

Think of $(125 \times 2) \times 2 = 250 \times 2$

$= 500$

d. 25×6

Think of $50 \times 3 = 150$.

Exercise: 10

Apply halving and doubling to solve each of the following.

1. 20×4
2. 32×5
3. 44×5
4. 33×4
5. 39×4
6. 64×5
7. 82×5
8. 142×5
9. 225×4
10. 325×4

5.5 Applying the Distributive Property to Multiply Two Numbers

Let us look at how to use the distributive property to multiply numbers.

Example

Apply the distributive property to multiply the following.

a. 7×15

b. 18×6

c. 35×4

Solution

a. To find 7×15,

think of $7 \times (10 + 5) = (7 \times 10) + (7 \times 5)$

$= 70 + 35$

$= 105$

b. To solve 18×6,

think of $(20 - 2) \times 6 = (20 \times 6) - (2 \times 6)$

$= 120 - 12$

$= 108$

c. To find the product of 35×4,

think of $(30 + 5) \times 4 = (30 \times 4) + (5 \times 4)$

$= 120 + 20$

$= 140$

Exercise: 11

Use the distributive property to solv each of the following.

1. 48×4
2. 9×15
3. 7×27
4. 39×6
5. 65×5
6. 8×42
7. 53×6
8. 98×5
9. 7×92
10. 8×87

CHAPTER 6

APPLYING MENTAL STRATEGIES TO SOLVE WORD PROBLEMS

STRAND 1: NUMBER

SUB-STRAND 2: Number Operations

CONTENT STANDARD: B7.1.2.1 Apply mental mathematics strategies and number properties used to solve problems.

INDICATOR B7.1.2.1.2 Apply mental mathematics strategies to solve word problems.

The following are some words relating to the four operations (addition, subtraction, multiplication and division). Note them well.

1. Addition – plus, add, calculate the sum, increase a number by, find the total etc.
2. Subtraction – minus, from a number take, find the difference, what must be added to make, etc.
3. Multiplication – times, multiply, find the product, square, what must be divided by __ to give ___
4. Division – share, divide, how many times does it go into, what must be multiplied by ___ to give ___

Exercise: 1

Create ten story problem using words related to the four operations.

We have learnt various mental strategies. Let us apply them appropriately to solve some problems.

1. What is the cost of three 5kg bags of rice at ¢2 per kg.

Solution: Find the cost of each 5kg bag of rice and multiply by 3 since there are three bags.

5kg at ¢2 per kg

$5 \times 2 = 10$

We can apply halving and doubling here.

Double 5 to get 10 and halve 2 to get 1

$5 \times 2 = 10 \times 1 = 10$

Each 5kg of rice costs ¢10.

Since there are three bags, multiply ¢10 by 3.

$10 \times 3 = 30$

2. 8×99

Solution: 99 is close to 100 which is a multiple of 10.

$8 \times 99 = (8 \times 100) - (8 \times 1)$

Use annexing and adding zeros,

8×100

There are 2 zeros. Multiply 8 by 1 and put the 2 zeros after the product.

8×100

$8 \times 1 = 8$

$8 \times 100 = 800$

$8 \times 99 = 800 - 8$

$= 792$

3. 28×25

Solution: Use doubling and halving.

Double 25 to get 50 and halve 28 to get 14.

$28 \times 25 = 14 \times 50$

$= 50 \times (10 + 4)$

$= (50 \times 10) + (50 \times 4)$

Use annexing and adding zeros.

In 50×10, there are 2 zeros.

Multiply 5 by 1 to get 5 and put the 2 zeros after 5.

$5 \times 1 = 5$

$50 \times 10 = 500$

There is 1 zero in 50×4.

$50 \times 4 \longrightarrow 5 \times 4$ and put 1 zero after the product.

$50 \times 4 = 200$

$(50 \times 10) + (50 \times 4)$

$= 500 + 200$

$= 700$

4. How many 21cm pieces can I cut off a string of one metre long?

Solution: The length of each piece should be 21cm.

The whole string is 1metre long.

Convert 1 metre into centimetres.

1metre = 100cm

How many times could we cut 21cm from 100cm?

Subtract 21cm from 100cm until you can no more subtract.

$100 - 21 = 79$

$79 - 21 = 58$

$58 - 21 = 37$

$37 - 21 = 16$

21 was subtracted from 100 four times remainder 16.

4 of 21cm pieces could be cut from 100cm.

5. What fraction of a litre is 250ml?

Solution: 1 litre = 1000ml.

$$\frac{250ml}{1000ml} = \frac{1}{4}$$

250ml is $\frac{1}{4}$ of a litre.

6. The area of a square board is 81cm What is perimeter?

Solution: A square is quadrilateral wi all sides equal in length.

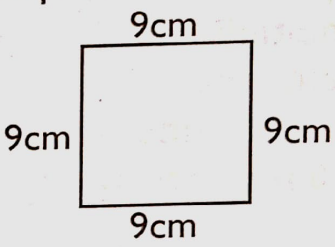
Area of a square = length × length

$l \times l = l^2$

$81cm^2$ If the area is $81cm^2$, then the length is obtained by finding t number when multiplied by itself wou give 81.

$9 \times 9 = 81$

The square measures 9cm each side. Perimeter is the total distance arou a shape.



Perimeter of a square is obtained b adding all the 4 sides.

$= 9cm + 9cm + 9cm + 9cm$

$= 4 \times 9$

Add 1 to 9 to get 10.

Because 10 is more friendly to wor with

$4 \times 9 = (4 \times 10) - 4$

$= 40 - 4$

$= 36cm.$

The perimeter of the square is 36cm

7. Write 60p as a decimal of ¢2.40.

Solution:

¢1 = 100 pesewas

¢2.40 = 2.4×100

Since there are 2 zeros, move th decimal point by 2 to the right.

= 2.4 0

¢2.40 = 240 pesewas.

$\frac{60}{240} = \frac{1}{4}$

Change $\frac{1}{4}$ to decimal.

$$
\begin{array}{r|l}
 & 0.25 \\
\hline
4 & 10 \\
 & -8 \\
\hline
 & 20
\end{array}
$$

60 pesewas is 0.25 of ¢2.40

Exercise: 2

Apply appropriate mental strategies to solve the following.

1. Two angles of a triangle add up to 98°. What is the size of the third angle?
2. What is the cost of 1 crate of egg at 80 pesewas each?
3. How many groups of 4 make 20?
4. An orange cost ¢1.50. How much do 9 oranges cost?
5. Find the product of 35 and 12.
6. How many 180g could be obtained from 1kg?
7. A square is 36cm^2 in area. What is its perimeter?
8. How many centimetres are in 2.5 metres?
9. What fraction of a metre is 50cm?
10. Find the cost of 5 shirts with a price tag ¢17?

CHAPTER 7 ADDITION AND SUBTRACTION UP TO FOUR-DIGIT NUMBERS

STRAND 1: NUMBER

SUB-STRAND 2: Number Operations

CONTENT STANDARD: B.7.1.2.2 Demonstrate an understanding of addition subtraction, multiplication and division of (i) whole numbers, and (ii) decima numbers, to solve problems.

INDICATOR B7.1.2.2.1 Add and subtract up to four-digit numbers.

7.1 Addition of Whole Numbers and Decimals

In this lesson, we shall use partitioning (or expanded form) and place value system to add whole numbers and decimal numbers.

In this strategy, the addends are expanded before they are added according to the place value system. Thus, Thousands are added together, Hundreds are added together, Tens are added together and Ones are added together, tenths are added together etc.

Example 1

Add the following whole numbers using the partitioning and place value system.

a. 3524 and 2373

b. 785 and 9342

c. 3124 and 5243

Solution.

a. Expand the numbers and add.

$$\begin{array}{rl} 3524 & = 3000 + 500 + 20 + 4 \\ +2373 & = 2000 + 300 + 70 + 3 \\ \hline 5897 & = 5000 + 800 + 90 + 7 \end{array}$$

b. Expand the numbers and add.

$$\begin{array}{rl} 785 & = \quad 700 + 80 + 5 \\ +\ 9342 & = 9000 + 300 + 40 + 2 \\ \hline 10{,}127 & = 9000 + 1000 + 120 + 7 \end{array}$$

c.

$$\begin{array}{rl} 3124 & = 3000 + 100 + 20 + 4 \\ +\ 5243 & = 5000 + 200 + 40 + 3 \\ \hline 8{,}367 & = 8000 + 300 + 60 + 7 \end{array}$$

Exercise: 1

Add the following whole numbe using the partitioning and place valu system.

1. 1464 and 1282
2. 2526 and 1593
3. 649 and 2380
4. 853 and 3146
5. 3053 and 972
6. 5483 and 4625
7. 4019 and 3983
8. 5208 and 5940
9. 6404 and 5598
10. 4387 and 5613

Exercise: 2

Add the following.

1. 3986 + 4288
2. 6975 + 4384
3. 7921 + 35
4. 263 + 1538
5. 141 + 6392
6. 932 + 115
7. 7932 + 4111
8. 9847 + 5192

Example

Add the following decimals using partitioning and place value system.

i. 245.43 and 152.26

ii. 327.60 and 54.13

Solution

Expand and add the numbers.

$$245.43 = 200 + 40 + 5 + \frac{4}{10} + \frac{3}{100}$$

$$+\ 152.26 = 100 + 50 + 2 + \frac{2}{10} + \frac{6}{100}$$

$$397.69 = 300 + 90 + 7 + \frac{6}{10} + \frac{9}{100}$$

Solution

ii. Expand the decimals and add.

$$327.60 = 300 + 20 + 7 + \frac{6}{10} + \frac{0}{100}$$

$$+\ 54.13 = 50 + 4 + \frac{1}{10} + \frac{3}{100}$$

$$381.73 = 300 + 70 + 11 + \frac{7}{10} + \frac{3}{100}$$

Exercise: 3

Add the following decimals using partitioning and place value system.

1. 143.25 and 135.34
2. 253.30 and 233.16
3. 284.04 and 215.96
4. 634.6 and 4532.2
5. 3468.3 and 569.7
6. 4021.5 and 3979.4
7. 597.64 and 86.48
8. 609.52 and 78.48
9. 54.65 and 545.35
10. 865.28 and 137.72

Exercise: 4

Find the sum of the following.

1. 4639.84 + 4253.11
2. 673.81 + 34.92
3. 4281 + 3763.35
4. 6095 + 2540.40
5. 863.90 + 27.50
6. 4392.85 + 32.72
7. 2249.85 + 632.45
8. 9399.40 + 279.55
9. 606.61 + 2250.83
10. 4275.40 + 2738.25

7.2 Subtraction of Whole Numbers and Decimals

Let us continue to look at subtraction of numbers using the same expanded form or partitioning and place value system.

To use this strategy to subtract numbers, each number is expanded and then subtracted according to the place value system.

Example

Find the difference using partitioning and place value system.

a. 5347 – 2134

b. 6275 – 732

Solution

a. Expand the numbers and subtract.

$$\begin{array}{rl} & 5347 = 5000 + 300 + 40 + 7 \\ - & 2134 = 2000 + 100 + 30 + 4 \\ \hline & 3{,}213 = 3000 + 200 + 10 + 3 \end{array}$$

b. Expand the numbers and subtract.

$$\begin{array}{rl} & 6275 = 6000 + 200 + 70 + 5 \\ - & 732 = \quad 700 + 30 + 2 \\ \hline & 5{,}543 = 5000 + 500 + 40 + 3 \end{array}$$

Exercise: 5

Use the partitioning and place value system to find the difference of each of the following.

1. 3562 – 2231
2. 3867 – 1534
3. 2945 – 724
4. 1438 – 527
5. 5421 – 910
6. 7340 – 632
7. 8234 – 5226
8. 9113 – 5114
9. 9515 – 426
10. 6341 – 5458

Example

Subtract the following decimals using the partitioning and place value system.

i. 375.68 – 26.52

ii. 93.6 – 7.85

Solution

i. Expand and subtract the figures.

$$\begin{array}{rl} & 375.68 = 300 + 70 + 5 + \frac{6}{10} + \frac{8}{100} \\ - & 26.52 = \quad 20 + 6 + \frac{5}{10} + \frac{2}{100} \\ \hline & 349.16 = 300 + 40 + 9 + \frac{1}{10} + \frac{6}{100} \end{array}$$

Solution

ii. Expand the figures and subtract

$$\begin{array}{rl} & 93.60 = 90 + 3 + \frac{6}{10} + \frac{0}{100} \\ - & 7.85 = \quad 7 + \frac{8}{10} + \frac{5}{100} \\ \hline & 85.75 = 80 + 5 + \frac{7}{10} + \frac{5}{100} \end{array}$$

Exercise: 6

Subtract the following using the partitioning and place value system.

1. 56.37 – 25.23
2. 67.3 – 54.8
3. 82.5 – 64.67
4. 375.12 – 154. 18
5. 452.37 – 63.49
6. 485.7 – 278.74
7. 494.25 – 85.35
8. 500.47 – 99.59
9. 8435.3 – 5679.8
10. 8536.4 – 775.52

CHAPTER 8

MULTIPLICATION AND DIVISION OF MULTI-DIGIT NUMBERS BY 1 –AND 2-DIGIT NUMBERS

STRAND 1: NUMBER

SUB-STRAND 2: Number Operations

CONTENT STANDARD: B.7.1.2.2 Demonstrate an understanding of addition, subtraction, multiplication and division of (i) whole numbers, and (ii) decimal numbers, to solve problems.

INDICATOR B71.2.2.2 Multiply or divide multi-digit numbers by 1- and 2- digit numbers.

8.1 Multiplying Using Partitioning/Expanded Method

Since we need to expand numbers by identifying the place value of the digits, let us revise place value and expanded form of numbers.

Example: 3, 576, 942.

Millions	Hundred Thousands	Ten Thousands	Thousands	Hundreds	Tens	Ones
3	5	7	6	9	4	2

From the extreme right, the place of the first digit, 2 is Ones and its place value is 2 Ones = 2.

The next digit is 4. The place of the 4 is Tens and its value is 4 Tens = 40.

The place of the next digit, 9 is Hundreds and its values is 9 Hundreds = 900.

The place of the next digit, 6 is Thousands and its value is 6 Thousands = 6,000.

The place of the next digit, 7 is Ten –Thousands and its value is 7 Ten –Thousands = 70,000.

The place of the next digit, 5 is Hundred –Thousands and its value is 5 Hundred –Thousands = 500,000.

The place of the next digit, 3 is Millions and its value is 3 Millions = 3,000,000.

The ability to identify the place value of digits in a number is important in expanding the number.

Exercise: 1

Complete the table by writing the place and place value of the underlined digits.

Number	Place	Place value
1<u>7</u>34638		
8546<u>8</u>17		
203<u>9</u>778		
927853<u>6</u>		
<u>5</u>983115		
60<u>4</u>5468		
469<u>8</u>911		
3<u>9</u>88503		
784432<u>4</u>		
249<u>5</u>512		

Exercise: 2

Expand the following.

Example: 3576942 = 3000000 + 500000 + 70000 + 6000 + 900 + 40 + 2

1. 4256374 =
2. 6386435 =
3. 2491656 =
4. 9582721 =
5. 1742838 =
6. 3834694 =
7. 4469211 =
8. 1452362 =
9. 8214359 =
10. 5469355 =

The Partitioning/Expanded Method of Multiplying numbers involves the following.

1. Expand the multiple
2. Multiply the expanded number by the multiplier
3. Add all the resultant products.

Example 1: Solve 743 × 5 using th expanded method.

Solution

743 = (700 + 40 + 3)

× 5 = × 5

3,500 + 200 + 15

3,715 = 3,715

Example 2

Multiply 584 by 8 using the portionin expanded method.

Solution

584 = (500 + 80 + 4)

× 8 = × 8

4000 + 640 + 32

4,672 = 4,672

Exercise: 3

Multiply each of the following usir the partitioning/expanded method.

1. 381 × 6
2. 539 × 5
3. 816 × 4
4. 903 × 7
5. 794 × 9
6. 408 × 5
7. 989 × 3
8. 849 × 8
9. 424 × 5
10. 683 × 6

Exercise: 4

Use the partitioning/expanded metho to multiply the following.

1. 4436 × 3
2. 5408 × 5
3. 7180 × 6
4. 6243 × 4

5. 3824 × 9
6. 5167 × 7
7. 1498 × 6
8. 2899 × 5
9. 3908 × 8
10. 2489 × 9

8.2 The Vertical Place Value Method

Under this method, the numbers to be multiplied are arranged vertically over one another with their least significant digits aligned. The top number is the multiplicand and the down number is the multiplier.

After arranging the numbers correctly, the multiplicand is multiplied by the least significant digit of the multiplier to produce a partial product. The process is continued for the next higher order digit in the multiplier and its partial product is right – aligned with the corresponding digit in the multiplier. The partial products are then summed.

Example 1
Solve 243 × 24 using the place value method.

Solution

$$\begin{array}{r} 243 \\ \times\ 24 \\ \hline 972 \\ +\ 486 \\ \hline 5{,}832 \end{array}$$

Example 2 Multiply 345 by 27.

Solution

$$\begin{array}{r} 345 \\ \times\ 27 \\ \hline 2\,415 \\ +\ 6\,90 \\ \hline 9{,}315 \end{array}$$

Exercise: 5

Solve the following using the vertical place value method.

1. 419 × 51
2. 628 × 42
3. 399 × 34
4. 924 × 25
5. 747 × 26
6. 648 × 35
7. 906 × 24
8. 469 × 44
9. 652 × 29
10. 515 × 35

Exercise: 6

Multiply the following numbers using the vertical place value method.

1. 2143 × 21
2. 2561 × 24
3. 3484 × 25
4. 1996 × 22
5. 4032 × 34
6. 5114 × 35
7. 6425 × 30
8. 6588 × 27
9. 7829 × 28
10. 4128 × 44

8.3 The Lattice Method

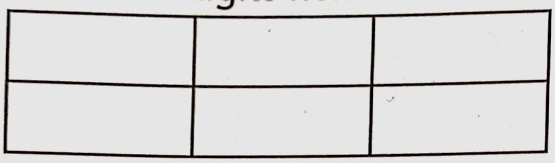
In B.6, we learned how to use the lattice method to multiply multi – digit numbers by 2 – digit numbers. We are going to continue in this lesson.

Example 1
Multiply 243 by 24 using the lattice method.

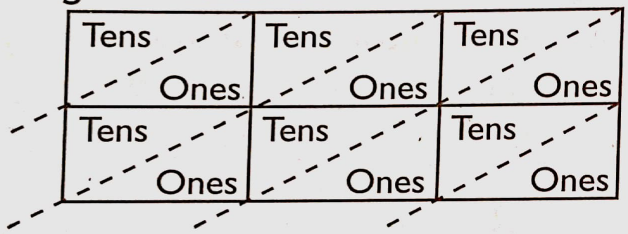
Solution

Draw a 3 × 2 rectangular box. The number of divisions in the rectangular box depends on the number of digits in the numbers being multiplied.

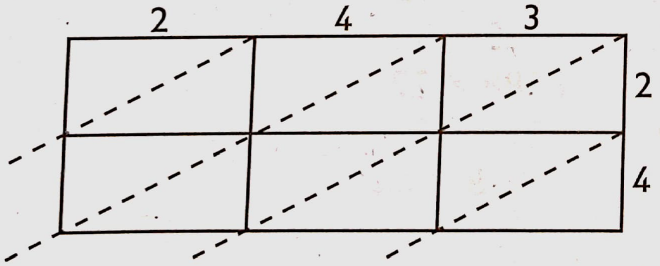
In 243 × 24, the 243 has 3 digits and the 24 has 2 digits hence the 3 × 2 box.



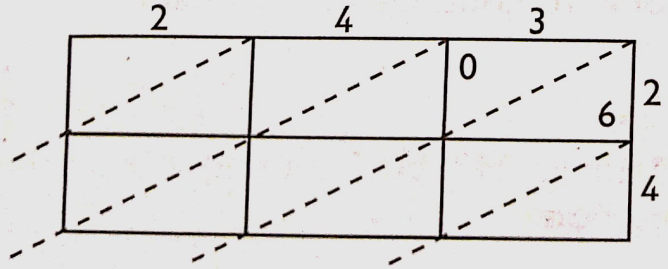
Draw a diagonal across each box, and within each of the boxes, the left upper part of the diagonal takes the value of Tens and the right lower part of the diagonal takes the value of the Ones.



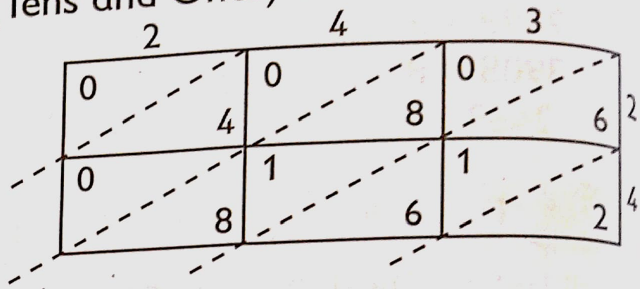
Write the multiplicand, 243 along the top of the box and the multiplier, 24 by the side of the box as shown.



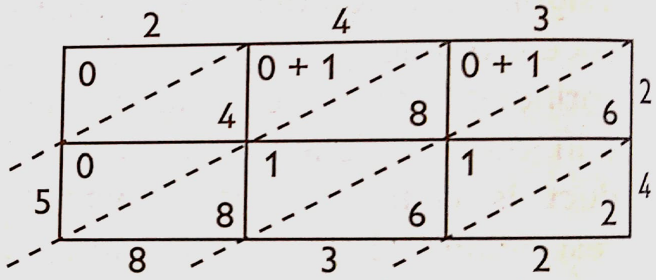
Multiply 2 by 3 and put the product, 6 in the box under the 3. Write the Tens, 0 in the left upper part of the diagonal and the Ones, 6 under the right lower part of the diagonal.



Now, multiply 2 by 4, 2 by 2, 4 by 3, 4 by 4, 4 by 2 and write the products (Tens and Ones) as shown.



