

# GCSE Mathematics

## Practice Tests: Set 9

### Paper 3F (Calculator)

**Time: 1 hour 30 minutes**

You should have: Ruler graduated in centimetres and millimetres, protractor, pair of compasses, pen, HB pencil, eraser, calculator. Tracing paper may be used.

#### Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided – *there may be more space than you need.*
- **Calculators may be used.**
- Diagrams are **NOT** accurately drawn, unless otherwise indicated.
- You must **show all your working out.**



#### Information

- The total mark for this paper is 80
- The marks for **each** question are shown in brackets – *use this as a guide as to how much time to spend on each question.*

#### Advice

- Read each question carefully before you start to answer it.
- Keep an eye on the time.
- Try to answer every question.
- Check your answers if you have time at the end.

Answer ALL questions.

Write your answers in the stages provided.

You must write down all the stages in your working.

- 1 On the dotted line, write the number so that the two fractions are equivalent.

Equivalent Fractions

$$\frac{40}{100} = \frac{\dots\dots\dots}{25}$$

*Handwritten work:*  $\frac{40}{100} \xrightarrow{\div 4} \frac{10}{25}$

(Total for Question 1 is 1 mark)

- 2 Write  $\frac{6}{20}$  as a percentage.

Converting FDP

$$\frac{6}{20} = 0.3 = \frac{3}{10} = \underline{\underline{30\%}}$$

..... 30% .....

(Total for Question 2 is 1 mark)

- 3 Write  $\frac{18}{100}$  as a decimal.

USE YOUR CALCULATOR

..... 0.18 .....

(Total for Question 3 is 1 mark)

- 4 Work out  $\frac{5}{9}$  of 72

Fractions of an Amount

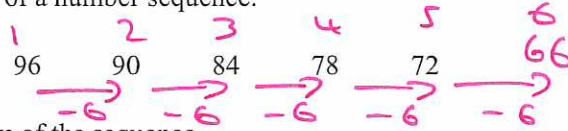
$$\frac{5}{9} \times 72 = \underline{\underline{40}}$$

..... 40 .....

(Total for Question 4 is 1 mark)

# Number Patterns

5 Here are the first five terms of a number sequence.



(a) Write down the 6th term of the sequence.

66

(1)

(b) Explain how you found your answer to part (a).

Take 6 away every time.  $72 - 6 = 66$ .

(1)

The 15th term of the sequence is 12.

(c) Work out the 14th term of the sequence.



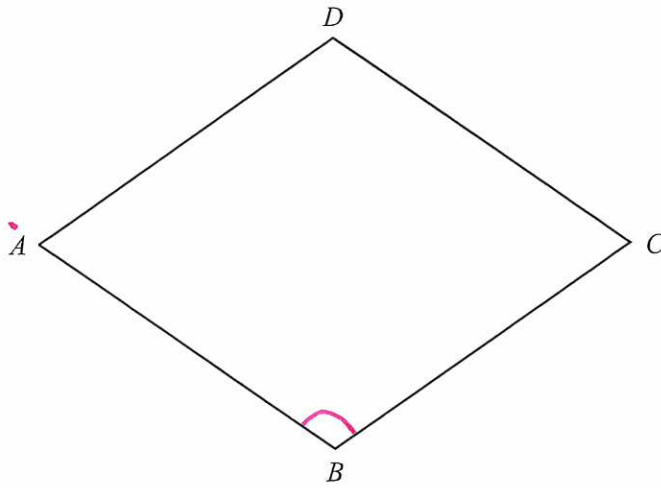
18

(1)

(Total for Question 5 is 3 marks)

measuring Lines and Angles

6 The diagram shows a rhombus  $ABCD$ .



(a) Measure the length of  $AB$ .

Ruler

..... 4.8 ..... cm  
(1)

(b) Measure the size of angle  $ABC$ .

Protractor

..... 110 ..... °  
(1)

(Total for Question 6 is 2 marks)

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## Unitary Method

7 Potatoes cost 1.20 euros per kilogram.

(a) Work out the cost of 5 kilograms of potatoes.

$$\begin{array}{l|l} & \text{€1.20 : 1kg} \\ (x5) & \text{€6.00 : 5kg} \\ & \underline{\underline{\hspace{1cm}}} \end{array}$$

..... 6 euros  
(1)

Courgettes cost 2.55 euros per kilogram.

