

TOPIC: Reading and Writing numbers up to One billion in words and figures

- i. Count, read and write numbers in millions
- ii. Count, read and write numbers in billions
- iii. Count and read numbers in trillions

We put digits together to make larger number with 2, 3, 4, 5, 6, 7, 8 digits etc. For example:

A diagram showing base ten blocks for the number 1,234,567. The blocks are organized into columns labeled from left to right: B (Billions), HM (Hundred Millions), TM (Ten Millions), M (Millions), HTh (Hundred Thousands), TTh (Ten Thousands), Th (Thousands), H (Hundreds), T (Tens), and U (Units). The blocks are colored and stacked as follows: B has 1 yellow block; HM has 2 blue blocks; TM has 3 green blocks; M has 4 purple blocks; HTh has 1 light green block; TTh has 2 light green blocks; Th has 5 light green blocks; H has 6 pink blocks; T has 7 red blocks; and U has 1 blue block.

Two hundred and twenty-three million, six hundred and seventy-four thousand, four hundred and two

1,000,000	2,000,000	3,000,000	4,000,000	5,000,000	6,000,000	7,000,000	8,000,000
9,000,000	10,000,000	11,000,000	12,000,000	13,000,000	14,000,000	15,000,000	16,000,000
17,000,000	18,000,000	19,000,000	20,000,000	21,000,000	22,000,000	23,000,000	24,000,000
25,000,000	26,000,000	27,000,000	28,000,000	29,000,000	30,000,000	31,000,000	32,000,000
33,000,000	34,000,000	35,000,000	36,000,000	37,000,000	38,000,000	39,000,000	40,000,000
41,000,000	42,000,000	43,000,000	44,000,000	45,000,000	46,000,000	47,000,000	48,000,000
49,000,000	50,000,000						

Write in figure, forty- two thousand and eighteen (a) 420, 118 (b) 420,018 (c) 42,118 (d) 42,118 (e) 42,018 (NCEE, 2014)

Forty- two thousand

eighteen

↓

↓

42, 000

18

42 000

+ 18

42, 018

50,000,000	55,000,000	60,000,000	65,000,000	70,000,000	75,000,000	80,000,000	85,000,000
90,000,000	95,000,000	100,000,000	105,000,000	110,000,000	115,000,000	120,000,000	125,000,000
130,000,000	135,000,000	140,000,000	145,000,000	150,000,000	155,000,000	160,000,000	165,000,000
170,000,000	175,000,000	180,000,000	185,000,000	190,000,000	200,000,000		

Write eight million, two hundred thousand and nine in figures (a) 8000209 (b) 8002009 (c) 8020090 (d) 8200009 (e) 8200900 (NCEE,

Eight Million

Two Hundred Thousand

Nine

↓

↓

↓

8 000 000

200 000

9

8000000 + 200000 + 9

8200009

Write in figure fifty -three million, eight hundred thousand and thirteen (a) 53800013 (b) 5380013 (c) 530813 (d) 530813 (e) 530013 (NCEE, 1995)

Fifty Three Million

Eight Hundred Thousand

Thirteen

↓

↓

↓

53 000 000

800 000

13

53000000 + 800000 + 13s

53800013

Value	Place value
1 = 1 000 000 000 000	trillion
2 = 200 000 000 000	hundred billion
3 = 30 000 000 000	ten billion
5 = 5 000 000 000	billion
2 = 200 000 000	hundred million
6 = 60 000 000	ten million
8 = 8 000 000	million
0 = 000 000	hundred thousand
2 = 20 000	ten thousand
4 = 4 000	thousand
5 = 500	hundred
6 = 60	tens
2 = 2	units

Examples

7 in base ten = 111_2 in base two

111_2 is read as 'one one one, base two'. Please *do not* read 111_2 as 'one hundred and eleven base 2'.

The expanded form of:

$101_2 = (1 \times 2^2) + (0 \times 2^1) + (1 \times 2^0)$
 $= (1 \times 4) + (0 \times 2) + (1 \times 1)$
 $= 4 + 0 + 1 = 5$

$111_2 = (1 \times 2^2) + (1 \times 2^1) + (1 \times 2^0)$
 $= (1 \times 4) + (1 \times 2) + (1 \times 1)$
 $= 4 + 2 + 1 = 7$

1001_2 means:

$1001_2 = (1 \times 2^3) + (0 \times 2^2) + (0 \times 2^1) + (1 \times 2^0)$
 $= 8 + 0 + 0 + 1 = 9$

Remember

$2^0 = 1$

$2^1 = 2$

$2^2 = 4$

$2^3 = 8$

$2^4 = 16$

$2^5 = 32$

$2^6 = 64$

$2^7 = 128$

$2^8 = 256$

$2^9 = 512$

$2^{10} = 1\,024$

2^3	2^2	2^1	2^0
1	0	0	1

Unit 2

Conversion of base 10 to binary numbers

Examples

Here the following numbers are converted to base 2.

1. 2 | 14

2 | 7 rem 0

2 | 3 rem 1

2 | 1 rem 1

0 rem 1

$\therefore 14_{\text{ten}} = 1110_{\text{two}}$

2. 2 | 27

2 | 13 rem 1

2 | 6 rem 1

2 | 3 rem 0

2 | 1 rem 1

0 rem 1

$\therefore 27_{\text{ten}} = 11011_{\text{two}}$

3. 2 | 33

2 | 16 rem 1

2 | 8 rem 0

2 | 4 rem 0

2 | 2 rem 0

2 | 1 rem 0

0 rem 1

$\therefore 33_{\text{ten}} = 100001_{\text{two}}$

4. 2 | 44

2 | 22 rem 0

2 | 11 rem 0

2 | 5 rem 1

2 | 2 rem 1

2 | 1 rem 0

0 rem 1

$\therefore 44_{\text{ten}} = 101100_{\text{two}}$

Exercise

Convert the following numbers in base ten to numbers in base 2.

1. 19
2. 37
3. 20
4. 41
5. 60
6. 39
7. 47
8. 29
9. 38
10. 57

Unit 3

Conversion of binary numbers to base 10

The binary number will be expressed as the sum of the power of 2.

Examples

The following numbers have been converted to base 10.

Method 1

Using place value: 2^6 2^5 2^4 2^3 2^2 2^1 2^0

1.

2^4	2^3	2^2	2^1	2^0
1	1	1	0	1

$$\begin{aligned} 11101_{\text{two}} &= (1 \times 2^4) + (1 \times 2^3) + (1 \times 2^2) + (0 \times 2^1) + (1 \times 2^0) \\ &= (1 \times 16) + (1 \times 8) + (1 \times 4) + (0 \times 2) + (1 \times 1) \\ &= 16 + 8 + 4 + 0 + 1 \\ &= 29_{\text{ten}} \end{aligned}$$

2.

2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	0	1	0	1	0	0

$$\begin{aligned} 1010100_{\text{two}} &= (1 \times 2^6) + (0 \times 2^5) + (1 \times 2^4) + (0 \times 2^3) + (1 \times 2^2) + (0 \times 2^1) + (0 \times 2^0) \\ &= 64 + 0 + 16 + 0 + 4 + 0 + 0 \\ &= 84_{\text{ten}} \end{aligned}$$

Method 2

To convert from base two to base ten:

1.

1

$\times 2$

2

1

$\times 2$

3

1

$\times 2$

6

0

$\times 2$

14

1

$\times 2$

28

1

$\times 2$

2

1

$\times 2$

6

1

$\times 2$

14

0

$\times 2$

28

1

$\times 2$

2

1

$\times 2$

6

1

$\times 2$

14

0

$\times 2$

28

1

$\times 2$

28

1

$\times 2$

2

1

$\times 2$

6

1

$\times 2$

14

0

$\times 2$

28

1

$\times 2$

28

1

$\times 2$

29

$\therefore 11101_{\text{two}} = 29_{\text{ten}}$

2.

1

$\times 2$

2

0

$\times 2$

4

1

$\times 2$

10

0

$\times 2$

20

1

$\times 2$

42

0

$\times 2$

84

1

$\times 2$

2

0

$\times 2$

4

1

$\times 2$

10

0

$\times 2$

20

1

$\times 2$

42

0

$\times 2$

84

1

$\times 2$

2

0

$\times 2$

4

1

$\times 2$

10

0

$\times 2$

20

1

$\times 2$

42

0

$\times 2$

84

0

$\times 2$

84

$\therefore 1010100_{\text{two}} = 84_{\text{ten}}$

Exercise

Convert the following binary numbers to base ten.

1. 1011_{two}
2. 11110_{two}
3. 11101_{two}
4. 10111_{two}
5. 10011_{two}
6. 11001_{two}
7. 11010_{two}
8. 11100_{two}
9. 101111_{two}
10. 110111_{two}
11. 100111_{two}
12. 111010_{two}
13. 111001_{two}
14. 111100_{two}
15. 101011_{two}

Unit 4 Addition of binary numbers

Examples

1.
$$\begin{array}{r} 1011_{\text{two}} \\ + 111_{\text{two}} \\ \hline 10010_{\text{two}} \end{array}$$

$1 + 1 = 2_{\text{ten}} = 10_{\text{two}}$
 $1 + 1 + 1 = 3_{\text{ten}} = 11_{\text{two}}$

2.
$$\begin{array}{r} 11011_{\text{two}} \\ + 1011_{\text{two}} \\ \hline 100110_{\text{two}} \end{array}$$

$1 + 1 = 2_{\text{ten}} = 10_{\text{two}}$
 $1 + 1 + 1 = 3_{\text{ten}} = 11_{\text{two}}$

3.
$$\begin{array}{r} 10110_{\text{two}} \\ + 1001_{\text{two}} \\ \hline 11111_{\text{two}} \end{array}$$

$0 + 1 = 1_{\text{ten}} = 1_{\text{two}}$

4.
$$\begin{array}{r} 11001_{\text{two}} \\ + 1111_{\text{two}} \\ \hline 101000_{\text{two}} \end{array}$$

$1 + 1 = 2_{\text{ten}} = 10_{\text{two}}$
 $0 + 1 = 1_{\text{ten}} = 1_{\text{two}}$

Exercise

Work out these totals.

1. $1110_{\text{two}} + 100_{\text{two}}$
2. $10101_{\text{two}} + 1001_{\text{two}}$
3. $11100_{\text{two}} + 1011_{\text{two}}$
4. $10111_{\text{two}} + 1001_{\text{two}}$
5. $11010_{\text{two}} + 1001_{\text{two}}$
6. $11001_{\text{two}} + 1111_{\text{two}}$
7. $11011_{\text{two}} + 1010_{\text{two}}$
8. $10011_{\text{two}} + 1010_{\text{two}}$
9. $10011_{\text{two}} + 1001_{\text{two}}$
10. $11101_{\text{two}} + 1010_{\text{two}}$

You have learnt that

- The digits in 0, 1, 2, 3, 4, 5, 6, 7, 8 and 9 are base 10 numbers.
- The digits in base 2 are 0 and 1.
- Decimal numbers can be converted to binary and vice-versa.
- Binary numbers can be added together.

Revision exercise 36

Convert the following numbers in base ten to numbers in base 2.

1. 61
2. 44
3. 28
4. 25
5. 49

Convert the following binary numbers to base ten.

