1. An experiment was carried out to investigate the probability of obtaining a head when a biased coin is thrown.
The number of times the coin landed and showed a head in 4 sets of ten throws is shown in the table below.

Number of throws	Number of times a head is recorded
1st ten throws	2
2nd ten throws	4
3rd ten throws	3
4th ten throws	1

(a) Complete the table below to show the relative frequency of obtaining a head after throwing the coin a total of 10 times, 20 times, 30 times and 40 times. [2]

Number of times the coin is thrown altogether		10	20	30	40
Relative frequency of obtaining a head	Fraction	$\frac{2}{10}$	$\frac{6}{20}$		
	Decimal	0·2	0·3		

(b) Using the above results, write down the best estimate for the probability of obtaining a head when this biased coin is thrown.
Give a reason for your answer. [2]

.....

.....

.....

Examiner only

10. *(a)* Write down the nth term of the following sequence. [2]

3, 4, 5, 6, ...

.....

.....

.....

.....

(b) The nth term of a different sequence is given by $n^2 + 7$.

(i) Write down the first three terms of this sequence. [2]

.....

.....

.....

1st term = ... 2nd term = ... 3rd term = ...

(ii) Which **term** in this sequence is the first that has a value greater than 85? [2]

.....

.....

.....

.....

Answer = ... term.

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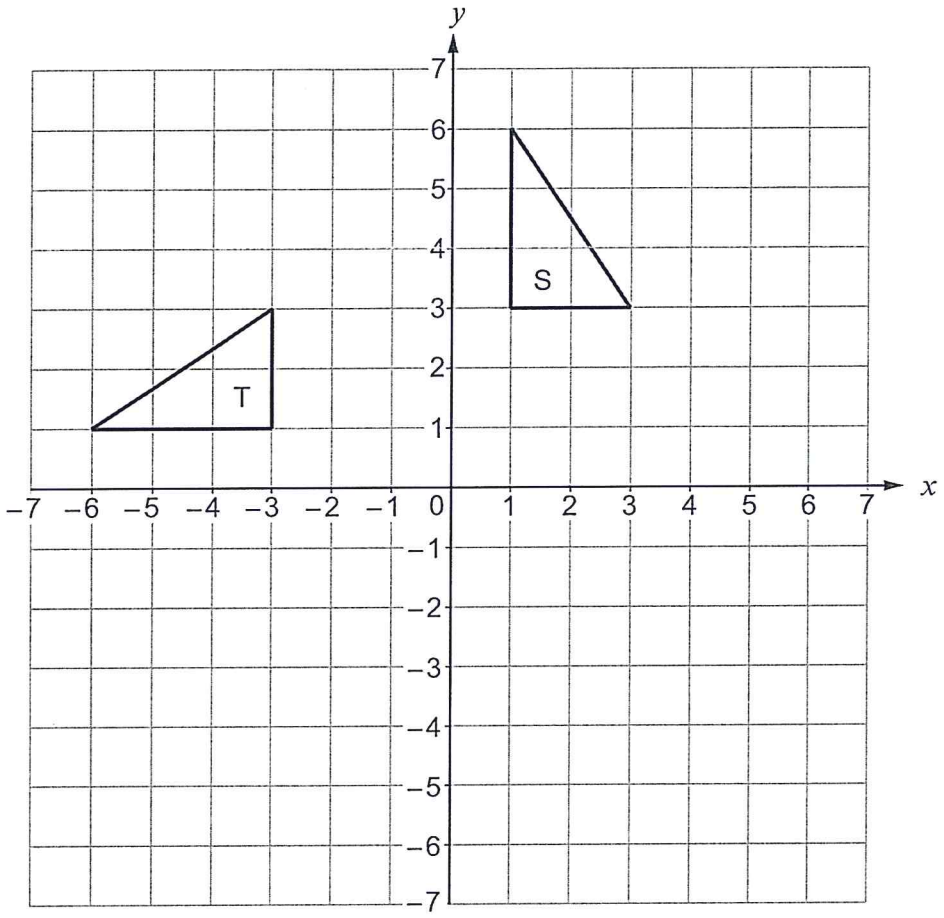
Examiner only

(b) Describe fully a single transformation that transforms triangle S onto triangle T. [3]



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Examiner only

12. Circle the correct answer for each of the following.

(a) $x^3 \times x^6 =$ [1]

x^{36} $x^{0.5}$ x^2 x^9 x^{18}

.....

(b) $(7x - 5y) - (3x + 2y) =$ [1]

$4x - 3y$ $4x - 7y$ $4x + 3y$ $-4x + 7y$ $-4x - 7y$

.....

.....

(c) A car travels x miles in 30 minutes.
Its average speed in miles per hour is [1]

$\frac{x}{2}$ $\frac{x}{30}$ $2x$ $\frac{2}{x}$ $30x$

.....

.....