Start from the extreme right and add the numbers in the boxes diagonally. So 2, then 6 + 1 + 6 = 13. Write 3 and carry 1 forward to the next diagonal. We have 1 + 0 + 8 + 1 + 8 = 18. Write 8 and carry 1 forward to the next diagonal. So, 1 + 0 + 4 + 0 = 5. Ignore the 0 since it is beginning a number



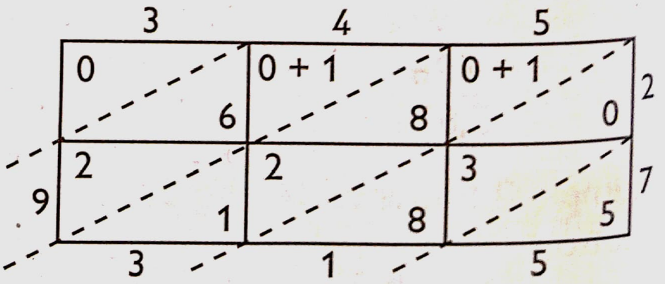
Write the answer as 5832.

Thus, 243 × 24 = 5,832

Example 2

Solve 345 × 27 using the lattice method

Solution

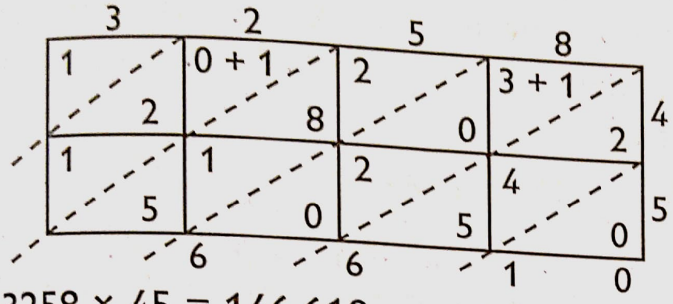


345 × 27 = 9,315

Example 3

Use the lattice method to find 3258 × 45

Solution



3258 × 45 = 146,610

Exercise: 7

Use the lattice method to find the product of

1. 258 × 25
2. 296 × 24
3. 364 × 26
4. 464 × 27
5. 485 × 28
6. 528 × 44
7. 652 × 52
8. 735 × 50
9. 809 × 81
10. 927 × 95

Exercise: 8

Multiply the following using the lattice method.

1. 2043 × 25
2. 2149 × 27
3. 3510 × 28
4. 4008 × 34
5. 5119 × 55
6. 5674 × 48
7. 6348 × 39
8. 7219 × 56
9. 8015 × 70
10. 9582 × 95

8.4 Using the Distributive Property to Multiply Numbers

In this lesson, we are going to use the distributive property of multiplication to rewrite expression by breaking down a factor as a sum of two numbers.

Example 1

Use the distributive property to multiply 349 × 12

Solution

We can break down or expand 12 as 10 + 2.

$$\begin{aligned} 349 \times 12 &= 349 \times (10 + 2) \\ &= (349 \times 10) + (349 \times 2) \\ &= 3490 + 698 \\ &= 4{,}188 \end{aligned}$$

Example 2

Multiply 325 × 15 using the distributive property method.

Solution

$$\begin{aligned} 325 \times 15 &= 325 \times (10 + 5) \\ &= (325 \times 10) + (325 \times 5) \\ &= 3250 + 1625 \\ &= 4{,}875 \end{aligned}$$

Exercise: 9

Multiply each of the following using the distributive property method.

1. 369 × 11
2. 458 × 12
3. 499 × 13
4. 517 × 14
5. 575 × 15
6. 816 × 14
7. 884 × 15
8. 798 × 15
9. 985 × 12
10. 872 × 15

Exercise: 10

Use the distributive property method to solve the following.

1. 4,125 × 12
2. 4637 × 12
3. 2531 × 15
4. 2883 × 15
5. 4362 × 13
6. 2114 × 17
7. 5038 × 13
8. 1999 × 12
9. 5445 × 15
10. 8009 × 12

8.5 8.5 Basic Division Facts

A multiple of a number is the set of all the numbers obtained by multiplying the number by 1, 2, 3, 4, 5, 6,...

For example, the multiple of 3 are obtained as follows:

$3 \times 1 = 3, 3 \times 2 = 6, 3 \times 3 = 9, 3 \times 4 = 12, 3 \times 5 = 15...$

Thus, the multiples of 3 are {3, 6, 9, 12, 15,...}.

Again, the multiples of 7 are obtained as follows:

$7 \times 1 = 7, 7 \times 2 = 14, 7 \times 3 = 21, 7 \times 4 = 28, 7 \times 5 = 35...$

The multiples of 7 are {7, 14, 21, 28, 35,...}.

Let us go through this activity to find if a number is a multiple of a given number.

Testing for numbers that are divisible by 2, 3, 4, 5, 6, 7, 8, 9, 10, 11 and 12.

For example, if a number is divisible by 7, then the number is a multiple of 7.

Any number which is divisible by a certain number is then a multiple of that number.

a. Test of divisibility by 2

A number is divisible by 2 if the last digit in the Ones place is 0, 2, 4, 6 or 8..

Thus, a number whose last digit is 0, 2, 4, 6 or 8, is a multiple of 2.

Example: 124 is divisible by 2 since the last digit of 124 is 4.

Other examples of numbers that are divisible by 2 are 40, 82, 136, 2018, etc.

b. Test of divisibility by 3

A number is divisible by 3 if the sum of the digits of the number can be divided exactly by 3.

Thus, if the sum of the digits of a number is divisible by 3, then the number is a multiple of 3.

Example: 291, $\longrightarrow \frac{2+9+1}{3} = \frac{12}{3} = 4$

c. Test of divisibility by 4

A number is divisible by 4 if the last two digits of the number is divisible by 4. Eg. 116, The last two digits make 16. $\frac{16}{4} = 4$

124, 372, 480, 2312, 5020, etc are also divisble by 4.

d. Test of divisibility by 5

A number is divisible by 5 if the last digit is 0 or 5. Thus, if the end digit of a number is 0 or 5, then that number is divisible by 5.

Example: 90 is divisible by 5 since the last digit is 0.

$\frac{90}{5} = 18$

25, 100, 615, 2720, 3645 are all divisible by 5.

Exercise: 11

Draw a 12 by 12 multiplication chart
Circle all numbers that are divisible by
Cross all the multiples of 4.

×	1	2	3	4	5	6	7	8	9	10	11	12
1												
2												
3												
4												
5												
6												
7												
8												
9												
10												
11												
12												

e. Test of divisibility by 6

A number is divisible by 6 if the last digit is even number and the sum of its digits is divisible by 3.

Thus, a number is divisible by 6 if it is divisible by 2 and 3.

Example: 258 is divisible by 6 since the last digit, 8 is even and the sum of the digits (2 + 5 + 8), 15 is divisible by 3.

Other examples of numbers that are divisible by 6 are 126, 174, 288, 2340, etc.

f. Test of divisibility by 7

To find out if a number is divisible by 7, take the last digit in the number then double it and subtract from the rest of the number. If the result is 0 or a multiple of 7, then the number is divisible by 7.

Example 1: 595 is divisible by 7 since the double of the last digit, 5 is $2 \times 5 = 10$ and when 10 is subtracted from 59, it gives 49 which is a multiple of 7.

Example 2: Given 623,

The double of the last digit $= 2 \times 3$

$= 6$

Subtract the double from the rest of the number.

$62 - 6 = 56$

$56 = 7 \times 8$

Since 56 is a multiple of 7, then 623 is divisible by 7.

Other examples of numbers that are divisible by 7 are 147, 273, 308, 693, etc.

g. Test of divisibility by 8

A number is divisible by 8 if the last three digits of the number form a number that is divisible by 8.

Example 1: 3120

The last three digits of 3120 is 120 and it is divisible by 8 since 8×15 gives 120.

Therefore, 3120 is divisible by 8.

Example 2: 48,104

The last three digits of 48104 is 104.

$$\frac{104}{8} = 13$$

48,104 is divisible by 8 since its last 3 digits are divisible by 8.

Other examples of numbers that are divisible by 8 are 1200, 2400, 30240, 96184, etc.

h. Test of divisibility by 9

A number is divisible by 9 if the sum of the digits of the number is divisible by 9.

Example: 1089 is divisible by 9 since 1 + 0 + 8 + 9 is 18 which is divisible by 9.

Thus, $9 \times 2 = 18$

Other examples of numbers that are divisible by 9 are 261, 711, 4473, 19611, etc.

i. Test of divisibility by 10

A number is divisible by 10 if its last digit is 0.

Example: 4930 is divisible by 10 since its last digit is 0.

Other examples of numbers that are divisible by 10 are 400, 940, 6030, 78100, etc.

j. Test of divisibility by 11

A number is divisible by 11 if subtracting the last digit from the other digits, the result is divisible by 11.

Example 1: 319 is divisible by 11 since 31 – 9 is 22 which is divisible by 11.

Example 2: 1408

The last digit of 1408 is 8.

So $140 - 8 = 132$

132 is divisible by 11 because $11 \times 12 = 132$.

Therefore, 1408 is divisible by 11.

Other examples of numbers that are divisible by 11 are 143, 429, 1331, etc

k. Test of divisibility by 12

A number is divisible by 12 if the number is divisible by 3 and 4.

Example: 432.

The sum of the digits (4 + 3 + 2) is 9 which is divisible by 3. The last two digits of 432 is 32 which is divisible by 4.

Therefore, 432 is divisible by 12 since it is also divisible by 3 and 4.

Other examples of numbers that are divisible by 12 are 132, 276, 540, 1116, 1524, etc.

Exercise: 12

Fill each blank with 3, 4, 5, 7 or 11.

1. 203 is divisible by _____
2. 116 is divisible by _____
3. 319 is divisible by _____
4. 230 is divisible by _____
5. 117 is divisible by _____
6. 928 is divisible by _____
7. 638 is divisible by _____
8. 1,495 is divisible by _____
9. 406 is divisible by _____
10. 1,521 is divisible by _____

Exercise: 13

Fill in the missing digit of each of following.

Eg. The number 34 is divisible by 2.

1. The number 13 __ is divisible by
2. The number 43 ___ is divisible by
3. The number 10 ___ is divisible by
4. The number 3 ___ is divisible by
5. The number 709 ___ is divisible by
6. The number 7 ____ is divisible by
7. The number 477 __ is divisible by
8. The number 21 ____ is divisible by
9. The number 32____ is divisible by
10. The number 16 ___ is divisible by

Exercise: 14

Fill each blank with "True" or "False"

1. 4005 is divisible by 10. _____
2. 3,543 is divisible by 2. _____
3. 6,240 is divisible by 5. _____
4. 5,436 is divisible by 4. _____
5. 4,248 is divisible by 3. _____
6. 1,234 is divisible by 9. _____
7. 2,145 is divisible by 11. _____
8. 1,112 is divisible by 8. _____
9. 3,138 is divisible by 6. _____
10. 1,070 is divisible by 7. _____

CHAPTER 9

STORY PROBLEMS INVOLVING DECIMALS ON THE FOUR BASIC OPERATIONS

STRAND 1: NUMBER

SUB-STRAND 2: Number Operations

CONTENT STANDARD: B.7.1.2.2 Demonstrate an understanding of addition, subtraction, multiplication and division of (i) whole numbers, and (ii) decimal numbers, to solve problems.

INDICATOR B7.1.2.2.3. Create and solve story problems involving decimals on the four basic operations.

In this Chapter, we shall learn about applying the strategies learnt to solve word problems involving the four basic operations.

The four basic operations are addition, subtraction, multiplication and division (+, -, × and ÷).

To solve word problems, read it carefully and note the relevant information. Identify the operations involved in the problem.

9.1 Problems that Involve Multiplication and Addition

Example: A group of 215 men and 784 women went to watch a musical concert. An amount of GH¢ 25 was collected at the gate from each person. How much money was collected altogether?

Solution: The problem involves adding the number of men and women and multiplying the sum by the amount charged per person.

Use the expanded form to add.

215 men and 784 women.

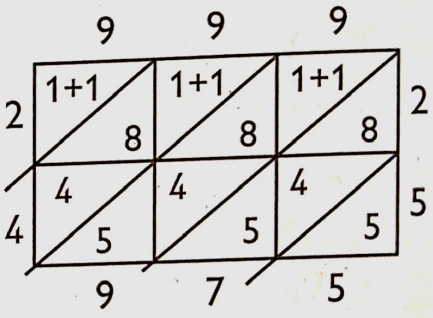
$$\begin{array}{r} 215 = 200 + 10 + 5 \\ +\ 784 = 700 + 80 + 4 \\ \hline 999 = 900 + 90 + 9 \end{array}$$

A total of 999 people went to watc the musical concert.

If each person was charged GH¢ 2 we multiply GH¢ 25 by 999.

Let us use the lattice method t multiply.

999×25



$999 \times 25 = 24{,}975$

$999 \times 25 = 24{,}975$

GH¢24,975 was collected together.

The distributive property could also be used to multiply.

999×25

$= 999 \times (20 + 5)$

Note that it is easier to multiply by multiples of 10.

$= 19,980 + 4995$

$= 24,975$

GH¢24,975 was collected altogether.

Example: At Seth Simons International School, there are 30 tables in B7A class and 28 tables in B7B class.

Each table has 4 legs. A painter is hired to paint all the legs in orange colour.

If the painter charges GH¢2 per leg. How much is the painter charging?

Solution:

The problems involves addition and multiplication.

There are 30 tables in B7A

There are 28 tables in B7B.

Add the number of tables in B7A and B7B.

30 and 28 are 2 away from each other. They could be added by doubling the bigger number, 30 and subtracting 2 from the sum. This

$30 + 28 = 30 + 30 - 2$

$= 60 - 2$

$= 58$

There are 58 tables in both classes.

Multiply the total number of tables by 4 since each has 4 legs.

58×4

Let us use the expanded form to multiply.

$58 = (50 + 8)$

$\times\ 4 = \times\ 4$

$= 200 + 32$

$232 = 232$

There are 232 legs.

If he charges GH¢ 2 per leg, then we have to multiply GH¢2 by 232.

Using the expanded form to multiply.

$232 = (200 + 30 + 2)$

$\times\ 2 = \times\ 2$

$= 400 + 60 + 4$

$464 = 464$

The painter charges GH¢ 464 for painting all the table legs.

Exercise: 1

Apply appropriate strategies to solve the following word problems.

1. Five Divisional Police Command offices in a region have these number of officers; 126, 139, 208, 89 and 341.

If each officer receives 13 uniforms. How many uniforms are supplied to the officers in the region?

2. A special duty vehicle has 26 tyres. Asumadu has 871 of these vehicle and his sister, Afia has 639 vehicles. If they want to import brand new tyres for all their vehicles, how many tyres would the siblings import?

3. In a Science library, there are 743 chemistry books, 428 Physics books, 810 Biology books. A librarian needs 2 minutes to dust and put each book in a shelf. How long does it take the librarian to finish dusting and putting all the books in shelves?

4. Hamid has 586 cows and 994 goats. He needs 17 litres of water daily for each animal. What quantity of water does the animals drink?

5. At a Food Court, a waitress has to

serve 29 tables. Each table has 33 women and 24 men. How many guest is the waitress supposed to serve?

9.2 Problems Involving Addition and Subtraction

Example: Mrs. Adamu bought 13.6kg of meat. Mrs. Anderson bought 2.4kg of meat less than Mrs. Adamu. How many kilogram of meat did they buy altogether?

Solution:

Mrs. Adamu's meat = 13.6kg

Mrs. Anderson's meat = 2.4kg less than Mrs. Adamu's

Subtract 2.4kg from Mrs. Adamu's meat, 13.6kg to get Mrs. Anderson's meat.

Use the expanded form method.

$$\begin{array}{r} 13.6 \\ -\ 2.4 \end{array} = 10 + 3 + \frac{6}{10}$$

$$2 + \frac{4}{10}$$

$$11.2 = 10 + 1 + \frac{2}{10} = 11\frac{2}{10}$$

$\frac{6}{10}$ and $\frac{4}{10}$ are like fractions, subtract the numerators and maintain the denominator Mrs. Anderson bought 11.2kg of meat.

Add 13.6kg and 11.2kg to find the kilogram of meat both women bought together.

Use the expanded form.

$$13.6 = 10 + 3 + \frac{6}{10}$$

$$+\ 11.2 \quad 10 + 1 + \frac{2}{10}$$

$$24.8 \quad 20 + 4 + \frac{8}{10}$$

They bought 24.8kg of meat altogether.

Example: A farmer reared 165 male goats and 283 female goats last year. He sold 312 goats because he needed money to build a house. How many goats were left?

Solution: Add the male and female goats.

$$165 + 283$$

Use the expanded form method.

$$165 = 100 + 60 + 5$$

$$+\ 283 = 200 + 80 + 3$$

$$300 + 140 + 8$$

$$= 300 + 100 + 40 + 8$$

$$448 = 400 + 40 + 8$$

The farmer reared 448 goats.

If he sold 312 goats, then subtract 312 from 448.

Use the expanded form to subtract.

$$\begin{array}{rl} 448 & = 400 + 40 + 8 \\ -\ 312 & \quad 300 + 10 + 2 \\ \hline 136 & \quad 100 + 30 + 6 \end{array}$$

136 goats were left.

Exercise: 2

Use appropriate strategies to solve the following problems.

1. There were 497 mathematics textbooks and 216 Science textbooks in a bookshop. The shop owner decided to donate 610 of the books to an orphanage. How many books were left?

2. A farmer planted 2437 cocoa trees. His wife also planted 937 cocoa trees. During the dry season, a bush fire burn 1,387 cocoa trees. How many cocoa trees were left?

3. Amina fetched 36.4 litres of

water into a barrel. Dede also fetched 29.3 litres into the same barrel. 42.1 litres of the water leaked away.

What is the quantity of water left in the barrel?

4. A contractor sent 784 bags of cement to Wise Ant Estates. 236 bags were used at Wise Ant Estate and the rest taken to Gadzepo Estate. There were 365 bags at Gadzepo Estate already before the rest was brought.

How many bags of cement were at Gadzepo Estate altogether?

5. Two sisters, Ameley and Ayeley saved GH¢432 and GH¢684 respectively. They put their monies together and bought a bicycle at GH¢840.

How much of their money was left?

9.3 Story Problems Involving Subtraction and Division

Example: At the end of May 2021, Mr. Latif received a salary of GH¢745. He gave GH¢145 to his mother and saved ¢200. The balance was shared among his 8 children equally. How much did each child receive?

Solution:

Subtract amount paid to his mother and savings from the total salary to get the balance.

$= ¢745 - ¢145 - ¢200$

$= ¢400.$

8 children are to share the balance of ¢400. Divide ¢400 by 8.

$400 \div 8 = 50$

Each child received ¢50

Example: Mrs. Armah bought 45.75 metres of linen for her five children. If they shared the material equally, how many metres of linen did each receive?

Solution: This problem involves only division. Divide 45.75 by 5.

$45 \div 5 = 9$

$0.75 \div 5 = \frac{75}{100} \div 5$

$= \frac{75}{100} \times \frac{1}{5}$

$= \frac{75}{500} = \frac{3}{20}$

$$\begin{array}{r} 0.15 \\ 20\overline{)\,30} \\ -\,20 \\ \hline 100 \\ -\,100 \\ \hline 000 \end{array}$$

$9 + 0.15 = 9.15$

$45.75 \div 5 = 9.15$

Exercise: 3

Solve the following word problems.

1. Adusa saved ¢500 during a lockdown period. He used ¢420 to buy school items and shared the balance among his 16 friends. How much did each friend receive?

2. Kofi gave 320 oranges to 4 men to share. One of the friends gave 37 of his oranges to an orphanage. How many oranges were left?

3. A typist spent 6 minutes to type 5400 letters. How many letters were typed a minute?

4. A story book contains 463 pages. A teacher asked 7 learners to

read from page 43 to the end. The learners were to read equal number of pages. How many pages did each learner read?

5. After baking 138 loaves of bread, a baker sold 6 of them and packed the rest into boxes. Each box could take 12 loaves of bread. How many boxes were used?

9.4 Problems Involving Multiplication and Division

Example: In a school, all learners in 6 classes are going for an excursion. If there are 32 learners in each class and 3 buses are to convey them equally, how many learners are in each bus?

Solution:

Multiply 32 by 6 to get the total number of learners.

$$32 = (30 + 2)$$
$$\times 6 = \quad \times 6$$
$$= 180 + 12$$
$$192 = 180 + 12$$

$$32 \times 6 = 192$$

There are 192 learners.

Divide 192 by 3 to get the number of learners each bus could convey.

$$192 \div 3 = 64$$

Each bus conveyed 64 learners.

Exercise: 4

Solve these word problems.

1. There were 20 tables in 6 classrooms. 10 learners were asked to clean them equally. How many tables did each learner clean?

2. A farmer has three farms with each measuring 18 hectares. If 6 workers are to plough the farms equally. How many hectares of land would each farmer plough?

3. A hospital recorded 635 new COVID-19 cases for four consecutive days. If they were quarantined in 20 hotels of equal capacity. How many patients were quarantined in a hotel?

4. A court ordered a debtor to pay an amount of ¢600 each to two complainants. If the debtor is supposed to pay in 12 months installments. How much would he pay in every month?

5. A dentist is cleaning the teeth of 3 adult patients. Each adult has 32 teeth. If he used 192 minutes to get the job done. How many minutes were spent on each tooth?

9.5 Word Problems on Data Presented in a Table

In preparation towards an open day anniversary, a school's Management Committee approved the following budget on some projects.

Activity	Cost GH¢
Painting school building	4,580
Mending cracks on the basketball pitch	3,050
Restock the library with new books	2,690
Buying of choir robes	5,340
Buying prizes for awards	4,270

a. How much was approved for painting the school building and buying choir robes.

b. How much more was to be spent on mending the cracks on the basketball pitch than restocking the library with new books?

c. How much was spent on buying prizes for awards if twice the amount approved was spent on this activity?

