Essential

Level 2 Skills

needed for

Level 3 Maths

Before you begin **Level 3 (MNU 2-04a)** you need to be sure that you can:

Use the rules for the order of operations.

Consider the calculation 5 + 3 x 2. Is the answer 16 or 11? You get different answers depending on the order you carry out the calculation.

If we add then multiply we get   If we multiply then add we get

$\quad$ (5 + 3) x 2 $\qquad\qquad\qquad\qquad$ 5 + 3 x 2

$\qquad$ 8 x 2 $\qquad\qquad\qquad\qquad\qquad$ 5 + 6

$\qquad\quad$ 16 $\qquad\qquad\qquad\qquad\qquad\quad$ 11

We cannot have two different answers so to solve this problem there are RULES that everyone follows.

First $\qquad\qquad$ **B**rackets
Second $\qquad\quad$ Powers **O**f (or **I**ndices)
Third $\qquad\qquad$ **D**ivide or **M**ultiply (these are equally important)
Fourth $\qquad\quad$ **A**dd or **S**ubtract (these are equally important)

You can remember this as BODMAS (or BIDMAS)

Example 1

Calculate 12 - 8 + 4

Solution

$\qquad$ 12 - 8 + 5   (Subtract and Add have equal importance so work left to right)
$\qquad\quad$ 4 + 5
$\qquad\qquad$ 9

Example 2

Calculate   13 - 5 x 2

Solution

$\qquad$ 13 - 5 x 2   (Do the multiplying first)
$\qquad\quad$ 13 - 10
$\qquad\qquad$ 3

Example 3

Calculate $\qquad$ 2 + 15 ÷ 3

Solution

$\qquad$ 2 + 15 ÷ 3   (Do the division first)
$\qquad\quad$ 2 + 5
$\qquad\qquad$ 7

Practice

Set A

(a) 4 x 3 + 5   (b) 12 + 2 x 3   (c) 4 + 3 x 2   (d) 2 + 10 - 5

(e) 12 + 5 x 2   (f) 7 x 2 + 5   (g) 5 x 1 + 4   (h) 6 + 1 x 1

(i) 5 + 4 x 3   (j) 7 - 3 + 8   (k) 5 + 8 x 10   (l) 4 x 4 - 7

(m) 7 x 6 - 20   (n) 20 - 2 x 5   (o) 15 - 5 x 3   (p) 14 - 7 x 0

Set B

(a) 20 ÷ 2 + 3   (b) 10 ÷ 5 + 1   (c) 8 ÷ 4 + 11   (d) 9 - 3 + 4

(e) 6 + 16 ÷ 8   (f) 14 - 27 ÷ 9   (g) 15 + 6 ÷ 3   (h) 9 + 10 ÷ 2

(i) 12 - 12 + 3   (j) 8 + 16 ÷ 4   (k) 14 - 18 ÷ 6   (l) 20 - 21 ÷ 7

(m) 9 + 10 ÷ 5   (n) 21 - 16 ÷ 2   (o) 30 - 8 - 8   (p) 24 ÷ 8 - 2

Set C

(a) 12 - 3 x 4   (b) 25 + 5 x 4   (c) 10 + 5 - 8   (d) 16 ÷ 8 + 1

(e) 6 x 8 - 14   (f) 18 ÷ 9 + 6   (g) 20 - 16 ÷ 2   (h) 25 - 4 x 4

(i) 7 ÷ 7 + 10   (j) 18 - 16 + 4   (k) 6 + 7 x 9   (l) 7 x 2 - 14

(m) 56 ÷ 8 - 1   (n) 7 + 12 ÷ 6   (o) 28 ÷ 4 + 7   (p) 30 - 5 x 6

Answers:
Set A
(a) 17 (b) 18 (c) 10 (d) 7 (e) 22 (f) 19 (g) 9 (h) 7 (i) 17 (j) 12 (k) 85 (l) 9 (m) 22
(n) 10 (o) 0 (p) 14

Set B
(a) 13 (b) 3 (c) 13 (d) 10 (e) 8 (f) 11 (g) 17 (h) 14 (i) 3 (j) 12 (k) 11 (l) 17 (m) 11
(n) 13 (o) 14 (p) 1

Set C
(a) 0 (b) 45 (c) 7 (d) 3 (e) 34 (f) 8 (g) 12 (h) 9 (i) 11 (j) 6 (k) 69 (l) 0 (m) 6 (n) 9
 (n) 9 (o) 14 (p) 0

Before you begin **Level 3 (MNU 2-02a)** you need to be sure that you can:

Find a fraction of a Whole Number

Basic everyday fractions: **(ACTIVE LEARNING – BEACH BALL as PLENARY to lesson)**

$\frac{1}{10}$ means divide by 10, $\frac{1}{4}$ means divide by 4, $\frac{1}{5}$ means divide by 5, $\frac{1}{3}$ means divide by 3 and $\frac{1}{8}$ means divide by 8

Of means "MULTILPLY"

e.g.

1) Find: $\frac{1}{5}$ of £45

2) $\frac{1}{8}$ of 320g

$= \frac{1}{5}$ x £45 (45 ÷ 5)

$= \frac{1}{8}$ x 320g (320 ÷ 8)

$= £9$

$= 40g$

*ALWAYS REMEMBER YOUR UNITS** – e.g Money (2 decimal places)

Examples

1. $\frac{1}{10}$ of 90g
2. $\frac{1}{4}$ of 36g
3. $\frac{1}{5}$ of 125g
4. $\frac{1}{3}$ of £33.63
5. $\frac{1}{8}$ of £24

Solutions

1. $\frac{1}{10}$ of 90g
2. $\frac{1}{4}$ of 32g
3. $\frac{1}{5}$ of 125g
4. $\frac{1}{3}$ of £33.63
5. $\frac{1}{8}$ of £24

$= \frac{1}{10}$ x 90

$= \frac{1}{4}$ x 32g

$= \frac{1}{5}$ x 125g

$= \frac{1}{3}$ x £33.63

$= \frac{1}{8}$ x £24

$= 9g$

$= 8g$

$= 25g$

$= £11.21$

$= £3$

Practice

1. $\frac{1}{10}$ of 100g
2. $\frac{1}{4}$ of 92g
3. $\frac{1}{5}$ of 75g
4. $\frac{1}{3}$ of £96.36
5. $\frac{1}{8}$ of £72

6. $\frac{1}{10}$ of 300g
7. $\frac{1}{4}$ of 164g
8. $\frac{1}{5}$ of 220g
9. $\frac{1}{3}$ of £423.24
10. $\frac{1}{8}$ of £816

Answers

1. 10g	2. 23g	3. 15g	4. £32.12	5. £9
6. 30g	7. 41g	8. 44g	9. £141.08	10. £102

Fraction of Whole Number quantity using $\frac{1}{10}$, $\frac{1}{4}$, $\frac{1}{5}$, $\frac{1}{3}$ and $\frac{1}{8}$

1) $\frac{1}{10}$ of 50

2) $\frac{1}{10}$ of 90

3) $\frac{1}{10}$ of 100

4) $\frac{1}{10}$ of £570

5) $\frac{1}{10}$ of 400g

6) $\frac{1}{10}$ of £2 500

7) $\frac{1}{10}$ of 3 900

8) $\frac{1}{10}$ of £75

9) $\frac{1}{10}$ of 47m

10) $\frac{1}{10}$ of €480

11) $\frac{1}{4}$ of 96

12) $\frac{1}{4}$ of £184

13) $\frac{1}{4}$ of 800m

14) $\frac{1}{4}$ of 10 000

15) $\frac{1}{4}$ of $3 000

16) $\frac{1}{5}$ of 40m

17) $\frac{1}{5}$ of 500g

18) $\frac{1}{5}$ of £150

19) $\frac{1}{5}$ of 2500

20) $\frac{1}{5}$ of $7 500

21) $\frac{1}{3}$ of 90cm

22) $\frac{1}{3}$ of £150

23) $\frac{1}{3}$ of 630g

24) $\frac{1}{3}$ of €930

25) $\frac{1}{3}$ of 9 600m

26) $\frac{1}{8}$ of 32mm

27) $\frac{1}{8}$ of £96

28) $\frac{1}{8}$ of 120g

29) $\frac{1}{8}$ of 200m

30) $\frac{1}{8}$ of $1 000

Answers

|					
1. 5	2. 9	3. 10	4. £57	5. 40g	6. £250
7. 390	8. £7.50	9. 4.7m	10. 48	11. 24	12. £46
13. 200m	14. 2500	15. $750	16. 8m	17. 100g	18. £30
19. 500	20. $1500	21. 30cm	22. £50	23. 210g	24. 310
25. 3200m	26. 4mm	27. £12	28. 15g	29. 25m	30. $125

Before you begin **MTH 3-07a** you need to be sure that you can:

Carry out calculations using fractions, percentages and decimal fractions

Notes before you begin

Fractions

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

$$\frac{5}{8} - \frac{2}{8} = \frac{3}{8}$$
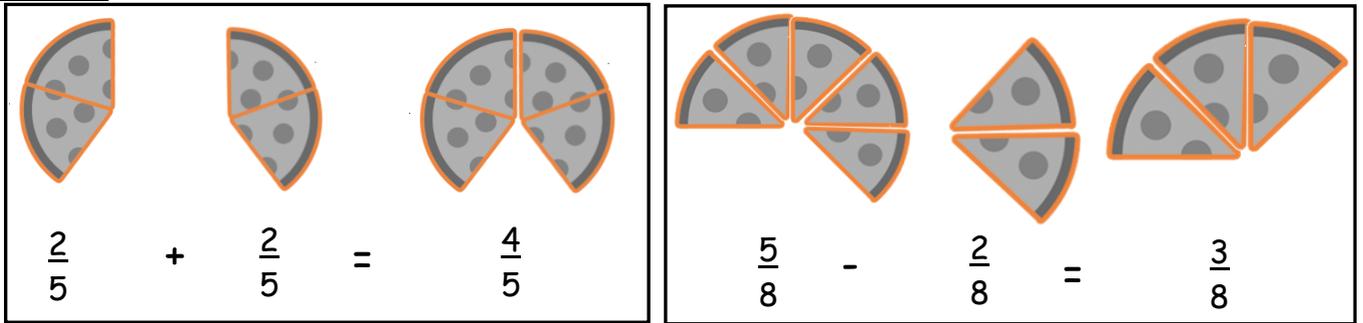
Percentages

You should **learn** the above percentage —> fraction conversions:

percentage	10%	20%	25%	50%
fraction	1/10	1/5	1/4	½

Decimal fractions

Amounts of money written like £0.50 can be seen as a decimal fraction.
A decimal fraction, like a fraction, represents <u>part of</u> one whole.
£0.50 is part of one whole pound £1.00.

The decimal fractions do not have to be amounts of money:
0.2, 0.5, 0.54 are all decimal fractions.

Examples

Fraction calculations

1. $\frac{1}{7} + \frac{1}{7} = \frac{2}{7}$ 2. $\frac{4}{9} + \frac{2}{9} = \frac{6}{9}$ 3. $\frac{4}{5} - \frac{1}{5} = \frac{3}{5}$ 4. $\frac{6}{11} - \frac{1}{11} = \frac{5}{11}$

Percentage Calculations

1. Find 50% of £60
    50% = ½ so find ½ of £60: £60 ÷ 2 = £30

2. Find 25% of £40
    25% = ¼ so find ¼ of £40: £40 ÷ 4 = £10

3. Find 20% of £100
    20% = 1/5 so find 1/5 of £100: £100 ÷ 5 = £20

4. Find 10% of £70
    10% = 1/10 so find 1/10 of £70: £70 ÷ 10 = £7

Decimal Fractions   always line up the decimal point when writing out a calculation

1. £0.50 + £0.20 = £0.70

2. £0.22 + £0.75 = £0.97

3. 0.4 + 0.5 = 0.9

4. 0.23 + 0.45 = 0.68

Practice

Fraction calculations

Find:

1. $\dfrac{3}{5} + \dfrac{1}{5}$ 2. $\dfrac{4}{6} + \dfrac{1}{6}$ 3. $\dfrac{4}{7} + \dfrac{2}{7}$ 4. $\dfrac{5}{8} + \dfrac{2}{8}$

5. $\dfrac{7}{9} - \dfrac{2}{9}$ 6. $\dfrac{4}{6} - \dfrac{1}{6}$ 7. $\dfrac{7}{10} - \dfrac{2}{10}$ 8. $\dfrac{5}{8} - \dfrac{3}{8}$

Percentage Calculations

Find:

9.   50% of £20   10. 25% of £80   11. 20% of £50   12. 10% of £150
13. 10% of £60   14. 25% of £80   15. 50% of £90   16. 10% of £150
17. 20% of £60   18. 50% of £130

Decimal fractions calculations

19. £0.20 + £0.30   20. £0.50 + £0.25   21. £0.85 + £0.12
22. 0.2 + 0.7   23. 0.27 + 0.62   24. 0.56 + 0.35
25. 0.85 + 0.15

Answers

Fraction Calculations

1. $\dfrac{4}{5}$ 2. $\dfrac{5}{6}$ 3. $\dfrac{6}{7}$ 4. $\dfrac{7}{8}$ 5. $\dfrac{5}{9}$ 6. $\dfrac{3}{6}$ (= $\dfrac{1}{2}$)

7. $\dfrac{5}{10}$ (= $\dfrac{1}{2}$)   8. $\dfrac{2}{8}$ (= $\dfrac{1}{4}$)

Percentage Calculations

9. £10   10. £20   11. £10   12. £15   13. £6   14. £20
15. £45   16. £15   17. £12   18. £65

Decimal Fractions Calculations

19. £0.50   20. £0.75   21. £0.97   22. 0.9
23. 0.89   24. 0.91   25. 1 (or 1.0)

Before you begin MTH 3-07c you need to be sure that you can:

Simplify fractions, create equivalent fractions, and put fractions in order

Notes before you begin

Simplifying Fractions

It's possible to split two different pizzas into slices of different sizes.

Stephen splits his pizza into 6 equal sized slices. Stephen eats 2 of his slices.	Anne splits her pizza into 3 equal sized slices. Anne eats 1 of her slices.
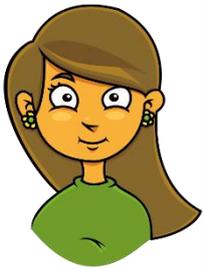
Who has eaten more pizza?

Stephen has eaten $\frac{2}{6}$ of his pizza.

This can be simplified to $\frac{1}{3}$.

Anne has eaten $\frac{1}{3}$ of his pizza.

$$\frac{2}{6} \overset{\div 2}{\underset{\div 2}{=}} \frac{1}{3}$$

Examples

Simplify:

a) $\frac{3}{9} \overset{\div 3}{\underset{\div 3}{}} \frac{1}{3}$

b) $\frac{6}{8} \overset{\div 2}{\underset{\div 2}{}} \frac{3}{4}$

c) $\frac{10}{15} \overset{\div 5}{\underset{\div 5}{}} \frac{2}{3}$

d) $\frac{12}{18} \overset{\div 6}{\underset{\div 6}{}} \frac{2}{3}$
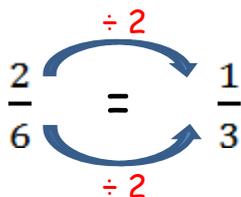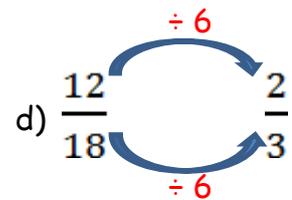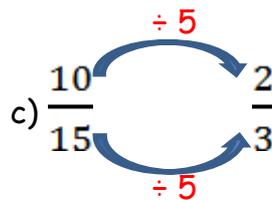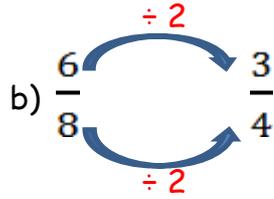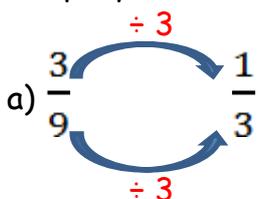
Practice

Simplify:

1) $\dfrac{4}{6}$ 2) $\dfrac{5}{25}$ 3) $\dfrac{7}{21}$ 4) $\dfrac{8}{24}$

5) $\dfrac{12}{30}$ 6) $\dfrac{28}{35}$ 7) $\dfrac{9}{15}$ 8) $\dfrac{20}{32}$

9) $\dfrac{10}{35}$

Solutions

a) $\dfrac{2}{3}$ (divide by 2)

b) $\dfrac{1}{5}$ (divide by 5)

c) $\dfrac{1}{3}$ (divide by 7)

d) $\dfrac{1}{3}$ (divide by 8)

e) $\dfrac{2}{5}$ (divide by 6)

f) $\dfrac{4}{5}$ (divide by 7)

g) $\dfrac{3}{5}$ (divide by 3)

h) $\dfrac{5}{8}$ (divide by 4)

i) $\dfrac{2}{7}$ (divide by 5)

Before you begin MTH 3-09a you need to be sure that you can:

Manage money, compare costs from different retailers and determine what you can afford to buy

Notes before you begin
The unit cost is the price for _one_ item.

60p for 2 bottles of cola
Unit cost   = 60 ÷ 2
              = 30 p

63 p for 3 cartons of orange juice
Unit cost   = 63 ÷ 3
              = 21p

Starter Examples:
Calculate the unit cost of the following:

    a. 20p for 2 chocolate bars
    b. 48p for 4 bags of crisps
    c. 96p for 3 pens

Solutions

    a. Unit cost = 20 ÷ 2 = 10p
    b. Unit cost = 48 ÷ 4 = 12p
    c. Unit cost = 96 ÷ 3 = 32p

Exercise A

Calculate the unit cost of the following:

1. 4 sweets for 12p	7. 4 books for £1.20
2. 3 pencils for 24p	8. 5 rulers for 55p
3. 4 rubbers for £1.20	9. 7 chocolate bars for £1.40
4. 2 coffees for £1.60	10. 4 pens for £1.00
5. 6 bananas for £1.20	11. 4 oranges for 92p
6. 4 batteries for £2.40	12. 6 tomatoes for 78p

Exercise B
Comparison of Costs
Two shops sell the same products. Find out the unit cost of the item in each shop and state which shop is cheaper.