(b) Work out the cost of 0.6 kilograms of courgettes.

$$\begin{array}{l|l} & \text{€2.55 : 1kg} \\ (\div 10) & \text{€0.255 : 0.1kg} \\ (x6) & \text{€1.53 : 0.6kg} \\ & \underline{\underline{\hspace{1cm}}} \end{array}$$

..... 1.53 euros  
(1)

Carrots cost 0.84 euros per kilogram.

Onions cost 0.92 euros per kilogram.

Anna buys 500 grams of carrots and 750 grams of onions.

She pays with a 5 euro note.

(c) Work out how much change Anna should receive.

$$\begin{array}{l|l} \text{Carrot price} & \text{€0.84 : 1kg} \\ (\div 2) & \text{€0.42 : 500g} \\ & \underline{\underline{\hspace{1cm}}} \\ \text{Onions price} & \text{€0.92 : 1kg} \\ (\div 4) & \text{€0.23 : 250g} \\ (x3) & \text{€0.69 : 750g} \\ & \underline{\underline{\hspace{1cm}}} \end{array}$$

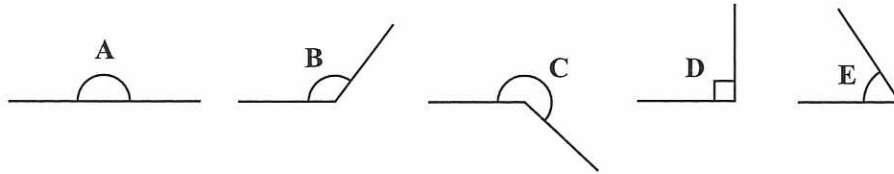
Total cost ..... euros  
(3)

change given ..... euros  
€5.00 - €1.11 = €3.89

(Total for Question 7 is 5 marks)

# Angle Properties

8 Five angles are marked in the following diagram.



(a) Write down the letter of the angle that is a reflex angle.

Between  $180^\circ$  and  $360^\circ \therefore \underline{\underline{C}}$   
 .....  
 (1)

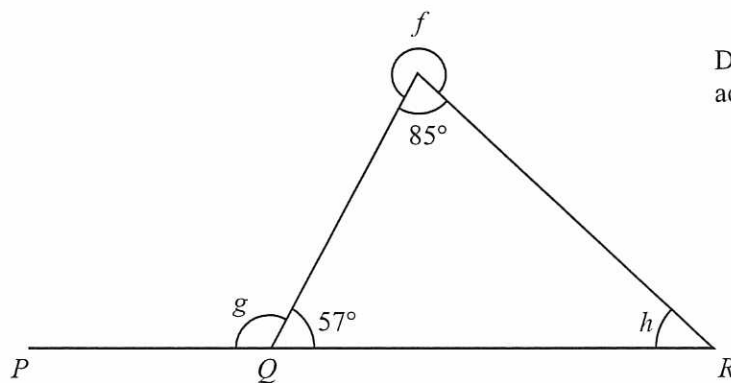


Diagram NOT accurately drawn

Angles in 2D shapes

(b) Work out the size of angle  $f$ .

Angles around a point =  $360^\circ$  |  $360^\circ - 85^\circ = \underline{\underline{275^\circ}}$   
 .....  
 (1)

$PQR$  is a straight line.

(c) Work out the size of angle  $g$ .

Angles on a straight line =  $180^\circ$  |  $180^\circ - 57^\circ = \underline{\underline{123^\circ}}$   
 .....  
 (1)

(d) Work out the size of angle  $h$ .

Angles in a triangle =  $180^\circ$  |  $180^\circ - 85^\circ - 57^\circ = \underline{\underline{38^\circ}}$   
 .....  
 (2)

(Total for Question 8 is 5 marks)

# Negative Numbers

9 (a) Work out  $(-9) - (-15)$

$$\begin{aligned} &= -9 - (-15) \\ &= -9 + 15 \\ &= \underline{\underline{6}} \end{aligned}$$

6

.....  
(1)

(b) Work out  $6 \times (-8)$

$$\begin{aligned} &+6 \times -8 \\ &+ \times - = \ominus \\ \therefore &= \underline{\underline{-48}} \end{aligned}$$

-48

.....  
(1)