Solution:

a. The amount approved for painting the school building and buying choir robes could be obtained by adding the two amounts.

GH¢4,580 = 4000 + 500 + 80

Using the expanded form:

$$\begin{array}{rl} 4580 & = 4000 + 500 + 80 \\ +\ 5340 & = 5000 + 300 + 40 \\ & = 9000 + 800 + 120 \\ \hline 9{,}920 & = 9000 + 900 + 20 \end{array}$$

GH¢9,920 was spent on the two activities.

b. Subtract 2690 from 3,050

$$\begin{array}{rl} 3050 & = 3000 + 0 + 50 \\ -\ 2690 & \quad 2000 + 600 + 90 \\ \hline 360 & = \quad 0 \quad + 300 + 60 \end{array}$$

GH¢ 360 more was spent on mending the cracks on the basketball pitch than restocking the library with new books.

c. The amount approved for buying prizes for awards was GH¢4,270. If twice was actually spent, then multiply by 2.

$$\begin{array}{rl} 4270 & = (4000 + 200 + 70) \\ \times\ 2 & = \times\ 2 \\ & \quad 8000 + 400 + 140 \\ & \quad 8000 + 500 + 40 \end{array}$$

GH¢8,540 was actually spent on buying prizes for awards.

Exercise: 5

Solve the following word problems.

1. The table below shows the flight charges from Accra to various destinations. Answer the questions that follow.

From Accra to	Kumasi	Tamale	Ho	Sunyani
Single	¢265	¢280	¢110	¢290
Return	¢310.50	¢350	¢150	¢340

a. If 8 friends travelled from Accra to Ho on a return ticket, how much did they pay?

b. Avedzi bought a single ticket to Tamale and decided to change his destination to Ho. How much would the airline give back to him if they accept his change of destination?

c. Dzifa and Namoele bought a return ticket to Kumasi. How much did they pay altogether?

CHAPTER 10 POWERS OF NATURAL NUMBERS

STRAND 1: NUMBER

SUB-STRAND 2: Number Operations

CONTENT STANDARD: B7.1.2.3 Demonstrate understanding and the use of powers of natural numbers in solving problems.

INDICATOR B7.1.2.3.1 Illustrate with examples the meaning of repeated factors using counting objects such as bottle tops or bundle sticks.

B7.1.2.3.2 Express a given number as a product of a given number or numbers, as well as, in the form of a power or two such numbers as product of powers.

B7.1.2.3.3 Show that the value of any natural number with zero as its exponent or index is 1 and use it to solve problems.

B7.1.2.3.4 Find the value of a number written in index form.

B7.1.2.3.5 Apply the concept of powers of numbers (product of prime) to find HCF.

10.1 Repeated Factors

Repeated factors are factors that are used more than once in a multiplication.

For instance, 3 × 3 means to use two factors of 3 in the multiplication. Clearly, 3 × 3 is repeated factors, and each factor is 3.

Let us look at how represent repeated factors with objects.

Example 1

Represent 3 × 3 × 3 with objects.

Solution

3 × 3 × 3 means thrice of 3 groups with 3 objects.

3 × 3 × 3

Example 2

Represent 2 × 2 × 2 with objects.

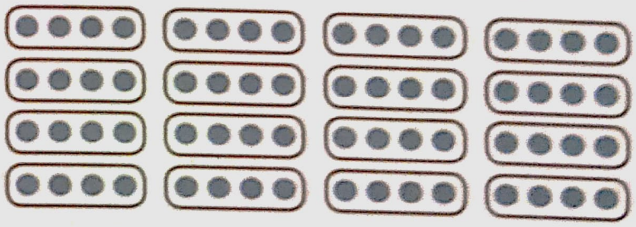
Solution

2 × 2 × 2 means twice of 2 groups of 2.

2 × 2 × 2

Exercise: 1

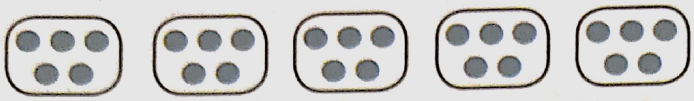
Write the repeated factors for each of these.

1. 

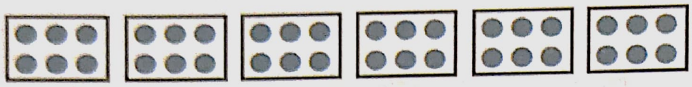
Repeated factors = _____

2. 

Repeated factors = _____

3. 

Repeated factors = _____

4. 

Repeated factors = _____

5. 

Repeated factors = _____

Powers of Numbers

Repeated factors or multiplication such as $3 \times 3 \times 3 \times 3 \times 3$, can be written in a short form as 3^5. Thus, 3 multiplying itself five times. This short way of writing a number being multiplied by itself a certain number of times, is called the index form. The power of a number is the index form of it. In 3^5, the number 3 is called the base and the number 5 is called the exponent or power or index. The base is the number being multiplied by itself, and the index or exponent or power is the number that tells how many times the base is multiplied by itself.

3^5 can be read as "three to the power of five" or "three to the fifth power" or "three raised to the power five".

A number with an exponent of "2" is usually called a square.

For example, 7^2 is 7 squared or the square of 7 or 7 to the power 2.

A number with an exponent of "3" is called a cube.

For example, 2^3 is 2 cubed or the cube of 2 or 2 to the power 3.

The index or exponent or power of number is always written as a sm number to the right and above th base number.

2^3 means use 2 in multiplication 3 time That is $2^3 = 2 \times 2 \times 2$

Example 1

Write the index form of $2 \times 2 \times 2 \times$

Solution

In $2 \times 2 \times 2 \times 2$, the number multiplyin itself is 2, which is the base and th number of times it is being multiplied 4, which is also the exponent or inde

Therefore, the index form of $2 \times 2 \times \times 2 = 2^4$

Example 2

Write the index form of $8 \times 8 \times 8 \times \times 8$

Solution

The index form of $8 \times 8 \times 8 \times 8 \times 8 = 8^5$

Example 3

Express $3 \times 3 \times 3 \times 3 \times 3 \times 3 \times \times 3 \times 3$ in index form.

Solution

$3 \times 3 \times 3 \times 3 \times 3 \times 3 \times 3 \times 3 \times 3 \times 3 = 3^{10}$

Exercise: 2

Write the index form of each of the following.

1. $9 \times 9 \times 9 =$
2. $6 \times 6 \times 6 \times 6 \times 6 =$
3. $10 \times 10 \times 10 \times 10 \times 10 \times 10 \times 10 \times 10 =$
4. $100 \times 100 =$
5. $4 \times 4 \times 4 \times 4 =$
6. $8 \times 8 \times 8 \times 8 \times 8 \times 8 =$
7. $5 \times 5 \times 5 \times 5 \times 5 \times 5 \times 5 =$

8. $\frac{1}{3 \times 3 \times 3 \times 3 \times 3}$

9. $7 \times 7 \times 7 \times 7 \times 7 \times 7 \times 7 =$

10. $\frac{1}{2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2}$

10.2 Expressing a Number as a Product of a Given Number

In this lesson, we shall express a given number as repeated prime factors and then in index form.

To express a given number as repeated prime factor, find a prime factor of the given number such that when multiplied by itself a certain number of times, we the given number.

Example 1

Write the repeated prime factors and index form of 27.

Solution

The repeated prime factors of $27 = 3 \times 3 \times 3$

The index form of $27 = 3^3$

Example 2

Express 64 as repeated prime factors and index form.

Solution

$64 = 2 \times 2 \times 2 \times 2 \times 2 \times 2 = 2^6$

Example 3

Write 16×27 in index form.

Solution

$16 \times 27 = 2 \times 2 \times 2 \times 2 \times 3 \times 3 \times 3$

$= 2^4 \times 3^3$

Exercise: 3

Write the repeated prime factors and index form of each of the following.

1. $81 =$
2. $125 =$
3. $25 \times 49 =$
4. $8 \times 121 =$
5. $128 =$
6. $27 \times 125 =$
7. $16 \times 81 =$
8. $64 \times 25 =$
9. $343 =$
10. $4 \times 169 =$

10.3 The value of a Number with Zero as its Exponent

We know that $\frac{x}{x} = 1$

But from indices,

$\frac{x}{x} = x^1 \div x^1 = x^{1-1} = x^0 = 1$

Again, $\frac{x^3}{x^3} = x^3 \div x^3 = x^{3-3} = x^0 = 1$

For instance,

$\frac{13}{13} = 13 \div 13 = 13^{1-1} = 13^0 = 1$

NB: The value of any natural number with exponent zero is 1.

So, $5^0 = 1, 7^0 = 1, 43^0 = 1, 590^0 = 1$, etc.

Example 1

Express $\frac{27}{27}$, using the powers of numbers.

Solution

$\frac{27}{27} = \frac{3^3}{3^3} = 3^{3-3} = 3^0 = 1$

Example 2

Find the value of 32×19^0.

Solution

$3^2 \times 19^0 = 9 \times 1$

$= 9$

Exercise: 4

Find the value of each of the following.

1. $9^0 \times 8^0$
2. $5^2 - 4^0$
3. $2^0 + 3^0$
4. $15^0 + 5^0$
5. $43 + 28^0$
6. $11^0 \times 11^0$
7. $29^0 + 14^0$
8. $3^0 \times 3^0$
9. $4^0 \times 6^0$
10. $7^0 + 9^0$

10.4 The Value of a Number in Index Form

work out the multiplication.

Example 1

Find the value of 3^4

Solution

$3^4 = 3 \times 3 \times 3 \times 3$

$= 9 \times 9$

$= 81$

Example 2

Find the value of 5^3

Solution

$5^3 = 5 \times 5 \times 5$

$= 25 \times 5$

$= 125$

Example 3

What is the value of $\frac{1}{2^5}$?

Solution $\frac{1}{2^5} = \frac{1}{2 \times 2 \times 2 \times 2 \times 2}$

$= \frac{1}{32}$

Exercise: 5

Find the value of each of the following.

1. $11^2 =$
2. $7^3 =$
3. $13^2 =$
4. $\frac{1}{3^4}$
5. $\frac{3}{3^3}$
6. $11^3 \times 5^0 =$
7. $2^7 \times 3^0 =$
8. $3^2 \times 2^4 =$
9. $7^3 \times 2^3 =$
10. $5^4 \times 7^0 =$

10.5 Using the Product of Prime to find HCF

In this lesson, we shall use prime factorisation to find the HCF of numbers.

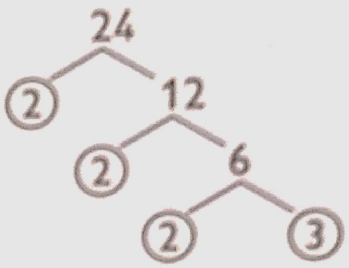
HCF is the Highest Common Factor of two or more numbers.

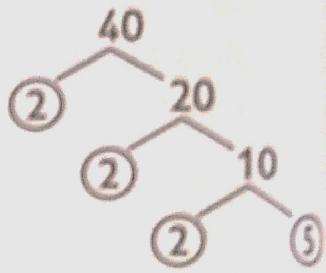
In determining the prime factorisation of given numbers, the factor tree will be used.

Example 1

Find the HCF of 24 and 40 using prime factorisation.

Solution





Prime factorisation of 24 = $2 \times 2 \times 2 \times 3$

Prime factorisation of 40 = $2 \times 2 \times 2 \times 5$

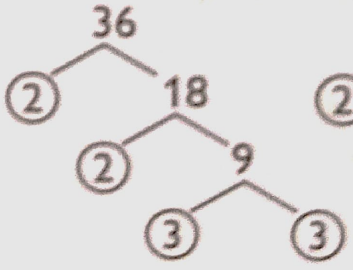
The common prime factorisation of 24 and 40 = $2 \times 2 \times 2$

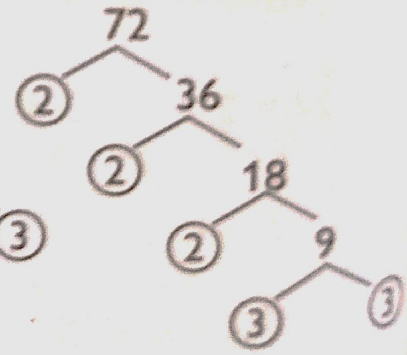
The HCF is the product of the common prime factorisation.

Therefore, the HCF of 24 and 40 is $2 \times 2 \times 2 = 8$

Example 2

Determine the HCF of 36 and 72 using prime factorisation.





$36 = 2 \times 2 \times 3 \times 3$ (prime factorisation)
$72 = 2 \times 2 \times 2 \times 3 \times 3$ (prime factorisation)
Common prime factorisation
$= 2 \times 2 \times 3 \times 3$
HCF of 36 and 72 = 36

Exercise: 6

Use prime factorisation to find the HCF of each pair of numbers.

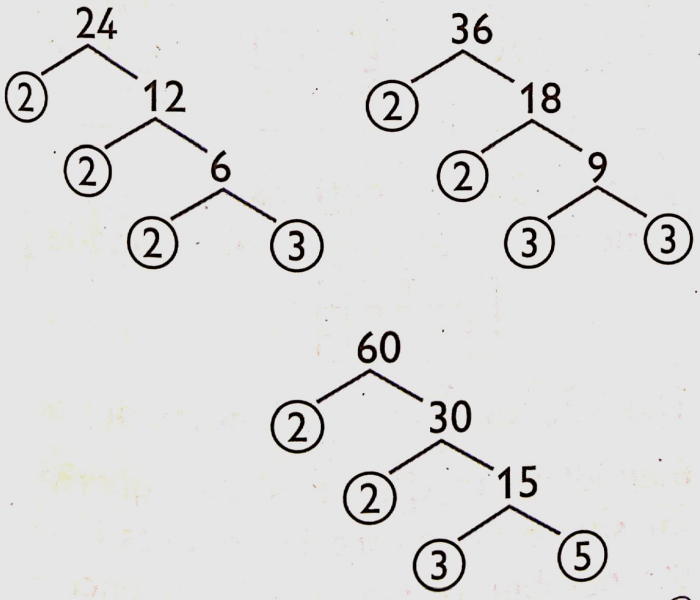
1. 18 and 30
2. 36 and 42
3. 44 and 66
4. 28 and 70
5. 39 and 65
6. 50 and 75
7. 42 and 63
8. 52 and 78
9. 60 and 105
10. 126 and 210

Now let us look at how to find the HCF of three given numbers using prime factorisation.

Example 1

Find the HCF of 24, 36 and 60 using prime factorisation.

Solution



Prime factorisation of 24 = $2 \times 2 \times 2 \times 3$
Prime factorisation of 36 = $2 \times 2 \times 3 \times 3$
Prime factorisation of 60 = $2 \times 2 \times 3 \times 5$

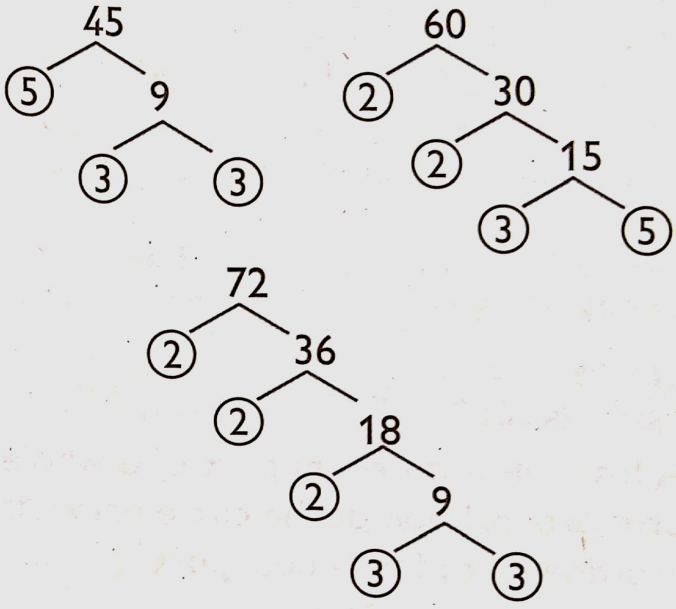
The common prime factorisation = $2 \times 2 \times 3$

The HCF of 24, 36 and 60 is the product of their common prime factorisation which is 12.

Example 2

Find the HCF of 45, 60 and 72.

Solution



$45 = 3 \times 3 \times 5$
$60 = 2 \times 2 \times 3 \times 5$
$72 = 2 \times 2 \times 2 \times 3 \times 3$

The common factor is 3
Therefore, the HCF of 45, 60 and 72 = 3

Exercise: 7

Find the HCF of the following numbers using prime factorisation.

1. 12, 20 and 36
2. 18, 36 and 54
3. 30, 42 and 54
4. 18, 30 and 24
5. 30, 48 and 60
6. 28, 56 and 98
7. 30, 45 and 75
8. 28, 63 and 70
9. 36, 60 and 84
10. 35, 70 and 105

CHAPTER 11 FRACTIONS

STRAND 1: NUMBER

SUB-STRAND 3: Fractions, Decimals and Percentages

CONTENT STANDARD: B7.1.3.1 Simplify, compare and order a mixture of positive fractions (i.e. common, percent and decimal) by changing all to equivalent (i) fractions (ii) decimals, or (iii) percentages.

INDICATOR B7.1.3.1.1 Determine and recall the percentages and decimals of given benchmark fractions (i.e. tenths, fifths, fourths, thirds and halves) and use these to compare quantities.

B7.1.3.1.2 Compare and order fractions (i.e. common, percent and decimal fractions up to thousandths) limit to the benchmark fractions.

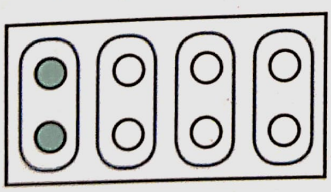
11.1 The Concept of Fraction

A fraction is an equal part of a whole or a group. Look at the circle below. It is divided into four equal parts.

One part is shaded. This shaded part or portion is described as one out of four equal parts. One part is shaded.

It is written as $\frac{1}{4}$. This is a fraction of a whole.

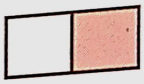
Again, look at the group of circles below. They are 8. They are grouped into 4 equal parts. One part is shaded.



The shaded circles represent 1 out of 4 equal parts. It is written as $\frac{1}{4}$.

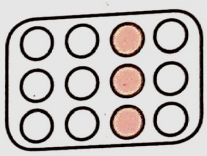
Exercise: 1

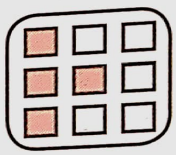
What fraction is shaded?

1. 

2. 

3. 

4. 

5. 

6. 

Shading Given Fractions

Look at the rectangle below. Shade $\frac{5}{6}$

The fraction $\frac{5}{6}$ means 5 parts out of 6 equal parts. Count all the squares in the shape. There are 18 squares. Divide the number of squares by 6 since we want to put them into 6 equal parts.

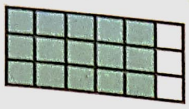
$18 \div 6 = 3$.

Each part contains 3 squares.

We are shading 5 parts so multiply 5 by 3 squares. $3 \times 5 = 15$.

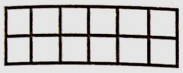
Shade 15 squares out of 18 squares.

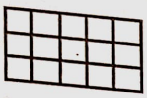
This represents $\frac{5}{6}$.



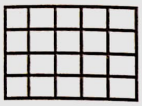
Exercise: 2

Shade the given fraction.

1. $\frac{1}{6}$ 

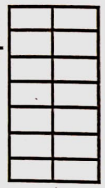
2. $\frac{3}{5}$ 

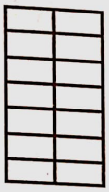
3. $\frac{1}{3}$ 

4. $\frac{2}{5}$ 

5. $\frac{1}{4}$ 

6. $\frac{2}{3}$ 

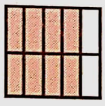
7. $\frac{2}{7}$ 

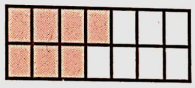
8. $\frac{3}{7}$ 

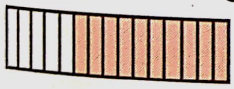
Exercise: 3

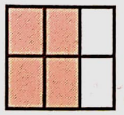
What fraction is shaded?

1. 

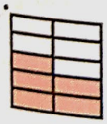
2. 

3. 

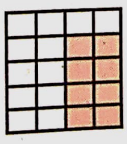
4. 

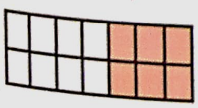
5. 

6. 

7. 

8. 

9. 

10. 

Equivalent Fractions

Equivalent fractions are fractions that have different numerators and denominators but represent the same value or proportion of the whole or group.

Look at the sizes of the shaded portions in the shapes below. What can you say about them?

What fraction is shaded in each?

$\frac{2}{3}$ $\frac{4}{6}$ $\frac{6}{9}$

The shaded sizes or proportions are the same but the fractions are different.

The fractions have different numerators. They are, 2, 4 and 6 respectively.

The denominators are also different. They are 3, 6 and 9 respectively.

The fractions are equivalent fractions because they represent the same value.

$$\frac{2}{3} = \frac{4}{6} = \frac{6}{9}$$

To find the equivalent of a given fraction, multiply the numerator and denominator each by the same non-zero whole number.

Example: Write three fractions equivalent to $\frac{3}{5}$.

Multiply $\frac{3}{5}$ by 2.

$$\frac{3}{5} = \frac{3 \times 2}{5 \times 2} = \frac{6}{10}$$

Multiply $\frac{3}{5}$ by 3.

$$\frac{3}{5} = \frac{3 \times 3}{5 \times 3} = \frac{9}{15}$$

Multiply $\frac{3}{5}$ by 4.

$\frac{3}{5} = \frac{3 \times 4}{5 \times 4} = \frac{12}{20}$

$\frac{6}{10}$, $\frac{9}{15}$ and $\frac{12}{20}$ are equivalent to $\frac{3}{5}$

Example 2: Write 3 equivalent fractions of $\frac{2}{3}$

Multiply $\frac{2}{3}$ by 2.