	Shop	Offer	Unit Cost
1	Jane's Juice	60p for 3 colas	
2	Dave's Drinks	44p for 2 colas	

	Shop	Offer Cost	Unit Cost
3	Bert's Burgers	80p for 2 burgers	
4	Sam's Snacks	90p for 3 burgers	

	Shop	Offer Cost	Unit Cost
5	Bob's Books	£1.48 for 2 books	
6	Jim's Jotters	£1.80 for 3 books	

	Shop	Offer Cost	Unit Cost
7	Gary's Gardens	£6.00 for 3 roses	
8	Fred's Flowers	£5.00 for 2 roses	

Exercise C
Total Amount Spent
The school library has some special offers for school stationery.
Look at the following items:

Pencil 5p

Pen Drive
£2.90

Rubber
10p

Sharpener
25p

Pen 15p

Calculator
£3.49

Ruler 30p

How much would it cost to buy:
1. A pencil and a rubber?
2. 2 pencils and a pen?
3. 4 rubbers and 2 sharpeners?
4. A ruler and 3 pens?
5. A calculator and 4 pencils?
6. A pen drive and a ruler and a sharpener?

Solutions

Exercise A
Unit Cost

1. 3p	7. £0.30
2. 8p	8. 11p
3. £0.30	9. £0.20
4. £0.80	10. £0.25
5. £0.20	11. 23p
6. £0.60	12. 13p

Exercise B
Comparison of Unit Costs

1. Janes Juice   -   20p
2. Dave's Drinks -   22p
   Jane's Juice is cheaper.

3. Bert's Burgers -   40p
4. Sam's Snack's -   30p
   Sam's Snacks is cheaper.

5. Bob's Books -   £0.74
6. Jim's Jotters -   £0.60
   Jim's Jotters is cheaper.

7. Gary's Gardens -   £2.00
8. Fred's Flowers -   £2.50
   Gary's Gardens is cheaper.

Exercise C
Total Amount Spent

1. 15p
2. 25p
3. 90p
4. 75p
5. £3.69
6. £3.45

Before you begin MTH 3-09b you need to be sure that you can:

Use the terms profit and loss in buying and selling activities and make simple calculations for this

Notes before you begin
If you sell something, you may sell it for more than the price you bought it for. This is making a profit. If you sell it for less you are selling at a loss.

Examples

April bought a bike for £50
She sold it for £75
How much profit or loss did she make?

Selling price	£75
- Buying price	£50
	£25 **PROFIT**

Jim bought a TV for £90
He sold it for £50
How much profit or loss did he make?

Selling price	£90
- Buying price	£50
	- £40 **LOSS**

Exercise A

Say whether or not a profit of loss was made, and the amount of the profit or loss in the examples below.

2. Car
Selling price £750
Buying price £500

1.   Box of eggs
Selling price 90p
Buying price 60p

3.   DVD player
Selling price £32
Buying price £40

4. Diamond
Selling price £99
Buying price £85

5. PC
Selling price £95
Buying price £85
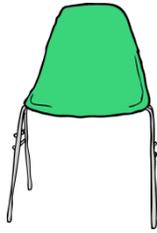
6. Chair
Selling price £80
Buying price £65

7. Dress
Selling price £40
Buying price £65

8. Book
Selling price – free
(given to charity)
Buying price £8

9. Motorbike
Selling price £700
Buying price £500

12. Golf club
Selling price £237
Buying price £22

10. Smartphone
Selling price £85
Buying price £52

11. Tennis Racket
Selling price £10
Buying price £85

Solutions

Exercise A

1. 30p profit
2. £250 profit
3. £8 loss
4. £14 profit
5. £10 profit
6. £ 15 profit

7. £25 loss
8. £8 loss
9. £200 profit
10. £23 profit
11. £75 loss
12. £215 profit

Before you begin **Level 3** (MTH 2-11b) you must be sure that you can:

Change between common units of metric measure - length

To change from **metres** to **centimetres**, you **multiply** by **100**

  2 m = 2 x 100 = 200 cm

 3.5 m = 3.5 x 100 = 350 cm

7.04 m = 7.04 x 100 = 704 cm

150 m = 150 x 100 = 15000 cm

To change from **centimetres** to **metres**, you **divide** by **100**

  500 cm = 500 ÷ 100 = 5 m

   75 cm = 75 ÷ 100 = 0.75 m

    8 cm = 8 ÷ 100 = 0.08 m

    1 cm = 1 ÷ 100 = 0.01 m

Examples	**Solutions**
1. Jamie has 6 metres of ribbon. How many centimetres is this?	6m = 6 x 100 = 600 cm
2. Lee runs 80 metres. How many centimetres is this?	80m = 80 x 100 = 8000 cm
3. A toy train is 120 cm long. How long is it in metres?	120cm = 120 ÷ 100 = 1.2 cm
4. A table is 76cm wide. How wide is it in metres?	76cm = 76 ÷ 100 = 0.76cm

Practice

1. Change these into metres: a) 6 cm   b) 85 cm   c) 350 cm   d) 1000 cm   e) 12430 cm
2. Change these into centimetres: a) 5 m   b) 2.3 m c) 12 m d) 17.25m e) 0.5m f) 0.1m
3. A room needs a border on the wall. It has perimeter of 15.25m. How many centimetres is this?
4. A picture has a perimeter of 3.25m. How many centimetres is this?
5. 265 centimetres of fabric is put around a table. How many metres of fabric is this?
6. Convert 1378 centimetres into metres
7. Convert 0.02 metres into centimetres
8. Convert 4.05 metres into centimetres
9. Convert 1 metre 5 centimetres into centimetres
10. Convert 3 metres 9 centimetres into centimetres

Answers:

1a) 0.06m b) 0.85m c) 3.5m   d) 10m   e) 124.3m

2a) 500cm b) 230cm c) 1200cm d) 1725cm e) 50cm   f) 10cm

3) 1525cm

4) 325cm

5) 2.65m

6) 13.78m

7) 2cm

8) 405cm

9) 105 centimetres

10) 309 centimetres

Before you begin **Level 3** (MTH 2-11b) you must be sure that you can:

Convert measurements when solving problems

> When solving problems, make sure that all of the measurements are in the same units BEFORE you start to answer. Check the question to see if it tells you what units to use

Example
1. A snail moves 2 metres, stops for 10 minutes and then moves 85 centimetres. How far has the snail moved in total?
   Make sure all the units are in centimetres first:- 2 metres = 200cm

   $$85cm = \underline{\ \ 85cm}$$
   Total distance   = 285cm

2. A bottle holding 5 litres has 250ml poured out. What is the volume in the bottle now, in litres?
   Since the answer needs to be in litres, write the 250ml in litres
   250ml = 0.25 litres
   Volume in bottle   = 5 – 0.25
                       = 4.75 litres

Practice
1. A tortoise walks 4 metres 25 centimetres, eats some food, then walks another 150 centimetres. How far does the tortoise walk, in metres?

2. A plank of wood is 3 metres long. A piece 124cm is cut off. What is the new length of the plank on centimetres?

3. A basin holds 3 litres of water has another 1500ml added. How many litres of water is now in the basin?

4. A jug containing 2 litres of juice has 745 ml poured out. How many millilitres of juice is left in the jug?

5. Jamie has a spool of ribbon 15 metres long. 3 different lengths are cut from this; the lengths are 3 metres, 1 metres 67 centimetres and $2\frac{1}{2}$ metres.
   a) What is the total length of the ribbon being cut off?
   b) What is the length of ribbon left on the roll?

6. From a large 2 litre bottle of cola, 3 glasses are filled. The first has 230ml poured in, the second has 0.3l poured in and the third has $\frac{1}{4}$ of a litre poured in.
   a) How much cola is used?
   b) How much cola is left in the large bottle?

> Answers:
> 1. 5m 75cm = 5.75 metres
> 2. 1m 76 cm = 176 cm
> 3. 4 litres 500ml = 4.5 litres
> 4. 1litre 255 ml = 1255 millilitres
> 5. a) 7 metres 17 cm
>   b) 7 metres 83cm
> 6. a) 780ml or 0.78 litres
>   b) 1220ml or 1.22 litres

Before you begin **Level 3** (MTH 2-11b) you must be sure that you can:

Change between common units of metric measure - volume

To change from **litres** to **millilitres**, you **multiply** by **1000**

2 l = 2 x 1000 = 2000 ml

1.5 l = 1.5 x 1000 = 1500 ml

4.05 l = 4.05 x 1000 = 4050 ml

6.789l = 6.789 x 1000 = 6789ml

150 l = 150 x 1000 = 150000 ml

To change from **millilitres** to **litres**, you **divide** by **1000**

2250ml = 2250 ÷ 1000 = 2.25l

500 ml = 500 ÷ 1000 = 0.5 l

75 ml = 75 ÷ 1000 = 0.075 l

8 ml =   8 ÷ 1000 = 0.008 l

1 ml =   1 ÷ 1000 = 0.001 l

Examples

1. Kiera has 2 litres of juice. How many millilitres is this?
2. Len drinks 1.5 litres of cola. How many millilitres is this?
3. A bottle holds 1200ml. How many litres is this?
4. A mug holds 275ml. How many litres is this?