(c) Work out  $(-64) \div (-4)$

$$\begin{aligned} &-64 \div -4 \\ &- \div - = \oplus \end{aligned}$$

$$\begin{array}{r} 16 \\ 4 \overline{)64} \end{array}$$

$$\therefore = \underline{\underline{16}}$$

16

.....  
(1)

(Total for Question 9 is 3 marks)

# Simplifying Algebraic Expressions

10 (a) Simplify  $g + 2g + 3g - 4g$

$$1\text{lot} + 2\text{lots} + 3\text{lots} - 4\text{lots} = 2\text{lots} = \underline{\underline{2g}}$$

$$\dots\dots\dots \underline{2g} \dots\dots\dots \quad (1)$$

(b) Solve  $6m = 18$

Solving Equations

$$\begin{array}{l|l} & 6m = 18 \\ (\div 6) & \underline{\underline{m = 3}} \end{array}$$

$$m = \dots\dots\dots \underline{3} \dots\dots\dots \quad (1)$$

$$P = 46 - 3st$$

(c) Work out the value of  $P$  when  $s = 2$  and  $t = 5$

Substitution

$$P = 46 - 3(2)(5) \quad \leftarrow \text{USE YOUR CALCULATOR}$$

$$P = \underline{\underline{16}}$$

$$P = \dots\dots\dots \underline{16} \dots\dots\dots \quad (2)$$

$$Q = 4e + 3f$$

(d) Work out the value of  $e$  when  $Q = 43$  and  $f = 7$

Substitution and rearranging

$$\begin{array}{l|l} \text{Substitute} & 43 = 4e + 3(7) \\ & 43 = 4e + 21 \\ (-21) & 22 = 4e \\ (\div 4) & \underline{\underline{\frac{22}{4} = e = 5.5}} \end{array}$$

$$e = \dots\dots\dots \underline{5.5} \dots\dots\dots \quad (3)$$

(Total for Question 10 is 7 marks)



## Fractions of an Amount

11 The area of land on a farm is 120 hectares.

The farmer grows crops on  $\frac{7}{8}$  of the land.

On  $\frac{2}{3}$  of the land used to grow crops, the farmer grows wheat.

(a) Work out the area of the land on the farm used to grow wheat.

Crops	$\frac{7}{8}$ of 120 = $\frac{7}{8} \times 120 = \underline{105}$
Wheat	$\frac{2}{3}$ of 105 = $\frac{2}{3} \times 105 = \underline{70}$

..... 70 hectares  
(3)

Last year, the farmer made 31 500 euros from selling his wheat.  
His total income was 42 000 euros.

Percentages

(b) Write 31 500 as a percentage of 42 000.

"31500 out of 42000"	= $\frac{31500}{42000} = 0.75$
% (x100)	= $\underline{75\%}$

..... 75 %  
(2)

(Total for Question 11 is 5 marks)

## Mixed Number Operations

12 Show that  $3\frac{3}{8} \div 2\frac{1}{4} = 1\frac{1}{2}$

Improper fraction	$3\frac{3}{8} = \frac{27}{8}$ and $2\frac{1}{4} = \frac{9}{4}$
$\therefore 3\frac{3}{8} \div 2\frac{1}{4}$	$= \frac{27}{8} \div \frac{9}{4}$
K    C    F	$= \frac{27}{8} \times \frac{4}{9}$ ← USE YOUR CALCULATOR
	$= \frac{108}{72}$
	$= \frac{3}{2}$
Mixed Number	$= \underline{1\frac{1}{2}}$ $\square$

(Total for Question 12 is 3 marks)

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## Powers and Roots

13 (a) Find the value of  $\sqrt[3]{59.319}$

3.9

(1)

(b) Find the value of  $6^4$

$$= 6 \times 6 \times 6 \times 6$$

1296

(1)

(c) Work out the value of  $\left(\frac{125.6}{4.7}\right)^2$

Calculator Skills

Write down all the figures on your calculator display.

~~714~~.140335

(2)

(d) Write your answer to part (c) correct to 3 significant figures.