$\frac{2}{3} = \frac{2 \times 2}{3 \times 2} = \frac{4}{6}$

Multiply $\frac{2}{3}$ by 3.

$\frac{2}{3} = \frac{2 \times 3}{3 \times 3} = \frac{6}{9}$

Multiply $\frac{2}{3}$ by 3.

$\frac{2}{3} = \frac{2 \times 4}{3 \times 4} = \frac{8}{12}$

$\frac{4}{6}$, $\frac{6}{9}$ and $\frac{8}{12}$ are equivalent to $\frac{2}{3}$

Exercise: 4

Write down three fractions that are equivalent to the given fraction.

1. $\frac{1}{3}$ 2. $\frac{1}{2}$ 3. $\frac{2}{5}$ 4. $\frac{3}{7}$ 5. $\frac{2}{9}$
6. $\frac{4}{5}$ 7. $\frac{3}{8}$ 8. $\frac{5}{6}$ 9. $\frac{5}{7}$ 10. $\frac{1}{4}$

Simplifying Fractions

To express a fraction in simplest form means reducing the fraction so that the numerator and denominator cannot be any smaller as whole numbers.

Example: Find the simplest form of $\frac{6}{10}$.

Find the largest number or highest common factor of the numerator and denominator.

Solution: Factors of 6 are 1, 2, 3 and 6
Factors of 10 are 1, 2, 5 and 10.
Common factors are 1 and 2. Highest Common Factor is 2.
Divide both numerator and denominator by 2.

$\frac{6}{10} = \frac{6 \div 2}{10 \div 2} = \frac{3}{5}$

Example 3: Simplify $\frac{8}{20}$

Factors of 8 are 1, 2, 4 and 8.
Factors of 20 are 1, 2, 4, 5, 10 and 20.
Common factors are 1, 2, 4
Highest common factor is 4
Divide 8 and 20 each by 4.

$\frac{8}{20} = \frac{8 \div 4}{20 \div 4} = \frac{2}{5}$

Exercise: 5

Simplify the following fractions.

1. $\frac{4}{8}$ 2. $\frac{6}{18}$ 3. $\frac{4}{10}$ 4. $\frac{16}{24}$
5. $\frac{10}{25}$ 6. $\frac{8}{18}$ 7. $\frac{14}{35}$ 8. $\frac{8}{10}$
9. $\frac{16}{20}$ 10. $\frac{4}{36}$ 11. $\frac{20}{45}$ 12. $\frac{25}{100}$

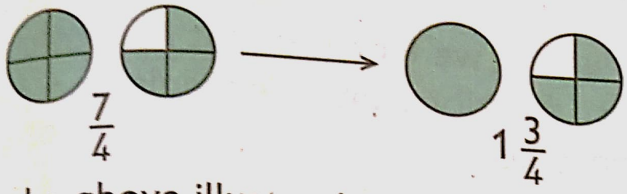
11.2 Conversion of Fractions

Converting Improper Fractions to Mixed Numbers

A fraction whose numerator is larger than the denominator is an improper fraction.

For Example $\frac{7}{4}$ is an improper fraction. It could be changed into mixed numbers. A mixed number contains whole number and proper fraction.

Look at how $\frac{7}{4}$ is shown.

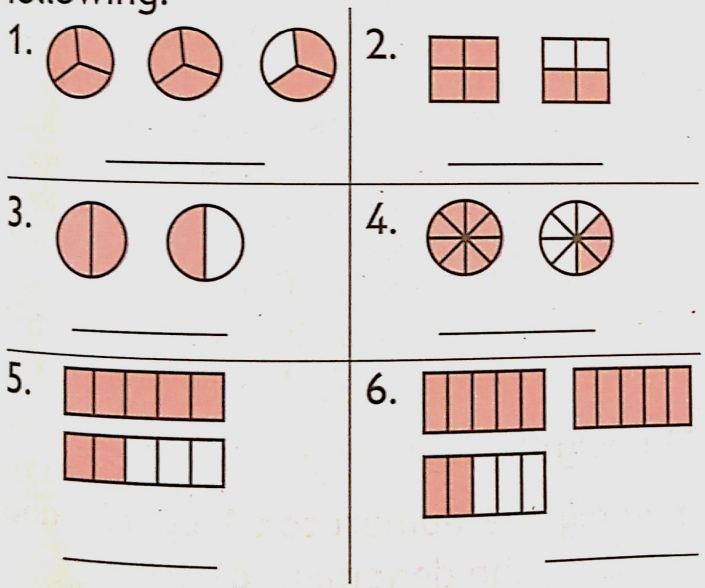


In the above illustration, the improper fraction $\frac{7}{4}$ is changed to mixed numbers. The divisions in the full circle shaded is removed. The circle which is partly shaded is maintained.

The mixed number, $1\frac{3}{4}$ is read as 1 whole number, 3 over 4. It means 1 full circle and 3 parts of 4 equal parts of a circle.

Exercise: 6

Write the improper fraction for the following.



Example: Change $\frac{7}{3}$ into mixed number.

The following steps is followed to convert improper fraction into mixed numbers.

STEP 1: Divide the numerator by the denominator.

$7 \div 3 = 2$ remainder 1

STEP 2: Write down the whole number. The whole number is the number of times the denominator divides into the numerator.

2 is the whole number.

STEP 3: Write the remainder as the numerator of the fractional part of the mixed number.

Maintain the denominator.

$\frac{7}{3} = 2\frac{1}{3}$

Example: Convert $\frac{12}{7}$ to mixed number.

$12 \div 7 = 1$ remainder 5

$\frac{12}{7} = 1\frac{5}{7}$

Exercise: 7

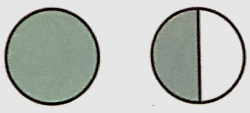
Convert the improper fractions to mixed numbers.

1. $\frac{5}{3}$ 2. $\frac{7}{4}$ 3. $\frac{11}{8}$ 4. $\frac{15}{2}$ 5. $\frac{12}{5}$

6. $\frac{10}{6}$ 7. $\frac{3}{2}$ 8. $\frac{9}{7}$ 9. $\frac{6}{5}$ 10. $\frac{5}{5}$

Converting Mixed Numbers to Improper Fractions

Look at the mixed number shown below.



It is $1\frac{1}{2}$

The second circle is divided into two equal parts. Each part is one – half ($\frac{1}{2}$).

To change it to improper fraction, divide the first circle also into two equal parts. Count the number of halves shaded. This becomes the numerator. 3 halves are shaded.

The denominator is the number of equal parts a circle is divided. Each circle is divided into 2.

The improper fraction is $\frac{3}{2}$.

$1\frac{1}{2} = \frac{3}{2}$

To convert a mixed number into improper fraction, multiply the whole number by the denominator.

Add the product to the numerator. The result becomes the numerator of the improper fraction. The denominator remains the same.

Example 1: Change $1\frac{1}{2}$ to improper fraction.

Solution: $1\frac{1}{2}$ $\quad 1 \times 2 = 2$

$2 + 1 = 3$

$1\frac{1}{2} = \frac{3}{2}$

Example 2: Convert $2\frac{3}{5}$ to improper fraction.

$2\frac{3}{5}$ $\quad 2 \times 5 = 10$

$10 + 3 = 13$

$2\frac{3}{5} = \frac{13}{5}$

Example 3: Convert $2\frac{5}{9}$ to improper fraction.

$2\frac{5}{9}$ $\quad 2 \times 9 = 18$

$18 + 5 = 23$

$2\frac{5}{9} = \frac{23}{9}$

11.3 Common, Decimal Fractions and Percent Equivalences

In unit 5, we learnt about how to co vert fractions into decimals and pe centages.

Let us look at the conversion of som benchmark fractions.

Example: Convert $\frac{1}{10}$ to decimal number and percentage.

Solution: $\frac{1}{10}$ to decimal number.

Use long division, the numerator is p inside the long division and the denom inator is put outside as shown below

$$10\overline{)\begin{array}{r}0.1\\10\\-10\\\hline 00\end{array}}$$

Since 10 cannot divide 1 to ge a whole number, put 0 beside the 1 in the long division.

Put the same 0 at the top o the long division and put decimal point. The 1 is now 10

Divide 10 by 10 to get 1. Write the 1 after the decimal point.

Multiply this 1 by 10 and write it under the 10 inside the long division sign. Subtract 10 from 10 to get 0.

0 cannot be divided by 10.

Therefore, $\frac{1}{10} = 0.1$

Multiply the fraction by 100. In $\frac{1}{10}$, multiply the numerator, 1 by 100 an divide by the denominator, 10.

$\frac{1}{10} \times 100 = \frac{1 \times 100}{10} = 10\%$

$\frac{1}{10} = 10\%$

Example: Change $\frac{3}{5}$ into percent and decimal number.

Solution: $\frac{3}{5}$ into percent.

Multiply 3 by 100 and divide by 5.

$\frac{3}{5} = \frac{3 \times 100}{5} = \frac{300}{5} = 60\%$

$\frac{3}{5} = 60\%$

$\frac{3}{5}$ into decimal

Put 3 in the sign and 5 outside as shown.

$$5\overline{)30}\ \ 0.6$$
$$-30$$
$$00$$

$\frac{3}{5} = 0.6$

Example: Change 80% into fraction and decimal number.

Solution: $80\% = \frac{80}{100} = \frac{8}{10} = \frac{4}{5}$

$80\% = \frac{80}{100}$

$$100\overline{)800}\ \ 0.8$$
$$-800$$
$$000$$

$80\% = 0.8$

Example: Change 75% into fraction and decimal number.

Solution: $75\% = \frac{75}{100} = 3/4$

$75\% = \frac{75}{100}$

$$100\overline{)750}\ \ 0.75$$
$$-700$$
$$500$$
$$-500$$
$$000$$

$75\% = 0.75$

Example: Change 0.5 into fraction and percent.

Solution:

$0.5 = \frac{50}{100} = \frac{1}{2}$

$0.5 = \frac{1}{2}$

Change 0.5 into decimal.

Multiply 0.5 by 100 and put the % sign.

$= 0.5 \times 100$

$0.5\overset{\curvearrowleft}{0}$

$= 50\%$

$0.5 = 50\%$

Exercise: 8

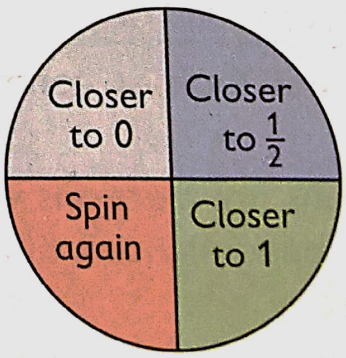
Work out and complete the table below.

Common	$\frac{1}{10}$		$\frac{1}{4}$	$\frac{3}{20}$					$\frac{3}{10}$
Percent					50%		40%		
Decimal	0.1	0.2						0.6	

Spinning the fraction wheel and identifying Fractions

a. Closer to 1/2
b. Closer to 1
c. Closer to zero

Look at the fraction wheel below.



With these given fraction cards, after spinning the wheel, choose the correct fraction among the cards.

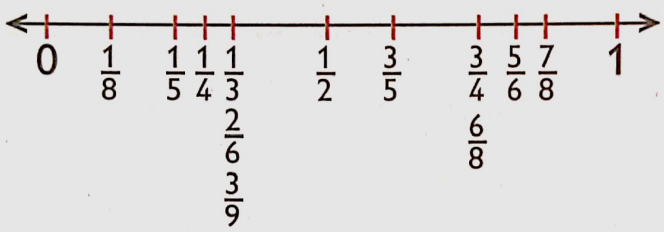
From the wheel, after the spin, the arrow is on closer to 0. Find among the fraction cards, the one that is closest to 0.

$\frac{1}{2}$ $\frac{1}{3}$ $\frac{1}{4}$ $\frac{1}{8}$

$\frac{3}{4}$ $\frac{1}{5}$ $\frac{3}{5}$ $\frac{6}{8}$

$\frac{3}{9}$ $\frac{2}{6}$ $\frac{5}{6}$ $\frac{7}{8}$

Let us place the fractions card on a number line so that it is easier to find which is closer to 1, which is closer to $\frac{1}{2}$ and which is closer to 0.



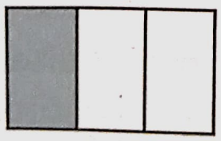
From the number line $\frac{1}{8}$ is closest to 0. Therefore, choose the fraction card for 1/8.

Again, from the number line, the fraction closest to 1 is $\frac{7}{8}$.

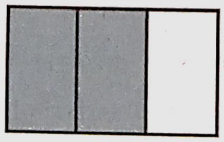
11.4 Comparing and Ordering Common Fractions

We shall first look at comparing like fractions.

Like fractions are fractions which have the same denominator but different numerators.



$\frac{1}{3}$



$\frac{2}{3}$

Each rectangle is divided into 3 equal parts. In the first one, one-third $(\frac{1}{3})$ is shaded.

The second one, two-thirds $(\frac{2}{3})$ is shaded.

The fractions are like fractions. Which of the shaded portions (fractions) is greater.

From the pictures, $\frac{2}{3}$ is greater than $\frac{1}{3}$.

From the above illustration, to compare like fractions; compare their numerators. The fraction which has bigger numerator is greater or larger than the other.

Thus, in like fractions, the bigger the numerator the bigger the fraction.

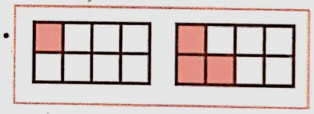
Exercise: 9

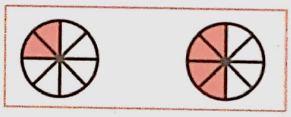
Use the diagrams to compare the fractions. Write the fraction for the shaded part.

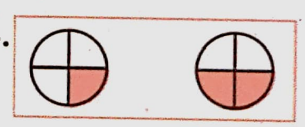
Write greater than or less than.

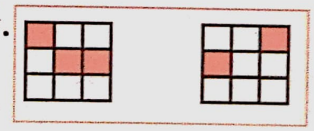
1. 

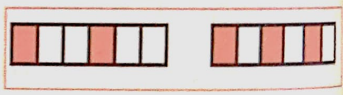
$\frac{3}{4}$ greater than $\frac{1}{4}$

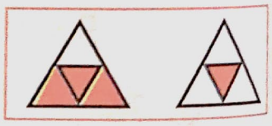
2. 

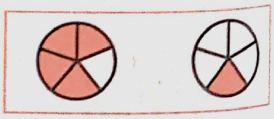
3. 

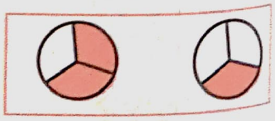
4. 

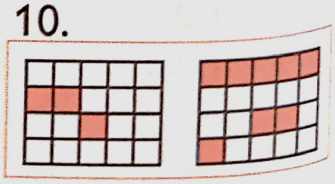
5. 

6. 

7. 

8. 

9. 

10. 

Exercise: 10

Insert <, > or =

1. $\frac{6}{14}$ ___ $\frac{3}{14}$
2. $\frac{1}{5}$ ___ $\frac{3}{5}$
3. $\frac{2}{7}$ ___ $\frac{6}{7}$
4. $\frac{3}{6}$ ___ $\frac{1}{6}$
5. $\frac{3}{4}$ ___ $\frac{3}{4}$
6. $\frac{1}{9}$ ___ $\frac{3}{9}$
7. $\frac{4}{5}$ ___ $\frac{1}{5}$
8. $\frac{10}{15}$ ___ $\frac{13}{15}$
9. $\frac{4}{6}$ ___ $\frac{1}{6}$
10. $\frac{3}{9}$ ___ $\frac{2}{9}$

Unit Fractions

A unit fraction is a fraction which has a numerator of 1.

Look at the diagrams below.

$\frac{1}{2}$ $\frac{1}{3}$ $\frac{1}{4}$

In each circle, 1 part is shaded.

We can observe that the shaded portion of $\frac{1}{2}$ is bigger than the shaded portion of $\frac{1}{3}$. Again, the shaded portion for $\frac{1}{3}$ is bigger than the shaded portion of $\frac{1}{4}$.

For unit fractions, *the smaller the denominator, the bigger the fraction.* Again, *the bigger the denominator, the less the fraction.*

Example: Which is less?

$\frac{1}{4}$ and $\frac{1}{7}$

Compare the denominators, 4 and 7. 4 is smaller than 7 so $\frac{1}{4}$ is greater than $\frac{1}{7}$ because the smaller the denominator, the bigger the fraction.

That is $\frac{1}{4} < \frac{1}{7}$

Exercise: 11

Insert < or > to compare the following unit fractions.

1. $\frac{1}{6}$ ___ $\frac{1}{4}$
2. $\frac{1}{8}$ ___ $\frac{1}{7}$
3. $\frac{1}{5}$ ___ $\frac{1}{2}$
4. $\frac{1}{3}$ ___ $\frac{1}{6}$
5. $\frac{1}{2}$ ___ $\frac{1}{4}$
6. $\frac{1}{9}$ ___ $\frac{1}{7}$
7. $\frac{1}{7}$ ___ $\frac{1}{4}$
8. $\frac{1}{8}$ ___ $\frac{1}{3}$
9. $\frac{1}{5}$ ___ $\frac{1}{2}$
10. $\frac{1}{10}$ ___ $\frac{1}{12}$

Let us continue to compare unlike fractions.

Unlike fractions have different numerators and different denominators.

To compare unlike fractions, find the Lowest Common Denominator (LCD). It is also the Lowest Common Multiple of the denominators. It is the smallest number divisible by the denominators. Change the fractions to like fractions for easier comparison.

Hopefully, you remember how to find multiples of numbers.

Example: Which is smaller, $\frac{2}{5}$ and $\frac{3}{7}$.

Solution: the denominators are 5 and 7.

Multiples of 5 = 5, 10, 15, 20, 25, 30, 35, 40, 45, 50, 55, 60, 65, 70…

Multiples of 7 = 7, 14, 21, 24, 35, 42, 49, 56, 63, 70 …

Common multiples = 35, 70

Least Common Multiples = 35.

$\frac{2}{5} = \frac{\square}{35}$ $\frac{2}{5} = \frac{2 \times 7}{5 \times 7} = \frac{14}{35}$

$\frac{3}{7} = \frac{\square}{35}$ $\frac{3}{7} = \frac{3 \times 5}{7 \times 5} = \frac{15}{35}$

$\frac{14}{35}$ and $\frac{15}{35}$ are now like fractions.

We learnt that in like fractions, the smaller the numerator, the less the fraction.

$\frac{14}{35}$ is less than $\frac{15}{35}$

$\frac{2}{5}$ is less than $\frac{3}{7}$

Example: Which is greater: $\frac{7}{12}$ and $\frac{8}{10}$.

Solution: $\frac{7}{12}$ and $\frac{8}{10}$ are unlike fractions.

The LCM of the denominators 12 and 10 is 120.

$\frac{7}{12} = \frac{\square}{120} = \frac{7 \times 10}{12 \times 10} = \frac{70}{120}$

$\frac{8}{10} = \frac{\square}{120} = \frac{8 \times 12}{10 \times 12} = \frac{96}{120}$

Now, compare $\frac{70}{120}$ and $\frac{96}{120}$ which are like fractions.

For like fractions, the greater the numerator the greater the fraction. 96 is greater than 70.

$\frac{96}{120}$ is greater than $\frac{70}{120}$

$\frac{8}{10}$ is greater than $\frac{7}{12}$

Exercise: 12

Put < or > to compare the following unlike fractions.

1. $\frac{3}{5} \_\_\_\_ \frac{2}{7}$
2. $\frac{4}{9} \_\_\_\_ \frac{2}{3}$
3. $\frac{3}{6} \_\_\_\_ \frac{1}{20}$
4. $\frac{2}{9} \_\_\_\_ \frac{3}{7}$
5. $\frac{5}{8} \_\_\_\_ \frac{3}{4}$
6. $\frac{7}{12} \_\_\_\_ \frac{3}{10}$
7. $\frac{3}{5} \_\_\_\_ \frac{7}{8}$
8. $\frac{6}{7} \_\_\_\_ \frac{2}{3}$
9. $\frac{3}{4} \_\_\_\_ \frac{5}{6}$
10. $\frac{8}{9} \_\_\_\_ \frac{5}{7}$

Ordering Fractions in Ascending and Descending order

We have just learnt to compare fractions (like, unit and unlike fractions. Let us continue to order fractions.

Let us continue to order fractions.

Fractions could be arranged in order of magnitude.

To arrange fractions in ascending order means arranging the fractions from smallest to greatest. For example, $\frac{1}{2}$, $\frac{2}{3}$ and $\frac{4}{5}$ are arranged in ascending order.

To arrange fractions in descending order means to arrange the fractions from biggest to smallest.

For example, $\frac{4}{5}$, $\frac{2}{3}$ and $\frac{1}{2}$ are arranged in descending order.

In like fractions, the fraction with biggest numerator is the greatest.

Example: Order $\frac{2}{6}$, $\frac{1}{6}$ and $\frac{3}{6}$ in ascending order.

Solution: the fractions are like fractions because they have the same denominator but different numerators. The fraction with smallest numerator is the smallest.

Comparing the numerators $1 < 2 < 3$.

So $\frac{1}{6} < \frac{2}{6} < \frac{3}{6}$

To order unlike fractions, first change them into like fractions.

Example: Arrange these fractions in descending order.

$\frac{2}{3}, \frac{1}{10}, \frac{4}{5}$

Solution: The Least Common Denominator of 3, 10 and 5 is 30.

Change each of the fractions to have a denominator of 30.

$$\frac{2}{3} = \frac{\square}{30} = \frac{2 \times 10}{3 \times 10} = \frac{20}{30}$$

$$\frac{3}{10} = \frac{\square}{30} = \frac{2 \times 3}{10 \times 3} = \frac{9}{30}$$

$$\frac{4}{5} = \frac{\square}{30} = \frac{6 \times 4}{5 \times 6} = \frac{24}{30}$$

Now compare $\frac{20}{30}, \frac{9}{30}$ and $\frac{24}{30}$

They are now like fractions comparing the numerators, 24 > 20> 9.