Solutions

2 l = 2 x 1000 = 2000 ml

1.5l = 1.5 x 1000 = 1500 ml

1200ml = 1200 ÷ 1000 = 1.2litres

275ml = 275 ÷ 1000 = 0.275litres

Practice

11. Change these into litres: a) 3000 ml   b) 7000ml   c) 2500ml   d) 350ml   e) 62ml
12. Change these into millilitres: a) 5 l   b) 2.3 l   c) 12 l   d) 17.25 l   e) 0.5 l   f) 0.01 l
13. A bucket can hold 6 litres. How many millilitres is this?
14. A fish tank holds 20 litres of water. How many millilitres is this?
15. A balloon is filled with 3000 millilitres of air. How many litres is this?
16. A bucket is filled with 950 millilitres of water. How many litres is this?
17. Convert 2.2 litres into millilitres
18. Convert 0.7 litres into millilitres
19. Convert 1 litre 800 millilitres into millilitres
20. Convert 3 litres 15 millilitres into millilitres

Answers:

1a) 3 l   b) 7 l   c) 2.5 l   d) 0.35 l   e)   0.062 l

2a) 5000 ml b) 2300 ml c) 12000 ml d) 17250 ml   e) 500 ml   f) 10ml

3) 6000ml

4) 20000ml

5) 3 litres

6) 0.95 litres

7) 2200 millilitres

8) 700 millilitres

9) 1800 millilitres

10) 3015 centimetres

Before you begin **Level 3** (MNU 2-11c) you need to be sure that you can:

Calculate the perimeter

The **perimeter** of a shape is the **total distance around its outside**.

To calculate the perimeter of a shape you **add together** the length of all of the sides.

Perimeter = 4 + 4.5 + 3 + 5 + 5.5
          = 22 cm

4cm   4.5cm
       3 cm
5.5cm
       5cm
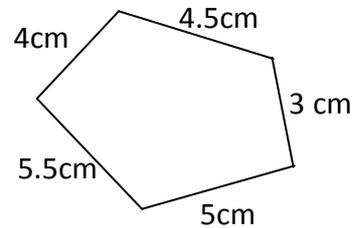
Examples

1. Calculate the perimeter of this triangle.

6 cm   8 cm

7.5 cm
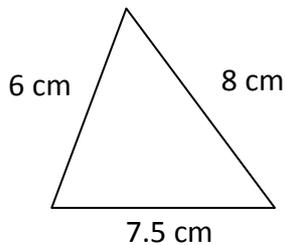
2. Calculate the perimeter of this shape.

3.5 m
4.1 m
       2.3 m
       5 m
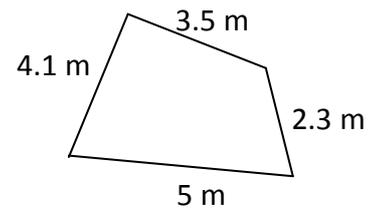
3. Calculate the perimeter of this rectangle.

4 cm

11 cm
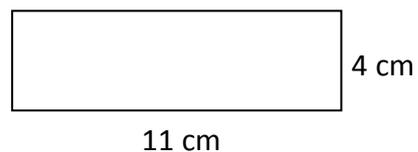
Solutions

1. Perimeter = 6 + 8 + 7.5
            = 21.5 cm

2. Perimeter = 3.5 + 2.3 + 4.1 + 5
            = 14.9 m

3. Perimeter = 4 + 11 + 4 + 11
            = 30 cm

Practice

1. Calculate the perimeter of these shapes:

a)

5.5 cm

4 cm

5 cm

4.8 cm

b)

12 cm

25 cm

10 cm

8 cm

15 cm

c)

3.5 m

4.8 m

4 m

d)

8.2 cm

12.4 cm

15.6 cm
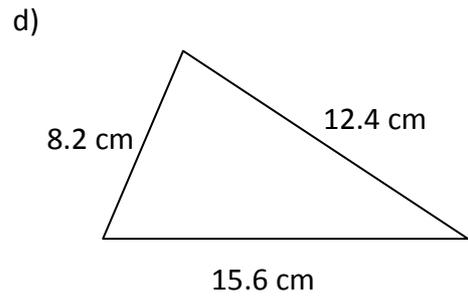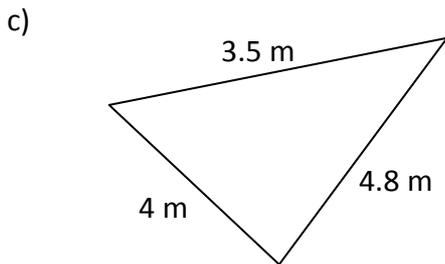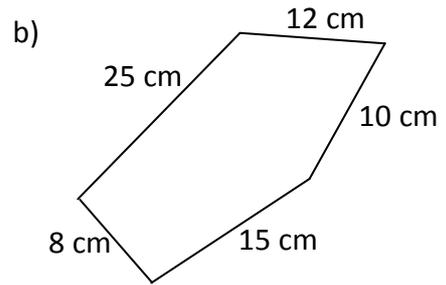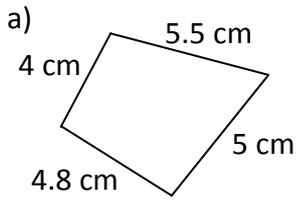
2. Calculate the perimeter of these rectangles:

a)

5 cm

9 cm

b)

14 cm

35 cm

c)

18 m

4 m

d)

2.3 cm

8.6 cm
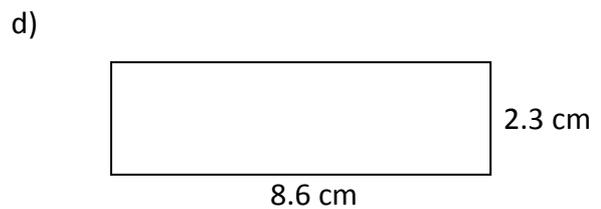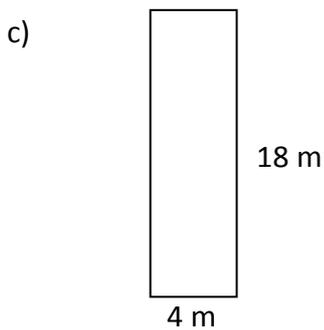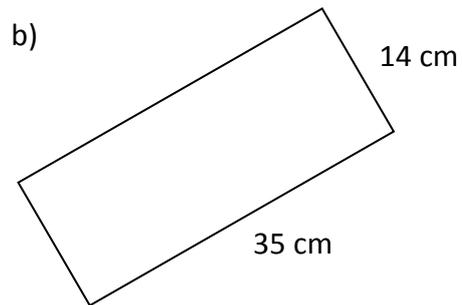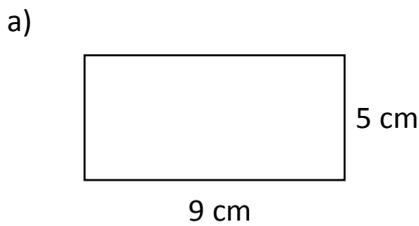
Answers:

1. a) 23.3cm   b) 70cm   c) 12.3 m   d) 36.2 cm

2. a) 28 cm   b) 98cm   c) 44 m   d) 21.8 cm

Before you begin **Level 3** (MNU 2-11c) you need to be sure that you can:

Calculate the area

The **area** of a 2D shape is the **amount of space it takes up.**

To calculate the area of a rectangle we use the formula
Area = Length x Breadth
or **A = L x B**

Area = 11 x 5
Area = 55cm^2

5 cm

11 cm
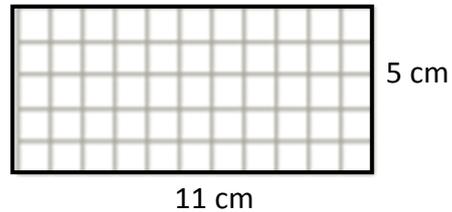
The area of a right angled is half of the area of the surrounding rectangle.
To calculate the area of a right angled triangle we use the formula:
Area = $\frac{1}{2}$ of L x B

Area = $\frac{1}{2}$ of 8 x 5

Area = $\frac{1}{2}$ of 40

Area = 20 cm^2

8 cm

5 cm
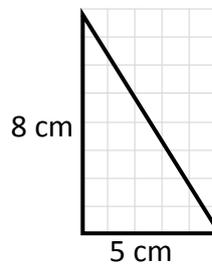
Examples

1. Calculate the area of this rectangle.

7 cm

4 cm
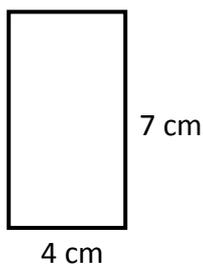
2. Calculate the area of this triangle.