Rounding

714.140335

1 rounds down

= 714

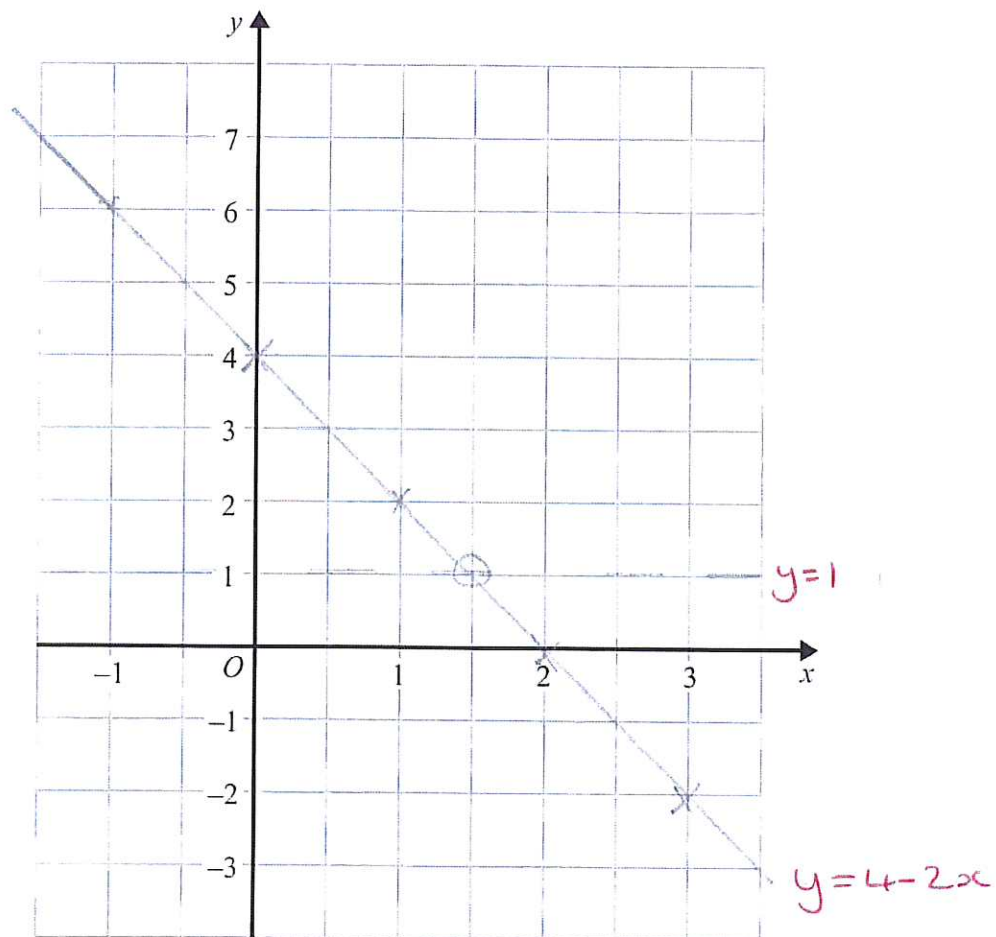
(1)

(Total for Question 13 is 5 marks)

## Plotting Straight Lines

- 3 (a) On the grid, draw the graph of  $y = 4 - 2x$  for values of  $x$  from  $-1$  to  $3$ .

$x$	$-1$	$0$	$1$	$2$	$3$
$y$	$6$	$4$	$2$	$0$	$-2$



(3)

- (b) Write down the coordinates of the point where the graph of  $y = 4 - 2x$  crosses the line  $y = 1$

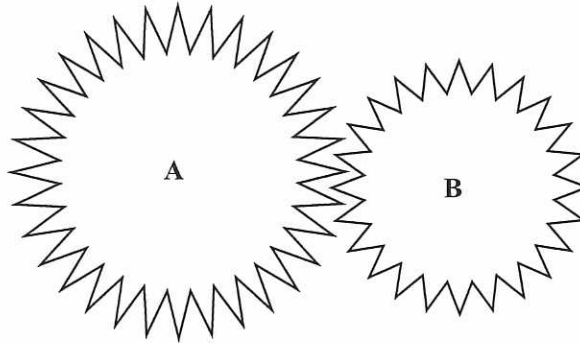
(.....<sup>1.5</sup>....., .....<sup>1</sup>.....)

(1)

(Total for Question 3 is 4 marks)

## Simplifying Ratio

- 15 The diagram shows two cogs, **A** and **B**.



There are 32 teeth on cog **A**.  
There are 24 teeth on cog **B**.