$\frac{24}{30} > \frac{20}{30} > \frac{9}{30}$ Corresponding to

$\frac{4}{5}, \frac{2}{3}$ and $\frac{3}{10}$

Exercise: 13

Arrange the fractions from smallest to greatest.

1. $\frac{1}{2}, \frac{4}{9}, \frac{2}{3}$
2. $\frac{2}{5}, \frac{2}{3}, \frac{3}{10}$
3. $\frac{2}{7}, \frac{3}{10}, \frac{4}{5}$
4. $\frac{2}{5}, \frac{6}{7}, \frac{3}{10}$
5. $\frac{3}{7}, \frac{2}{7}, \frac{4}{7}$
6. $\frac{4}{9}, \frac{2}{6}, \frac{2}{3}$
7. $\frac{3}{8}, \frac{2}{8}, \frac{7}{8}$
8. $\frac{4}{5}, \frac{1}{5}, \frac{3}{5}$
9. $\frac{4}{5}, \frac{3}{10}, \frac{2}{7}$
10. $\frac{1}{8}, \frac{7}{8}, \frac{3}{8}$

Exercise: 14

Arrange the fractions in descending order.

1. $\frac{3}{7}, \frac{2}{8}, \frac{5}{10}$
2. $\frac{3}{9}, \frac{2}{7}, \frac{3}{5}$
3. $\frac{4}{5}, \frac{3}{10}, \frac{4}{6}$
4. $\frac{1}{5}, \frac{3}{6}, \frac{5}{7}$
5. $\frac{2}{7}, \frac{3}{4}, \frac{4}{5}$
6. $\frac{3}{9}, \frac{2}{9}, \frac{4}{9}$
7. $\frac{2}{8}, \frac{3}{8}, \frac{1}{8}$
8. $\frac{3}{10}, \frac{2}{10}, \frac{9}{10}$
9. $\frac{4}{5}, \frac{3}{5}, \frac{1}{5}$
10. $\frac{2}{5}, \frac{3}{5}, \frac{4}{5}$

11.5 Comparing and Ordering Mixture of Common, percent and Decimal Fractions

We may be required to compare and order decimals, percent and common fractions.

Don't worry. It is not difficult.

All we need to do is to convert the fractions into one form.

Do you remember what we learnt about these conversions in Unit 5?

Example: Which decimal fraction is greater: 0.99 and 0.977?

Solution:

Put them on a place value chart.

Ones	Decimal point	Tenths	Hundredths	Thousandths
0	.	9	9	0
0	.	9	7	7

Start comparing from tenths. Both numbers have the digit, 9 in the tenths place.

Compare the hundredths, the digit 9 is greater than 7. So 0.99 is greater than 0.977.

We could also convert the decimal fraction into percent fraction and compare.

Multiply by 100.

$= 0.99 \times 100$

There are 2 zeros, move the decimal by 2 places to the right.

$0.99 = 99\%$

0.977×100

$= 0.977 = 97.7\%$

99% is greater than 97.7%

Example: Order the decimal numbers 0.098, 0.985 and 0.123 from least to greatest.

Solution: Place the numbers on the place value chart.

Ones	Decimal point	Tenths	Hundredths	Thousandths
0	.	0	9	8
0	.	9	8	5
0	.	1	2	3

From the chart, in the Tenths place, $0 < 1 < 9$.

$0.098 < 0.123 < 0.985$.

Arranging from least to greatest 0.098, 0.123, 0.985.

Alternatively, we could also convert them into percent fraction by multiplying each by 100.

$0.098 \times 100 = 9.8\%$

$0.985 \times 100 = 98.5\%$

$0.123 \times 100 = 12.3\%$

Exercise: 15

Underline the greater decimal fraction

1. 0.015 and 0.231
2. 0.460 and 0.95
3. 0.443 and 0.098
4. 0.215 and 0.561
5. 0.332 and 0.567
6. 0.831 and 0.729
7. 0.436 and 0.224
8. 0.536 and 0.663
9. 0.599 and 0.009
10. 0.345 and 0.362

Exercise: 16

Order the decimals from least to greatest.

1. 0.321, 0.404, 0.009
2. 0.226, 0.386, 0.910
3. 0.247, 0.299, 0.230
4. 0.665, 0.695, 0.069
5. 0.831, 0.278, 0.847
6. 0.327, 0.427, 0.839
7. 0.427, 0.392, 0.667
8. 0.327, 0.427, 0.395
9. 0.899, 0.437, 0.667
10. 0.321, 0.866, 0.395

Example: Order $\frac{1}{5}$, 0.5 and 60% from least to greatest.

Solution: Change the mixture of fraction into one form.

Let us change them into common fraction.

$0.5 = \frac{5}{10} = \frac{1}{2}$

$60\% = \frac{60}{100} = \frac{6}{10} = \frac{3}{5}$

$\frac{1}{5}, \frac{1}{2}$ and $\frac{3}{5}$ They are unlike fractions.

The Least Common Denominator of the fractions is 10.

$\frac{1}{5} = \frac{\square}{10} = \frac{1 \times 2}{5 \times 2} = \frac{2}{10}$

$\frac{1}{2} = \frac{\square}{10} = \frac{1 \times 5}{2 \times 5} = \frac{5}{10}$

$\frac{3}{5} = \frac{\square}{10} = \frac{3 \times 2}{5 \times 2} = \frac{6}{10}$

They are now like fractions having the same denominator of 10.

$\frac{2}{10}$, $\frac{5}{10}$ and $\frac{6}{10}$

For like fractions the smaller the numerator, the smaller the fraction.
The numerator $2 < 5 < 6$.

$\frac{2}{10} < \frac{5}{10} < \frac{6}{10}$

$\frac{1}{5} < \frac{1}{2} < \frac{3}{5}$ corresponding to

$\frac{1}{5} < 0.5 < 60\%$

Thus arranging from least to greatest, we have $\frac{1}{5}$, 0.5 and 60%.

Alternatively, we could also express them in percent form.

0.5 in percent = 0.5×100

$= 50\%$

1/5 in percent = $\frac{1}{5} \times 100 = 20\%$

$20\% < 50\% < 60\%$ corresponding to

$\frac{1}{5} < 0.5 < 60\%$.

Arranging from least to greatest, we have $\frac{1}{5}$, 0.5, and 60%.

Exercise: 17

Arrange the following in ascending order (least to greatest)

1. 0.6, $\frac{1}{4}$, 97%
2. 28%, 0.25, $\frac{2}{5}$
3. 30%, 0.75, $\frac{3}{8}$
4. 0.881, 97%, $\frac{5}{6}$
5. $\frac{7}{9}$, 0.927, 16%
6. 0.831,82%, $\frac{4}{5}$
7. $\frac{1}{4}$, 0.4, 75%
8. 0.2, $\frac{1}{7}$, 35%
9. 0.832, 38%, $\frac{5}{8}$
10. 0.098, $\frac{1}{4}$, 26%

CHAPTER 12 ADDITION AND SUBTRACTION OF FRACTIONS

STRAND 1: NUMBER

SUB-STRAND 3: Fractions, Decimals and Percentages

CONTENT STANDARD: B7.1.3.2 Demonstrate an understanding of the process of addition and/or subtraction of fractions and apply this in solving problems.

INDICATOR B7.1.3.2.1 Explain the process of addition and subtraction of two or three unlike and mixed fractions.

B7.1.3.2.2 Solve problems involving addition or subtraction of fractions.

12.1 Addition of Mixed Unlike Fractions

Unlike fractions are fractions which have different denominators.

For example $\frac{1}{3}$ and $\frac{2}{5}$ are unlike fractions.

A mixed fraction has a combination of whole number and a proper fraction.

To add mixed fractions which are unlike, add the whole numbers. Add the fractions and put sum of the whole numbers and sum of the fractions together.

Example 1: Add $2\frac{2}{5}$ and $1\frac{2}{3}$.

Solution: Add the whole numbers

$$2 + 1 = 3$$

Add the fractions $\frac{2}{5} + \frac{2}{3}$

Find the LCM of the denominators. Use the LCM as new denominator.

$$\frac{6+10}{15} = \frac{16}{15} = 1\frac{1}{15}$$

Add the sum of the whole number and that of the fractions.

$$3 + 1\frac{1}{15} = 4\frac{1}{15}$$

Alternatively, change the mixed fractions into improper fractions and add them.

$$2\frac{2}{5} + 1\frac{2}{3}$$

To change a mixed fraction into improper fraction, multiply the denominator by the whole number and add the numerator.

$$2\frac{2}{5} = \frac{12}{5}$$

$$1\frac{2}{3} = \frac{5}{3}$$

Add the improper fractions.

$$\frac{12}{5} + \frac{5}{3}$$

$$\frac{36+25}{15} = \frac{61}{15}$$

Change $\frac{61}{15}$ into mixed fraction.

15 goes into 61, 4 times remainder 1

So $\frac{61}{15} = 4\frac{1}{15}$

Example 2: Find the sum of $1\frac{1}{5}$ and $2\frac{1}{2}$

Add the whole number parts of the fraction.

$1 + 2 = 3$

Add the fractions parts.

$$\frac{1}{5} + \frac{1}{2} =$$

$$\frac{2+5}{10} = \frac{7}{10}$$

Put the sum of the whole numbers and the fractions together.

$$3 + \frac{7}{10} = 3\frac{7}{10}$$

Solution: Alternatively, change the mixed fractions into improper fractions.

$$1\frac{1}{5} = \frac{6}{5}$$

$$2\frac{1}{2} = \frac{5}{2}$$

Add the improper fractions.

$$\frac{6}{5} + \frac{5}{2} =$$

$$\frac{12+25}{10} = \frac{37}{10} = 3\frac{7}{10}$$

Example 3: Add $2\frac{1}{3}$, $1\frac{1}{4}$ and $3\frac{2}{3}$

Solution: $2\frac{1}{3} + 1\frac{1}{4} + 3\frac{2}{3}$

$$= 2 + 1 + 3 + \frac{1}{3} + \frac{1}{4} + \frac{2}{3}$$

$$= 6 + \frac{1}{3} + \frac{1}{4} + \frac{2}{3}$$

$$= 6 + \frac{4+3+8}{12} = 6\frac{15}{12}$$

$$\frac{15}{12} = 1\frac{3}{12}; \quad = 6 + 1\frac{3}{12} = 7\frac{3}{12}$$

Alternatively, change the mixed fractions into improper fractions.

$$2\frac{1}{3} = \frac{7}{3} \qquad 1\frac{1}{4} = \frac{5}{4} \qquad 3\frac{2}{3} = \frac{11}{3}$$

$$\frac{7}{3} + \frac{5}{4} + \frac{11}{3}$$

$$\frac{28+15+44}{12} = \frac{87}{12}$$

Change $\frac{87}{12}$ into improper fraction.

$$\frac{87}{12} = 7\frac{3}{12}$$

Exercise: 1

Add the following fractions.

1. $2\frac{1}{5} + 3\frac{2}{8}$
2. $5\frac{1}{2} + 1\frac{1}{4}$
3. $3\frac{3}{4} + 3\frac{1}{3}$
4. $2\frac{7}{8} + 3\frac{1}{3}$
5. $2\frac{2}{3} + 5\frac{1}{7}$
6. $7\frac{1}{2} + 5\frac{1}{4}$
7. $10\frac{2}{3} + 5\frac{1}{6}$
8. $4\frac{1}{7} + 2\frac{1}{3}$
9. $3\frac{2}{5} + 4\frac{3}{7}$
10. $2\frac{1}{8} + 7\frac{2}{4}$

Exercise: 2

Find the sum of the fractions.

1. $4\frac{3}{6} + 2\frac{1}{3} + 8\frac{1}{2}$
2. $4\frac{1}{4} + 2\frac{3}{8} + 7\frac{1}{2}$
3. $5\frac{1}{5} + 2\frac{3}{7}$
4. $2\frac{5}{10} + 3\frac{1}{5}$
5. $5\frac{1}{5} + 3\frac{3}{4}$
6. $2\frac{6}{7} + 5\frac{1}{8}$
7. $4\frac{1}{5} + 3\frac{2}{3}$
8. $1\frac{2}{3} + 4\frac{1}{5}$
9. $6\frac{1}{4} + 5\frac{1}{2} + 3\frac{1}{6}$
10. $2\frac{2}{3} + 12\frac{1}{6}$

12.2 Subtraction of Unlike Mixed Fractions

To subtract mixed fractions, first subtract the whole numbers and then subtract the fractions.

Example 1: Find the difference of $2\frac{4}{5} - 1\frac{2}{3}$

Solution: $2\frac{4}{5} - 1\frac{2}{3} = (2-1) + \frac{4}{5} - \frac{2}{3}$

$= 1 + \frac{4}{5} - \frac{2}{3}$

$\frac{12-10}{15}$

$= 1 + \frac{2}{15} = 1\frac{2}{15}$

The other method is to first change the mixed numbers or fractions into improper fractions.

$2\frac{4}{5} = \frac{14}{5}$

$1\frac{2}{3} = \frac{5}{3}$

$\frac{14}{5} - \frac{5}{3}$

$\frac{42-25}{15} = \frac{17}{15} = 1\frac{2}{15}$

Example 2: $3\frac{3}{4} - 1\frac{1}{8}$

Solution: $3\frac{3}{4} - 1\frac{1}{8}$

$(3-1) + \frac{3}{4} - \frac{1}{8}$

$2 + \frac{6-1}{8}$

$2 + \frac{5}{8} = 2\frac{5}{8}$

Alternatively, change the mixed fractions into improper fractions and subtract.

$3\frac{3}{4} - 1\frac{1}{8}$

$= \frac{15}{4} - \frac{9}{8}$

$= \frac{30-9}{8}$

$= \frac{21}{8} = 2\frac{5}{8}$

Example

Solution: $9\frac{4}{6} - 5\frac{1}{5}$

$= (9-5) + \frac{4}{6} - \frac{1}{5}$

$4 + \frac{20-6}{30} = \frac{14}{30}$

$= 4 + \frac{14}{30} = 4\frac{14}{30}$

Alternatively, change mixed fractions into improper fractions and subtract.

$9\frac{4}{6} - 5\frac{1}{5}$

$= \frac{58}{6} - \frac{26}{5}$

$= \frac{290-156}{30}$

$= \frac{134}{30} = 4\frac{14}{30}$

Exercise: 3

Find the difference.

1. $8\frac{9}{10} - 5\frac{2}{3}$
2. $7\frac{1}{2} - 3\frac{1}{8}$
3. $10\frac{7}{12} - 8\frac{1}{2}$
4. $18\frac{3}{4} - 3\frac{1}{3}$
5. $5\frac{3}{5} - 3\frac{1}{10}$
6. $4\frac{2}{3} - 1\frac{1}{2}$
7. $6\frac{2}{4} - 2\frac{1}{8}$
8. $12\frac{7}{10} - 7\frac{2}{3}$
9. $4\frac{1}{4} - 2\frac{1}{5}$
10. $6\frac{4}{5} - 2\frac{1}{4}$

Exercise: 4

Subtract the following fractions.

1. $12\frac{3}{10} - 2\frac{1}{8}$
2. $4\frac{3}{5} - 1\frac{2}{4}$
3. $6\frac{3}{10} - 4\frac{1}{7}$
4. $10\frac{6}{7} - 7\frac{2}{6}$
5. $8\frac{4}{5} - 3\frac{1}{8}$
6. $5\frac{2}{6} - 3\frac{1}{8}$

7. $4\frac{2}{3} - 2\frac{1}{9}$

8. $8\frac{3}{4} - 2\frac{1}{2}$

9. $3\frac{1}{2} - 2\frac{1}{4}$

10. $2\frac{10}{11} - 1\frac{1}{3}$

12.3 Word Problems Involving Addition or Subtraction of Fractions

To solve a problem, read the entire problem and determine the appropriate mathematical operation(s) involved.

Example 1: $3\frac{1}{3}$ feet is cut off a board that is $12\frac{1}{4}$ feet long. How long is the remaining part of the board?

Solution: The problems involves subtraction because part of the board is cut off.

We are to find the remaining length. We need to subtract the length of the part that is cut off from the length of the whole board.

Length of whole board $= 12\frac{1}{4}$

Length of cut off part $= 3\frac{1}{3}$

Length of remaining board $= 12\frac{1}{4} - 3\frac{1}{3}$

$$12\frac{1}{4} = \frac{49}{4}$$

$$3\frac{1}{3} = \frac{10}{3}$$

$$\frac{49}{4} - \frac{10}{3}$$

$$\frac{147-40}{12}$$

$$= \frac{107}{12} = 8\frac{11}{12}$$

Example 2: The Musa family decided to hike to a waterfall, approximately $8\frac{5}{8}$ kilometres away. After an hour, the lake was still $5\frac{1}{3}$ kilometres away. How far did they hike after an hour?

Solution: The problem involves subtraction.

Total distance to be covered $= 8\frac{5}{8}$ km

Distance left to be covered $= 5\frac{1}{3}$

Distance covered so far $= 8\frac{5}{8} - 5\frac{1}{3}$

$$8\frac{5}{8} - 5\frac{1}{3}$$

$$= (8-5) + \frac{5}{8} - \frac{1}{3}$$

$$= 3 + \frac{5}{8} - \frac{1}{3}$$

$$= 3 + \frac{15-8}{24}$$

$$= 3 + \frac{7}{24} = 3\frac{7}{24}$$

Alternatively,

$$8\frac{5}{8} - 5\frac{1}{3}$$

$$= \frac{69}{8} - \frac{16}{3}$$

$$= \frac{207-128}{24}$$

$$\frac{79}{24} = 3\frac{7}{24}$$

Example 3: A tiler measured the length of a living room and had $15\frac{1}{4}$ feet. He also measured the length of a bedroom and it was $12\frac{1}{2}$ long.

What was the total length of the two rooms?

Solution: The problem involves addition.

Length of living room = $15\frac{1}{4}$ feet

Length of bedroom = $12\frac{1}{2}$ feet

Length of the two rooms = $15\frac{1}{4} + 12\frac{1}{2}$

$$15\frac{1}{4} + 12\frac{1}{2}$$

$$= 15 + 12 + \frac{1}{4} + \frac{1}{2}$$

$$27 + \frac{1+2}{4}$$

$$27 + \frac{3}{4} = 27\frac{3}{4}$$

Alternatively,

$$15\frac{1}{4} + 12\frac{1}{2}$$

$$= \frac{61}{4} + \frac{25}{2}$$

$$\frac{61+50}{4}$$

$$= \frac{111}{4} = 27\frac{3}{4}$$

Exercise: 5

1. A floor space of $12\frac{1}{2}$ m² was to be cleaned. Araba has cleaned $7\frac{1}{3}$ m². What is the area of space left uncleaned?

2. Three friends were given some oranges. Adom had $3\frac{1}{4}$, Adisi had $3\frac{1}{8}$ and Ahmed had $5\frac{1}{2}$. How many oranges were given to them altogether?

3. There was $8\frac{3}{4}$ litres of water in a gallon. It fell down and some of the water leaked away. Only $1\frac{1}{3}$ litres was left. How much leaked away?

4. A caterer cut away $1\frac{2}{5}$ cm of a piece of cassava which was $3\frac{3}{4}$ cm long because that portion was rotte How long was the unrotten part?

5. Two contractors were building new road. At the time of inspection, one had built $6\frac{1}{3}$ km long and the other had also built $5\frac{1}{2}$ km.

What is the distance of road constru ted so far by both contractors?

6. A bag of wet cocoa beans weighed $9\frac{3}{4}$ kg. After drying, the weight came down to $6\frac{1}{3}$. What w the weight loss?

7. There were $18\frac{4}{5}$ cups of rice for a family before COVID-19 lock down. After the lockdown, only $1\frac{1}{2}$ cup was left. How many cups of ric were consumed during the lockdown

8. Kofi used $10\frac{1}{2}$ minutes to walk and $7\frac{1}{9}$ minute on a bus to cover a distance from his house to gym cente What is the total time spent from hi house to the gym center.

CHAPTER 13

MULTIPLICATION OF A FRACTION BY A WHOLE NUMBER AND BY A FRACTION

STRAND 1: NUMBER

SUB-STRAND 3: Fractions, Decimals and Percentages

CONTENT STANDARD: B7.1.3.3 Demonstrate an understanding of the process of multiplying and dividing positive fractions and apply this in solving problems.

INDICATOR B7.1.3.3.1 Explain the process of multiplying a fraction (i.e. common, percent and decimal fractions up to thousandths) by a whole number and by a fraction.

B7.1.3.3.2 Find a fraction of given quantity (i.e. money or given quantity of objects).

13.1 Multiplying a Whole Number by a Fraction

In this lesson, we shall learn about how to multiply a whole number by a fraction. The multiplication is read as 'times'.

For instance, $3 \times \frac{1}{4}$ means 3 times $\frac{1}{4}$ or 3 groups of $\frac{1}{4}$.

Example: $3 \times \frac{1}{4}$

Let us use pictorial representation for a better understanding.

$3 \times \frac{1}{4}$ means 3 groups of $\frac{1}{4}$.

Thus, $\frac{1}{4} + \frac{1}{4} + \frac{1}{4}$

$\frac{1}{4} + \frac{1}{4} + \frac{1}{4} = \frac{3}{4}$

To find the product of a whole number and common fraction, multiply the whole number by the numerator and maintain the denominator.

$$3 \times \frac{1}{4} = \frac{3 \times 1}{4} = \frac{3}{4}.$$

Exercise: 1

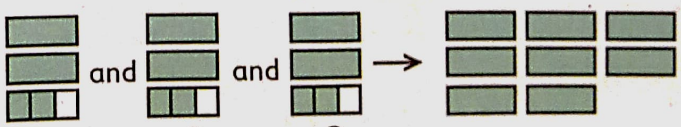
Multiply the following.