6. 1101_{two}
7. 10110_{two}
8. 10001_{two}
9. 111001_{two}
10. 100100_{two}
11. Add 10110_{two} to 1011_{two}
12. Add 10111_{two} to 1010_{two}

Examples

	tens	units	tenths	hundredths	thousandths
1.		4	0	3	6
2.		8	7	0	2
3.	5	0	9	3	1

Place value of each digit

- 1. 4 units + 0 tenth + 3 hundredths + 6 thousandths
- 2. 8 units + 7 tenths + 0 hundredth + 2 thousandths
- 3. 5 tens + 0 unit + 9 tenths + 3 hundredths + 1 thousandth

When you are given a number to find the place value of each digit or just one digit, write down the number in tabular form as shown above. Then pick the digits one by one or pick the single digit you were asked to find the place value of.

Exercise 1

Write down the place value and value of each digit in the numbers below. The first one is done for you.

- 1. 5.492 = 5 units + 4 tenths + 9 hundredths + 2 thousandths
- 2. 90.234 =
- 3. 6.187 =
- 4. 1.403 =
- 5. 29.502 =
- 6. 3.109 =
- 7. 68.973 =
- 8. 0.887 =
- 9. 471.057 =

Unit 3

Writing decimals in word and figure forms

A decimal point is read as 'and' or 'point' and written same way as in whole numbers.

Examples

6.74 in words will read six and seventy-four hundredths or six point seven four.

You will notice that the two digits are taken together using the place value of the last digit to the right.

Exercise 1

Write each of these in words in two ways.

- 1. 70.009
- 2. 8.343
- 3. 9.56
- 4. 13.125
- 5. 431.8
- 6. 15.29
- 7. 6.791
- 8. 62.08

Exercise 2

Fill in the digits or write the names to complete the place value.

	Hundreds	Tens	Units	Tenths	Hundredths	Thousandths	
1.		1		9			Twelve and nine tenths
2.			4			5	Four and two hundred and forty-five thousandths
3.							Three and sixteen hundredths
4.	3	0	7				Three hundred and seven and seventy-six thousandths
5.							Fifty-eight hundredths
6.		6	5	2	2	2	
7.							Eighty-nine and four hundredths

Exercise 3

Write the following numbers in figures.

1. Two thousand and one hundredth.
2. Seven hundred and seven thousandths.
3. One and two hundred and seven thousandths.
4. Eighty-three and sixty-four hundredths.
5. Nine and twenty-five hundredths.
6. Fifty-one and eight thousandths.
7. Three hundred and sixty-one point two.
8. Eight and six hundred and ninety-three thousandths.
9. Two hundred and seventy-five thousandths.
10. Seventy-two point three seven one.

Unit 4 Comparing and ordering decimals

Decimals can be ordered in ascending and descending orders.
Ascending order means smallest first. Descending order means largest first.

Five steps to ordering of decimals:

1. Arrange all the decimals in a column with the decimal points underneath each order.

2. Make them all the same length by filling in extra zeros.

3. Ignore the decimal points and treat the numbers as whole numbers.

4. Arrange them in order of size.

5. Put the decimal points in the correct position.

Examples

1. These numbers have been arranged in an ascending order: 0.06, 0.1, 0.51, 0.052

Step 1	Step 2	Step 3	Step 4	Step 5
0.06	0.060	60	52	0.052
0.1	0.100	100	60	0.06
0.51	0.510	510	100	0.1
0.052	0.052	52	510	0.51

∴ Ascending order = 0.052, 0.06, 0.1 and 0.51

2. These numbers have been arranged in a descending order: 0.085, 0.2, 1.0, 0.0089 and 0.178

	Working	Position
0.085	= 0.0850	4th
0.2	= 0.2000	2nd
1.0	= 1.0000	1st
0.0089	= 0.0089	5th
0.178	= 0.1780	3rd

∴ Descending order = 1.0, 0.2, 0.178, 0.085, 0.0089

Exercise 1

Arrange these in an ascending order.

- | | |
|------------------------------------|--------------------------------|
| 1. 0.095, 0.1, 0.55 and 1.01 | 2. 0.7, 0.017, 0.0077 and 0.81 |
| 3. 1.9, 0.21, 2.1, 0.05 and 0.0091 | 4. 0.06, 0.61, 0.0066 and 1.06 |

Arrange these in a descending order.

- | | |
|--------------------------------|---------------------------------|
| 5. 0.15, 0.051, 0.1 and 0.5 | 6. 0.27, 0.071, 0.17 and 0.7 |
| 7. 0.359, 0.592, 0.925 and 0.9 | 8. 0.8, 1, 0.419, 0.91 and 0.14 |
9. A miner picked up gold of the following sizes: 0.3 g, 0.28 g, 0.19 g, 0.32 g and 0.25 g. Arrange these weights in order of size, beginning with the smallest.
10. A pupil has different pencils of lengths 2.5 cm, 1.95 cm, 5.05 cm, 3.01 cm and 2.95 cm. Arrange these lengths in a descending order.
11. Five FM Radio stations transmit at the following wavelengths: 96.9 Hz, 106.6 Hz, 88.75 Hz, 93.7 Hz and 101.5 Hz respectively. Arrange these wavelengths in an ascending order.
12. A boy grows taller monthly by the following heights: 0.2 cm, 0.08 cm, 0.15 cm, 0.12 cm and 0.21 cm respectively. Arrange these heights in order, starting from the least.

Exercise 2

1. Which is the larger number from each pair?
a) 7.78 7.87 b) 3.13 3.09 c) 6.61 $6\frac{6}{100}$
2. Which is the smaller number from each pair?
a) $\frac{19}{100}$ 0.91 b) 8.54 8.45 c) $4\frac{35}{100}$ 4.36
3. Give the colour of the winning card:
a) The value of the winning card is greater than 3.97

1.51 + 0.28

7.24 – 3.05

1.86 + 2.01

8.05 – 6.38

b) The value of the winning card is greater than 9.3

3.78 + 5.21

9.02 – 2.59

4.96 + 4.87

11.01 – 2.85
4.

34.78

15.92

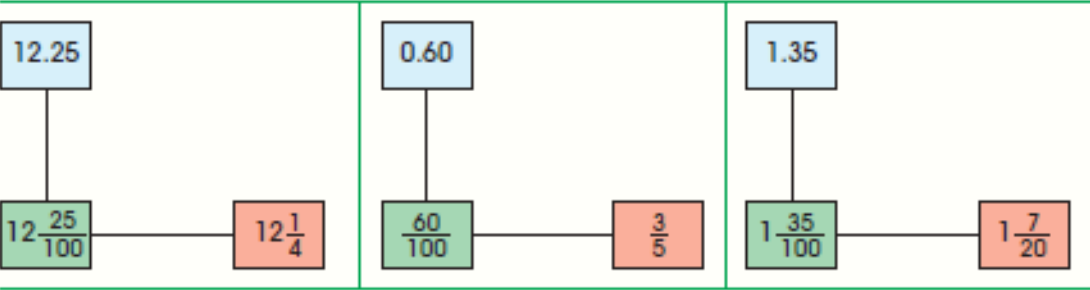
1.674

2.005

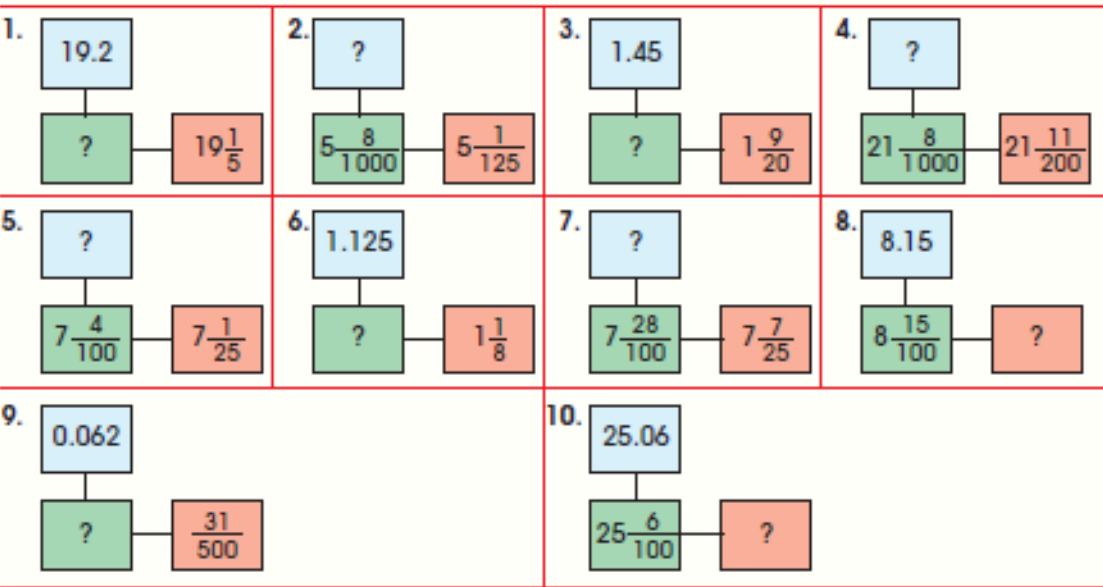
Which number has
a) 8 hundredths b) 9 tenths c) 5 thousandths d) 2 units

Quantitative reasoning 2

Examples



Use the examples above to answer the following questions.



You have learnt that

- Decimal fraction (number) consists of two parts: the whole number to the left of decimal point and the fraction to the right of decimal point.
- Its position in a number determines the value of each digit in that number.

Revision exercise 2

1. Write the following as decimal fractions.
a) Seventy nine and fifty-two hundredths b) Eight and six thousandths
2. Copy and complete each sequence
a)

2.74

2.76

b)

8.10

8.15

8.20
3. Write a number between:
a) 75.66 and 73.56 b) 120.55 and 119.99
4. Write these numbers, putting in a decimal point to make the 3 have a value of 3 hundredths
a) 1 023 b) 5 130 c) 39 d) 380

find common multiples of 2-digit whole numbers

find the LCM of 2-digit whole numbers.

A factor of a given number is a number that can divide the given number without a remainder. For instance 2 can divide 6 without a remainder, hence 2 is a factor of 6.

Rules for divisibility

2: A number is divisible by 2 if the last digit is an even number or zero.

3: A number is divisible by 3 if the sum of the digits is divisible by 3. For example, 4302.

$4 + 3 + 0 + 2 = 9$, this is divisible by 3. Hence 4302 is divisible by 3. Therefore, 3 is a factor of 4302.

4: A number is divisible by 4, if the last two digits are zeros or if the last two digits of the number is divisible by 4.

Examples

1. 324 is divisible by 4

because the last two digits (24) are divisible by 4.

2. 736 is divisible by 4

because the last two digits (i.e. 36) are divisible by 4.

5: A number is divisible by 5 if the last digit is either 5 or zero.

Examples

75 is divisible by 5 Hence 5 is a factor of 75

80 is divisible by 5 5 is a factor of 80

76 is not divisible by 5.

5 is not a factor of 76.

78 is divisible by 2 76 is divisible by 2

78 is also divisible by 3 but 76 is not divisible by 3.

Hence 78 is divisible by 6. (Remember $7 + 6 = 13$ and 13 is not divisible by 3)!

6 is a factor of 78. Since 2 but not 3 can divide 76 without remainder.

Thus 76 is not divisible by 6.!