2.5 cm

6 cm

3.

8 cm

11 cm
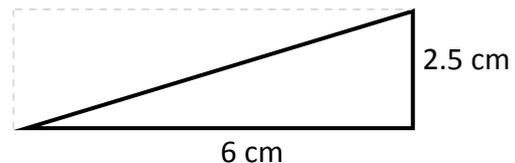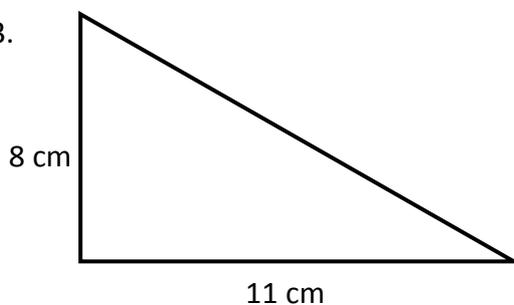
Solutions

1. Area = L x B

   = 4 x 7

   = 28 cm^2

2. Area = $\frac{1}{2}$ of 6 x 2.5

   Area = $\frac{1}{2}$ of 15

   Area = 75 cm^2

3. Area = $\frac{1}{2}$ of 11 x 8

   Area = $\frac{1}{2}$ of 88

   Area = 44 cm^2

<u>Practice</u>

1. Calculate the area of these rectangles:

a)

4 cm

9 cm

b)

3 cm

6.5 cm

c)

45 cm

5 cm

d)

2 cm

7.4 cm
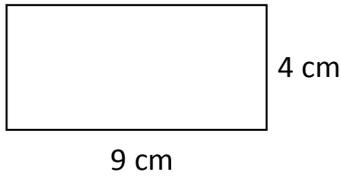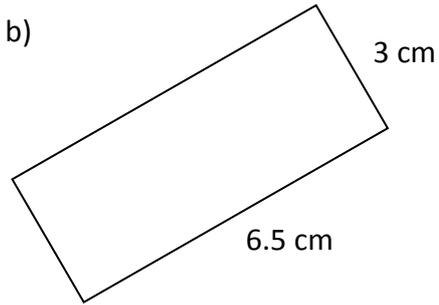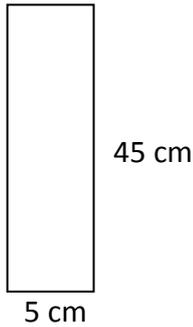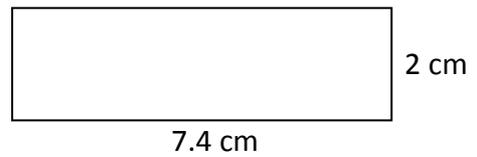
2. Calculate the area of these triangles:

a)

8 cm

6 cm

b)

14 cm

2.5 cm

c)

11 cm

8 cm

d)

12 cm

5 cm
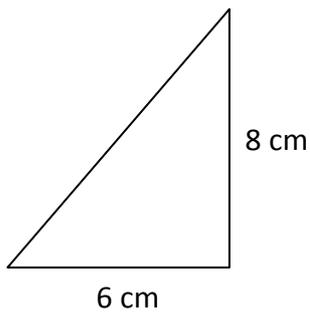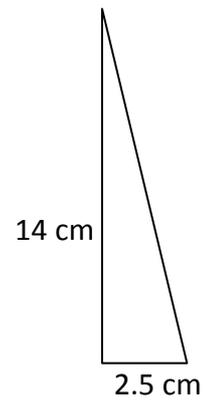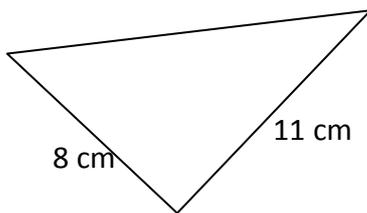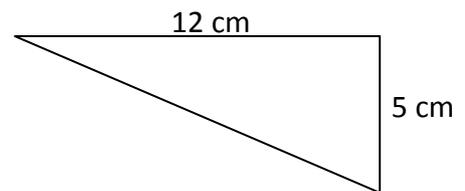
<u>Answers:</u>

1. a) 36cm^2 b) 19.5cm^2 c) 225 cm^2 d) 14.8 cm^2

2. a) 24 cm^2 b) 17.5 cm^2 c) 44 m^2 d) 30 cm^2

Before you begin **Level 3** (MNU 2-11c) you need to be sure that you can:

Calculate the volume

The **volume** of a 3D shape is the **amount of space it takes up**.

A small cube that measures 1cm by 1cm by 1cm has the volume of 1 cubic centimetre or 1cm^3.
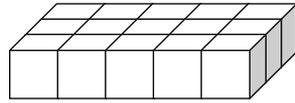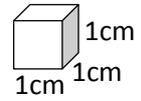
Volume = 15cm^3
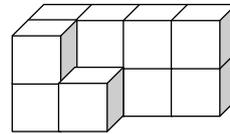
Volume = 11cm^3

To calculate the volume of a cuboid you have to multiply:

length x breadth x height   or **V = L x B x H**

2cm
5cm
7cm
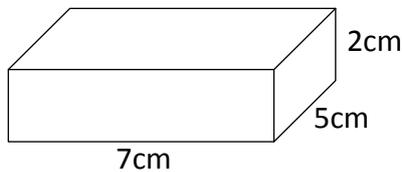
$V = L \times B \times H$
$V = 7 \times 5 \times 2$
$V = 70 \text{ cm}^3$

Volume is measured in mm^3, cm^3, or m^3.

Examples

1. State the volume of this shape.
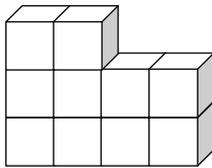
2. State the volume of this shape.
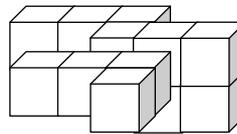
3. Calculate the volume of this cuboid.

5cm
3cm
18cm
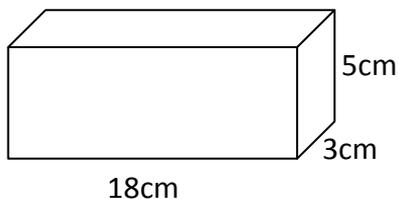
4. Calculate the volume of this cuboid.
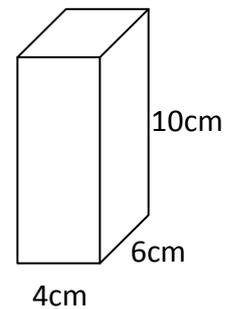
10cm
6cm
4cm

Solutions

1. 10cm^3 2. 12cm^3 3. 120cm^3 4. 240cm^3

Practice

1. State the volume of the following shapes

a)

b)

c)
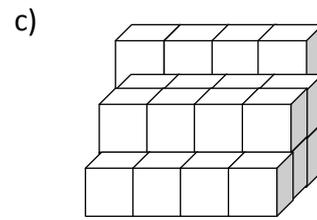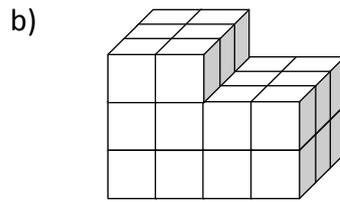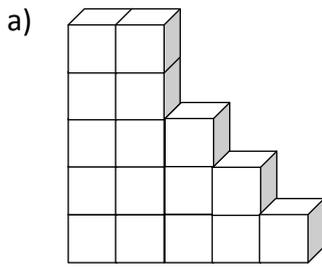
2. Calculate the volume each of the following cuboids:

a)

3cm
7cm
4cm

b)

8cm
5cm
2cm

c)

6cm
4cm
12cm

d)

3cm
5cm
9cm

e)

5cm
5cm
5cm

f)

4cm
5cm
15cm

g)

4cm
25cm
15cm

h)