1. $4 \times \frac{2}{3}$
2. $3 \times \frac{1}{8}$
3. $2 \times \frac{1}{5}$
4. $3 \times \frac{2}{3}$
5. $4 \times \frac{1}{5}$
6. $3 \times \frac{2}{7}$
7. $4 \times \frac{3}{10}$
8. $2 \times \frac{1}{6}$
9. $1 \times \frac{4}{5}$
10. $5 \times \frac{1}{3}$

Let us look at how to multiply a whole number by a mixed number. Look at the pictorial representation of the given example.

Example: $3 \times 2\frac{2}{3}$

Solution: $3 \times 2\frac{2}{3}$ means 3 times $2\frac{2}{3}$ or 3 groups of $2\frac{2}{3}$.



$2\frac{2}{3} + 2\frac{2}{3} + 2\frac{2}{3} = 8$

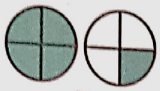
Since we need to change mixed numbers into improper fractions before we multiply by a whole number, let us first look at how to change mixed numbers.

Example: change $1\frac{1}{4}$ to improper fraction.

Solution: Let us show $1\frac{1}{4}$ in picture.

$1\frac{1}{4}$

The second circle is divided into fourths so to change the mixed number into improper fraction, the first circle (whole) has to be divided into fourths.



$\frac{5}{4}$

$1\frac{1}{4} = \frac{5}{4}$ because the same amount is shaded.

To change a mixed number into an improper fraction, multiply the denominator by the whole number. Add the product to the numerator. The result becomes the numerator of the improper fraction. The denominator remains unchanged.

$$1\frac{1}{4} = \frac{(1\times4)+1}{4} = \frac{5}{4}$$

Example: Change $5\frac{1}{3}$ into improper fraction.

Solution: $5\frac{1}{3} = \frac{(3\times5)+1}{3} = \frac{16}{3}$

Example: Change $2\frac{1}{3}$ into improper fraction.

Solution: $2\frac{1}{3} = \frac{(3\times2)+1}{3} = \frac{7}{3}$

Exercise: 2

Change these mixed fractions into improper fractions.

1. $2\frac{1}{6}$
2. $3\frac{2}{3}$
3. $4\frac{1}{5}$
4. $5\frac{3}{7}$
5. $4\frac{1}{6}$
6. $3\frac{2}{5}$
7. $3\frac{2}{8}$
8. $4\frac{1}{7}$
9. $3\frac{1}{4}$
10. $2\frac{1}{4}$
11. $3\frac{2}{9}$
12. $5\frac{3}{4}$
13. $1\frac{1}{7}$
14. $1\frac{3}{8}$
15. $6\frac{3}{4}$

To multiply a whole number by a fraction, follow these steps.

1. Change the mixed fraction into common fraction.
2. Multiply all numerators and denominators.
3. Simplify the results.

Example: Multiply the following.

1. $3 \times 2\frac{2}{3}$

Solution:

$$3 \times 2\frac{2}{3}$$
$$= 3 \times \frac{8}{3}$$
$$= \frac{3}{1} \times \frac{8}{3} = \frac{3\times8}{1\times3} = \frac{\cancel{24}^{\,8}}{\cancel{3}_{\,1}}$$
$$= 8$$

Alternatively, multiply the whole number by the whole number part of the mixed number. Again, multiply the whole number by the fraction part of the mixed numbers. Add the two products.

$$3 \times 2\frac{2}{3} = (3 \times 2) + (3 \times \frac{2}{3})$$

$= 6 + \frac{\cancel{6}^{2}}{\cancel{3}_{1}}$

$= 6 + 2 = 8$

2. $12 \times 1\frac{3}{5}$

Solution: $12 \times 1\frac{3}{5}$

$= 12 \times \frac{8}{5}$

$= \frac{12}{1} \times \frac{8}{5} = \frac{12 \times 8}{1 \times 5} = \frac{96}{5} = 19\frac{1}{5}$

3. $4 \times 3\frac{2}{6}$

Solution: $4 \times 3\frac{2}{6} = \frac{4}{1} \times \frac{20}{6}$

$= \frac{4 \times 20}{1 \times 6} = \frac{80}{6} = \frac{40}{3} = 13\frac{1}{3}$

Exercise: 3

Multiply the following.

1. $2 \times 6\frac{1}{5}$
2. $4 \times 3\frac{3}{7}$
3. $3 \times 2\frac{1}{5}$
4. $5 \times 4\frac{3}{8}$
5. $6 \times 2\frac{1}{4}$
6. $10 \times 3\frac{1}{2}$
7. $5 \times 6\frac{1}{2}$
8. $3 \times 2\frac{1}{8}$
9. $4 \times 8\frac{3}{5}$
10. $2 \times 5\frac{3}{7}$

To multiply a whole number by a common fraction, multiply the whole number by the numerator. Maintain the denominator.

Example: Find $15 \times \frac{2}{3}$

$15 \times \frac{2}{3} = \frac{15}{1} \times \frac{2}{3}$

$= \frac{15 \times 2}{1 \times 3}$

$= \frac{30}{3}$

Simplify $\frac{\cancel{30}^{10}}{\cancel{3}_{1}} = 10$

Example: Find $12 \times \frac{3}{8}$

Solution: $12 \times \frac{3}{8} = \frac{12}{1} \times \frac{3}{8} = \frac{12 \times 3}{1 \times 8}$

$= \frac{36}{8} = \frac{9}{2} = 4\frac{1}{2}$

Example: Find $2 \times \frac{2}{6}$

Solution: $2 \times \frac{2}{6} = \frac{2}{1} \times \frac{2}{6}$

$= \frac{2 \times 2}{1 \times 6} = \frac{\cancel{4}^{2}}{\cancel{6}_{3}} = \frac{2}{3}$

Exercise: 4

Find the products.

1. $3 \times \frac{4}{5}$
2. $10 \times \frac{4}{6}$
3. $2 \times \frac{1}{3}$
4. $4 \times \frac{3}{7}$
5. $5 \times \frac{1}{8}$
6. $5 \times \frac{3}{7}$
7. $2 \times \frac{3}{5}$
8. $6 \times \frac{1}{9}$
9. $4 \times \frac{3}{6}$
10. $3 \times \frac{1}{3}$
11. $12 \times \frac{3}{8}$
12. $15 \times \frac{1}{4}$
13. $8 \times \frac{2}{5}$
14. $9 \times \frac{3}{4}$
15. $5 \times \frac{2}{7}$

13.2 Multiplying a Fraction by a Whole Number

To multiply a fraction by a whole number, the multiplication is read as 'of'. For instance, $\frac{1}{2} \times 10$ means $\frac{1}{2}$ of 10.

To multiply a fraction by a whole number;

1. Change all into common fractions.
2. Multiply the numerators and denominators. *NB: every whole number is out of 1 or over 1.*
3. Simplify the results.

$$\frac{1}{2} \times 10 = \frac{1}{2} \times \frac{10}{1}$$
$$= \frac{10}{2} = 5$$

Example: $\frac{2}{3} \times 5$

$$\frac{2}{3} \times 5 = \frac{2}{3} \times \frac{5}{1}$$
$$= \frac{10}{3} = 3\frac{1}{3}$$

Example: $\frac{1}{8} \times 15$

$$\frac{1}{8} \times 15 = \frac{1}{8} \times \frac{15}{1}$$
$$= \frac{15}{8} = 1\frac{7}{8}$$

Exercise: 5

Multiply the following.

1. $\frac{2}{3} \times 6$
2. $\frac{1}{4} \times 10$
3. $\frac{1}{2} \times 14$
4. $\frac{3}{5} \times 20$
5. $\frac{2}{5} \times 7$
6. $\frac{3}{4} \times 18$
7. $\frac{1}{8} \times 5$
8. $\frac{2}{7} \times 12$
9. $\frac{4}{5} \times 60$
10. $\frac{3}{4} \times 9$

Mixed numbers should be changed into improper fractions before multiplying.

$1\frac{2}{3} \times 7$

Solution: $1\frac{2}{3} = \frac{5}{3}$

$$1\frac{2}{3} \times 7 = \frac{5}{3} \times 7$$
$$= \frac{5}{3} \times \frac{7}{1} = \frac{35}{3} = 11\frac{2}{3}$$

Example: $2\frac{2}{3} \times 6 = \frac{8}{3} \times \frac{6}{1}$
$$= \frac{48}{3} = 16$$

Example: $1\frac{1}{2} \times 9 = \frac{3}{2} \times \frac{9}{1}$
$$= \frac{27}{2} = 13\frac{1}{2}$$

Exercise: 6

Multiply the following.

1. $1\frac{2}{3} \times 8$
2. $3\frac{1}{5} \times 4$
3. $2\frac{2}{5} \times 14$
4. $4\frac{3}{5} \times 18$
5. $2\frac{1}{8} \times 16$
6. $5\frac{3}{4} \times 22$
7. $4\frac{1}{4} \times 30$
8. $2\frac{1}{2} \times 40$
9. $1\frac{1}{4} \times 16$
10. $3\frac{2}{7} \times 15$

It is also important to also look at how to change a mixed number into improper fraction and vice versa.
To do this, multiply the denominator by the whole number and add the numerator. The result becomes the numerator of the improper fraction. Maintain the denominator.

Example: $2\frac{1}{5}$

Multiply 5 by 2 to get 10. Add 1 to 10 to get 11 which becomes the numerator. 5 is maintained as the denominator.

$$2\frac{1}{5} = \frac{(5\times2)+1}{5} = \frac{11}{5}$$

Example: $5\frac{2}{3} = \frac{(3\times5)+1}{3} = \frac{17}{3}$

Exercise: 7

Change the mixed numbers into improper fractions.

1. $2\frac{3}{5}$
2. $5\frac{1}{8}$
3. $10\frac{3}{7}$
4. $3\frac{1}{2}$
5. $4\frac{1}{4}$
6. $7\frac{2}{5}$
7. $3\frac{4}{5}$
8. $11\frac{2}{7}$
9. $16\frac{4}{7}$
10. $1\frac{1}{2}$

On the other hand, to change an improper fraction into mixed numbers, divide the numerator by the denominator. Write the whole number. The remainder becomes the numerator. The denominator is maintained.

Example: $\frac{7}{3}$

Solution:

Divide 7 by 3 to get 2 remainder 1.
The 2 becomes the whole number part of the mixed numbers. The remaining 1 becomes the numerator.
The denominator, 3 is maintained.

$\frac{7}{3} = 2\frac{1}{3}$

Example: $\frac{16}{9}$

$\frac{16}{9} = 1\frac{7}{9}$

Example: $\frac{12}{5}$

$\frac{12}{5} = 2\frac{2}{5}$

Exercise: 8

Convert the improper fractions into mixed numbers.

1. $\frac{10}{4}$
2. $\frac{10}{3}$
3. $\frac{10}{6}$
4. $\frac{16}{5}$
5. $\frac{6}{4}$
6. $\frac{12}{10}$
7. $\frac{23}{16}$
8. $\frac{14}{11}$
9. $\frac{25}{20}$
10. $\frac{13}{9}$
11. $\frac{15}{12}$
12. $\frac{30}{17}$
13. $\frac{17}{5}$
14. $\frac{28}{19}$
15. $\frac{9}{5}$

13.3 Percent of Given Quantities

Percent means 'out of 100' or 'over 100'. To multiply a percent fraction by a whole number, change the percentage to common fraction. Multiply them and simplify where necessary.

Example: Calculate 15% of 60.

Solution: 15% of 60 means $\frac{15}{100} \times 60$

Multiply the numerators. Multiply the denominators.

$$\frac{15}{100} \times \frac{60}{1} = \frac{15 \times 60}{100 \times 1} = \frac{15 \times 6}{10}$$

$$= \frac{90}{10} = 9$$

Example: 28% of 40

Solution: 28% of 40 means $\frac{28}{100} \times 40$

$$= \frac{28}{100} \times \frac{40}{1} = \frac{28 \times 40}{100 \times 1}$$

$$= \frac{28 \times 4}{10} = \frac{28 \times 2}{5} = \frac{56}{5} = 11\frac{1}{5}$$

Example: 234% of 8: Round your answer to the nearest tenth.

Solution: 234% of 8 means $\frac{234}{100} \times 8$

$= \frac{234 \times 8}{100 \times 1} = \frac{234 \times 2}{25} = \frac{468}{25} = 18.72$

= 18.7 to the nearest tenth

Example: 0.2% of 15000

Solution: 0.2% of 15000 means $\frac{0.2}{100} \times$ 15000

$\frac{0.2}{100} = \frac{2}{1000}$

$= \frac{2}{1000} \times \frac{15000}{1} = \frac{2 \times 15000}{1000 \times 1}$

$= \frac{2 \times 15}{1} = 30$

Exercise: 9

Calculate the following.

1. 5% of 60
2. 23% of 1000
3. 15% of 180
4. 80% of 20
5. 150 % of 32
6. 25% of 80
7. 0.5% of 2000
8. 3.5% of 600
9. 7% of 85
10. 28% of 540

Exercise: 10

Find the percent of the following.

1. 5% of 60 aeroplanes
2. 25% of 10,000 students
3. 35% of 18000 trees
4. 50% of 18 houses
5. 75% of 40 buses
6. 2% of 1000 bags
7. 160% of 15000 people
8. 200% of 75 tables
9. 15% of 180 girls
10. 1.5% of 1000 chairs

To multiply a fraction by another fractio

1. Change all into common fractio
2. Multiply the numerators togethe and multiply the denominators togethe
3. Simplify the results by cancellin where possible so that the fractio cannot be reduced further.

Example: Multiply the following.

1. $\frac{2}{3} \times \frac{1}{2}$ 2. $\frac{4}{5} \times \frac{2}{8}$ 3. $\frac{3}{4} \times \frac{1}{4}$ 4. $\frac{2}{3} \times$

Solutions:

1. $\frac{2}{3} \times \frac{1}{2} = \frac{2 \times 1}{3 \times 2}$

$= \frac{2}{6} = \frac{1}{3}$

2. $\frac{4}{5} \times \frac{2}{8} = \frac{4 \times 2}{5 \times 8}$

$= \frac{8}{40} = \frac{1}{5}$

3. $\frac{3}{4} \times \frac{1}{4} = \frac{3 \times 1}{4 \times 4}$

$= \frac{3}{16}$

4. $\frac{2}{3} \times \frac{3}{5} = \frac{2 \times 3}{3 \times 5}$

$= \frac{6}{15} = \frac{2}{5}$

Exercise: 11

Multiply the following.

1. $\frac{3}{5} \times \frac{1}{4}$
2. $\frac{2}{7} \times \frac{1}{8}$
3. $\frac{1}{4} \times \frac{1}{2}$
4. $\frac{5}{8} \times \frac{1}{8}$
5. $\frac{4}{7} \times \frac{1}{8}$
6. $\frac{3}{4} \times \frac{3}{5}$
7. $\frac{3}{5} \times \frac{5}{6}$
8. $\frac{8}{11} \times \frac{5}{7}$
9. $\frac{1}{5} \times \frac{3}{4}$
10. $\frac{9}{10} \times \frac{5}{7}$

Mixed numbers should be changed to common fractions before you multiply them.

Examples:

1. $2\frac{1}{4} \times 3\frac{5}{6}$ 2. $4\frac{3}{4} \times 5\frac{1}{4}$ 3. $2\frac{3}{8} \times 6\frac{1}{4}$ 4. $\frac{1}{2} \times 3\frac{1}{5}$

Solution: 1. $2\frac{1}{4} \times 3\frac{5}{6}$

$= \frac{9}{4} \times \frac{23}{6} = \frac{9 \times 23}{4 \times 6} = \frac{3 \times 23}{4 \times 2}$

$= \frac{69}{8} = 8\frac{5}{8}$

2. $4\frac{3}{4} \times 5\frac{1}{4}$

$= \frac{19}{4} \times \frac{21}{4}$

$= \frac{19 \times 21}{4 \times 4} = \frac{399}{16} = 24\frac{15}{16}$

3. $2\frac{3}{8} \times 6\frac{1}{4}$

$= \frac{19}{8} \times \frac{25}{4}$

$= \frac{19 \times 25}{8 \times 4} = \frac{475}{32} = 14\frac{27}{32}$

4. $\frac{1}{2} \times 3\frac{1}{5}$

$= \frac{1}{2} \times \frac{16}{5} = \frac{1 \times 16}{2 \times 5}$

$\frac{16}{10} = \frac{8}{5} = 1\frac{3}{5}$

Exercise: 12

Multiply the following.

1. $3\frac{1}{4} \times 2\frac{3}{5}$
2. $6\frac{3}{4} \times 2\frac{3}{8}$
3. $5\frac{1}{2} \times 4\frac{1}{4}$
4. $\frac{7}{8} \times 2\frac{1}{2}$
5. $\frac{3}{10} \times 4\frac{1}{8}$
6. $4\frac{1}{8} \times 2\frac{3}{7}$
7. $5\frac{4}{6} \times 3\frac{3}{5}$
8. $8\frac{1}{2} \times \frac{2}{11}$
9. $2\frac{1}{5} \times 5\frac{1}{2}$
10. $3\frac{2}{7} \times \frac{5}{6}$

13.5 Finding a Fraction of a Given Quantity

When we need to find a fraction of a given quantity such as money, population etc, multiply the fraction by the quantity.

Example: $\frac{1}{3}$ of GH¢90

Solution: $\frac{1}{3}$ of GH¢90 means $\frac{1}{3} \times$ GH¢90

$\frac{1}{3} \times 90 = \frac{90}{3} = 30$

$\frac{1}{3}$ of GH¢90 is GH¢30.

Example: $\frac{3}{5}$ of a town's population are males. The population of the town is 10,000 people. How many are males? How many are female?

Solution: $\frac{3}{5}$ of $10{,}000 = \frac{3}{5} \times 10{,}000$

$= \frac{3 \times 10{,}000}{5 \times 1} = \frac{30{,}000}{5} = 6{,}000$

6,000 people are males.

If the rest are females,

Then females = $10{,}000 - 6{,}000 = 4{,}000$

4,000 people are females.

Example: There are 132 learners in a class. If $\frac{2}{3}$ of the learners are girls, how many boys are in the class?

Solution: $\frac{2}{3}$ of 132 are girls.

$\frac{2}{3} \times 132 = \frac{2 \times 132}{3} = \frac{264}{3} = 88$

There are 88 girls in the class.

The number of boys = total number of learners – number of girls

= 132 – 88

= 44.

There are 44 boys in the class.

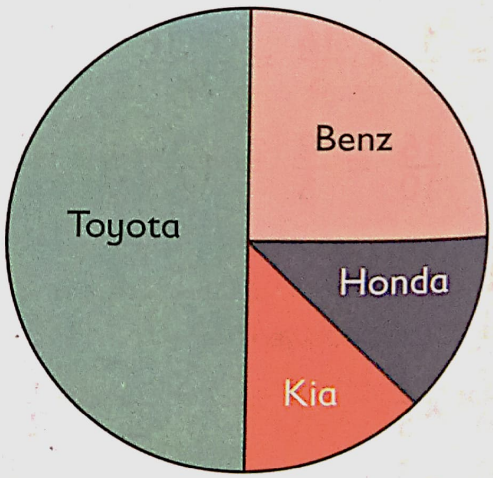
Exercise: 13

Solve the following.

1. There are 300 soldiers on a training ground. $\frac{3}{4}$ are from the Army. The rest are from Navy. How many Navy soldiers are on the ground?
2. Abi was given GH¢800 cedis by her mother. Abi was asked to use $\frac{1}{8}$ of the money to buy clothes and deposit the balance into her savings account?
   (i) How much was spent on clothes?
   (ii) How much was deposited in the savings account?
3. There are 600 apples in a bag. If $2\frac{1}{2}$% of the apples are rotten. How many are rotten?
4. Mr. Ansah conducted a Mathematics class test. There were 48 learners in the class. If $\frac{3}{8}$ of the class failed the test. (i) How many learners failed? (ii) How many learners passed?
5. A rider used a bicycle to cover $\frac{1}{3}$ of a journey. If the journey was 6km. What distance was covered using a bicycle?
6. $\frac{3}{10}$ of the weight in a sack is made up of cocoa. If the weight is 120kg.
   What is the weight of cocoa in the sack?
7. There are 4000 fowls in a cag $\frac{7}{8}$ are layers. The rest are broilers. How many broilers are in the cage?
8. Customs officials stopped truck containing expired rice and flo in bags. There were 150 bags. If $\frac{2}{5}$ ar rice. How many bags of flour were the truck?
9. A boy was given 70 minutes t finish a class test. He used $\frac{3}{7}$ of the time to plan his answers and the re to write the answers.
   (i) How many minutes were used to pl the answers? (ii) How many minut were used to write the answers?
10. $\frac{3}{10}$ of the patients on admissio in a hospital are discharged. If the are 60 patients. How many are still a admission?

Fractions on a Pie Chart

The graph shows the type of cars o a car park.



a. Approximately, what fraction of cars are Toyota.

b. If there are 80 cars on the park, how many cars are Honda?

Solution:

a. From the graph, approximately $\frac{1}{2}$ of the cars on the park are Toyota.

Toyota covers approximately one-half of the circle.

b. The sector for Honda about $\frac{1}{8}$ of the graph or circle. If there are 80 cars.

The number of Honda cars

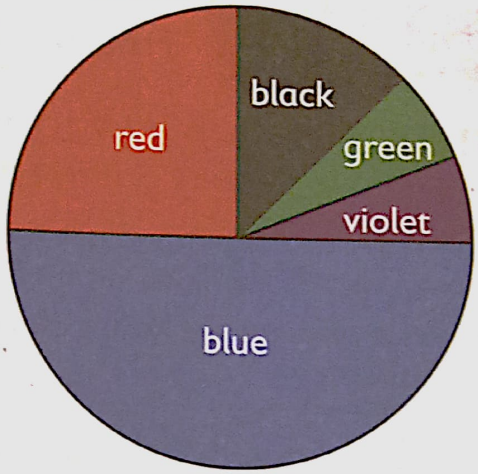
$= \frac{1}{8} \times 80 = \frac{80}{8} = 10$

10 cars are Honda.