6 is not a factor of 76.

7: A number is divisible by 7 if the difference between twice the last digit and the number formed by the remaining digits is divisible by 7.

Examples

1. Consider 91 2. Consider 959

The last digit is 1. The last digit is 9.

Twice the last digit is $2 \times 1 = 2$. Twice the last digit is $2 \times 9 = 18$.

The remaining digit is 9. The remaining digits = 95.

Difference between 9 and 2 is 7. Difference between 95 and 18 = $95 - 18 = 77$

Since 7 is divisible by 7. Since 77 is divisible by 7.

91 is also divisible by 7. 959 is also divisible by 7.

Thus 7 is a factor of 91. Thus 7 is a factor of 959.

8: A number is divisible by 8 if the last three digits are zeros or the number is divisible by 2 without a remainder three times

Examples

1. Consider 784 2. Consider 74

$784 \div 2 = 392$ (First division) $748 \div 2 = 374$ (First division)

$392 \div 2 = 196$ (Second division) $374 \div 2 = 187$ (Second division)

$196 \div 2 = 98$ (Third division) $187 \div 2 = 93$ remainder 1 (Third division)

Thus $784 \div 8 = 98$ Here 748 cannot be divided by 2, without a remainder, three times. Thus 8 cannot divide 748 without a remainder.

Hence 8 is factor of 784. Therefore 8 is not a factor of 748.

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

Examples

1. Consider 801 2. Consider 234

$8 + 0 + 1 = 9$ $2 + 3 + 4 = 9$

Since 9 is divisible by 9 Since 9 is divisible by 9

Then 801 is divisible by 9 Then 234 is divisible by 9

Hence 9 is a factor of 801. Hence 9 is a factor of 234.

10: A number is divisible by 10 if the last digit is ZERO. For example, 180 is divisible by 10

but 108 is not. Thus 10 is a factor of 180, but not a factor of 108.

How to find the factors of a given number

Starting from 1, find all other numbers that can divide the given number without a remainder.

Examples

This method finds the factors of 48.

$48 = 1 \times 48$

$= 2 \times 24$

$= 3 \times 16$

$= 4 \times 12$

$= 6 \times 8$

Exercise 1

For each number, list all the factors.

1. 84 2. 36 3. 40 4. 24 5. 96 6. 32

7. 80 8. 54 9. 90 10. 72 11. 19 12. 71

Common factors

Examples

Look at the method of finding the common factors of 24 and 30.

Factors of 24 are 1, 2, 3, 4, 6, 8, 12 and 24 Factors of 30 are 1, 2, 3, 5, 6, 10, 15 and 30

Common factors of 24 and 30 are 1, 2, 3, and 6

Examples

Look at these methods of finding common factors (CF) and highest common factors (HCF) of 8, 24 and 40.

Method 1

Factors of 8 = 1, 2, 4 and 8
Factors of 24 = 1, 2, 3, 4, 6, 8, 12 and 24
Factors of 40 = 1, 2, 4, 5, 8, 10, 20 and 40.

Common Factors (CF) = 1, 2, 4 and 8
∴ Highest Common Factor (HCF) = 8

Method 2 (a shorter method)

2	8, 24, 40	→ Divide 8, 24 and 40 by smallest CF
2	4, 12, 20	→ Divide 4, 12 and 20 by smallest CF
2	2, 6, 10	→ Divide 2, 6 and 10 by smallest CF
	1, 3, 5	

There are no more common factors for 1, 3 and 5
HCF of 8, 24 and 40 = $2 \times 2 \times 2 = 8$

Exercise 1

- Find the HCF of each of the following.
- | | | | |
|---------------|----------------|----------------|----------------|
| 1. 27, 45, 48 | 2. 32, 40, 24 | 3. 36, 48, 80 | 4. 30, 36, 48 |
| 5. 40, 60, 80 | 6. 16, 40, 48 | 7. 45, 90, 60 | 8. 24, 40, 64 |
| 9. 36, 42, 24 | 10. 18, 24, 30 | 11. 60, 24, 48 | 12. 84, 60, 48 |

Prime numbers

- Some numbers have only two factors. Example are:
- | | |
|--|---------------------------------------|
| i) 1 and 2 are the only factors of 2 | ii) 1 and 3 are the only factors of 3 |
| iii) 1 and 5 are the only factors of 5 | iv) 1 and 7 are the only factors of 7 |

Note: Every number except 1 has at least two factors.
Numbers that have only two factors are known as prime numbers.
Examples are 2, 3, 5, 7, 11, 13, 17, 19, 23, 29, etc.

Definition: A prime number is a number that can only be divided by 1 and itself. 1 is not a prime number.
A prime factor is a factor which is a prime number.

- Exercise 2
- Find the common factors of the following numbers.
1. 30 and 42 2. 21 and 56 3. 28 and 40 4. 12 and 15 5. 15 and 18
6. 25 and 75 7. 21 and 35 8. 18 and 24 9. 81 and 90 10. 24 and 60
- Highest Common Factors (HCF) of 2 -digit whole numbers

Examples

The prime factors of 60 are illustrated below.
 $= 2 \times 30 = 3 \times 20 = 4 \times 15 = 5 \times 12 = 6 \times 10$.
Factors of 60 are 1, 2, 3, 4, 5, 6, 10, 12, 15, 20, 30 and 60.
Prime factors of 60 are 2, 3 and 5

Exercise 2

Find the prime factors of each of the following numbers.
1. 45 2. 48 3. 72 4. 54 5. 24
6. 84 7. 27 8. 56 9. 42 10. 65

Prime factorization

If a number is expressed as a product of its prime factors, the process is known as prime factorization.

Examples

Here 84 is expressed as a product of prime factors.

2

84

→ Divide 84 by 2 (because 2 is a factor of 84)

2

42

→ Divide 42 by 2 (because 2 is a factor of 42)

3

21

→ Divide 21 by 3 (because 2 is not a factor of 21, but 3 is)

7

7

→ Divide 7 by 7 (because 7 is a factor of 7 and not a factor of 3)

1

∴ 84 = 2 × 2 × 3 × 7

Note: You will divide the given number by prime numbers only.

Exercise 3

Write the following as products of prime factors.
1. 156 2. 256 3. 288 4. 172 5. 196 6. 200 7. 242
8. 250 9. 306 10. 390 11. 18 × 39 12. 63 × 75 13. 75 × 27 14. 6 × 5 × 183

Copy and write the correct numbers in the empty boxes

15. 144 = 2 × 72

16. 168 = 2 × □

= 2 × □ × 36

= 2 × □ × □

= 2 × □ × □ × □ × □ × 3

= 2 × □ × □ × 3 × □

= □⁴ × □²

= □³ × □ × □

Finding HCF using prime factorisation

Examples

Find the Highest Common Factor (HCF) of 18 and 30.

Solution

1. 18 =
2 × 3 × 3
2. 30 =
2 × 3 × 5

Note: The common prime factors are 2 and 3.

Highest Common Factors (HCF) = 2 × 3 = 6

6 is the highest factor that can divide both 18 and 30.

Exercise 4

A. Find the HCF of these numbers.

1. 16, 24 and 40 2. 72, 40 and 36 3. 20, 30 and 40 4. 84, 48 and 36
5. 30, 40 and 75 6. 12, 21 and 18 7. 12, 15, and 21 8. 18, 27 and 30

B. Find the HCF of the following numbers, using the factor method.

1. 12, 24 and 48 2. 15, 25 and 35 3. 20, 25 and 40
4. 22, 33 and 44 5. 16, 20 and 24 6. 13 and 52
7. What is the highest natural number which divides exactly into 40 and 100?
8. Find the difference between the HCF of 40 and 56; and the HCF of 27 and 63.
9. The highest common factor of two numbers is 2. The larger of the two numbers is 24. The other number has 5 as one of its factors. What is the other number?

Unit 3

Common multiples of 2-digit whole numbers

Multiples of a given number are numbers that are formed by successfully multiplying the given number by counting numbers 1, 2, 3, 4, 5, 6 ...

Examples

Multiples of 3 and 5 are found here.

$3 \times 1 = 3, 3 \times 2 = 6, 3 \times 3 = 9, 3 \times 4 = 12 \dots$

Multiples of 3 are

3, 6, 9, 12...

Multiples of 5 are

5, 10, 15, 20...

Multiples of 5 are

Note: Multiples of a number do not end, so we use the sign (...) to show that there are still more.

Common multiple: If two or more numbers have the same multiple, such a multiple is known as common multiple to the given numbers.

Examples

The common multiples of 2 and 3 are shown below.

Solution

Multiples of 2 are 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24 ...

Multiples of 3 are 3, 6, 9, 12, 15, 18, 21, 24, 27, 30, 33, 36, ...

Common multiples are 6, 12, 18, 24...

Note: the common multiples are also multiples of 6.

Exercise 1

A. Find the common multiples of the following.

1. 15 and 10 2. 20 and 30 3. 10, 15 and 30 4. 18 and 36 5. 10 and 20

B. Write down the multiples of:

1. 2 between 11 and 17 2. 5 less than 24 3. 7 less than 30

List the common multiple of:

4. 4 and 6 less than 20 5. 5 and 7 less than 8

6. 10 and 12 less than 80

7. 11 and 12 less than 140

8. 12 and 14 less than 90

9. 12 and 15 between 20 and 130

10. 12 and 16 between 140 and 200

11. 15 and 25 between 140 and 250

12. 15 and 16 between 140 and 260

13. 18 and 27 between 100 and 200

Exercise 2

Find the common multiples of these numbers.

1. 15 and 20 2. 14 and 35 3. 15 and 30 4. 15 and 45

5. 20, 40 and 80 6. 10, 20 and 30 7. 12, 18 and 36 8. 10 and 15

Least common multiples

Least common multiple (LCM) of two or more numbers is the least/smallest of all the common multiples of the two or more given numbers.

Least common multiple (LCM) is also known as Lowest Common Multiple.

Examples

Method 1 (common multiples)

1. Here the LCM of 10, 15 and 30 have been found.

The multiples of 10 are: 10, 20, 30, 40, 50, and 60

The multiples of 15 are: 15, 30, 45, 60, 75, and 90

The multiples of 30 are: 30, 60, 90, 120, 150, and 180

The common multiples of 10, 15 and 30 are 30 and 60

1. The LCM of 10, 15 and 30 is 30.

2. Here we find the LCM of 9 and 12.

Solution

Multiples of 9 are 9, 18, 27, 36, 45, 54, 63, 72, 81, 90, 99, 108 ...

Multiples of 12 are 12, 24, 36, 48, 60, 72, 84, 96, 108, 120...

Common multiples of 9 and 12 are 36, 72, 108...

Least Common Multiple is the smallest/least of the three common multiples.

LCM = 36

Exercise 1

Find the common multiples and LCM of these numbers.

1. 12 and 16 2. 12 and 24 3. 10 and 12 4. 15 and 30

5. 12 and 18 6. 12 and 15 7. 10, 20 and 30 8. 18 and 36

9. 13 and 39 10. 10 and 15 11. 15 and 20 12. 14 and 35

13. 15 and 45 14. 10, 15 and 30 15. 12, 18 and 36 16. 20, 40 and 80

Examples

Here the LCM of 9 and 12 is found using other methods.

Examples

Study how the LCM of 48, 54 and 60 is found.

Solution

1.