Examiner only

13. A solution to the equation

$$2x^3 - 3x - 17 = 0$$

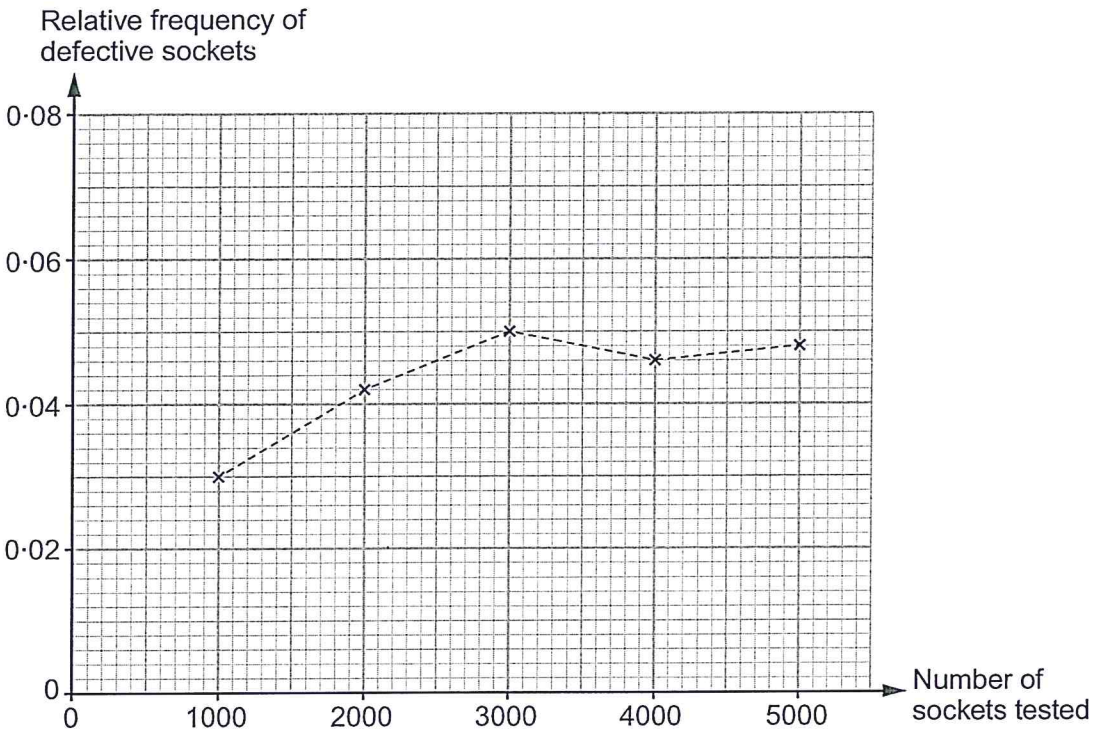
lies between 2 and 3.

Use the method of trial and improvement to find this solution correct to 1 decimal place. You must show all your working. [4]

Examiner only

16. A factory uses a machine to produce electrical sockets.
The manager carries out a survey to investigate the probability of the machine producing a defective socket.

The relative frequency of defective sockets produced was calculated after testing a total of 1000, 2000, 3000, 4000 and 5000 sockets.
The results are plotted on the graph below.



(a) How many of the first 3000 sockets tested were defective? [2]

.....

.....

(b) Write down the best estimate for the probability that one socket, selected at random, will be defective.
You must give a reason for your choice. [2]

Probability: .....

Reason: .....

.....

Examiner only

17. Points *A*, *B*, *C* and *D* lie on the circumference of a circle, centre *O*.
BD is a diameter of the circle.
The straight line *BC* = 4·7 cm and $\widehat{BAC}$ = 28°.

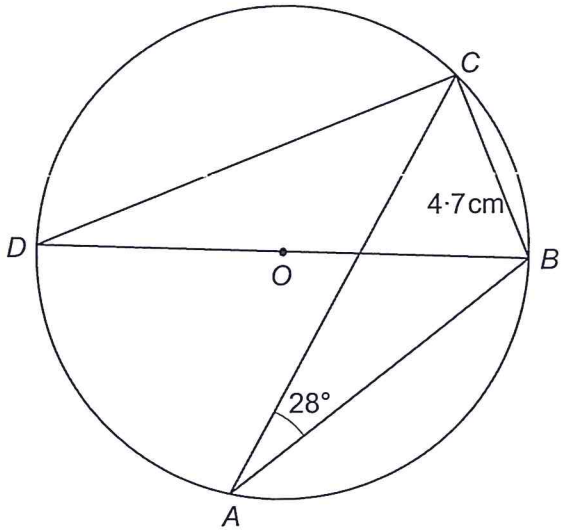


Diagram not drawn to scale

Write down the size of $\widehat{BDC}$.
Hence, calculate the length *BD*.
You must show all your working. [5]

Examiner only

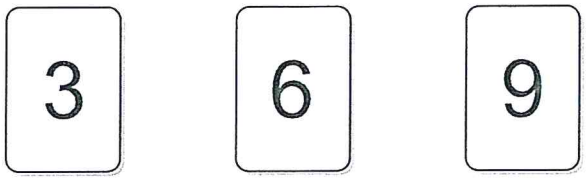
18. *(a)* Factorise $x^2 - 2x - 24$, and hence solve $x^2 - 2x - 24 = 0$. [3]

(b) Solve the equation $\frac{4x-3}{2} + \frac{7x+1}{6} = \frac{29}{2}$. [4]

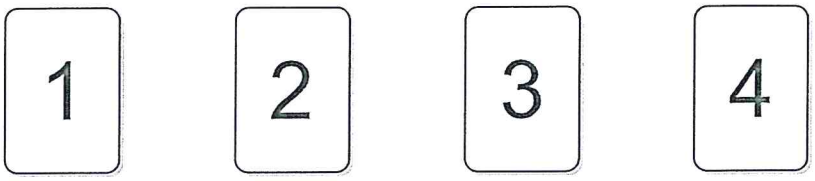
END OF PAPER

Examiner only

5. Three **red** cards have the following numbers written on them.



Four **green** cards have the following numbers written on them.