Exercise: 14

Use the graph to answer the questions that follow.

The colours of 1600 pens produced in a factory.



1. What fraction of the pens is red?
2. What fraction of the pens is violet?
3. How many pens are black if there are 1600 pens?
4. If a pen is sold at GH¢1.00. How much would be realised if all the black pens are sold?

CHAPTER 14

DIVISION OF A FRACTION BY A 1-DIGIT WHOLE NUMBER AND BY A FRACTION

STRAND 1: NUMBER

SUB-STRAND 3: Fractions, Decimals and Percentages

CONTENT STANDARD: B7.1.3.3 Demonstrate an understanding of the process of multiplying and dividing positive fractions and apply this in solving problems.

INDICATOR B7.1.3.3.3 Explain the process of dividing a fraction (i.e. common, percent and decimal fractions up to thousandths) by a 1-digit whole number and by a fraction.

B7.1.3.3.4 Determine the result of dividing a quantity (i.e. money or objects) or a fraction by a fraction.

In this unit, we shall learn about division of fractions.

14.1 Dividing a Whole Number by a Fraction

Division of a whole number by a fraction means 'how many times the fraction goes into the whole number'.

For instance. $5 \div \frac{1}{4}$ means how many $\frac{1}{4}$s can be obtained in 5 or $5 = \frac{1}{4} \times \square$

To divide a whole number by a fraction, multiply the whole number by the reciprocal of the fraction. The reciprocal of a fraction is obtained when the fraction is turned upside down so that the numerator becomes denominator and the denominator becomes the numerator.

Example: $5 \div \frac{1}{4}$

Solution: The reciprocal of $\frac{1}{4}$ is $\frac{4}{1}$

$5 \div \frac{1}{4} = 5 \times \frac{4}{1}$

$= \frac{5 \times 4}{1} = 20$

Example: Divide the following.

1. $5 \div 1\frac{2}{3}$ 2. $3 \div \frac{1}{8}$ 3. $10 \div 1\frac{1}{2}$

Solutions:

1. $5 \div 1\frac{2}{3}$

$= 5 \div \frac{5}{3} = (\frac{5}{1} \times \frac{3}{5})$

$= \frac{15}{5} = 3$

2. $3 \div \frac{1}{8}$

$= (\frac{3}{1} \times \frac{8}{1})$

$= 24$

3. $10 \div 1\frac{1}{2}$

$10 \div \frac{3}{2} = 10 \times \frac{2}{3}$

$= \frac{20}{3} = 6\frac{2}{3}$

Exercise: 1

Divide the following.

1. $5 \div \frac{3}{4}$
2. $6 \div \frac{1}{8}$
3. $12 \div \frac{3}{5}$
4. $10 \div \frac{2}{5}$
5. $7 \div \frac{4}{5}$
6. $12 \div \frac{1}{2}$

7. $9 \div \frac{1}{2}$

8. $4 \div \frac{1}{5}$

9. $3 \div \frac{1}{7}$

10. $2 \div \frac{1}{4}$

14.2 Dividing a Fraction by a Whole Number

To divide a fraction by a whole number, multiply the fraction by the reciprocal of the whole numbers.

Fraction ÷ whole number

$$= \text{Fraction} \times \frac{1}{\text{whole number}}$$

Note: Every whole number is 'out of' 1

For Example:

$$\frac{1}{4} \div 8$$

$$\frac{1}{4} \div \frac{8}{1} = \frac{1}{4} \times \frac{1}{8}$$

$$= \frac{1}{32}$$

Divide the following.

1. $\frac{5}{6} \div 5$ 2. $\frac{1}{5} \div 8$ 3. $\frac{6}{7} \div 12$

Solutions:

1. $\frac{5}{6} \div 5 = \frac{5}{6} \times \frac{1}{5}$

$$= \frac{5}{30} = \frac{1}{6}$$

2. $\frac{1}{5} \div 8 = \frac{1}{5} \times \frac{1}{8}$

$$= \frac{1}{40}$$

3. $\frac{6}{7} \div 12 = \frac{6}{7} \times \frac{1}{12}$

$$= \frac{6}{84} = \frac{1}{14}$$

Exercise: 2

Solve the following.

1. $\frac{1}{5} \div 4$
2. $\frac{3}{4} \div 12$
3. $\frac{5}{6} \div 5$
4. $\frac{2}{7} \div 7$
5. $\frac{5}{6} \div 15$
6. $\frac{10}{12} \div 6$
7. $\frac{3}{5} \div 3$
8. $\frac{1}{4} \div 3$
9. $2\frac{1}{5} \div 2$
10. $\frac{1}{5} \div 6$
11. $\frac{1}{2} \div 3$
12. $\frac{1}{2} \div 9$
13. $\frac{1}{8} \div 4$
14. $\frac{2}{5} \div 6$
15. $\frac{1}{2} \div 6$

14.3 Dividing a Fraction by another Fraction

To divide a fraction by another fraction, multiply the dividend by the reciprocal of the divisor.

Example: $\frac{5}{8} \div \frac{1}{2}$ $\frac{5}{8}$ is the dividend and $\frac{1}{2}$ is the divisor

Solution: $\frac{5}{8} \div \frac{1}{2} = \frac{5}{8} \times \frac{2}{1}$

$$= \frac{5 \times 2}{8 \times 1} = \frac{10}{8} = \frac{5}{4} = 1\frac{1}{4}$$

Example: $\frac{3}{7} \div \frac{1}{2}$

Solution: $\frac{3}{7} \div \frac{1}{2} = \frac{3}{7} \times \frac{2}{1}$

$$= \frac{3 \times 2}{7 \times 1} = \frac{6}{7}$$

Example: $\frac{2}{3} \div \frac{1}{5}$

Solution: $\frac{2}{3} \div \frac{1}{5} = \frac{2}{3} \times \frac{5}{1}$

$$= \frac{2 \times 5}{3 \times 1} = \frac{10}{3} = 3\frac{1}{3}$$

Example: $\frac{5}{12} \div \frac{3}{8}$

Solution: $\frac{5}{12} \div \frac{3}{8} = \frac{5}{12} \times \frac{8}{3} = \frac{40}{36}$

$$= \frac{10}{9} = 1\frac{1}{9}$$

Exercise: 3

Divide the following fraction. Leave your answer in simplest form.

1. $\frac{3}{5} \div \frac{10}{4}$
2. $\frac{2}{8} \div \frac{1}{2}$
3. $\frac{4}{5} \div \frac{1}{4}$
4. $\frac{6}{14} \div \frac{3}{5}$
5. $\frac{5}{7} \div \frac{8}{3}$
6. $\frac{4}{7} \div \frac{2}{12}$
7. $2\frac{3}{4} \div \frac{55}{24}$
8. $\frac{5}{8} \div \frac{55}{16}$
9. $\frac{30}{4} \div \frac{1}{6}$
10. $\frac{3}{10} \div \frac{1}{5}$

14.4 Word Problems Involving Division of Fractions

Some word problems requires your understanding of divisions of fractions.

Example: A set of stacked weighs 10kg. If each plate in the stack weighs $\frac{1}{4}$ kg, how many plates are in the stack?

Solution: Divide the total weight by the weight of a plate.

Total weight = 10kg.

Weight of a plate = $\frac{1}{4}$ kg

Number of plates?

$$10 \div \frac{1}{4} = 10 \times \frac{1}{4} = \frac{10 \times 4}{1} = 40$$

There are 40 plates in the stack.

Example: 5 boys were to carry a load of $2\frac{1}{3}$kg. They shared the load equally. What is the weight of load carried by each boy?

Solution: Total load to be carried

$= 2\frac{1}{3}$kg

Number of boys to carry the load = 5 boys

Weight of load per boy=?

$$2\frac{1}{3} \div 5$$

$$\frac{7}{3} \div \frac{5}{1} = \frac{7}{3} \times \frac{1}{5}$$

$$= \frac{7}{15} \text{ kg}$$

Exercise: 4

Solve the following word problems.

1. A cup can hold $\frac{2}{9}$ litres of wate How many cups of water can be fille with 3 litre bottle?
2. Some people are made to shar an amount of GH¢40. If each person received $\frac{2}{7}$ of a cedi. How many people received a share?
3. Adzo eats $\frac{2}{3}$ of a pizza every day. How long will it take her to ea 30 pizzas?
4. A boy was asked to fetch 3 litres of water. He was to use a small gallon which was $\frac{1}{8}$ litres capacity. How many times will he use the gallon to fetch the water?
5. A class was given $9\frac{1}{2}$ litres of juice to share equally. If there are 36 learners in the class, how many litres of fruit juice will each student get?

CHAPTER 15

RATIO AND PROPORTION

STRAND 1: NUMBER

SUB-STRAND 4: Number: Ratios and Proportion

CONTENT STANDARD: B7.1.4.1 Demonstrate an understanding of the concept of ratios and its relationship to fractions and use it to solve problems that involve rates, ratios, and proportional reasoning.

INDICATOR: B7.1.4.1.1 Find ratio and use ratio language to describe relationship between two quantities.

B7.1.4.1.2 Use the concept of a unit rate $\frac{a}{b}$ associated with a ratio a:b with $b \neq 0$, and use rate language in the context of a ratio relationship.

B7.1.4.1.3 Make tables of equivalent ratios (written as common fractions) relating quantities that are proportional.

B7.1.4.1.4 Use the proportional reasoning to find missing values in the tables, and plot pairs of values on the coordinate plane.

B7.1.4.1.5Find a percent of a quantity as a rate per 100 (e.g. 30% of a quantity means $\frac{3}{100}$ times the quantity);

INTRODUCTION

Ratio can be explained as a numerical comparison of two or more quantities which indicates their relative sizes. Thus, ratio compares two or more measures of the same dimension or unit. The ratio of x and y can be expressed as x:y or in a fraction as $\frac{x}{y}$.

The order of the terms in ratios is very important. The positions of the terms respectively matches the ratio.

For instance, in a class of 25 students, 10 of them are boys and the remaining 15 are girls. The ratio of the number of boys to the number of girls in the class is expressed as 10:15 or 2:3

In the ratio 2:3, the 2 is for the boys and the 3 is for the girls. The ratio is written in order of the terms.

15.1 The Ratio of Given Quantities

A ratio indicates how many times one number contains another in given quantities. The numbers in a ratio may be quantities of any kind, such as counts of people, measurements of lengths, time, weight, ages etc.

A ratio has no unit and it should always be expressed in its simplest form by dividing each term by a common factor.

Example 1: The weight of Aku is 80kg and that of Esi is 40kg. What is the

ratio of the weight of Esi to the weight of Aku?

Solution

The weight of Esi is 40kg.

The weight of Aku is 80kg.

The ratio of Esi's weight to Aku's weight can be expressed as $\frac{40}{80} = \frac{1}{2} = 1:2$

We can say that the weight of Esi is half the weight of Aku.

The weight of Aku is twice the weight of Esi or Aku is twice as heavy as Esi.

Example 2: A pattern has 72 red circles to every 48 black circles. What is the ratio of black circles to red circles?

Solution

The ratio of black circles to all red circles.

$$\frac{48}{72} = \frac{1}{2} = 2:3$$

Example 3: Mr. Appiagyei Bimpong of St. Louis Demonstration JHS asked his learners to find this ratio. If there were 60 boys and 120 girls in a school.

i. What was the ratio of boys to girls in the school?

ii. What was the ratio of girls to boys in the school?

Solution

The ratio of boys to girls in the school = $\frac{60}{120} = \frac{1}{2} = 1:2$

The ratio of girls to boys in the school = 120:60 = 2:1

Exercise: 1

Solve the following questions.

1. A pattern has 77 yellow triangles to every 33 green triangles. What is the ratio of green triangles to yellow triangles?

2. A pattern has 32 black rectangles to every 64 blue rectangles. Determine the ratio of black rectangles to all the rectangles.

3. There are 63 members in a group of which 28 of them are boys and the rest of them are girls. What is the ratio of girls to the total members of the group?

4. A bag contains 72 shirts out of which 48 of them are white shirts and the remaining are black shirts. What is the ratio of black shirts to white shirts in the bag?

5. The weight of a goat is 20kg and that of a pig is 80kg. What is the ratio of the weight of pig to that of the goat?

6. There are 90 pens in a box and 36 of them are red and the rest of them are black.

i. What is the ratio of the red pens to the black pens?

ii. What is the ratio of the red pens to all the pens in the box?

iii. What is the ratio of the black pens to all the pens in the box?

7. The ages of two brothers, Yao and Yameh are 39 and 42 respectively. What is the ratio of the age of Yameh to the age of Yao?

8. A farmer has 150 goats and 50 sheep. What is the ratio of the farmer's sheep to goats?

9. There are 32 people in a room and out of them are 20 females and the rest are males. What is the ratio of males to females in the room?

10. The height of a ladder and a pole is 372m. If the height of the pole is 248m.

i. What is the ratio of the ladder to the pole?

ii. What is the ratio of the pole to both items?

iii. What is the ratio of the ladder to both of the items?

15.2 Expressing Two Quantities as Ratios

To be able to express two quantities as ratio, we have to express both quantities in the same unit of measurement and then find the ratio of the two quantities in its simplest form.

Example 1: Find the ratio of 40cm to 2m.

Solution

Ratio of 40cm to 2m = 40cm:2m

Since the quantities are in different units, we have to change one unit to the other in order to have the same unit of measurement.

We can change the 2m into centimetres.

If 100cm = 1m,

then 2m = 2 × 100cm

= 200cm

Now we have 40cm: 200cm

We can now simplify since both terms have the same unit.

Ratio of 40cm to 2m = 1:5

Example 2: Find the ratio of 45minutes to 2hours.

Solution

◆ Ratio of 45minutes to 2hours = 45minutes: 2hours

If 60minutes = 1hour

then 2 hours = 2 × 60minutes

= 120minutes

Now we have 45minutes: 120minutes.

Drop the units and simplify.

$\frac{45}{120} = 3:8$

◆ Ratio of 45minutes to 2hours = 3:8

Example 3: What is the ratio of wings to beaks in the bird house at the Kumasi zoo?

Solution

Ratio of wings to beaks = 2:1

This is because for every 2 wings there is 1 beak.

Exercise: 2

Solve the following questions.

1. Find the ratio of 500m to 2km in its simplest form.

2. Find the ratio of 55cm to 3m in its simplest form.

3. Find the ratio of 72mm to 9cm in its simplest form.

4. Find the ratio of 36minutes to 2hours in its simplest form.

5. What is the ratio of 24minutes to 4hours in its simplest form?

6. What is the ratio of 72seconds to 3minutes in its simplest form?

7. Determine the ratio of 600millilitres to 9litres in its simplest form.

8. Find the ratio of 250ml to 1.5l in its simplest form.

9. Find the ratio of 28days to 5weeks in its simplest form.

10. Find the ratio of 125g to 2.5kg in its simplest form.

15.3 15.3 Using Ratio Language to Describe Quantities

In this section, we are going to determine the ratio of given quantities and describe the relationship of the quantities based on its ratio.

Example 1: There are 24 green cars and 48 white cars in a parking lot. Find the ratio of green cars to white cars in the parking lot and describe their relationship.

Solution

Ratio of green cars to white cars = 24:48 = 1:2

This means that the green cars are half the number of the white cars.

The white cars are twice the number of green cars.

Example 2: If Alhasan is 50years old and his son, Musa is 25years old,

i. Find the ratio of Musa to Alhasan's age.

ii. Explain the relationship between their ages.

Solution:

i. Ratio of Musa to Alhasan's age
25:50 = 1:2

ii. Alhasan is twice as old as his son.
Musa is half the age of his father.

Example 3: There are 54 lizards and 1
snakes at a zoo. Find the ratio of snake
to lizards at the zoo and explain th
relationship that exists between them

Solution

Ratio of snakes to lizards = 18:54 = 1:
The lizards are three times or thric
the number of snakes at the zoo.
The snakes are one – third the numbe
of lizards at the zoo.

Exercise: 3

Answer the following questions.

1. Mrs. Konadu is 74 years old an
her daughter, Adobea is 37 years old

i. Find the ratio of the mother t
the daughter's age.

ii. What can you say about thei
ages?

2. There are 63 sheep and 21 goats
on a field.

i. Determine the ratio of goats to
sheep on the field.

ii. Explain the relationship that
exits between the number of animals
on the field.

3. There are 41 tractors and 82
buses in a parking lot.

i. Find the ratio of buses to
tractors in the parking lot.

ii. What can you say about them?

4. A box contains 51 pens and part of them are 17 red pens and the rest are blue pens. Determine the ratio of blue pens to red pens in the box and explain the relationship based on their numbers.

5. The ages of Nate and Joe are 13 and 26 respectively.
   i. Find the ratio of Joe's age to Nate's.
   ii. What can you say based on their ages?

6. There are 42 tigers and 126 lions at a zoo.
   i. Find the ratio of lions to tigers at the zoo.
   ii. Explain the relationship based on their numbers.

15.4 Writing Given Ratios as Unit Rate

A unit rate is a rate which is expressed as a quantity of one. This is where one of the quantities is equal to 1.

To solve a problem involving unit rate,

i. make ratios out of the problem.
ii. express the ratios in fractions.
iii. equate the fractions and solve for the missing value.

Example 1: Rita can run 150 laps in 50 minutes.

How many laps does she run per minute?

Solution

If 50 minutes = 150 laps

1 minute = ?

If less more divide

$\frac{1}{50} \times 150 = \frac{150}{50} = 3$

Rita runs 3laps per minute.

Alternatively, let x be the number of laps Rita runs per minute.

So the ratios are $150:50 \longrightarrow \frac{150}{50}$

$x:1 \longrightarrow \frac{x}{1}$

Now, $\frac{150}{50} = \frac{x}{1}$

$x = \frac{150 \times 1}{50}$

$\frac{150}{50} = 3$

Rita runs 3 laps per minute.

Example 2: If Aisha polishes 8 square yards of floor tiles every 7 minutes, how many square yards of floor does she polish per minute?

Solution

If she polishes 8 square yards every 7 minutes.

1 minute =?

1 is less than 7

If less more divides.

$\frac{1}{7} \times 8$

$\frac{8}{7}$ square yards.

Alternatively, let x be square yards of floor polished per unit.

We have $8:7 \longrightarrow \frac{8}{7}$

$x:1 \longrightarrow \frac{x}{1}$

so, $\frac{8}{7} = \frac{x}{1}$

$x = \frac{8 \times 1}{7} = \frac{8}{7}$

Aisha polishes $\frac{8}{7}$ square yards per minute.

Example 3: Ato bought 40 apples for GH¢ 120.00.

What is the unit price or the cost of one apple?

Solution

If 40 apples cost GH¢120.

then 1 apple costs what?

1 is less than 40

$\frac{1}{40} \times 120 = \frac{120}{40} = 3$

= GH¢3.00

The cost of 1 apple is GH¢3.00

Exercise: 4

1. A car travels 1000km on 50litres of fuel. How long does the car go per litre of fuel?
2. If 100 cars pass by in 4 hours, how many cars pass by per hour?
3. There are 120 students and 3 teachers. How many students are there per a teacher?
4. Sarah needs 12m of thread to make 2cm of cloth. How long thread does she need to make 1cm piece of cloth?
5. Frank used 5 weeks to earn GH¢ 400.00. How much did he earn per week?
6. If 8 bags of cement molds 200 blocks, how many blocks are molded by each bag of cement?
7. 240 spring rolls were eaten by 30 people at a party. How many spring rolls did each person eat?
8. A pottery store can make 110 coffee mugs in 5 hours. How many mugs can be made in an hour?
9. If Esi can type 800 words in 20minutes, how many words can she type per minute?
10. If there are 350 oranges in 7 bags, how many oranges are in each bag?

15.5 Rates

Rate is the ratio between two related quantities in different units.

Example 1: A baker can bake 92 bagels in 2 hours.

How many bagels can she bake in 10 hours?

Solution

Let x be the number of bagels that can be baked in 10 hours.

Now, the ratios are 92:2 and x:10.

Express the ratios in fractions and equate them.

$\frac{92}{2} = \frac{x}{10}$

$x = \frac{92 \times 10}{2}$

$= \frac{920}{2}$

$= 460$

The baker can bake 460 bagels in 10 hours.

Alternatively, find the unit rate and multiply it by the given hours.

If the baker uses 2 hours to bake 92 bagels, then in 1 hour would be

$\frac{92}{2} = 46$

In 1 hour the baker can bake 46 bagels, so in 10 hours she can bake 46 × 10 which is 460 bagels.

Example 2: If 2litres of coke cost GH¢18.00, find the cost of

i. 1.5litres
ii. 3litres
iii. 7litres
iv 10litres
v. 15litres

Solution

If 2litres of coke cost GH¢18,

then the cost of 1litre = $\frac{18}{2}$ = 9

The unit price or the cost of 1litre of coke is GH¢9.00

i. If 1litre of coke costs GH¢9.00,
then 1.5litres = 1.5 × 9
= GH¢ 13.50

ii. If 1litre of coke costs GH¢ 9.00,
then, the cost of 3litre s = 3 × 9
= GH¢27

iii. If 1litre of coke costs GH¢ 9.00,
then the cost of 7litres = 7 × 9
= GH¢63.00

iv. If 1litre of coke costs GH¢ 9.00,
then the cost of 10litre s = 10 × 9
= GH¢90.00

v. If 1litre of coke costs GH¢9.00,
Then the cost of 15litre s = 15 × 9
= GH¢135.00

Example 3: The table below shows the weight and cost of meat at Salaga Market.
If 3kg of meat costs GH¢60, use the information to complete the table.

Meat (kg)	2	3	5	10	12	15	20	28
Cost (GH¢)		60						

Solution

If 3kg of meat cost GH¢60,

then 1kg of meat = $\frac{60}{3}$
= GH¢20.00

If 1kg of meat costs GH¢20,
then 2kg of meat cost = 2 × 20 = GH¢40.00
OR if 3kg cost GH¢60
Then 2kg = ?