2	48
2	24
2	12
2	6
3	3
1	

$\therefore 48 = 2 \times 2 \times 2 \times 2 \times 3$
 $= 2^4 \times 3^1$

2.

2	54
3	27
3	9
3	3
1	

$\therefore 54 = 2 \times 3 \times 3 \times 3$
 $= 2^1 \times 3^3$

3.

2	36
2	18
3	9
3	3
1	

$\therefore 36 = 2 \times 2 \times 3 \times 3$
 $= 2^2 \times 3^2$

Step 1: Write each number in the index form.

Step 2: Select the highest index power of the same base. For 2, 2⁴ is selected for 3, 3³ is selected.

$\therefore \text{LCM of } (48, 54, 36) = 2^4 \times 3^3 = 432$

Exercise 2

A. Find the LCM of these numbers.

1. 12 and 16
2. 20 and 25
3. 40 and 60
4. 36 and 42
5. 54 and 72
6. 30 and 48
7. 12, 54 and 49
8. 36, 54 and 84

B. Find the LCM of these numbers, using the factor method.

1. 16 and 32
2. 25 and 30
3. 15 and 45
4. 11 and 33
5. 22, 33 and 11
6. 18, 36 and 72
7. 22, 66, and 132
8. 50, 100 and 150
9. James, Joshua and John waved their hands at 10 minutes, 20 minutes and 30 minutes interval respectively. At what point will they all wave at the same time?
10. Three machines using the same speed and accuracy make 20, 25 and 50 punches each time. After each machine has completed a round, it starts again. At what count will these machines be making the same number of punches?
11. Three cars set off on a race. After 11 km, 22 km and 33 km, each car's siren comes on. After what number of km will their sirens all be on at the same time?
12. Ngozi and Chioma count in 13's and 30's and their counts show on the computer. Anytime they have similar numbers, the computer circles them. What number is likely to be their first similar number?
13. What is the smallest weight that can be measured in equal amount of 12 kg, 21 kg and 18 kg?

Equivalent fractions name the same amount. For example $\frac{1}{2}$, $\frac{5}{10}$ and $\frac{50}{100}$ are exactly the same amount. They all mean half. As a decimal, they are all 0.5. Therefore, multiplication or division of both numerator and denominator by the same number gives equivalent fractions.

Examples

$$\frac{2 \times 2}{5 \times 2} = \frac{4 \times 3}{10 \times 3} = \frac{12}{30}$$

Thus, $\frac{2}{5}$, $\frac{4}{10}$ and $\frac{12}{30}$ are all equivalent fractions

$$\frac{12 \div 6}{30 \div 6} = \frac{2}{5}$$

The lowest term for $\frac{12}{30}$ is $\frac{2}{5}$

Thus, $\frac{12}{30} = \frac{2}{5}$ are the same or equivalent fractions.

Exercise 1

Copy and complete the equivalent fractions.

1. $\frac{4}{5} = \frac{12}{\square}$

2. $\frac{5}{7} = \frac{\square}{28}$

3. $\frac{1}{10} = \frac{\square}{50}$

4. $\frac{3}{4} = \frac{30}{\square}$

5. $\frac{3}{7} = \frac{\square}{35}$

6. $\frac{20}{25} = \frac{4}{\square}$

7. $\frac{9}{10} = \frac{\square}{100}$

8. $\frac{5}{45} = \frac{\square}{9}$

Exercise 2

Give two equivalent fractions to each fraction.

1. $\frac{8}{14}$
2. $\frac{7}{10}$
3. $\frac{3}{8}$
4. $\frac{5}{6}$
5. $\frac{3}{5}$
6. $\frac{3}{4}$
7. $\frac{2}{3}$
8. $\frac{8}{9}$
9. $\frac{3}{8}$
10. $\frac{5}{9}$

Unit 2 Simplifying fractions

Examples

These fractions have been simplified.

1. $\frac{5}{10} \div 5 = \frac{1}{2}$ The common factor is 5
2. $\frac{18}{24} \div 6 = \frac{3}{4}$ The common factor is 6

To reduce or simplify a fraction to its lowest term you must divide by the common factor of the numerator and denominator. A fraction is in its lowest term when both the numerator and the denominator can no longer be divided by a common factor.

Exercise

Simplify these fractions.

1. $\frac{36}{81}$
2. $\frac{49}{50}$
3. $\frac{150}{180}$
4. $\frac{75}{100}$
5. $\frac{125}{1000}$
6. $\frac{24}{100}$
7. $\frac{255}{500}$
8. $\frac{63}{81}$
9. $\frac{550}{1000}$
10. $\frac{144}{168}$
11. $\frac{99}{108}$
12. $\frac{132}{264}$
13. $\frac{48}{144}$
14. $\frac{65}{100}$
15. $\frac{15}{125}$

Unit 3 Comparing and ordering fractions

There are three methods that can be used to find out which fraction is the largest or smallest in a group of fractions.

- First method: Convert all fractions to decimals and order them.
- Second method: Use fraction bars and see which is shaded most.
- Third method: If the denominators are the same, just compare the numerators. The fraction with the largest numerator is the largest.

Examples

1. The fractions $\frac{1}{5}, \frac{1}{4}, \frac{2}{3}$ are put in order, starting with the largest.
2. Here $\frac{1}{2}, \frac{5}{8}, \frac{3}{4}$ are put in order, starting with the largest.

Method 1 Change them to decimal $\frac{1}{5} = 0.20$;

$\frac{1}{4} = 0.25$; $\frac{2}{3} = 0.66$

The largest is 0.66, then 0.25, then 0.20.

So the order is $\frac{2}{3}, \frac{1}{4}, \frac{1}{5}$.

Method 2 Show fraction bars



You can see at a glance

that the order is $\frac{3}{4}, \frac{5}{8}, \frac{1}{2}$.

Put $\frac{5}{12}, \frac{11}{12}$ and $\frac{7}{12}$ are put in order, starting with the smallest.

This is easy because all the denominators are the same. Remember, the smallest goes first. The third method applies here. 5 is the smallest, followed by 7, followed by 11.

So, the order is $\frac{5}{12}, \frac{7}{12}, \frac{11}{12}$.

Exercise 1

Arrange these fractions in order of size, starting with the smallest.

1. $\frac{1}{3}, \frac{4}{5}, \frac{9}{30}$
2. $\frac{2}{5}, \frac{6}{8}, \frac{13}{40}$
3. $\frac{5}{6}, \frac{1}{4}, \frac{7}{12}$
4. $\frac{3}{4}, \frac{2}{3}, \frac{1}{9}$
5. $\frac{2}{3}, \frac{5}{12}, \frac{1}{4}$
6. $\frac{6}{7}, \frac{5}{21}, \frac{2}{3}$
7. $\frac{2}{9}, \frac{2}{7}, \frac{2}{5}$
8. $\frac{2}{5}, \frac{9}{10}, \frac{1}{2}$
9. $\frac{13}{20}, \frac{7}{10}, \frac{3}{5}$
10. $\frac{11}{15}, \frac{4}{5}, \frac{2}{3}$
11. $\frac{11}{12}, \frac{5}{6}, \frac{3}{18}$
12. $\frac{17}{25}, \frac{3}{5}, \frac{18}{100}$
13. $\frac{13}{20}, \frac{4}{5}, \frac{23}{60}$
14. $\frac{4}{5}, \frac{5}{7}, \frac{3}{7}$
15. $\frac{11}{15}, \frac{11}{12}, \frac{11}{14}$

Exercise 2

Copy and put in the missing signs =, > or < in place of □.

1. $\frac{4}{7} \square \frac{13}{21}$
2. $\frac{2}{9} \square \frac{7}{36}$
3. $\frac{12}{21} \square \frac{5}{7}$
4. $\frac{8}{28} \square \frac{2}{7}$
5. $\frac{5}{15} \square \frac{2}{3}$
6. $\frac{2}{3} \square \frac{4}{5}$
7. $\frac{1}{5} \square \frac{2}{15}$
8. $\frac{3}{10} \square \frac{19}{30}$

By how many:

9. tenths is $\frac{1}{2}$ greater than $\frac{3}{10}$?
10. eighths is $\frac{3}{4}$ less than $\frac{7}{8}$?
11. sixths is $\frac{2}{3}$ less than $\frac{5}{6}$?
12. tenths is $\frac{4}{5}$ greater than $\frac{1}{2}$?

Unit 4 Converting fractions to decimals and vice versa

To convert fractions into decimals, just divide the numerator by the denominator and add zeros until it divides equally.

Examples

Here $\frac{3}{4}$ and $\frac{1}{6}$ have been changed to decimals.

1. $\frac{3}{4} = 4 \overline{) 3.00}$ $\underline{2.8}$ 2 0 $\underline{2.0}$ 0 $\frac{3}{4} = 0.75$	2. $\frac{1}{6} = 6 \overline{) 1.000}$ $\underline{6}$ 4 0 $\underline{3.6}$ 4 0 $\underline{3.6}$ 4 0 $\frac{1}{6} = 0.167$ $\frac{1}{6} = 0.1666...$ 0.166 is a continuous fraction $\therefore \frac{1}{6} = 0.1666$
---	---

Since a decimal also names part of a whole number, every decimal can also be written as a fraction.
To convert decimals to fractions, you have got to look at where the last digit after the decimal point is.

Examples

1. $0.7 = \frac{7}{10}$

2. $0.85 = \frac{85}{100} = \frac{17}{20}$

3. $0.165 = \frac{165}{1000} = \frac{33}{200}$

Exercise 1

Write these as a decimal fraction. Round off to the nearest thousandths.

1. $\frac{1}{3}$
2. $\frac{2}{5}$
3. $\frac{4}{25}$
4. $\frac{23}{77}$
5. $\frac{35}{50}$
6. $\frac{7}{9}$
7. $\frac{12}{63}$
8. $\frac{3}{8}$
9. $\frac{4}{16}$
10. $\frac{15}{40}$

Exercise 2

Convert these decimals to fractions. Then reduce each to its lowest term where necessary.

1. 0.005
2. 0.807
3. 0.125
4. 0.75
5. 0.375
6. 0.625
7. 0.18
8. 0.3
9. 0.184
10. 0.666

Unit 5

Fractions of quantities

When talking about fractions, we say “of” but we mean “times” or “multiply”.

Examples

To answer the example of what is $\frac{1}{5}$ of 60 metres:
“Of” means times

So $\frac{1}{5}$ of 60 metres is just $\frac{1}{5} \times 60$ metres
 $\therefore (60 \div 5) \times 1$
 $12 \times 1 = 12$ metres

By cancelling:

$$\frac{1}{\cancel{5}^1} \times \frac{\overset{12}{\cancel{60}_1}}{1} \text{ metres} = 1 \times 12 \text{ metres} = 12 \text{ metres}$$

Exercise 1

Find the value of the following.

1. $\frac{9}{10}$ of 1 hour
2. $\frac{5}{8}$ of 1 minute
3. $\frac{1}{5}$ of 35 litres
4. $\frac{3}{5}$ of 1 tonne
5. $\frac{1}{100}$ of 1 kg
6. $\frac{1}{10}$ of $2\frac{1}{2}$ kg
7. $\frac{2}{3}$ of $2\frac{1}{2}$ litres
8. $\frac{3}{5}$ of 5.5 m
9. $\frac{1}{3}$ of 88.5 cm

Exercise 2

Find the whole number of quantity for the following. The first one includes some workings.