In a game, the cards are turned face down.
A player chooses one red card and one green card at random.
The player's score is the sum of the two numbers.

(a) Complete the following table. [1]

		Score		
Red card	9	.....	11	.....	.....
	6	.....	8	.....	.....
	3	4	5	6	7
		1	2	3	4

Green card

(b) A player wins a prize if the score is **more** than 9.
Safira plays the game once. What is the probability that she wins a prize? [2]

.....

.....

(c) 60 people play the game once.
Approximately how many people would you expect to win a prize? [2]

.....

.....

Examiner only

7. Solve each of the following equations.

(a) $\frac{w}{5} = 10$ [1]

.....

.....

(b) $\frac{42}{x} = 7$ [1]

.....

.....

.....

(c) $13y - 5 = 9y + 27$ [3]

.....

.....

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Examiner only

10. A regular polygon has exterior angles of 45°.

(a) How many sides does this polygon have? [2]

.....

.....

.....

(b) Each side of this regular polygon is 7 cm.
A sketch of two sides of the polygon is shown below.
The two sides are *AB* and *BC*.

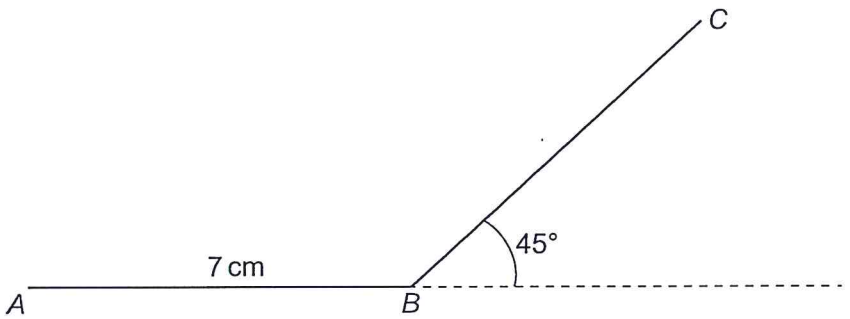


Diagram not drawn to scale

Construct an accurate drawing that shows these **two sides** of the polygon.
Use only a ruler and a pair of compasses.
The point *A* has been given.
You must show your construction arcs. [4]

A •

Examiner only

12. A fair six-sided dice and a fair coin are thrown together once.

Circle the correct answer for each of the following statements.

(a) The number of possible outcomes is [1]

2 6 8 12 24.

(b) The probability of getting a **4** on the dice and a **tail** on the coin is [1]

$\frac{1}{8}$ $\frac{1}{12}$ $\frac{1}{2}$ $\frac{1}{6}$ $\frac{1}{24}$.

(c) The probability of getting a **multiple of 3** on the dice and a **head** on the coin is [1]

$\frac{1}{8}$ $\frac{1}{12}$ $\frac{1}{2}$ $\frac{1}{6}$ $\frac{1}{24}$.

Space for working:

Examiner only

16. Alwyn often drives from Bangor to Cardiff.
He always chooses one of two routes for these journeys.
He either travels through Rhayader or through Hereford.
The probability that he travels through Rhayader is 0·7.

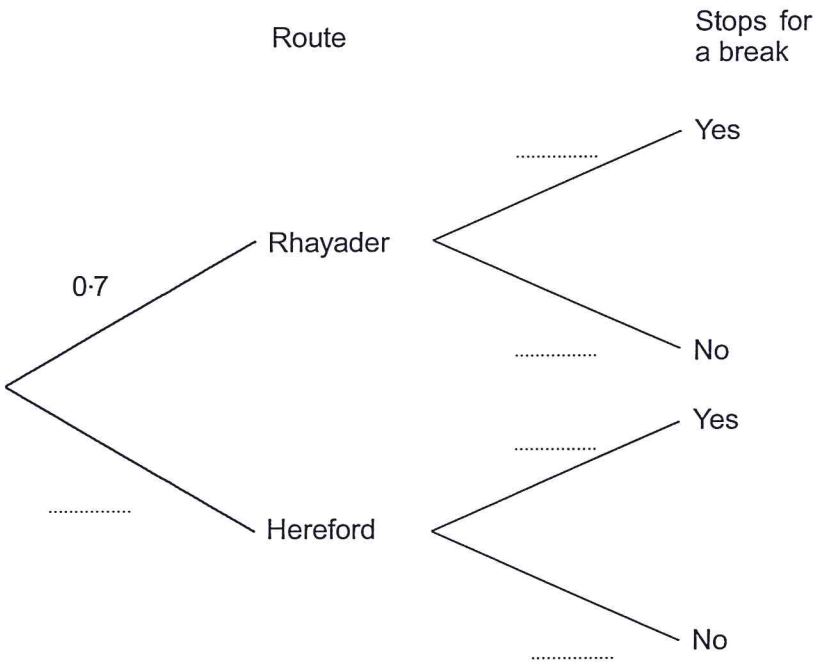
Sometimes he decides to stop for a break during his journey.
His decision is independent of the route he takes.

The probability that he travels through Rhayader **and** stops for a break is 0·42.

(a) Complete the following tree diagram. [4]

.....

.....



(b) Calculate the probability that Alwyn travels through Hereford but **does not** stop for a break. [2]

.....

.....