5m
8m
20m
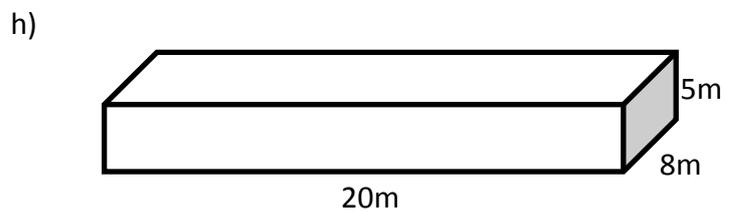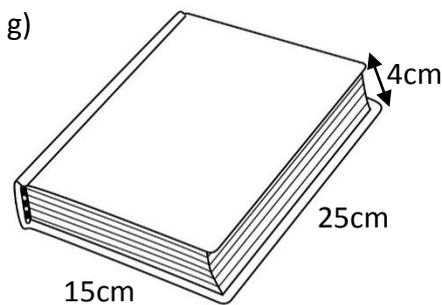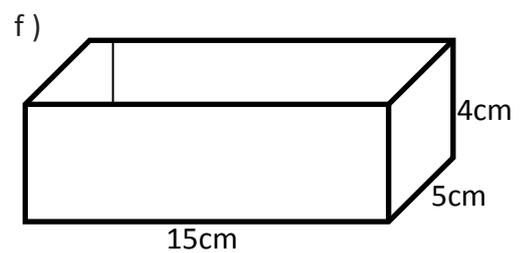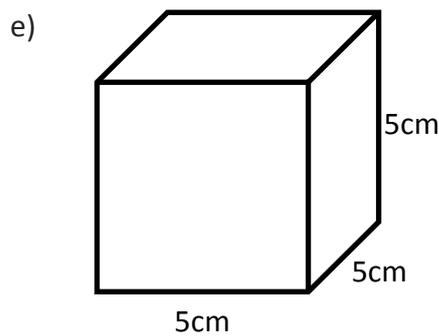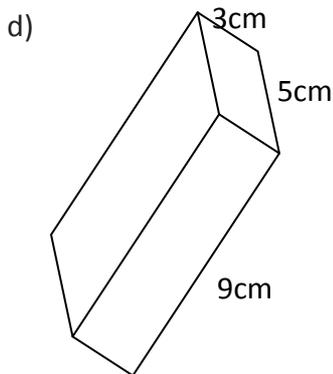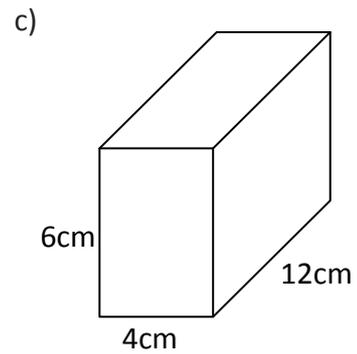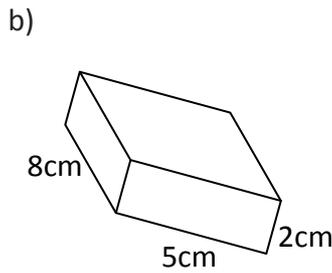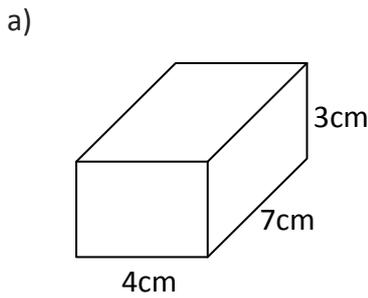
Answers:

1. a) 16cm^3 b) 30cm^3 c) 24cm^3

2. a) 84cm^3 b) 80cm^3 c) 288cm^3 d) 135cm^3 e) 125cm^3 f) 300cm^3

   g) 150cm^3 h) 800m^3

Before you begin **Level 3** (MTH 2-13a) you must be sure that you can:

Explain the rule used to generate the sequence, and apply it to extend the pattern

> Try to identify what is being added/subtracted to each number and check that it works for each term in the sequence.

Example
1. a) What is the rule to get this pattern?

    3, 7, 11, 15 …   …   …

    We add 4 onto 3 to get 7, add 4 onto 7 to get 11………. Rule is add 4

    b) What are the next 3 numbers in the pattern?

    15 + 4 = 19

    19 + 4 = 23

    23 + 4 = 27

    So the complete pattern is

    3, 7, 1, 15, 19, 23, 27

2. a) What is the rule to get this pattern?

    56, 50, 44, 38 … … …

    We subtract 6 from 56 to get 50, subtract 6 from 50 to get 44, subtract 6 from 44 to get

    38……….

    the rule is subtract 6

    b) What are the next 3 numbers in the pattern?

    38 – 6 = 32

    32 – 6 = 26

    26 – 6 = 20

    So the complete pattern is

    56, 50, 44, 38, 32, 26, 20

Practice
For each of the following patterns, write down the rule and find the next 3 numbers in the pattern

1. 7, 15, 23, 31, ….., ….., …..

2. 24, 21, 18, 15, ….., ….., …..

3. 64, 68, 72, ….., ….., …..

4. 91, 84, 77, ….., ….., …..

5. 49, 62, 75, ….., ….., …..

6. 142, 123, 104, ….., ….., …..

> Answers:
> 1. Add 8 :   39, 47, 55
> 2. Subtract 3:   12, 9, 6
> 3. Add 4:   76, 80, 84
> 4. Subtract 7:   70, 63, 56
> 5. Add 13:   88, 101, 114
> 6. Subtract 19:   85, 66, 47

Before you begin **Level 3(MTH 2-15a)** you need to be sure that you can:

Solving Equations

Solving an equation is finding the missing number that makes the statement true.

Examples Addition

Solve the equations by filling in the missing number.

a) 2 + ❏ = 10

Think   What do you need to add to 2 to make 10?

b) ❏ + 6 = 13

Think   What number would you add to 6 to make 13?

Solutions

a) ❏ = 8   b) ❏ = 7

Practice

1. Solve the equations by finding the missing number.

a) 3 + ❏ = 7   b) 2 + ❏ = 9   c) 7 + ❏ = 11   d) 4 + ❏ =4

e) 1 + ❏ =16   f) 5 + ❏ = 8   g) ❏ + 1 = 9   h) ❏ + 2 = 7

i) ❏ + 8 = 10   j) ❏ + 5 = 12   k) ❏ + 4 = 6   l) ❏ + 7 = 15

m) 3 + ❏ =17   n) ❏ + 6 = 9   o) 12 + ❏ = 20   p) ❏ + 1 = 19

Examples Subtraction

Solve the equation by finding in the missing number

a)   10 – ▼   = 7

Think. What do you subtract from 10 to make 7 ?

b)   ▼ – 6 = 4

Think. What do you subtract 6 from to make 4 ?

Solutions

a) ▼ = 4   b) ▼= 10

Practice

1. Solve the equation by finding in the missing numbers

a) 20 – ▼ = 15   b) 18 – ▼= 12   c) 100 – ▼= 80   d) 25 – ▼ = 9

e) 32 – ▼ = 25   f) 48 – ▼ = 22   g) 19 – ▼ = 7   h) 66 – ▼ = 41

i) 12 – ▼ = 9   j) 89 – ▼ = 72   k) 26 – ▼ = 7   l) 15 – ▼ = 11

m) 42 – ▼ = 27   n) 75 – ▼ = 57   o) 63 – ▼ = 33   p) 121 – ▼ = 21

Examples Multiplication

Solve the equations by filling in the missing number.

　　　a) $2 \times \triangle = 10$

Think   2 times "what" makes 10?

　　　b) $\triangle \times 3 = 18$

Think   What number would you multiply by 3 to make 18?

Solutions

　　a) $\triangle = 5$ b) $\triangle = 6$

Practice

3. Solve the equations by finding the missing number.

a) $3 \times \triangle = 21$　　　b) $5 \times \triangle = 40$　　　c) $2 \times \triangle = 12$　　　d) $7 \times \triangle = 28$

e) $8 \times \triangle = 56$　　　f) $9 \times \triangle = 18$　　　g) $\triangle \times 4 = 24$　　　h) $\triangle \times 6 = 30$

i) $\triangle \times 2 = 22$　　　j) $\triangle \times 10 = 40$　　　k) $\triangle \times 6 = 6$　　　l) $\triangle \times 8 = 64$

m) $9 \times \triangle = 90$　　　n) $3 \times \triangle = 36$　　　o) $\triangle \times 4 = 8$　　　p) $\triangle \times 1 = 15$

Examples Division

Solve the equation   by finding in the missing number

　　　a) $* \div 4 = 5$

Think. What number do you divide by 4 to get 5 ?

　　　b) $15 \div * = 3$

Think. Fifteen divided by 'what' equals 3 ?

Solutions

　　　a) $* = 20$　　b) $* = 5$

Practice

4. Solve the equation by finding in the missing numbers

　　　a) $12 \div * = 4$　　　b) $6 \div * = 3$　　　c) $28 \div * = 7$　　　d) $30 \div * = 5$

　　　e) $32 \div * = 4$　　　f) $48 \div * = 6$　　　g) $49 \div * = 7$　　　h) $100 \div * = 20$

　　　i) $* \div 4 = 4$　　　j) $* \div 4 = 5$　　　k) $* \div 5 = 8$　　　l) $* \div 7 = 3$

　　　m) $* \div 9 = 4$　　　n) $* \div 8 = 7$　　　o) $* \div 9 = 4$　　　p) $* \div 10 = 5$

Answers: Addition

1 a) ❏ = 4   b) ❏ = 7   c) ❏ = 4   d) ❏ = 0   e) ❏ = 15   f) ❏ = 3
  g) ❏ = 8   h) ❏ = 5   i) ❏ = 2   j) ❏ = 7   k) ❏ = 2   l) ❏ = 8
  m) ❏ = 14   n) ❏ = 3   o) ❏ = 8   p) ❏ = 18

Answers: Subtraction

2 a) ▼ = 5   b) ▼ = 6   c) ▼ = 20   d) ▼ = 16   e) ▼ = 7   f) ▼ = 26
  g) ▼ = 12   h) ▼ = 25   i) ▼ = 3   j) ▼ = 17   k) ▼ = 19   l) ▼ = 4
  m) ▼ = 15   n) ▼ = 18   o) ▼ = 30   p) ▼ = 100