1. $\frac{1}{3}$ is 36 cm = $\frac{1}{3}$ of cm = 36 cm cm = 36 cm $\times 3 = 108$ cm = 1 m 8 cm
2. $\frac{5}{6}$ is 30 kg
3. $\frac{7}{8}$ is $3\frac{1}{2}$ km
4. $\frac{7}{10}$ is 140
5. $\frac{5}{8}$ is 6.25
6. $\frac{1}{5}$ is 250 km
7. $\frac{4}{5}$ is 900
8. What fraction of
 - a) 1 m is 65 cm
 - b) 800 m is 1 km
 - c) 650 g is 1 kg?

Exercise 3

Word problems

1. What is 8 hundredths as a decimal?
2. In a sale, items cost $\frac{3}{4}$ of their original prices. A television cost N30 000 in the sale. What was its original price?
3. Write down two fractions that are equivalent to one-ninth.
4. What fraction is equivalent to 0.85?
5. a) Write $\frac{7}{10}$ km in metres b) $\frac{7}{10}$ kg in grams
6. If 3 metres of ribbon are shared equally among 8 girls, how much does each girl get? Write your answer as a decimal.
7. How many sixths equal one-third?

WEEK 6&7

RATIO AND PROPORTION

Meaning

Ratio is a comparison of two or more quantities that are alike. The diagram below shows 12 buttons.

There are 4 red buttons and 8 blue buttons

The ratio of red button to all the buttons is 4 to 12 (4 : 12)

The ratio of blue buttons to all the buttons is 8 to 12 (8 : 12)

The ratio of red buttons to blue buttons is 4 to 8 (4 : 8)

The ratio of blue buttons to red buttons is 8 to 4 (8 : 4)

The first window is half the height of the second window.

The ratio of their heights is 8 : 16

Equal (Equivalent) ratios

Khadijah has 3 packs of pencils

There are 4 pencils in each pack

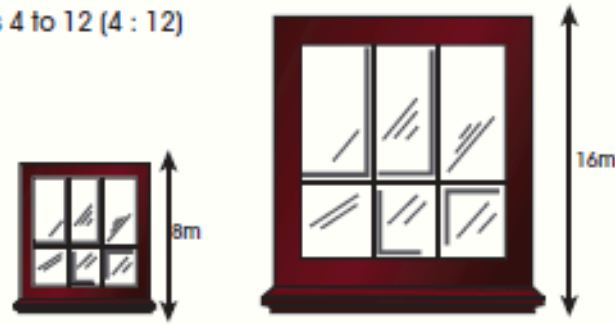
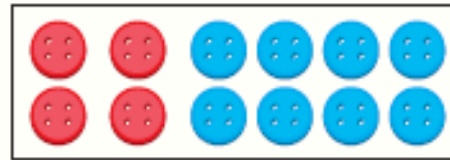
Chidi also has 2 packs of pencils with same number pencils

The ratio of the pack is 3 : 2

The ratio of pencils they have is 12 : 8

The ratio 3 : 2 and 12 : 8 are the same.

They are called **equal (equivalent) ratios**.



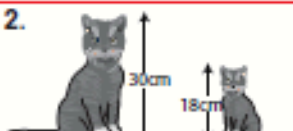
Exercise 1

A. Write down the ratio of each pair of the following pictures.

1.



2.



3.



4.



B. Copy and complete the following statements.

The ratio of

- 1. blue tacks to black tacks is 6 : 4
- 2. black tacks to blue tacks is
- 3. red tacks to all the tacks is
- 4. black tacks to red tacks is
- 5. all tacks to black tacks is
- 6. red and blue tacks to black tacks is



C. Copy and complete to give equal ratios. The first is done for you.

- 1. 3 : 4 = : 16
- 2. : 5 = 8 : 20
- 3. : 5 = 8 : 20
- 4. 2 : = 8 : 12
- 5. 3 : = 9 : 18
- 6. 1 : = 5 : 15
- 7. 10 : 4 = 5 :
- 8. 1 : = 6 : 18
- 9. 9 : 12 = : 4
- 10. : 20 = 6 : 40

Examples

The correct number of the ratio is worked out here.

The ratio of to 60 is 3 to 4.

$$\frac{\square}{60} = \frac{3}{4}; \square = \frac{60 \times 3}{4} = 45$$

Therefore, ratio to 60 is 3 to 4

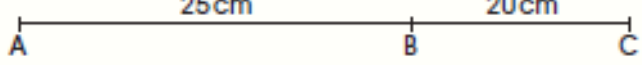
Exercise 2

A. Fill the boxes with the correct numbers.

- 1. The ratio of 72 to is 3 to 4.
- 2. The ratio of to 16 is 1 to 4.
- 3. The ratio of to 90 is 2 to 3.
- 4. The ratio of 80 to is 4 to 5

B. Find, in the simplest form, these ratios.

- 1. 16 to 12
- 2. 21 to 27
- 3. 40 to 35
- 4. 14 to 18
- 5. 35 to 42
- 6. 27 to 63
- 7. 50 to 70
- 8. 54 to 66



Write down, in the simplest form, these ratios.

- 9. AB to BC
- 10. AB to AC
- 11. BC to AC
- 12. AC to AB

Examples

Study how these word problems are solved.

Pencils are sold at 3 for ₦25. Kemisola bought 9 pencils. How much did she pay?

Solution

Pencil $\rightarrow 3 = \frac{9}{\square}$ $\therefore 9 = 3 \times 3$
Price $\rightarrow \frac{3}{25} = \frac{\square}{75}$

$\frac{3}{25} = \frac{3 \times 3}{25 \times 3} = \frac{9}{75}$

Kemi paid ₦75

6 kg of cornflour cost ₦80. How many kg of cornflour can Ali buy for ₦60?

Solution

Cornflour $\rightarrow \frac{6}{80} = \frac{\square}{60}$
Price $\rightarrow \frac{\cancel{6}^3 \times \cancel{80}_2}{\cancel{80}_2 \times \cancel{4}_2} = \frac{9}{60}$ $\therefore 60 = 80 \times \frac{3}{4}$

Ali will buy $4\frac{1}{2}$ kg

Exercise 3

Solve the following word problems.

- 1. Old newspapers are sold 8 for ₦200. How many can Bimbo buy with ₦1 000?
- 2. A trader sold 15 copies of a storybook and he received ₦4500. How much did 3 copies cost?
- 3. A newspaper vendor earns ₦50 for every 2 papers he sells. If he sells 50 papers, how much money will he earn?
- 4. 6 large pads of paper cost ₦1 920. How many pads of paper can Ismail buy for ₦6 400?
- 5. 24 cans of vegetable oil weigh 36 kg. What is the weight of 72 cans?
- 6. Mrs Gbinigie bought 3 big buckets of ₦500. How many buckets can she buy for ₦2 500?

Exercise 4

Study the figure on the right. From the figure, the ratio of grey to red is 3 : 4. Find the ratios of these.

- 1. Red to Green
- 2. Grey to Yellow
- 3. Grey to Blue
- 4. Red to Blue
- 5. Blue to Green
- 6. Blue to Grey



Express each of these as ratio reduced to the lowest term.

- 7. 3 cm : 36 cm
- 8. 12 grams : 48 grams
- 9. 35 : 180
- 10. 75k : ₦2.00
- 11. 25 mins : 1 h 20 mins
- 12. 150 m : 1 km

Simplify these as fractions in their lowest terms.

- 13. 10 cm : 30 cm
- 14. 18 : 24
- 15. 140 g : $1\frac{1}{2}$ kg
- 16. ₦5.50 : ₦2.20
- 17. 12 : 42
- 18. 15 litres : 35 litres

Unit 2 Application of ratio to real life situations

More problems involving ratio

When information is given, ratio can be used to describe how it can be solved.

Examples

- 1. There are several methods of solving the following word problems: The ratio of girls to boys in a class is 6 : 5. There are 18 girls. How many boys are in the class?

Method 1

Girls : Boys

$6 : 5$
 $18 : \square$

$\frac{6}{5} = \frac{18}{\square}$ $\therefore 18 = 6 \times 3$

$\therefore \square = 5 \times 3$
 $= 15$

There are 15 boys in the class

Method 2

Girls : Boys

$\frac{6}{5} : \frac{5}{5}$
 $\div 6 \downarrow : \downarrow \div 6$
 $1 : \frac{5}{6}$
 $\times 18 \downarrow : \downarrow \times 18$
 $1 \times 18 : \frac{5}{6} \times 18$
 $\downarrow : \downarrow$
 $18 : 15$

- 2. A piece of wood is 150 cm long. It is divided into two pieces in the ratio 7 : 3. How long is each piece?

Solution

A ratio of 7 : 3 means that one piece is made of 7 parts and the second piece is made of 3 parts. Altogether there are 10 parts.

10 parts = 150 cm long

1 part = 150 cm $\div$ 10 = 15 cm long

$\therefore$ 7 parts = 7 $\times$ 15 cm = 105 cm long and 3 parts = 3 $\times$ 15 cm = 45 cm long.

The pieces are 105 cm and 45 cm respectively.

Exercise 1

- 1. The ratio of pupils to teachers in a school is 5 : 1. How many teachers are in the school if the number of pupils is 105?
- 2. Sand and gravel are mixed in the ratio 4 : 3 to make pavement. In total, 80 kg of sand is used. How much gravel is used?
- 3. Water and orange are mixed in the ratio 7 : 4. An amount of 36 cm³ of orange is used. What volume of water is used?

4. A paint mix uses red and white in the ratio 3: 10. $6\frac{3}{5}$ liters of red paint are used. How much white paint is used?
5. A necklace has silver and blue beads in the ratio 2 : 3. There are 24 silver beads on the neck lace. How many blue beads are there?
6. In a school gathering, the ratio of boys to girls was 4 : 5. There were 32 boys.
 - a) How many are girls? b) How many people were there altogether?
 - c) What is the ratio of i) girls to boys? ii) girls to total people?
7. 2 000 is shared in the ratio 7: 3 between Faka and Osarentin. How much does each receive?
8. 2 kg of flour is shared in the ratio 4: 6 between Ololade and Chingere. How much does each receive?
9. The ratio of Mr Umo h's new salary to his old salary was 4: 3. If his old salary was #57 000, what is his new salary?
10. 70 liters of petrol was shared in the ratio 1: 2: 4 among three drivers. How many liters of petrol will each driver receive?
11. Vanilla milk shake is made by mixing milk and flavoring in the ratio of 14 :1. How much milk and flavoring is needed to make 3 liters of milk shake?
12. The ratio of the weight of Inyang and Onome is 5 : 3. The lighter person weighs 48 kg.
 - a) What does the heavier person weigh? b) Who is the heavier person?
 - c) What is their total weight?
13. Mr and Mrs. Shuaibu bought some shares for their three children Jumai, Danladi and Kabiru in the ratio 7: 5: 3. If the total shares bought were 90000 units, how many units did each receive?
14. Profits from a business are shared among Hakeem, Gafar and Eniola in the ratio 7: 2: 3.
 - a) What fraction of the profit does each person get?
 - b) If the profit shared was 7 350 000, find out how much each person gets.

Ratio and population issues

Examples

In Delta State, the money allocated to health care in one of its local government areas with a population of 96 000 people is 192 000 000.