.....

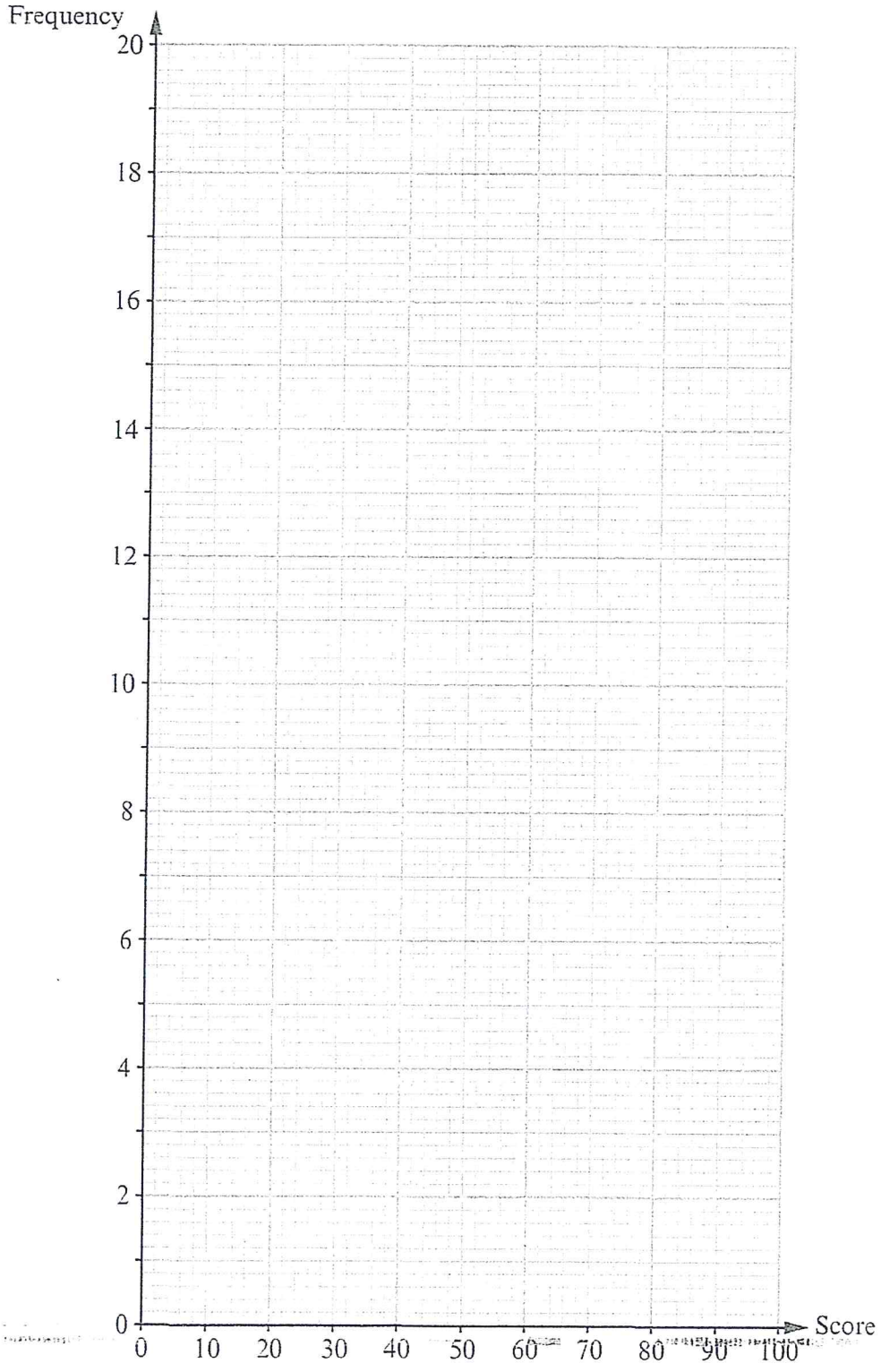
Frequency Polygons

Examiner only

(b) The points scored by 40 fishermen in a competition were recorded. The table shows a grouped frequency distribution of the results.