Answers: Mutiplication

3a) △ = 7   b) △ = 8   c) △ = 6   d) △ = 4   e) △ = 7   f) △ = 2
  g) △ = 6   h) △ = 5   i) △ = 11   j) △ = 4   k) △ = 1   l) △ = 8
  m) △ = 10   n) △ = 12   o) △ = 2   p) △ = 15

Answers: Division

4 a) * = 3   b) * = 2   c) * = 4   d) * = 6   e) * = 8   f) * = 8
  g) * = 7   h) * = 5   i) * = 16   j) * = 20   k) * = 40   l) * = 21
  m) * = 36   n) * = 56   o) * = 36   p) * = 50

Before you begin **Level 3(MTH 2-15a)** you need to be sure that you can:

Identify types of Angles

Angle Types

ACUTE	RIGHT	OBTUSE	STRAIGHT	REFLEX
Less than 90°	Exactly 90°	Between 90° and 180°	Exactly 180°	Between 180° and 360°

Example

Name the type of angles you see in the picture

Answer
 Letter E, L , T & H ; right angles horizontal meets vertical lines.
Letter A ; acute angle at top of inside of letter
Letter A ; reflex angle at top of letter around the outside.
Letter N , Y & W ; acute angle where lines meet
Letter I ; straight angle
Picture has right angles at the corners
Box under heading is a rectangle so has right angles at corners
Bold line at top of page is a straight angle

Practice

Find as many different types of angles as you can in each picture. Describe and state the type.
There may be more than one type of angle in each picture.

1

2

3

4

5

6

7

8

Answers

1

White angle - reflex

White angle - obtuse

White angle - obtuse

Green angle - obtuse

white angle - acute

White angle - acute

White angle - obtuse

White angle - reflex

2

Roof apex - obtuse angle

supports – right angle

Bench leg to top - obtuse angle

Steps to support – acute angle

3

Cross supports – acute/reflex angles

Cross supports – acute/reflex angles

Base - right angle

Lifted bridge - acute angle

4

Red angle - reflex

Blue angle - right

5

Frame – obtuse angle

Frame - right angle

Frame - acute angle

6

Chimney to roof – right angle

Roof apex - obtuse angle

Black white design - acute angle

Black white design – right angle

7

Door frame – straight angle

Roof frame – obtuse angle

Door frame – right

Black white design - acute angle

8

Octagonal frame – obtuse angle

Sign to post – right

Sign to post – right

Before you begin **Level 3(MTH 2-20a)** you need to be sure that you can:

Identify and interpret a variety of statistical diagrams and charts.

"A picture tells a hundred words"

ALWAYS read the key or scale of the diagrams carefully. Should also have a title.

Pictograph – pictures on a graph that have a value attached to them. Read the key carefully.

Bar Chart - evenly spaced bars of same width.

Histogram – bars of same width NO space between them

Line Graph – line across the graph used for continuous data like time.

Pie Chart – circular graph split into sections as per key.

Frequency Table – table to organise large amounts of data

Tally Chart – completed prior to frequency table to classify raw data into groups.

Example

Fifteen pupils were asked to state their favourite colour choice for a school shirt. First a survey was taken. Then a Frequency / Tally Chart made. Finally, a bar chart was made.

Raw data from survey results: blue, orange, yellow, green, blue, red, yellow, green, red, yellow, blue, green, yellow, blue, yellow.

Favourite shirt colour

Colour	Tally	Frequency
Red	I I	2
Blue	I I I I	4
Green	I I I	3
Yellow	ⅡⅠⅠⅠ	5
Orange	I	1
	TOTAL	15

Frequency is how often something appeared in the list i.e. Blue appeared 4 times in the raw data list

Total is the number of items in the raw data list i.e. 15 pupils in class were asked the question.

Bar Graph :

Favourite shirt colour

Title

Scale

Key - states what each coloured bar represents.
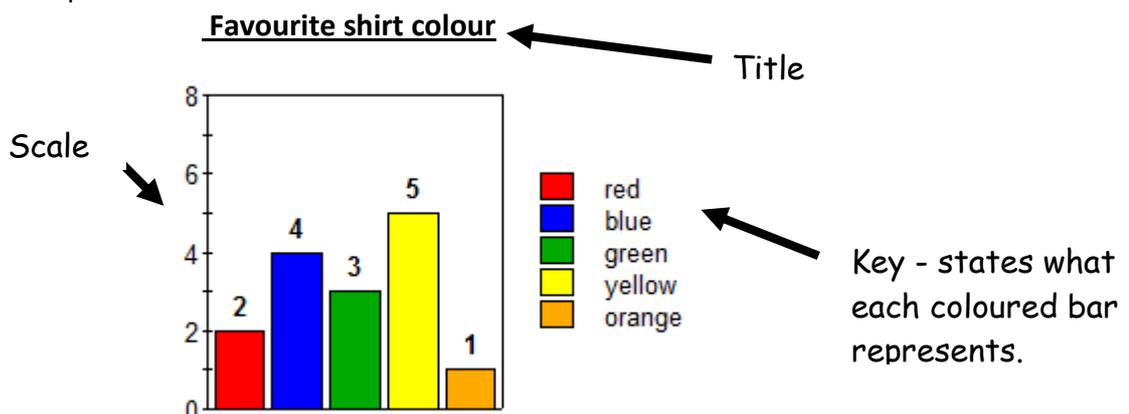
Practice

Identify the type of graph and then answer the question with either TRUE or FALSE

1.

Most people score grade B or C .
True or false statement?

2.

The pie chart shows that 11 out of the 89 people asked like classical music
True or false statement?

3.

This graph is called a line graph.
True or False statement ?

4.

The profit in 1993 was $400?
True or false statement?

5.

David read 3 books.
True or False ?

6.

The average weight of an 8 year old in America is between 70 and 76 lbs.
True or False ?

7.

How Long Animals Can Hold Their Breath

Whales hold their breath for 12 minutes.
   True or False statement?

8.

Table: Favorite Type of Movie				
Comedy	Action	Romance	Drama	SciFi
4	5	6	1	4

This is called a frequency table ?
True or False statement?

9.

Cara's Budget
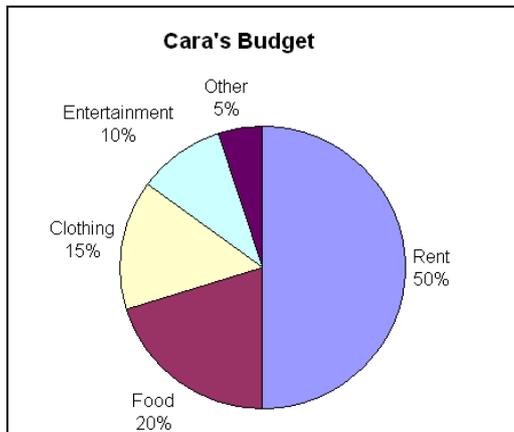
Cara spends most of her money on rent.
True or false statement?

10.
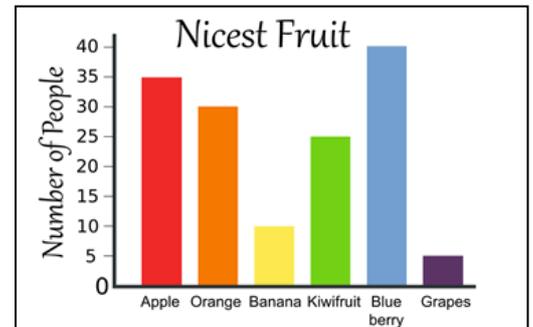
The nicest fruit is an orange.
True or False statement?

11.

Number of Books Read

Jeremy	📖📖📖📖📖
Kevin	📖📖📖📖
David	📖📖📖
Kelly	📖📖📖📖📖📖
Emily	📖📖
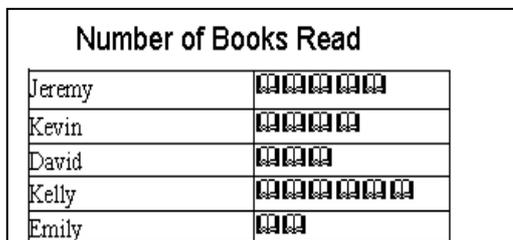
Each 📖 stands for 5 books.

We call this diagram a pictograph.
True or False ?

12.
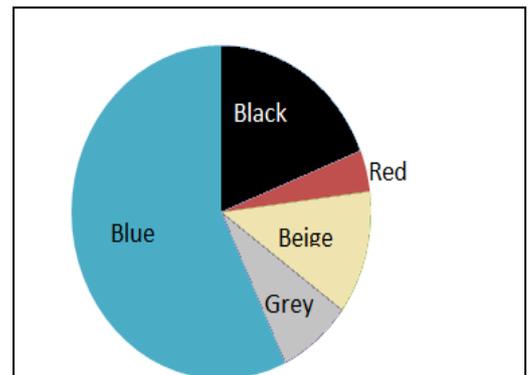
Beige is the third least popular colour of car.
True or False statement?