Here the ratio in naira per citizen is worked out. Solution

000: 192 000 000

000: 192 000 00 0

96: 192 000 (divide by 1 000)

1: 2 000

Exercise 2

The money allocated for health care from Lagos State Government to some of the local areas is listed below. Work out the ratio in naira per citizen. (Figures are not actual.) LGA Population Money allocated

1. Ikeja 72 000 144 000 000

2. Mushin 45 000 97 000 000

3. Alimosho 30 000 65 000 000

4. Epe 28 000 60 000 000

5. Shomolu 65 000 180 000 000

Examples

All the children in a community of 66 families add up to 110 children. Study how to calculate the ratio of children per family.

Ratio of children per family

66 families: 110 children

families: 5 children

family: 1.6 children

1: 2

Exercise 3

Find the ratio of the number of children to the number of families in the different communities below. Round up to the nearest whole number.

Community Number of families Number of children

1. Otu 53 123

2. Epe 38 120

3. Ajaji 64 185

4. Ute 110 328

5. Nkpitime 96 272

6. The total number of children in a village of 20 families is 125. Calculate the ratio of children per family.

Birth rate: The number of births every year for every 1 000 people in the population of a place.

Fertility rate: The number of children born per woman in a population.

Death rate: The number of deaths every year for every 1 000 people in the population of a place.

Infant mortality: The number of deaths of babies at birth or just after birth per 1 000 live-births in the population of a place.

Examples

2 800 children were born in a Nigerian city with a population of 250 000. Here the birth rate is calculated. Ratio of population to number of births

800

250

11.2

Therefore, the birth rate is

11 births/1 000.

If 1 820 children were born by all the women in town numbering 910, find the fertility rate. Study this answer. Ratio of the number of women to the number of children born

=910: 1 820

1: 2

Therefore, fertility rate is

2 children/woman.

1 890 people died in a year in a town with a population of 63 000. Here the death rate is calculated. Ratio of number of people to number of deaths

=63 000: 1 890

=1 000: 1890

63

=1 000: 30

Therefore, the death rate is

30 deaths/1 000 .

Exercise 4

1. In a new capital city established by a government, the population was 32000. If the total number of children born that year was 672, what was the birth rate?
2. If 1 845 children were born by all the women numbering 315 in a community, find the fertility rate.
3. A total of 2 002 deaths were recorded in a community with a population of 154 000. Calculate the death rate.
4. A total of 50 infant deaths were recorded among 500 live-births in a local government area. Calculate the infant mortality rate.
5. Find the total number of deaths in a city with a population 80 000, if the death rate is 13/1 000.

Examples

The number of infant deaths recorded among 78 000 live-births in a constituency was 1 560. Here the infant mortality rate has been calculated.

The ratio of the number of live-births to the number of infant deaths

=78 000: 1 560 = 1 000: 20

Therefore, the infant mortality rate is 20 deaths/1 000 live-births

In a year, the death rate recorded in a village with a population of 80 000 was 12 deaths/1 000. Here the total number of deaths in that year has been calculated.

Ratio of death rate

=1 000: 12 deaths

=80 000: 12 × 80

=80 000: 960 deaths

Therefore, number of deaths = 960

Exercise 5

1. If 1 845 children were born in a year in a city with a population of 123 000, calculate the birth rate.
2. If 1 890 children were born by all the women totaling 135 in a village, what is the fertility rate?
3. Assume that 2 448 people died in a year in a local government area with a population of 136 000. Find the death rate.
4. A total number of 6 364 children were born in a year in a village with a population of 172. Calculate the birth rate.
5. Work out the number of deaths in a camp with a population of 672 000 if the death rate was 32 deaths per 1 000.
6. The fertility rate in a settlement was 6 children born per woman. Calculate the number of children born by all the 1 792 women in the settlement.

PROPORTION

Study these statements:

The cost of 1 pencil is 10.00

Then the cost of 4 pencils is 40.00

Likewise the cost of 12 pencils is 120.00

As the number of pencils increases the cost also increases. The ratio of number of

We say, proportion is an equation showing when two ratios are equal.

For example, $1/10=4/40$

Since $1: 10 =4: 40$

We can then say that the cost of the pencils is in direct proportion to the number of pencils.

Examples

1. The cost of five pairs of shorts is

1 340. Find the cost of eight pairs.

These workings show how this word problem is solved.

Solution

5 pairs of shorts cost #1 340

1 pair of shorts costs #1 340/5 [Divide N1 340 by 5] =268

8 pairs of shorts will cost #268 ×8 [Multiply the cost of one pair by 8]

If 1 820 children were born by all the wo men in town numbering 910, find the fertility rate. Study this answer.

Ratio of the number of women to the number of children born =910: 1 820

1: 2

Therefore, fertility rate is 2 children/woman.

1 890 people died in a year in a town with a population of 63 000. Here the death rate is calculated. Ratio of number of people to number of deaths

=63 000: 1 890

=1 000: 1890

63

=1 000: 30

Therefore, the death rate is

30 deaths/1 000 .

Exercise 4

1. In a new capital city established b y a government, the population was 32000. If the total number of children born that year was 672, what was the birth rate?

2. If 1 845 children were born by all the wo men numbering 3 15 in a community, find the fertility rate.

3. A total of 2 002 deaths were recorded in a community with a population of 154000. Calculate the death rate.

4. A total of 50 infant deaths were recorded among 500 live-births in a local government area. Calculate the infant mortality rate.

5. Find the total number of deaths in a city with a population 80 000, if the death rate is 13/1 000.

Examples

The number of infant deaths recorded among 78 000 live-births in a constituency was 1 560. Here the infant mortality rate has been calculated.

The ratio of the number of live-births to the number of infant deaths

=78 000: 1 560

=1 000: 1560

78

=1 000: 20

Therefore, the infant mortality rate is

20 deaths/1 000 live-births

In a year, the death rate recorded in a village with a population of 80 000 was 12 deaths/1 000. Here the total number of deaths in that year has been calculated.

=1 000: 12 deaths

=80 000: 12 × 80

=80 000: 960 deaths

Therefore, number of deaths =

960

48

Exercise 5

1. If 1 845 children were born in a year in a city with a population of 123 000, calculate the birth rate.

2. If 1 890 children were born by all the wo men totaling 135 in a village, what is the fertility rate?

3. Assume that 2 448 people died in a year in a local government area with a population of 136 000. Find the death rate.

4. A total number of 6 364 children were born in a year in a village with a population of 172. Calculate the birth rate.

5. Work out the number of deaths in a camp with a population of 672 000 if the death rate was 32 deaths per 1 000.

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Examples

1. The cost of five pairs of shorts is
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These workings show how this word problem is solved.

Solution
5 pairs of shorts cost #1 340
1 pair of shorts costs #1 340/5 [Divide N1 340 by 5] =268
8 pairs of shorts will cost #268 ×8 [Multiply the cost of one pair by 8]

Exercise

- 1. A farmer has enough hay to feed 9 horses for 10 days. How long will the same supply of hay feed 6 horses?
- 2. If 24 workers can build a jetty in 15 weeks, how many workers will build the Jetty in 12 weeks if they are working at the same rate?
- 3. When a packet of chewing gums is shared among 30 children, each child gets 8 chewing gums. How many chewing gums will each child get if the packet is shared among 40 children?
- 4. A driver travels 80 km/h and completes a journey in 3 hours. How long will it take to complete the same journey if the speed is 120 km/h?
- 5. A fence can be built by 10 men in 7 days. If the fence is to be completed in 5 days, ho w many a) men are required in total? b) More men are required?
- 6. 40 children can eat a bag of rice in 8 days. How long will it last 5 children?
- 7. A plantation of palm fruits can be harvested by 20 men in 10 weeks. Each man harvests a fixed weight of palm fruits in 1 week. Find how many men can harvest the palm fruit in: a) 8 weeks b) 5 weeks.

WEEK 8

TOPIC: ADDITION AND SUBTRACTION OF NUMBERS, DECIMAL AND FRACTION

BEHAVIORAL OBJECTIVES: At the end of the lesson, pupils should be able to:
identify mixed numbers and imp roper fractions
add and subtract mixed numbers solve mixed operations of addition and subtraction of fractions
solve word problems involving addition and subtraction of fractions

CONTENT

$$\frac{2}{6} + \frac{1}{6} = \frac{2 + 1}{6} = \frac{3}{6}$$
$$4\frac{2}{6} + 2 \frac{1}{6} = 6\frac{2 + 1}{6} = 6 \frac{3}{6}$$
$$\frac{2}{6} - \frac{1}{6} = \frac{2 - 1}{6} = \frac{1}{6}$$

Simplify $4\frac{1}{2} - 3\frac{1}{3}$ (NCEE, 2012)

Lets find the LCM of the denominator

$$4\frac{1}{2} - 3\frac{1}{3}$$
$$\begin{array}{r} 1 \\ 3 - 2 \\ \hline 6 \end{array}$$

$$\begin{array}{r|l|l} 2 & 2 & 3 \\ 3 & 1 & 3 \\ \hline 1 & 1 & \end{array} = 2 \times 3 = 6$$

Lets the numerator and whole number

$$1 \frac{1}{6}$$

Examples

Study how these have been simplified.

1. $1\frac{2}{3} + 1\frac{5}{6} = 1 + \frac{2}{3} + 1 + \frac{5}{6}$ Rewrite the mixed numbers as whole numbers and fractions

$$= 1 + 1 + \frac{2}{3} + \frac{5}{6}$$
$$= 2 + \frac{4}{6} + \frac{5}{6}$$

Change each fraction to equivalent fraction with the same denominator

$$= 2 + \frac{9}{6}$$
$$= 2 + \frac{6}{6} + \frac{3}{6}$$

Note:
 $3 = 2 + 1$

$$= 2 + 1 + \frac{3}{6}$$
$$= 3 + \frac{1}{2} = 3\frac{1}{2}$$

2. $5\frac{1}{4} - 2\frac{2}{3} = 5 - 2 + \frac{1}{4} - \frac{2}{3}$

$$= 3 + \frac{1}{4} - \frac{2}{3}$$
$$= 3 + \frac{3-8}{12}$$
$$= 2 + \frac{12}{12} + \frac{3-8}{12}$$
$$= 2 + \frac{(12+3)-8}{12}$$
$$= 2 + \frac{15-8}{12} = 2\frac{7}{12}$$

Exercise

Work these out.

- | | | | |
|------------------------------------|--|---|---|
| 1. $1\frac{3}{4} + 1\frac{2}{3}$ | 2. $2\frac{1}{2} + 1\frac{3}{4}$ | 3. $4\frac{3}{4} - 2\frac{1}{4}$ | 4. $3\frac{3}{8} + 1\frac{3}{4}$ |
| 5. $3\frac{3}{8} - 1\frac{1}{2}$ | 6. $\frac{3}{8} + \frac{3}{4} + \frac{5}{8}$ | 7. $1\frac{2}{5} + 2\frac{7}{10} + 1\frac{9}{10}$ | 8. $6\frac{3}{4} + 2\frac{1}{3} + 3\frac{1}{6}$ |
| 9. $2\frac{2}{5} + 2\frac{11}{15}$ | 10. $1\frac{1}{5} - \frac{1}{2}$ | 11. $1\frac{1}{4} - \frac{1}{4}$ | 12. $5\frac{2}{3} - 2\frac{3}{4}$ |

Unit 3

Mixed operations of addition and subtraction

Examples

1. Study the methods to find $3\frac{1}{2} + 1\frac{2}{5} - 3\frac{3}{4}$

Method 1

Step 1

Find the LCM of their denominators. Here the denominators are 2, 5 and 4.