Score	1 to 20	21 to 40	41 to 60	61 to 80	81 to 100
Frequency	4	16	12	6	2

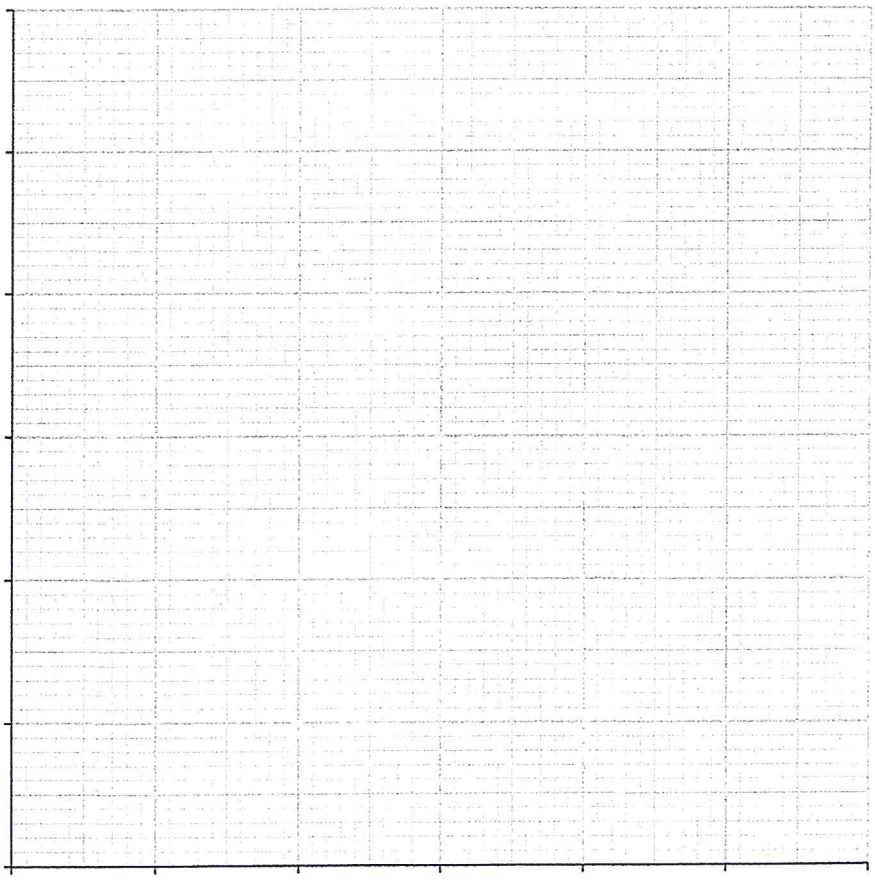
On the graph paper below, draw a frequency polygon to show the data. [2]



10. The duration, in minutes, of each of 150 phone calls was recorded. The table shows a grouped frequency distribution of the results.

Duration of phone call in minutes (t)	Number of phone calls
$0 < t \leqslant 5$	36
$5 < t \leqslant 10$	58
$10 < t \leqslant 15$	26
$15 < t \leqslant 20$	18
$20 < t \leqslant 25$	10
$25 < t \leqslant 30$	2

(a) On the graph paper below, draw a grouped frequency diagram for the data. [3]

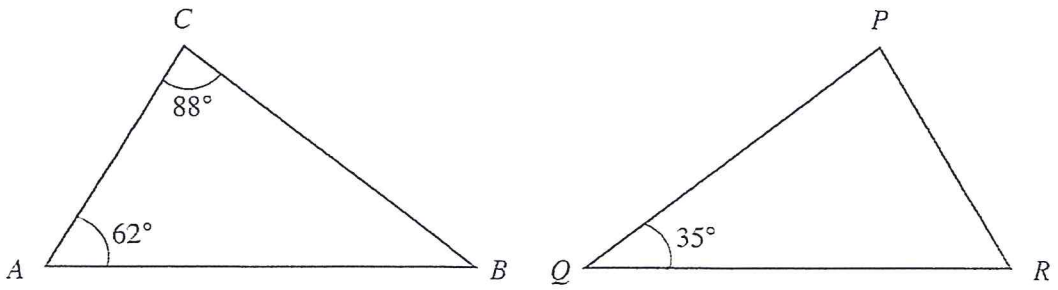


SIMILAR TRIANGLES

Examiner only
Arholwr yn unig

NC

12. *(a)* Explain clearly why the following triangles are **NOT** similar.



Diagrams not drawn to scale.

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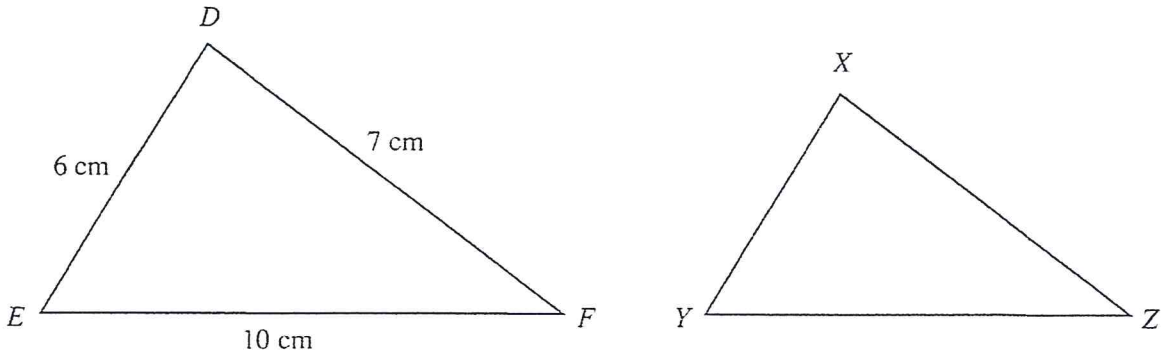
[2]

(b) Triangles *DEF* and *XYZ* are similar. Their corresponding sides are in the ratio 4:3. Calculate the length of *YZ*.



Diagrams not drawn to scale.