13.
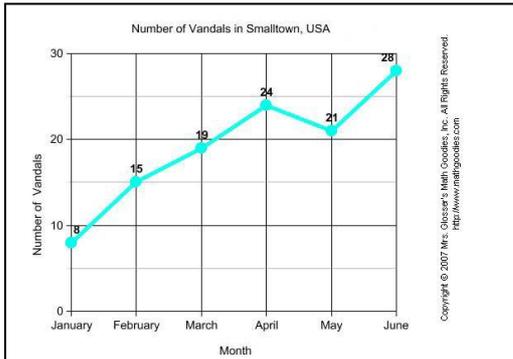
This graph show an upward trend of vandalism in Smalltown.
True or False?

14.
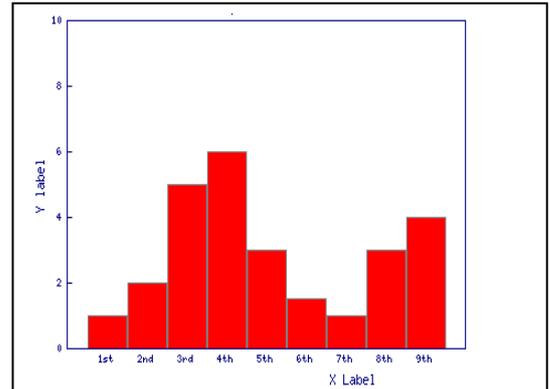
This diagram is called a histogram?
True or False statement?

15.
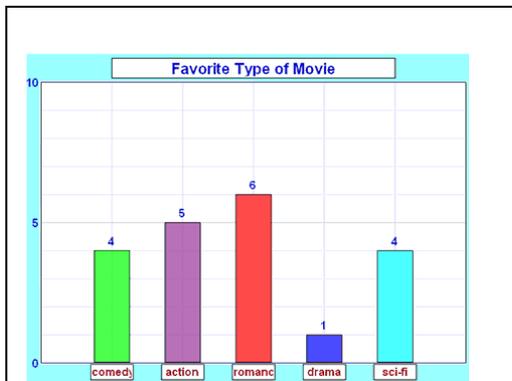
The number one favourite movie type was drama.
True or False statement?

16.
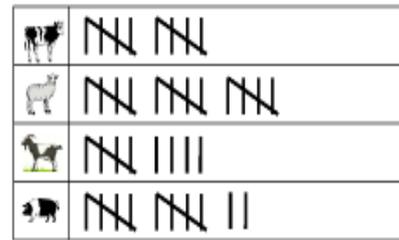
The total number of animals on the farm was 42.
True or False statement?

Answers:

1. Bar Graph. True   2. Pie Chart. False (shows only 5)   3. Line Graph. True

4. Bar Graph. True   5. Pictograph. False (read the key 3 × 5 books = 15 books)

6. Line Graph. False (average between 51-57)   7. Bar Graph. False (dolphins 12 mins)

8. Frequency Table. True   9. Pie Chart. True   10. Bar Graph. False (blueberry)

11. Pictograph. True   12. Pie Chart. True   13. Line Graph. True

14. Histogram. True   15. Bar Graph. False (favourite was romance)

16. Tally Chart.   False (8 bundles of 5 plus 6 single sticks – 8×5+6 = 46)

Before you begin **Level 3(MTH 2-22)** you need to be sure that you can:

communicate your predictions and findings using the vocabulary of probability.

Probability is the likelihood of chance. Probability values range from zero to one., or from impossible to certain. We can place the likelihood of events happening onto the number line as per the diagram below;
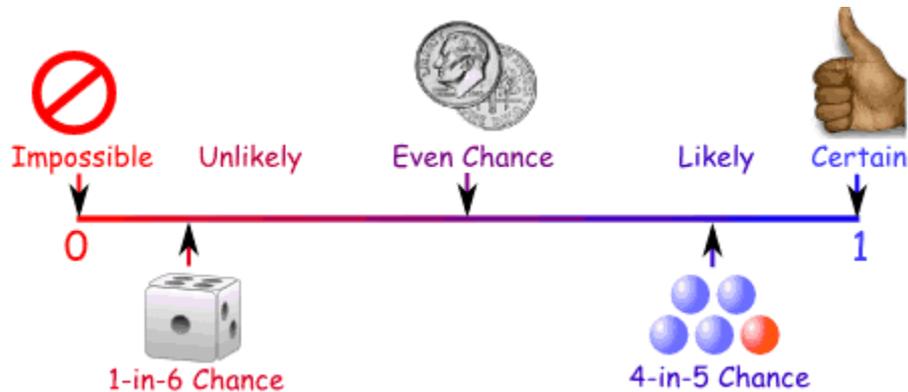
Rolling a 6 on the dice is unlikely to happen as got 6 different options;1,2,3,4,5,or a 6.
Getting a head on the toss of a coin is an even chance as only got two options heads ot tails.
Choosing a blue ball out of the choice of 5 balls is likely to happen - more blue than red balls.

Example

State what the probability (likelihood) of the following scenarios are using one of the following words; IMPOSSIBLE, UNLIKELY, EVEN, LIKELY, CERTAIN ?

a) Next baby born is a boy.

b) Tomorrow is a Saturday.

c) You will see a dog on the way home.

Solution

a) An EVEN chance. An almost equal number of either sex is born at any time 49% male 51% female.

b) CERTAIN if today is Friday but IMPOSSIBLE if any other day as Saturday follows Friday.

c) LIKELY as many people own a dog and take the dog out walking.

Practice

Answer the following with either

        IMPOSSIBLE, UNLIKELY, EVEN, LIKELY, or CERTAIN.

1.

You will go to Dundee University in September.

2.

You will meet an alien on your way home.

3.

You will eat lunch today.

4.

You will travel home from school by bus today.

5.

You will get a tails when you toss a coin.

6.

You will roll a 6 on the dice.

7.

Eastenders will be on TV tonight.

8.

You will see a dolphin in the swimming pool.

9.

You will become a famous footballer.

10.

It will snow tomorrow.

11.

You will win the National Lottery this Saturday.

12.

It will be sunny tomorrow.

13.
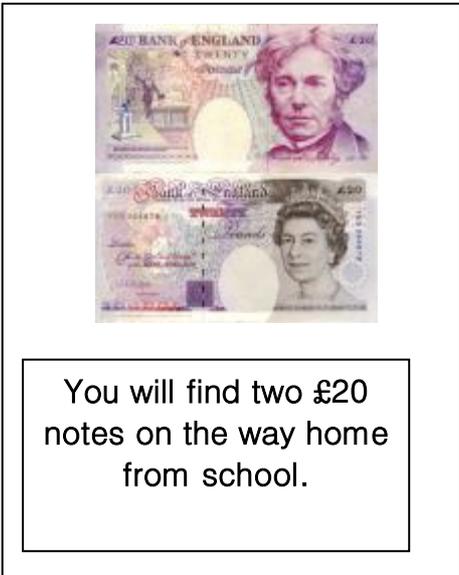
You will find two £20 notes on the way home from school.

14.

Scotland will win the next 6 Nations Grandslam.

15.
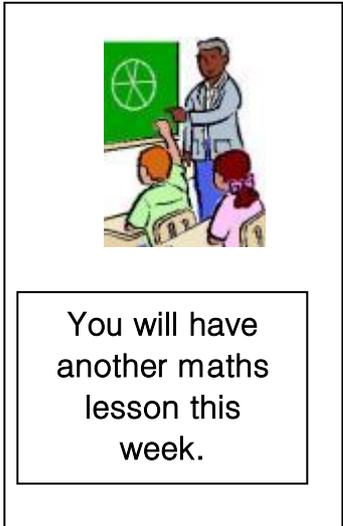
You will have another maths lesson this week.

16.

It will rain one day this week.

17.
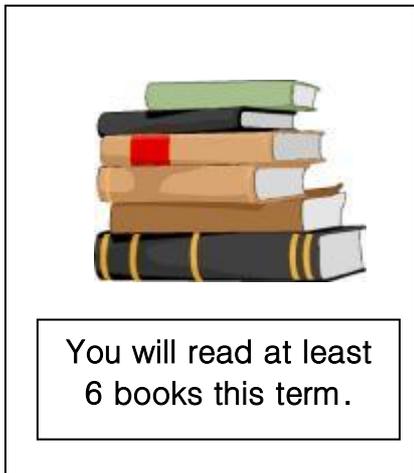
You will read at least 6 books this term.

18.

You will become a famous singer when you are older.

Answers:

1. LIKELY / UNLIKELY (Depends on pupil)   2. IMPOSSIBLE   3. CERTAIN

4. CERTAIN/ UNLIKELY (Depends if using school bus or not)   5. EVEN   6. UNLIKELY

7. CERTAIN   8.IMPOSSIBLE   9.UNLIKELY   10. UNLIKELY

11. IMPOSSIBLE (can't buy ticket under 16 years of age)   12.LIKELY   13. UNLIKELY

14. LIKELY (think positively!)   15. CERTAIN   16. CERTAIN (This is Scotland!)

17. EVEN   18. UNLIKELY