- (a) Write down the ratio of the number of teeth on cog **A** to the number of teeth on cog **B**.  
Give your ratio in its simplest form.

$$\begin{array}{l}
 A : B \\
 32 : 24 \\
 (\div 8) \quad \underline{\underline{4 : 3}}
 \end{array}
 \qquad \dots\dots\dots 4 : 3 \dots\dots\dots$$

(2)

The two cogs both rotate.  
Cog **A** completes 12 full turns while cog **B** completes 16 full turns.

- (b) Work out the number of full turns that cog **A** completes while cog **B** completes 60 full turns. Ratio

$$\begin{array}{l}
 \text{Cog A} : \text{Cog B} \\
 12 : 16 \\
 \times 3.75 \quad \downarrow \qquad \qquad \qquad \uparrow \times 3.75 \\
 x : 60 \\
 \underline{\underline{x = 45}}
 \end{array}
 \qquad 60 \div 16 = 3.75 \qquad \dots\dots\dots 45 \dots\dots\dots$$

(2)

(Total for Question 15 is 4 marks)

# Angles in Polygons

5 The size of each exterior angle of a regular polygon is  $24^\circ$

(a) Work out the number of sides of the polygon.

$$\begin{array}{l|l} \text{Sum of exterior} & 24n = 360 \\ \text{angles} & \\ = 360^\circ & \\ (\div 24) & n = 15 \end{array}$$

15

(2)

Here is a pentagon.

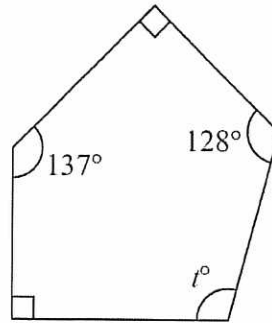


Diagram NOT accurately drawn

(b) Work out the value of  $t$ .

$$\begin{array}{l|l} \text{Sum of interior} & (5-2) \times 180^\circ = 540^\circ \\ \text{angles of a pentagon} & \\ & 137^\circ + 128^\circ + 90^\circ + 90^\circ + t^\circ = 540^\circ \\ & 445^\circ \qquad \qquad \qquad + t^\circ = 540^\circ \\ & (-445) \qquad \qquad \qquad t = 95^\circ \end{array}$$

95°

(3)

(Total for Question 5 is 5 marks)

## Averages From Grouped Frequency

- 6 Marta breeds dogs.  
32 dogs give birth to puppies.  
The table shows information about the number of puppies born to each dog.

Number of puppies	Frequency
1 - 3	5
4 - 6	12
7 - 9	10
10 - 12	4
13 - 15	1

midpoint	fm
2	10
5	60
8	80
11	44
14	14
	$\Sigma fm = 208$

- TOTALS  $\Sigma f = 32$   
(a) Write down the modal class.  
MOST FREQUENT

4 - 6

.....  
(1)

- (b) Work out an estimate for the mean number of puppies born to each dog.