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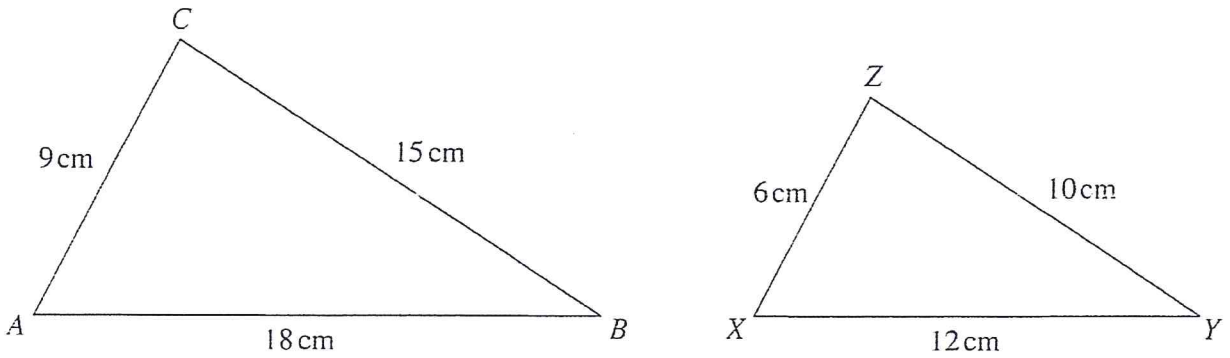
[2]

Examiner only

16. *(a)* Explain clearly why triangles *ABC* and *XYZ* are similar.



Diagrams not drawn to scale.

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[2]

(b) Triangle *PQR*, in which *PQ* = 15 cm, is similar to both triangles *ABC* and *XYZ*. Calculate the length of *QR*.

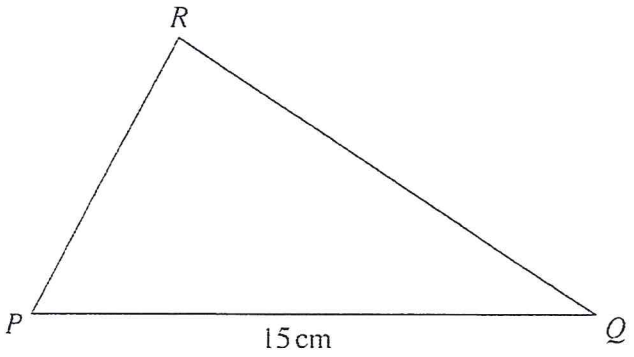

Diagram not drawn to scale.

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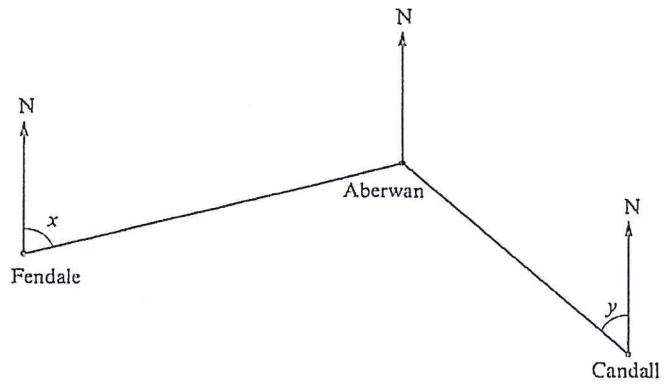
[2]

THREE-FIGURE BEARINGS

Examiner only

14. The diagram shows three places Fendale, Aberwan and Candall in the positions that they would appear on a map drawn to scale.



(a) Measure the angles marked x and y on the diagram.

$x =$ ..... °

$y =$ ..... °

[2]

(b) Find the bearing of

(i) Aberwan from Fendale,

.....

[1]

(ii) Fendale from Aberwan.

.....

[1]

(c) Find the bearing of Aberwan from Candall.

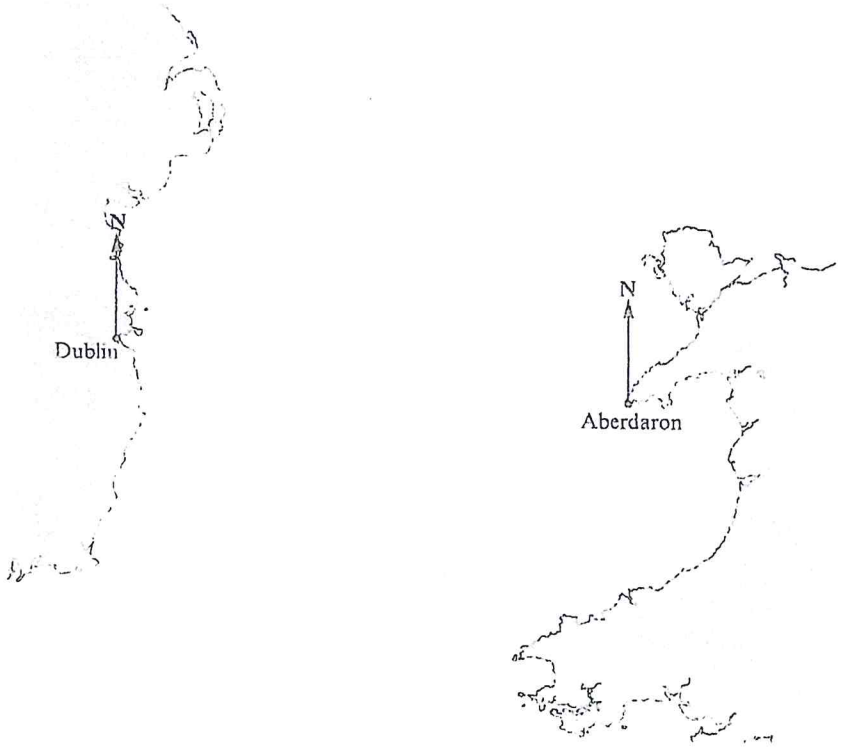
.....

[2]

Examiner only

11. A ship, S, is on a bearing of 075° from Dublin and on a bearing of 330° from Aberdaron. By drawing suitable lines on the diagram below, mark the position of S.