∴ LCM of 2, 5 and 4 is 20.

Step 2

$$3\frac{1}{2} + 1\frac{2}{5} - 3\frac{3}{4}$$

$$= 3 + \frac{1}{2} + 1 + \frac{2}{5} - 3 - \frac{3}{4} \quad \text{Rewrite the mixed number in the expanded form.}$$

$$= [3 + 1 - 3] + \frac{1}{2} + \frac{2}{5} - \frac{3}{4}$$

$$= 1 + \frac{10}{20} + \frac{8}{20} - \frac{15}{20} \quad \text{From step 1 above } \frac{1}{2} = \frac{10}{20}, \frac{2}{5} = \frac{8}{20} \text{ and } \frac{3}{4} = \frac{15}{20}$$

$$= 1 + \frac{10 + 8 - 15}{20}$$

$$= 1 + \frac{3}{20}$$

$$= 1\frac{3}{20}$$

Method 2**Step 1**

Write the mixed numbers as improper fractions i.e.

$$3\frac{1}{2} + 1\frac{2}{5} - 3\frac{3}{4} = \frac{7}{2} + \frac{7}{5} - \frac{15}{4}$$

Step 2

Write the fraction to have common denominators i.e.

$$\frac{7}{2} + \frac{7}{5} - \frac{15}{4} = \frac{70}{20} + \frac{28}{20} - \frac{75}{20}$$

$$= \frac{70 + 28 - 75}{20}$$

$$= \frac{98 - 75}{20}$$

$$= \frac{23}{20}$$

$$= 1\frac{3}{20}$$

2. Now study how $12\frac{3}{5} - 7\frac{4}{5} + 3\frac{3}{4}$ has been evaluated.

Method 1

$$\begin{aligned}
 12\frac{3}{5} - 7\frac{4}{5} - 3\frac{3}{4} &= 12 + \frac{3}{5} - 7 - \frac{4}{5} - 3 - \frac{3}{4} \\
 &= [12 - 7 - 3] + \frac{3}{5} - \frac{4}{5} - \frac{3}{4} \\
 &= (12 - 10) + \frac{12 - 16 - 15}{20} \\
 &= 2 + \frac{12 - 16 - 15}{20} \\
 &= 1 + 1 + \frac{12 - 16 - 15}{20} \\
 &= 1 + \frac{20 + 12 - 16 - 15}{20} \\
 &= 1 + \frac{32 - 16 - 15}{20} \\
 &= 1 + \frac{16 - 15}{20} \\
 &= 1 + \frac{1}{20} \\
 &= 1\frac{1}{20}
 \end{aligned}$$

Method 2

$$\begin{aligned}
 12\frac{3}{5} - 7\frac{4}{5} - 3\frac{3}{4} &= \frac{63}{5} - \frac{39}{5} - \frac{15}{4} \\
 \text{LCM is 20} \\
 &= \frac{252}{20} - \frac{156}{20} - \frac{75}{20} \\
 &= \frac{252 - 156 - 75}{20} \\
 &= \frac{21}{20} \\
 &= 1\frac{1}{20}
 \end{aligned}$$

Exercise

Evaluate the following.

- $12\frac{2}{5} + 4\frac{4}{5} - 15\frac{3}{5}$
- $3\frac{3}{4} + 4\frac{3}{8} - 5\frac{1}{2}$
- $5\frac{5}{6} - 2\frac{2}{3} + 1\frac{11}{12}$
- $3\frac{4}{5} - 2\frac{1}{2} + 1\frac{3}{10}$
- $7\frac{1}{4} - 2\frac{4}{5} + 1\frac{1}{2}$
- $8\frac{3}{4} - 5\frac{7}{8} + 1\frac{3}{8}$
- $7\frac{4}{5} + 1\frac{1}{2} - 5\frac{9}{10}$
- $19\frac{1}{4} + 1\frac{1}{2} + 2\frac{2}{3}$
- $23\frac{7}{12} + 5\frac{1}{4} - 20\frac{3}{4}$
- $1\frac{1}{4} - 2\frac{1}{6} + 4\frac{3}{4} - 1\frac{17}{20}$
- $1\frac{3}{4} + 2\frac{1}{2} + 3\frac{2}{3} - 6\frac{11}{12}$
- $11\frac{9}{10} - 2\frac{1}{2} - 3\frac{1}{3} - 4\frac{1}{4}$

Unit 4

Word problems on addition and subtraction of fractions

Examples

1. This solution finds the sum of $2\frac{1}{3}$ and $4\frac{3}{5}$.

Solution

$$\begin{aligned}
 2\frac{1}{3} + 4\frac{3}{5} &= 2 + \frac{1}{3} + 4 + \frac{3}{5} \\
 &= 2 + 4 + \frac{1}{3} + \frac{3}{5} = 6 + \frac{5+9}{15} \quad \text{LCM of 3 and 5 = 15} \\
 &= 6 + \frac{14}{15} = 6\frac{14}{15}
 \end{aligned}$$

2. Study the following solution to this word problem: Sumbo worked $2\frac{2}{3}$ hours on Monday, $4\frac{1}{4}$ on Tuesday and $1\frac{1}{2}$ hours on Wednesday. How many hours did he work altogether?

Solution

All the hours must be added together.

$$\begin{aligned}
 \text{Altogether, he worked for} &= \left[2\frac{2}{3} + 4\frac{1}{4} + 1\frac{1}{2} \right] \text{ hours} \\
 &= 2 + 4 + 1 + \frac{2}{3} + \frac{1}{4} + \frac{1}{2} \\
 &= 7 + \frac{8+3+6}{12} \quad \text{LCM of 3, 4 and 2 = 12} \\
 &= 7 + \frac{17}{12} = 7 + 1\frac{5}{12} = 8\frac{5}{12} \text{ hours}
 \end{aligned}$$

3. Nkechi spent $\frac{1}{3}$ of her pocket money on rice, and $\frac{1}{4}$ on chocolate drink. What fraction of her pocket money is left?

Solution

Let 1 represent the pocket money.

Fractional part of the pocket money spent on rice and soft drink

$$\begin{aligned}
 &= \frac{1}{3} + \frac{1}{4} = \frac{4+3}{12} = \frac{7}{12} \\
 \therefore \text{Fraction of her pocket money left} &= 1 - \frac{7}{12} = \frac{12}{12} - \frac{7}{12} = \frac{5}{12}
 \end{aligned}$$

Exercise

1. Akin used $10\frac{1}{4}$ tins of grey paint and $6\frac{3}{4}$ tins of yellow paint. How much more of the grey paint than yellow paint did he use?
2. What is the sum of $13\frac{3}{4}$ and $5\frac{5}{12}$ and $4\frac{3}{4}$?
3. What is the difference between $7\frac{5}{12}$ and $4\frac{3}{4}$?
4. What is the difference between $10\frac{1}{2}$ and the sum of $3\frac{3}{5}$ and $5\frac{7}{10}$?
5. Out of $\frac{4}{5}$ take away $\frac{4}{9}$.
6. Find the total value if $2\frac{2}{3}$ is added to the difference between $5\frac{5}{6}$ and $7\frac{7}{8}$.
7. Find the total value if $5\frac{5}{6}$ is subtracted from the sum of $3\frac{3}{4}$ and $4\frac{4}{5}$.
8. Subtract $3\frac{3}{4}$ from $6\frac{4}{5}$. Find the total value if $2\frac{2}{3}$ is further subtracted.
9. Out of 12 m of a ribbon, Yetunde cut off $4\frac{1}{4}$ m, Ngozi cut off $2\frac{1}{2}$ and Aminat cut off $3\frac{3}{4}$ m. What fraction of the ribbon is left?
10. By how much is the difference between $3\frac{7}{8}$ and $4\frac{3}{5}$ greater than $\frac{1}{2}$?

WEEK 9

TOPIC: MULTIPLICATION

BEHAVIORAL OBJECTIVES: At the end of the lesson, pupils should be able to:

multiply 3-digit by 3-digit numbers

Multiply 4- and 5-digit numbers by 1-digit numbers

Multiply 4- and 5-digit numbers by 2-digit numbers

Solve word problems on multiplication of whole numbers

CONTENT

MULTIPLYING 3-DIGITS

Examples

NUMBER

H

T

U

6

2

0

x2

3

2

1

2

4

0

+

11

8

6

0

1

2

4

0

1

4

3,

8

4

0

TH

H

T

U

6

2

0

2

x

2

12

4

0

4

TTH

TH

H

T

U

6

2

3

0

2

x

2

12

4

6

0

4

TTH

TH

H

T

U

6

2

3

0

2

x

1

2

1

2

4

6

0

4

+

6

2

3

0

2

7

4

7

6

2

4

Exercise

Simplify these.

1. $5\,302 \times 25$ 2. $33\,648 \times 55$ 3. $74\,629 \times 48$ 4. $9\,988 \times 37$
5. $68\,305 \times 94$ 6. $14\,736 \times 66$ 7. $7\,239 \times 39$ 8. $24\,361 \times 87$
9. $6\,783 \times 94$ 10. $32\,588 \times 65$ 11. $17\,430 \times 76$ 12. $5\,899 \times 55$

Word problems

Examples

Study this example to find out how the following word problem was solved:

A poultry farm produces 2 568 eggs a day. How many eggs will it produce in 28 days?

Number of eggs produced per day = 2 568

Number of eggs produced in 28 days = $2\,568 \times 28$ eggs

$= 2\,568 \times 28$

$20\,544 = 2\,568 \times 8$

$51\,360 = 2\,568 \times 20$

$71\,904$ eggs

Exercise 1

1. There are 125 rows of chairs in a theatre. Each row has 135 chairs. How many chairs are there in the theatre?
2. The net weight of a bag of sugar is 4 742 g. Find the net weight of 26 bags of sugar.
3. A drum holds 224 litres of water. Find the amount of water in a tank filled 35 times with the drum.
4. A man earns 95 350.00 a week. How much will he earn in 37 weeks?
5. A book has 145 lines per page. How many lines are there if the book has 125 pages?

MULTIPLICATION OF MIXED FRACTION

Examples

1. $5\frac{1}{3} \times 2\frac{2}{5} = \frac{16}{3} \times \frac{12}{5} = \frac{64}{5} = 12\frac{4}{5}$ 2. $\frac{4}{5} \times 9 = \frac{36}{5} = 7\frac{1}{5}$

Exercise

Simplify these.