$$\text{Estimate for the mean} = \frac{\Sigma fm}{\Sigma f}$$

$$= \frac{208}{32}$$

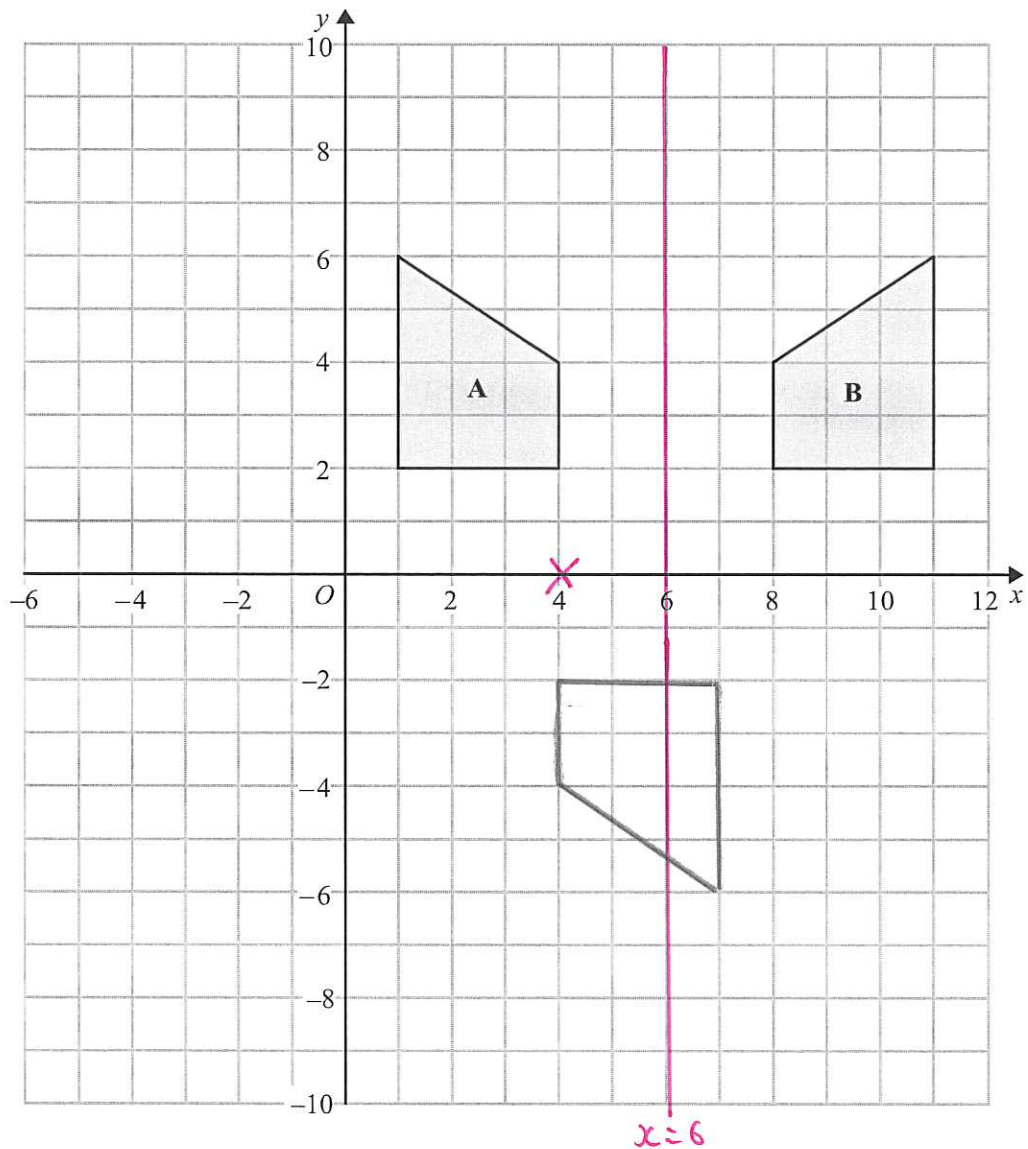
$$= \underline{\underline{6.5}}$$

6.5

.....  
(4)

(Total for Question 6 is 5 marks)

18



(a) Describe fully the single transformation that maps shape A onto shape B.

Reflection over the line  $x=6$

(2)

(b) On the grid, rotate shape A  $180^\circ$  about (4, 0)

(2)

(Total for Question 18 is 4 marks)



# Volume and Surface Area of Prisms

19 The diagram shows a solid triangular prism  $ABCDEF$ .

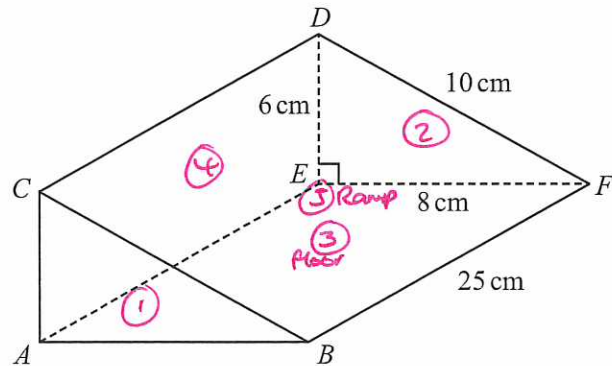


Diagram NOT accurately drawn

$EF = 8$  cm,  $DE = 6$  cm,  $DF = 10$  cm and  $BF = 25$  cm.  
Angle  $DEF = 90^\circ$

(a) Work out the area of triangle  $DEF$ .