[3]



Changing the Subject of a Formula PPQ's

Easier ones (subject only appears once) Grade C

1. Make n the subject of the formula $4(2n + x) = 6x - 5$ [3]
2. Make r the subject of the formula $7 - 6f = 4(5 - 2r)$ [3]
3. Make t the subject of the formula $2n + 5 = 3(8 - 3t)$ [3]
4. Make d the subject of the formula $4(d - 2e) = 7 + 3e$ [3]
5. Make d the subject of the formula $h = \sqrt{t - d}$ [2]
6. Make n the subject of the formula $\sqrt{3n + 4p} = m$ [3]

Harder ones (subject appears more than once) Grade B

7. Make t the subject of the formula $w(5 - 3t) = 2(t + 5)$ [4]
8. Make x the subject of the formula $y = \dfrac{x + 9}{2x - 5}$ [5]
9. Make e the subject of the formula $\dfrac{d(2 + e)}{5 - e} = 3$ [4]

Expanding Brackets

1. Expand $3(2x - 5)$

2. Expand and simplify $4(3x - 1) - 3(x - 5)$

3. Simplify $(5x^3)^2$

4. Expand and simplify $(x + 7)(x - 3)$

5. Make d the subject of the formula
   $4(d - 2e) = 7 + 3e$

Factorising

6. Factorise (a) $10x + 15$ (b) $14 + 7x$ (c) $3x^2 + 5x$ (d) $12x^2 - 8x$

7. Factorise (a) $x^2 + 8x + 12$ (b) $x^2 - 6x + 8$ (c) $x^2 + 8x - 20$

DENSITY

Examiner only
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(1) A metal bar has a uniform cross-section in the shape of a trapezium $ABCD$.

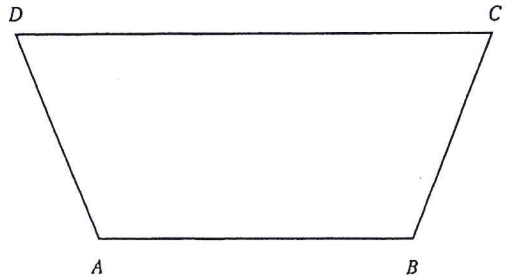


Diagram not drawn to scale.

The area of the cross-section of the metal bar is 48·7 cm^2.
It is 12·8 cm long and has a mass of 3·2 kg.
Calculate the density of the metal from which the bar is made, giving your answer in g/cm^3.

[4]

Turn over.

Examiner only
Arholwr yn unig

(2)

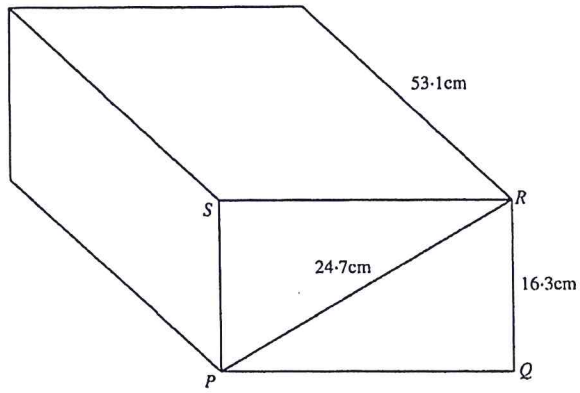


Diagram not drawn to scale.

The diagram shows a cuboid of length 53·1 cm. The cross-section, $PQRS$, is such that PR = 24·7 cm and QR = 16·3 cm.

(a) Calculate the length of PQ.

[3]

(b) The density of the material from which the cuboid is made is 4·3 g/cm^3. Calculate the mass of the cuboid in kilograms.

[3]

Turn over.

EXCHANGE RATES PPQ's

1

(a) Marcus changed £900 into US dollars ($), when the rate of exchange was £1 = $1.55.
How many dollars did he get?

.....

.....

.....

.....

[2]

(b) After his holiday Marcus had $132 left. He exchanged these dollars into pounds when the rate of exchange was £1 = $1.65. How many pounds did he get?

.....

.....

.....

.....

[2]

2

(a) Susan changed £500 into South African Rand, when the rate of exchange was £1 = 9.90 Rand. How many Rand did she get?

.....

.....

.....

[3]

(b) During her holiday Susan spent 4005 Rand.

(i) How many Rand did she have left?

.....

.....

[1]

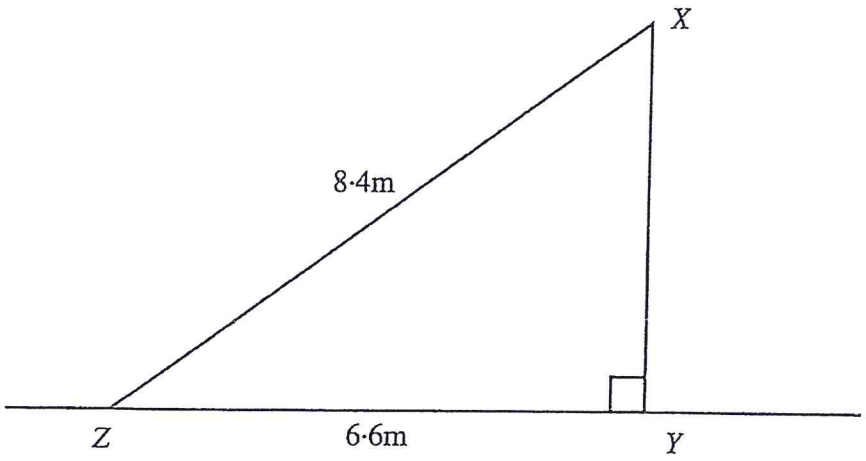
(ii) She changed her remaining Rand into pounds, when the exchange rate was £1 = 10.50 Rand.
How many pounds did she get?