1. $12\frac{1}{3} \times 7\frac{1}{2}$ 2. $13\frac{2}{3} \times 10\frac{4}{5}$ 3. $21\frac{3}{5} \times 11\frac{2}{3}$ 4. $23\frac{3}{4} \times 12\frac{2}{5}$
5. $1\frac{1}{5} \times \frac{3}{4} \times 2\frac{1}{2}$ 6. $12\frac{3}{5} \times 14\frac{6}{7}$ 7. $15\frac{5}{6} \times 3\frac{12}{25}$ 8. $3\frac{1}{3} \times 12\frac{1}{2}$
9. $7\frac{1}{2} \times 9\frac{2}{3} \times 10\frac{2}{5}$ 10. $3\frac{2}{3} \times 9\frac{4}{11} \times 6\frac{3}{4}$ 11. $27 \times 1\frac{7}{9}$ 12. $\frac{5}{6} \times 21$
13. $7\frac{5}{12} \times 96$ 14. $9 \times 5\frac{7}{12}$ 15. $7 \times 9 \times 3\frac{2}{7}$

Unit 2

Multiplication of decimals by 2-digit numbers

When multiplying decimals by 2-digit numbers:
Multiply the decimals the same way as with whole numbers.
The decimal point moves in multiplication. Count the number of decimal places in the problem and use the same number of decimal places in your answer.

Examples

1. $16.21 \times 56 =$

1 6.2 1

$\times 56$

$\hline 9726$

$+ 81050$

$\hline 907.76$

There are two decimal places here

2. $81.6 \times 312 =$

8 1.6

$\times 312$

$\hline 1632$

8160

$+ 244800$

$\hline 25459.2$

There is only one decimal place here

Exercise

- Solve the following.
1. 21.59×82

2. 31.63×47

3. 63.86×64

4. 24.39×32

5. 15.37×44

6. 56.68×67

7. 31.324×16

8. 19.415×22

9. 94.1×586

10. 83.62×69

11. 91.25×723

12. 94.1×586

13. 37×50.28

14. 93×66.96

Unit 3

Multiplication of decimals by decimals

Examples

$28.76 \times 3.1 =$

2 8.7 6

3.1

$\hline 2876$

86280

$\hline 89.156$

Therefore the answer will have 3 digits to the right of the decimal point.
 $\therefore 28.76 \times 3.1 = 89.156$

Multiply as if both are whole numbers i.e.
 28.76×3.1 as 2876×31
 28.76 has 2 digits to the right of the decimal point.
 3.1 has 1 digit to the right of the decimal point.
So 2 digits + 1 digit = 3 digits.

Exercise 1

1. 26.3×4.9

2. 10.4×18.7

3. 21.3×19.6

4. 47.2×31.4

5. 56.5×38.3

6. 20.38×11.2

7. 71.62×15.8

8. 83.59×20.7

9. 96.82×22.4

10. $2.7 \times 3.9 \times 5.8$

11. $12.3 \times 5.7 \times 2.4$

12. $15.3 \times 9.8 \times 6.2$

13. $6.83 \times 4.9 \times 7.2$

14. $5.6 \times 3.2 \times 8.91$

15. $8.24 \times 6.2 \times 5.6$

Exercise 2

Word problems

1. A rectangular field is 147 metres long and 126.7 metres wide. What is its area in square metres?

2. Find the cost of 36.6 kg of beef at 314 per kilogram.

3. The net weight of a packet of sugar is 474.2 g. Find the total net weight of 26 packets of sugar.

4. A keg holds 22.4 litres of water. Find the amount of water in a drum filled 40 times with the keg.

5. The propeller plane flies 26.512 kilometres per hour. Calculate the distance it can cover in 2 days.

Examples

1. Th H T U
 4 5 6

$$\begin{array}{r} 12 \overline{) 5472} \\ \underline{-48} \\ 67 \\ \underline{-60} \\ 72 \\ \underline{-72} \\ \dots \end{array}$$

In this case:
5472 is known as the dividend (i.e. the number to be divided by another number)
12 is known as the divisor
546 is known as the quotient.
Thus $5472 \div 12 = 456$ Or $\frac{5472}{12} = 456$

2. I.Th Th H T U
 3 5 9 2

$$\begin{array}{r} 17 \overline{) 61064} \\ \underline{-51} \\ 100 \\ \underline{-85} \\ 156 \\ \underline{-153} \\ 34 \\ \underline{-34} \\ \dots \end{array}$$

Steps to follow
Divide 61 by 17 to get 3
Put 3 directly on top of 1
Multiply 17 by 3 to get 51,
Subtract 51 from 61 to get 10
Bring down 0 in the first row, to have 100
Put 5 directly on top of 0
Multiply 17 by 5 to get 85
Subtract 85 from 100 to get 15
Bring down 6 in the first row, to have 156
Put 9 directly on top of 6, etc.

$\therefore 61064 \div 17 = 3592$

WEEK 10

TOPIC: DIVISION

BEHAVIORAL OBJECTIVES: At the end of the lesson, pupils should be able to:
divide 4- and 5-digit whole numbers by 2-digit numbers correctly
divide 5- and 6-digit whole numbers by 3-digit numbers correctly
divide decimals by 2- and 3-digit whole numbers
divide decimals by decimals.

CONTENT

3. Here 10493 is divided by 37 and the remainder is found.

I.Th

Th

H

T

U

2

8

3

37

10493

-74

309

-296

133

-111

22

→ remainder

Divide 104 by 37 to get 2
Put 2 directly on top of 4
Multiply 37 by 2 to get 74
Subtract 74 from 104 to get 30
Bring down 9 in the first row to get 309
Divide 309 by 37 to get 8
Multiply 37 by 8 to get 296
Subtract 296 from 309 to get 13
Bring down 3 in the first row to have 133
Divide 133 by 37 to get 3
Multiply 37 by 3 to get 111
22 now stands as the remainder
since it is less than 37

Hence 10493 ÷ 37 = 283 remainder 22

↓

Dividend

↓

Divisor

↓

Quotient

↓

Remainder

Exercise

1. Divide 6572 by 53

2. 22016 ÷ 43

3. 8459 ÷ 11

4. 6660 ÷ 37

5. 3784 ÷ 10

6. 8460 ÷ 10

7. 26928 ÷ 24

8. Evaluate 4248 ÷ 36

9. Simplify giving your remainder in whole number

a) 4236 ÷ 18

b) 92538 ÷ 45

c) 14029 ÷ 35

d) 96543 ÷ 32

Unit 2

Division of 5-digit and 6-digit whole numbers by 3-digit numbers

Examples

1.

I.Th

Th

H

T

U

2

5

4

173

43942

-346

934

-865

692

-692

.....

2.

H.Th

I.Th

Th

H

T

U

2

6

7

1

235

627685

-470

1576

-1410

1668

-1645

235

-235

1. What is $96\,036 \div 212$
2. Divide $147\,626$ by 446
3. Simplify $38\,375$ by 307
4. Divide $93\,025$ by 305
5. Divide $74\,175$ by 989
6. Divide $121\,401$ by 987
7. Divide $501\,015$ by 635
8. What is $354\,146 \div 689$
9. $108\,381 \div 397$
10. What is the quotient if the dividend and divisor are $2014\,120$ and 405 respectively?

Examples

$$\begin{array}{r} 3.75 \\ 25 \overline{) 93.75} \\ \underline{-75} \\ 187 \\ \underline{-175} \\ 125 \\ \underline{-125} \\ 000 \end{array}$$

2.
$$\begin{array}{r} \text{H T U t h} \\ \text{2 7.5 6} \\ \hline 32 \overline{) 881.92} \\ \underline{-64} \downarrow \\ 241 \downarrow \\ \underline{-22} \downarrow \\ 179 \downarrow \\ \underline{-16} \downarrow \\ 192 \downarrow \\ \underline{-19} \downarrow \\ 2 \downarrow \\ \dots \end{array}$$

- divide decimals as with whole numbers
- place the decimal point in the answer directly above the decimal point in the dividend.

[illegible]

etc.

Note: If we continued the division, the '185's' in the answer will never terminate. The answer will be 13.2185185185185... (...shows they continue). The answer will be written correctly as $13.2\dot{1}8\dot{5}$. The dots on 1, 8 and 5 show that these numbers will never terminate.

$13.2\dot{1}8\dot{5} = 13.2 \rightarrow$ correct 1 place of decimal.
 $= 13.22 \rightarrow$ correct 2 places of decimal.
 $= 13.219 \rightarrow$ correct 3 places of decimal.
 $= 13.2185 \rightarrow$ correct 4 places of decimal.

$13.2\dot{1}8\dot{5}$ may also be written as $13.2\overline{185}$ indicating that 1, 8 and 5 are repeating digits. Some other examples of repeating digits are:

$$\frac{3}{11} = 0.272727... = 0.\dot{2}7 = 0.\overline{27}$$

$$\frac{1}{6} = 0.166666... = 0.1\dot{6} = 0.\overline{16}$$

$$\frac{8}{9} = 0.888888... = 0.\dot{8} = 0.\overline{8}$$

$$\frac{5}{8} = 0.833333... = 0.8\dot{3} = 0.\overline{83}$$

$$\frac{7}{9} = 0.777... = 0.\dot{7} = 0.\overline{7}$$

Exercise

- | | |
|---------------------------------------|------------------------------|
| 1. Divide 84.55 by 25 | 2. Divide 565.2 by 36 |
| 3. Simplify $786.45 \div 49$ | 4. Simplify $147.05 \div 85$ |
| 5. Simplify $72.384 \div 96$ | 6. Evaluate $39.216 \div 86$ |
| 7. Find the value of $987.5 \div 790$ | 8. Divide 132.68 by 124 |
| 9. Divide 139.75 by 215 | 10. Simplify 152.32 by 28 |

Unit 4

Division of decimals by decimals

When dividing decimals by decimals:

- change the divisor to a whole number by multiplying by 10 100 or 1 000
- then multiply the dividend by the same number.

Examples

$5.6 \times 10 = 56$
 $47.5 \times 10 = 475$
 $0.84 \times 100 = 84$
 $0.96 \times 100 = 96$

When you multiply a decimal by 10, the decimal point moves one place to the right.
When you multiply by 100, the decimal point moves two places to the right.

Exercise 1

- By what number should the divisor and the dividend be multiplied?
1. $0.9 \overline{)12.33}$ 10

2. $17.7 \div 0.03$ 100

3. $37.2 \div 0.6$

4. $37.2 \div 0.06$

5. $37.2 \div 0.006$

6. $6.08 \div 0.008$

7. $14.35 \div 0.05$

8. $8.4 \div 1.2$

9. $0.366 \div 0.6$

10. $0.189 \div 0.09$

Examples

Examples

$0.006273 \div 0.051$
For the divisor (0.051) to become a whole number then 0.051 must have its decimal point moved 3 places to the right, or 0.051 be multiplied by 1 000.
i.e. $0.051 \times 1000 = 51.0 = 51$
or $0.051 \times 1000 = 51 = 51$
Similarly
 $0.006273 \times 1000 = 6.273$
or $0.006273 \times 1000 = 6.273$
Hence: $0.006273 \div 0.051$ becomes $6.273 \div 51$

Note: After the movement of the decimal points in both dividend and divisor, all zeros before the first significant figure must be cancelled.

0 . 1 2 3

51

6 . 2 7 3

-0

6 2

-5 1

1 1 7

-1 0 2

1 5 3

-1 5 3

. . .

Hence: $0.006273 \div 0.051 = 0.123$

Exercise 2

1. Divide 26.712 by 6.3

2. Divide 183.61 by 4.3

3. Divide 3.75 by 0.04

4. $0.225 \div 0.4$

5. $74.97 \div 4.9$

6. $0.783 \div 0.058$

7. $0.26712 \div 6.3$

8. $2.331 \div 1.26$

9. $32.4 \div 0.09$

10. $0.0783 \div 0.058$