$\frac{x}{1} \times 60 = \frac{120}{3} = 40$

= GH¢40.00
If 1kg of meat costs GH¢20,
then 5kg of meat cost = 5 × 20
= GH¢100.00
If 1kg of meat costs GH¢20,
then 10kg of meat cost = 10 × 20
= GH¢200
If 1kg of meat costs GH¢20,
then 12kg of meat cost = 12 × 20
= GH¢240.00
If 1kg of meat costs GH¢20,
Then 15kg of meat cost = 15 × 20
= GH¢300.00
If 1kg of meat cost GH¢20,
Then 28kg of meat cost = 28 × 20
= GH¢560.00
The completed table is shown below.

Meat (kg)	2	3	5	10	12	15	20	28
Cost (GH¢)	40	60	100	200	240	300	400	560

Exercise: 5

Solve the following questions.

1. If Aba can type 250 words in 50 minutes, how many words can she typ in 30 minutes?

2. A jet travels 320miles in 4 hours. Use this to find how far the jet could f in the given time. Complete the table.

Time (hours)	3	4	7	10	15	18
Distance (miles)		320				

3. James can read 21 pages of a book in 3hours. At this rate, how man pages could he read in

i. 2 hours
ii. 5 hours
iii. 8 hours
iv. 11 hours
v. 12 hours

4. If 3 litres of petrol cost GH¢21, find the cost of

i. 2 litres
ii. 9 litres
iii. 12 litres
iv. 17 litres
v. 25 litres

5. The table shows the weight and cost of beef at Quick Market. If 5kg o beef cost GH¢70, use the information to complete the table.

Weight of beef (kg)	2	5	8	13	15	18	20	27	35	50
Cost (GH¢)		70								

6. 4 bags of cement can be used to mould 120 blocks. How many blocks could be moulded by using

i. 3 bags of cement
ii. 9 bags of cement
iii. 18 bags of cement
iv. 30 bags of cement
v. 50 bags of cement

15.6 Proportional Quantities

A proportion is an equation that shows that two ratios are equivalent.

That is $\frac{a}{b} = \frac{c}{d}$, where neither b nor d is equal to zero (0).

If $\frac{a}{b} = \frac{c}{d}$, then ad = bc

Example 1: Find the value of y if $\frac{2}{7} = \frac{y}{35}$

Solution

Given $\frac{2}{7} = \frac{y}{35}$

Apply cross multiplication

$7 \times y = 2 \times 35$

$\frac{7y}{7} = \frac{70}{7}$

$y = 10$

The value of y is 10

Example 2: Find the missing values in the table of equivalent ratios and represent the values on the coordinate plane.

Time (s)	Distance (d)
3	10
6	x
9	30
y	40
15	z
18	w
t	70
24	q

Solution

To find the value of x,

Equate the ratio 3:10 to 6:x

$x = 20$

You may also equate 6:x to other equivalent ratio such 9:30.

$\frac{9}{30} = \frac{6}{x}$

$9x = 180$

$\frac{9x}{9} = \frac{180}{9}$

$x = 20.$

To find the value of y,

$\frac{3}{10} = \frac{y}{40}$

$\frac{10y}{10} = \frac{120}{10}$

$y = 12$

To find the value of z,

$\frac{3}{10} = \frac{15}{z}$

$\frac{3z}{3} = \frac{150}{3}$

$z = 50$

To find the value of w,

$\frac{3}{10} = \frac{18}{w}$

$\frac{3w}{3} = \frac{180}{3}$

$w = 60$

To find the value of t,

$\frac{3}{10} = \frac{t}{70}$

$\frac{10t}{10} = \frac{210}{10}$

$t = 21$

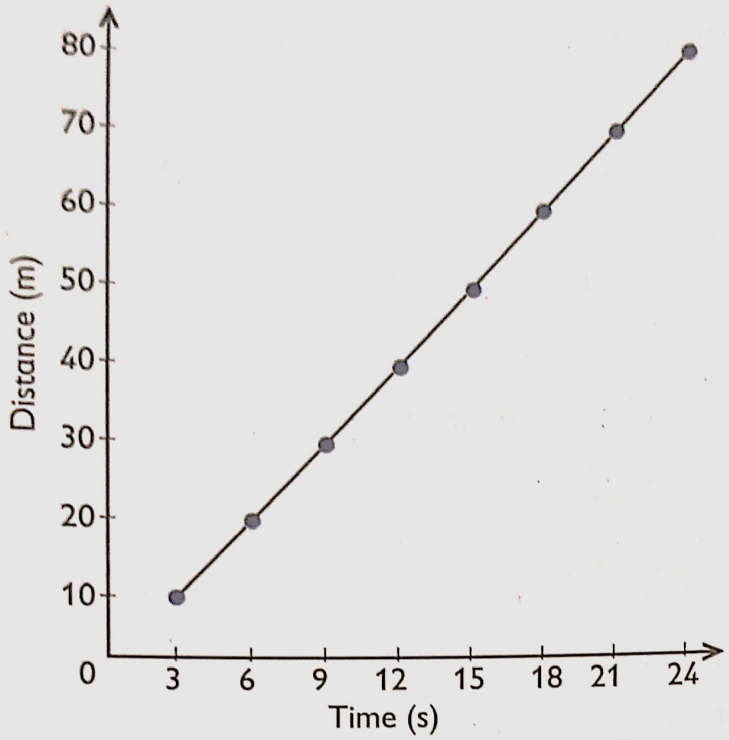
To find the value of q,

$\frac{3}{10} = \frac{24}{q}$

$\frac{3q}{3} = \frac{240}{3}$

$q = 80$

Representing the values on the coordinate plane.



As the time increases, the distance covered also increases.

Example 3: Kafui, Adoley and Jantuah shared an amount of money in the ratio of their ages.

Kafui is 36 years old, Adoley is 48 years and Jantuah is 24 years old. If Jantuah received GH¢24,000, how much money did they share?

Solution

If Kafui is 36 years old, Adoley is 48 years old, and Jantuah is 24 years old, then their ratio would be as follows:

Names	Equivalent ratios			
Kafui	36	18	9	3
Adoley	48	24	12	4
Jantuah	24	12	6	2

Total terms of the ratio = 3 + 4 +2 = 9

Let x be the amount of money share by three people.

Jantuah whose ratio is 2:9 or $\frac{2}{9}$

received GH¢24,000.00

So $2 \longrightarrow 24{,}000$

$9 \longrightarrow x$

$$\frac{2}{24000} = \frac{9}{x}$$

$$x = \frac{24000 \times 9}{2}$$

$$= \frac{216{,}000}{2}$$

$$= 108{,}000.00$$

The total amount shared wa GH¢108,000.00

Method 2

Find the unit amount and then multipl by the total terms of the ratio.

If $2 \longrightarrow 24{,}000$

then $1 \longrightarrow 12{,}000$

Therefore $9 \times 12{,}000 = 108{,}000$

The total amount shared wa GH¢108,000.00

Method 3

Finding the amount received by eac person and adding all their amount

Let x be the amount received by Kafu

If $2 \longrightarrow 24000$

then $3 \longrightarrow x$

$$x = \frac{24000 \times 3}{2}$$

$$= \frac{72{,}000}{2} = 36{,}000$$

The amount received by Kafui wa GH¢36,000.00

Let y be the amount received by Adole

If $2 \longrightarrow 24000$

Then $4 \longrightarrow y$

$x = \frac{24000 \times 4}{2}$

$= \frac{96,000}{2} = 48,000$

The amount received by Adoley was GH¢48,000.00

Jantuah received GH¢24,000.00

The total amount shared

= 24000 + 36000 + 48000

= GH¢108,000.00

Exercise: 6

Solve the following questions.

1. Find the value of w if $\frac{3}{8} = \frac{45}{w}$
2. Find the value of y if $\frac{5}{6} = \frac{y}{72}$
3. Find the value of x if $\frac{x}{5} = \frac{32}{40}$
4. Find the value of t if $\frac{2}{t} = \frac{30}{150}$
5. Rose ran 2miles in about 27 minutes. If she continued at the same pace, how long will it take her to run 10miles?

Exercise: 7

Solve the following.

1. Linda earned GH¢120 for working in a restaurant for 3 hours. If she charges the same rate, how much will she make after working for 9 hours?
2. Find the missing values in the table of equivalent ratios.

Weight (kg)	2	a	22	b	c
Cost (GH)	5	40	f	70	85

Weight (kg)	40	44	d	52	56
Cost (GH)	g	h	125	k	l

3. Find the missing values in the table of equivalent ratios.

Time (s)	Distance (m)
4	9
12	t
w	45
x	63
32	y
40	z

4. The ratio of the number of boys and girls in a class is 3:4 and there are 32 girls.
   a. Find the number of boys in the class.
   b. Find the total number of students in the class.
5. Mr. Kuma shared money among his sons, Pascal, Chris and Boris in the ratio 2:3:5. If Christ got GH¢150 of the amount shared,
   a. Find how much money Boris received.
   b. Find the total amount of money shared.

15.7 Percent of a Quantity as a Rate Per 100

If a quantity is expressed as a percentage, it is expressed over 100.

For Example, 10% means $\frac{10}{100}$.

10% of 30 cars

$= \frac{10}{100} \times 30$ cars

= 3 cars

25% of 52 students

$\frac{25}{100} \times 52 = 13$ students

Exercise: 8

Find the percentage given.

1. 20% of 35 boxes.
2. 70% of 700km
3. 50% of 120 people in a village.
4. 15% 12000 cars
5. 8% of 200 books
6. 75% of 60kg
7. 5% of GH¢400
8. 90% of 1000 pebbles.

Commission

A commission is a fee paid to an agent for his or her assistance in a business transaction especially in sales.

Commission is expressed as a percentage on sales made on goods or service.

$$\text{Commission} = \frac{\text{Rate of commission}}{100} \times \text{Total sales}$$

Example 1: Alidu is selling goats and makes a 5% commission on the sale of the goats. What would his commission be on the sale of the goats at GH¢2000?

Solution

Rate of commission = 5%

Total sales = GH¢2000

Commission = ?

$$= \frac{\text{Rate of commission}}{100} \times \text{Total sales}$$

$$= \frac{5}{100} \times 2000$$

$$= \frac{10{,}000}{20} = 100$$

Alidu's commission would be GH¢100.00

Example 2: A salesman gets paid 35% commissions. How much commission does he make on sales of GH¢700?

Solution

Rate of commission = 35%

Total sales = GH¢700

Commission =?

Commission =

$$\frac{\text{Rate of commission}}{100} \times \text{Total sales}$$

$$= \frac{35}{100} \times 700$$

$$= \frac{7}{20} \times 700$$

$$= \frac{490}{2}$$

$$= 245$$

He makes a commission of GH¢245.0

Exercise: 9

Answer the following questions.

1. Bridget gets paid 12% commissions How much commission does she make on sales of GH¢2000?
2. A shopkeeper receives a commission of 10% on all orders. If he makes sales of GH¢6000, what would be his commission?
3. Amina is a shopkeeper who is paid 15% commission on all the goods sold If she is able to make GH¢1,200 sales what would be her commission?
4. A salesman is paid 25% commission If he sells GH¢430,000, Find the commission received.
5. An agent receives 5% as commission from the sales of a house. If the house is sold at GH¢600,000. How much did the agent receive as commission?

6. Peter receives 30% commission on a sale of GH¢15,000. What amount did he receive as commission?

Discount

A discount is the deduction made from the actual price or marked price of an item.

Thus, the customer pays a little less than the price specified on a good.

The actual price of an item is the original price or marked price. The price after discount is called new price.

The original price or marked price in percentage is 100%. The new price in percentage is 100% - the discount%.

Marked price or original price =

$$\frac{100}{100\text{-discount\%}} \times \text{New price}$$

New price =

$$\frac{100\text{-discount\%}}{100} \times \text{Marked price}$$

Example 1: Abiba was given a discount of 15% of the price of a laptop selling for GH¢3,000. How much did he pay for the laptop?

Solution

Discount given = 15%

Original price or marked price = GH¢3,000

New price =?

New price =

$$\frac{100 - \text{discount\%}}{100} \times \text{original price}$$

$$= \frac{(100-15)}{100} \times 3{,}000$$

$$= \frac{85}{100} \times 3000$$

$$= \frac{85}{1} \times 30$$

$$= 2550$$

Abiba paid GH¢2,550.00 for the laptop instead of the original price of GH¢3000.

Method 2

The original price is 100% and the new price would be 100% – 15%.

Therefore, if 100% ⟶ 3,000

85% ⟶ x

$$= \frac{85}{100} \times 3000$$

$$= \frac{85}{1} \times 30$$

$$= 85 \times 30$$

$$= 2550$$

The laptop was bought at GH¢2,550.00

Method 3

Find the discount amount and then subtract it from the original price.

Discount =

$$\frac{\text{discount rate}}{100} \times \text{original price}$$

$$= \frac{15}{100} \times 3000$$

$$= 15 \times 30$$

$$= 450$$

Discount = GH¢450.00

New price = original price – discount

$$= 3{,}000 - 450$$

$$= \text{GH¢}2{,}550.00$$

Example 2: Yaw bought a shirt that was on sale for GH¢75 after a 10% discount. What was the original price?

Solution

New price = GH¢75

Discount = 10%

Original price = ?

Original price = $\frac{100}{100\text{-discount}} \times$ New price

$= \frac{100}{(100-10)} \times 75$

$= \frac{100}{90} \times 75$

$= \frac{750}{9}$

$= 83.3$

The original price for the shirt was GH¢83.30

OR

If 90% ⟶ 75

100% ⟶ x

$x = \frac{750}{9} \times 75$

$= \frac{750}{9}$

$= 83.30$

The original price is GH¢ 83.30

Example 3: A cell phone case which regularly sells for GH¢450 is on sale for 40% off. How much would you pay for the phone?

Solution

Original price = GH¢450

Discount rate = 40%

New price = ?

If 100% ⟶ GH¢450

60% ⟶ x

$x = \frac{60}{100} \times 450$

$= \frac{6 \times 45}{1}$

$= 270$

GH¢270.00 would be paid for the cell phone.

Exercise: 10

Answer the following questions.

1. A microwave that regularly sells fo GH¢500 is 10% off. What is the ne price?
2. After a 20% off sale, a fridge wa GH¢800. How much was the fridg before the sale?
3. A jeans that regularly sells fo GH¢120 is on sale for 30% off. Find th new price of the jeans.
4. A retailer is offering a 15% discoun on mattresses. If the regular price of mattress is GH¢1,500, what is the sal price?
5. Kestin bought a bag for GH¢300 a discount of 25%. What was the actua price of the bag?
6. A clock is on sale for 10% off. If th original price was GH¢180, what is th new sales price?
7. A discount of 5% is given on a ca originally priced at GH¢100,000. How much do you pay for the car?
8. A shop keeper is offering 20% discount on a trouser which is marked at GH¢60. What is the new price?
9. Amoh paid GH¢2,700 for a television which had a 10% discount. What was the original price of the television?
10. A desk is sold at GH¢120. If a discount of 15% is later offered. What is the new price?

Interest

Interest is a fee you pay on a loan or income you earn on a deposit of money. The interest paid or received is a fixed percentage of the principal amount borrowed or saved.

$$\text{Interest} = \frac{P \times R \times T}{100}$$

$(P \times R \times T)/100$

where:

P is the principal amount.

R is the rate. The percentage of the principal which is paid as interest.

T is the time. The period which is allotted for repayment of the principal.

(Note: if the time is given in months, change into years)

Example 1: Ato saved GH¢2,500 for a year at an interest rate of 5%. How much interest will he receive at the end of the period?

Solution

P = GH¢2,500

T = 1 year

R = 5%

$$\text{Interest} = \frac{P \times R \times T}{100}$$

$$= \frac{2500 \times 5 \times 1}{100}$$

$= 125$

Ato will receive GH¢125.00 interest.

Example 2: A woman put GH¢520 into a savings account for one year. The rate of interest on the account was 6%. How much was the interest for the year?

Solution

P = GH¢520

T = 1 year

R = 6%

$$\text{Simple Interest} = \frac{P \times R \times T}{100}$$

$$= \frac{520 \times 6 \times 1}{100}$$

$$= \frac{3120}{100}$$

$$= \frac{312}{10} = 31.2$$

The interest paid for the year was GH¢31.20

Exercise: 11

Answer the following questions.

1. Joana has deposited GH¢5,500 into her savings account for 1 year. If the rate of interest on the account is 10%, how much interest would she earn at the end of the period?
2. Find the interest paid on GH¢1,000 for one year at 12% rate per annum.
3. Eric lent GH¢3,000 to his friend, Charles for two years at an interest rate of 10%.
   i. How much interest will Charles pay on the loan?
   ii. What is the total amount that Eric will receive from Charles at the end of the period?
4. How much interest is earned on a principal of GH¢1,400 invested at an interest rate of 7% for two years?
5. What amount would yield an interest of GH¢250 in one year at 5% per annum?
6. What amount would be received as interest on GH¢2000 deposited for a year at 50% rate.
7. Aku kept GH¢1000 in savings for a year at 8% interest rate. How much did she get at the end of the year?
8. How much interest does Vera receive if she keeps GH¢5000 in a bank for a year at a rate of 15%.

STRAND 1 REVISION

1

Represent the given numbers on a graph sheet.
Let a cube = 100,000, a rod = 1,000,000, a flat = 10,000,000 and a block = 100,000,000

1. 210,000,000
2. 120,000,000
3. 313,200,000
4. 215,000,000
5. 150,000,000
6. 132,000,000
7. 160,000,000
8. 180,000,000

2

Determine the combination of notes required to make the given amount.
Use GH¢ 200, GH¢ 100, GH¢ 50 and GH¢ 20 notes. Each should be used.

1. GH¢ 600,000
2. GH¢ 2,400,000
3. GH¢ 3,900,000
4. GH¢ 6,200,000
5. GH¢ 1,800,000
6. GH¢ 200,000
7. GH¢ 950,000
8. GH¢ 360,000

3

Insert <,> or = to compare the numbers.

1. 392,135 _____ 63,159
2. 5,163,842 _____ 1,213,915
3. 46,381,213 _____ 32,131,500
4. 3,214,375 _____ 3,721,306
5. 86,112,391 _____ 86,143,892
6. 2,100,006 _____ 220,006
7. 21,631,119 _____ 21,631,246
8. 10,086,392 _____ 40,000

4

Find the product using the distributive property.

1. 99 × 7
2. 74 × 5
3. 28 × 9
4. 17 × 8
5. 44 × 7
6. 88 × 2
7. 43 × 9
8. 64 × 8
9. 37 × 5
10. 58 × 4

5

Round each of the following to the nearest hundred thousand.

1. 5,496,286 _____
2. 5,323,965 _____
3. 8,124,503 _____
4. 36,498,768 _____
5. 43,617,259 _____
6. 57,856,981 _____
7. 313,574,144 _____
8. 568,465,390 _____
9. 1,034,806,449 _____
10. 5,644,363,982 _____

6

Arrange the following fractions in descending order.

Example: $\frac{2}{5}, \frac{3}{4}, \frac{1}{2}, = \frac{3}{4} > \frac{1}{2} > \frac{2}{5}$

1. $\frac{4}{11}, \frac{5}{11}, \frac{3}{11}, =$
2. $\frac{5}{6}, \frac{5}{8}, \frac{5}{7}, =$
3. $\frac{3}{7}, \frac{3}{4}, \frac{3}{5}, =$
4. $\frac{2}{7}, \frac{4}{7}, \frac{3}{7}, =$
5. $\frac{2}{5}, \frac{5}{6}, \frac{3}{10}, =$
6. $\frac{4}{9}, \frac{7}{10}, \frac{2}{3}, =$
7. $\frac{5}{6}, \frac{4}{9}, \frac{1}{3}, =$
8. $\frac{1}{2}, \frac{13}{22}, \frac{6}{11}, =$
9. $\frac{5}{8}, \frac{9}{10}, \frac{4}{5}, =$
10. $\frac{4}{9}, \frac{7}{15}, \frac{2}{5}, =$

7

Multiply the following.

1. $\frac{2}{5} \times 3\frac{1}{4} =$
2. $\frac{3}{5} \times 2\frac{1}{7} =$
3. $\frac{4}{5} \times 3\frac{1}{3} =$
4. $3\frac{2}{3} \times 1\frac{1}{5} =$
5. $2\frac{1}{5} \times 3\frac{1}{3} =$
6. $4\frac{1}{2} \times 3\frac{1}{4} =$
7. $5\frac{1}{2} \times 1\frac{1}{3} =$
8. $2\frac{1}{4} \times 3\frac{1}{10} =$
9. $4\frac{1}{5} \times 1\frac{1}{6} =$
10. $7\frac{1}{2} \times 2\frac{2}{3} =$

8

Answer the following questions.

1. How much interest is earned in 2years on GH¢3,800 invested at an interest rate of 5% per year?
2. Find how much interest would be earned in 3years if GH¢24,000 is invested at an interest rate of 12% per annum.
3. Find the interest paid on GH¢15,000 for 2years at 8% per annum.
4. Kuma kept GH¢20,000 in his saving account for 3years at 13% interest rate. How much interest did he earn at the end of the period?
5. A man deposited GH¢50,000 into his saving account for 2years. If the interest rate on the account was 28% per annum, how much interest did he earn at the end of the period?
6. What amount would be earned as interest on GH¢48,000 deposited for 3years at 22% interest rate per annum?
7. Rooney deposited GH¢40,000 into a saving account at his local bank. If the interest rate is 12% per annum, then
   a. how much interest will he earn after 3years?
   b. what will be the total amount in Rooney's account at the end of 3years?
8. What amount would yield an interest of GH¢750 in 2years at 15% interest rate per annum?
9. What amount would yield an interest of GH¢56,000 in 4years at 20% interest rate per annum?
10. If you invest GH¢100,000 in savings account that offers 17% interest rate per annum,
    a. how much interest would you earn at the end of 2years period?
    b. what would be the total amount in your account at the end of 2years?