.....

.....

[2]

5 One end of a piece of rope 8·4 m long is tied to the top of a vertical pole XY and the other end is tied to the ground at the point Z which is at a horizontal distance of 6·6 m from the foot of the pole. Calculate the height of the pole.



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6 The diameter of a circle, AB, is of length 8·7 cm, BC has length 5·4 cm and $\hat{ACB} = 90°$. Calculate the length of AC.

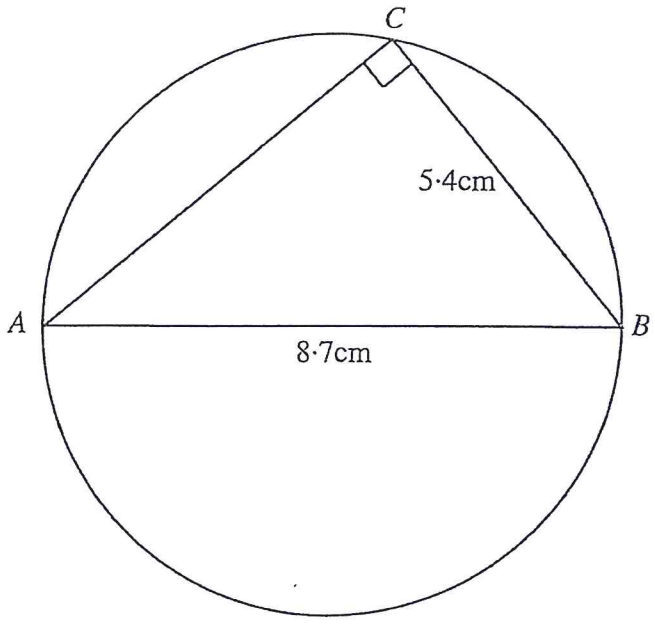

Diagram not drawn to scale.

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10. A building stands on the horizontal ground *ABC*. The point *E* is 23 metres below the top of the building along the vertical face, *DEB*. The point *C* is 46 m from the point *B*. The angle of elevation of the point *E* from the point *C* is 37°.

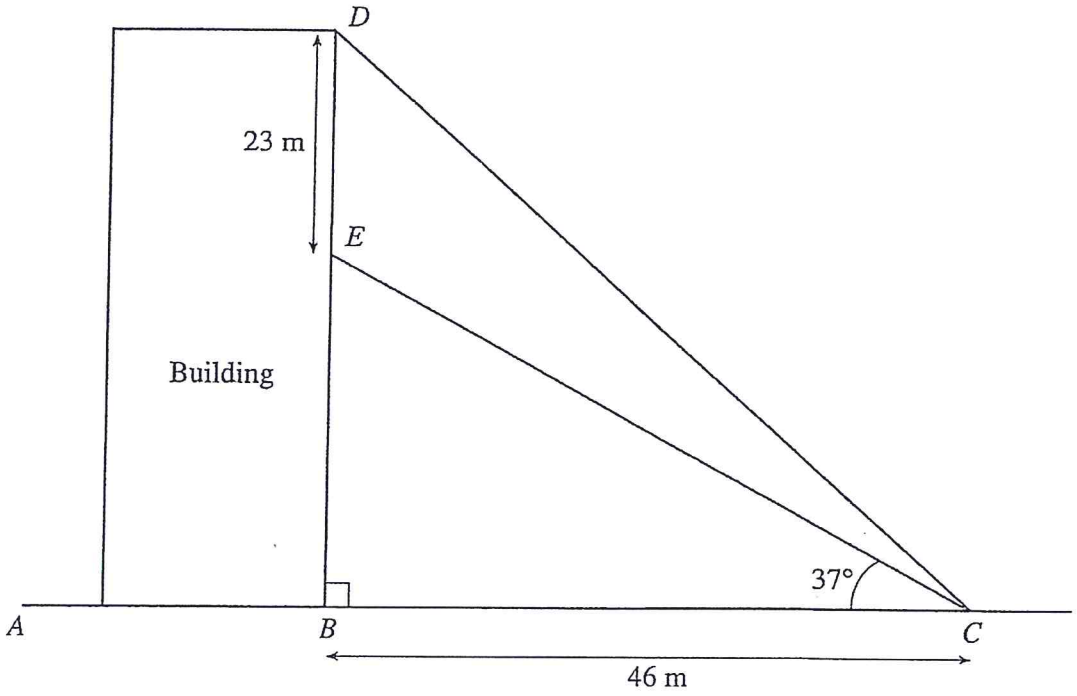

Diagram not drawn to scale.

(a) Calculate the height of the building.

.....

.....

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.....

.....

[3]

(b) Calculate the angle of elevation of the top of the building from the point *C*.

.....

.....

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.....

[3]

Examiner only

13. *(a)* From a harbour a yacht sails 4·1 km North.
It then sails 7·7 km East before dropping the anchor.
Calculate the bearing of the yacht from the harbour.

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[5]