"front face"

$$\text{Area} = \frac{b \times h}{2} \quad \Bigg| \quad A = \frac{8 \text{ cm} \times 6 \text{ cm}}{2} = \underline{\underline{24 \text{ cm}^2}}$$

..... 24 .....  $\text{cm}^2$   
(2)

(b) Work out the volume of the prism.

$$V = \text{CSA} \times \text{length} \quad \Bigg| \quad V = 24 \text{ cm}^2 \times 25 \text{ cm}$$

$$V = \underline{\underline{600 \text{ cm}^3}}$$

..... 600 .....  $\text{cm}^3$   
(2)

(c) Work out the total surface area of the prism.

5 faces...

① $A = \frac{b \times h}{2}$	① $A = \frac{8 \text{ cm} \times 6 \text{ cm}}{2} = 24 \text{ cm}^2$
② same as ①	② same as ① = $24 \text{ cm}^2$
③ $A = lw$ (floor)	③ $A = 8 \text{ cm} \times 25 \text{ cm} = 200 \text{ cm}^2$
④ $A = lw$ (back)	④ $A = 25 \text{ cm} \times 6 \text{ cm} = 150 \text{ cm}^2$ ..... $\text{cm}^2$ (3)
⑤ $A = lw$ (Ramp)	⑤ $A = 25 \text{ cm} \times 10 \text{ cm} = 250 \text{ cm}^2$ (Total for Question 19 is 7 marks)

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Total Surface Area  $24 \text{ cm}^2 + 24 \text{ cm}^2 + 200 \text{ cm}^2 + 150 \text{ cm}^2 + 250 \text{ cm}^2 = \underline{\underline{648 \text{ cm}^2}}$

## Set Theory

- 20  $\mathcal{E} = \{\text{fish in Jake's lake}\}$   
 $A = \{\text{fish of length greater than 20 cm}\}$   
 $B = \{\text{fish that weigh more than 1 kg}\}$   
 $C = \{\text{fish less than 1 year old}\}$

A fish in Jake's lake is caught.

The fish is 2 years old, weighs 1.2 kg and is 19 cm in length.

- (a) Write down the set,  $A$  or  $B$  or  $C$ , of which this fish is a member.

NOT in  $A$ ,  
IN  $B$ ,  
NOT in  $C$ ,  
 $\therefore$  Just  $B$  .....  $B$  ..... (1)

- (b) Describe in words fish that are members of the set  $A \cup B$

Any fish that are greater than <sup>or</sup> 20cm in length or  
weigh more than 1kg, or are both. .... (2)

(Total for Question 20 is 3 marks)

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# Farming expressions

- 21 The diagram shows a rectangle and an isosceles triangle. All measurements are in centimetres.

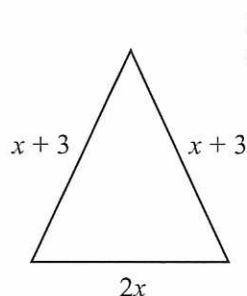
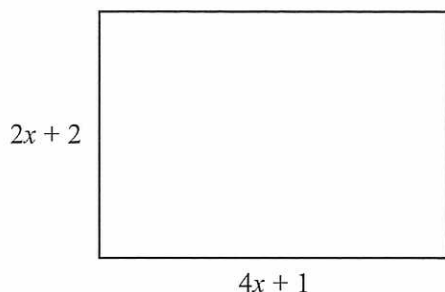


Diagram NOT accurately drawn

- (a) Write down an expression in terms of  $x$  for

- (i) the perimeter of the rectangle,

collect  $P = 2x + 2 + 4x + 1 + 2x + 2 + 4x + 1$   
 $P = \underline{12x + 6}$  .....  $12x + 6$  ..... cm

- (ii) the perimeter of the triangle.

collect  $P = x + 3 + x + 3 + 2x$   
 $P = \underline{4x + 6}$  .....  $4x + 6$  ..... cm (2)

The perimeter of the rectangle is equal to 2 times the perimeter of the triangle.

- (b) Work out the value of  $x$ .  
 Show clear algebraic working.

Farming and Solving Equations

Perimeter =  $2 \times P_{\text{triangle}}$   
 expand  
 $(-8x)$   
 $(-6)$   
 $(\div 4)$

$$\begin{aligned} \therefore 12x + 6 &= 2(4x + 6) \\ 12x + 6 &= 8x + 12 \\ 4x + 6 &= 12 \\ 4x &= 6 \\ x &= \frac{6}{4} = \underline{\underline{1.5}} \end{aligned}$$

1.5

(4)

(Total for Question 21 is 6 marks)

TOTAL FOR PAPER IS 80 MARKS