GCSE

wjec cbac

3300U40-1

MATHEMATICS
UNIT 2: CALCULATOR-ALLOWED
INTERMEDIATE TIER

THURSDAY, 7 JUNE 2018 – MORNING

1 hour 45 minutes

ADDITIONAL MATERIALS

A calculator will be required for this examination.
A ruler, protractor and a pair of compasses may be required.

INSTRUCTIONS TO CANDIDATES

Use black ink or black ball-point pen. Do not use gel pen or correction fluid.

You may use a pencil for graphs and diagrams only.

Write your name, centre number and candidate number in the spaces at the top of this page.

Answer **all** the questions in the spaces provided.

If you run out of space, use the continuation page at the back of the booklet. Question numbers must be given for all work written on the continuation page.

Take π as 3·14 or use the π button on your calculator.

INFORMATION FOR CANDIDATES

You should give details of your method of solution when appropriate.

Unless stated, diagrams are not drawn to scale.

Scale drawing solutions will not be acceptable where you are asked to calculate.

The number of marks is given in brackets at the end of each question or part-question.

In question **8**, the assessment will take into account the quality of your linguistic and mathematical organisation, communication and accuracy in writing.

For Examiner's use only		
Question	Maximum Mark	Mark Awarded
1.	6	
2.	3	
3.	4	
4.	3	
5.	4	
6.	3	
7.	4	
8.	6	
9.	3	
10.	4	
11.	4	
12.	3	
13.	4	
14.	4	
15.	3	
16.	5	
17.	6	
18.	5	
19.	6	
Total	80	

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1. *(a)* Solve $\frac{x}{4} = 7$.

[1]

$x = 7 \times 4$

$x = 28$

(b) Simplify $3f + 7g + f - 4g$.

[2]

$= 4f + 3g$

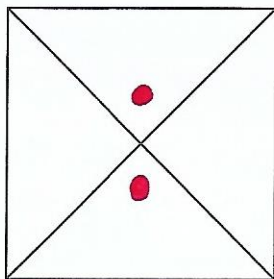*(c)* Use the formula $5p + 2q = t$ to find the value of q when $p = 4$ and $t = 24\cdot6$.

[3]

$= 5(4) + 2(24\cdot6)$

$= 20 + 49\cdot2$
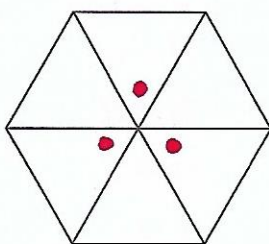
$= 69\cdot2$

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2. *(a)* The square drawn below has rotational symmetry of order 4.
Place **two** identical dots (•) on the square so that it will have rotational symmetry of order 2. [1]
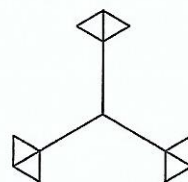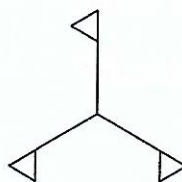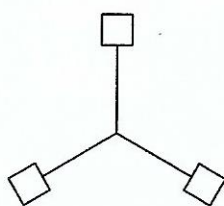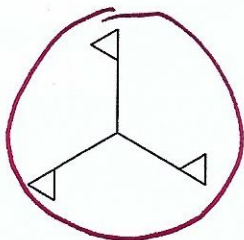

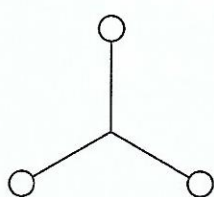*or equivalent*

(b) The regular hexagon drawn below has rotational symmetry of order 6.
Place **three** identical dots (•) on the regular hexagon so that it will have rotational symmetry of order 3. [1]

(c) Which of the following shapes has rotational symmetry of order 3, but has **no** line symmetry?
Circle the correct shape. [1]

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3. A travel company offers the following holiday options.

Time	Accommodation	Transport
Summer or Winter	Cottage or Hotel	Train or Bus or Car

(a) List all the possible different combinations of holiday options that the company offers. One has been done for you. [3]

Time	Accommodation	Transport
Summer	Cottage	Train
Summer	Cottage	Bus
Summer	Cottage	Car
Summer	Hotel	Train
Summer	Hotel	Bus
Summer	Hotel	Car
Winter	Cottage	Train
Winter	Cottage	Bus
Winter	Cottage	Car
Winter	Hotel	Train
Winter	Hotel	Bus
Winter	Hotel	Car

(b) A holiday is chosen at random from all the different combinations on offer. P is the probability that the chosen holiday is a

Summer holiday, staying in a Cottage and travelling by Train.

Mark the point P on the probability scale shown below. [1]

4. Which of the following fractions is nearest to $\frac{1}{4}$?

$$\frac{1}{5} \qquad \frac{7}{25} \qquad \frac{13}{50}$$

You must show all your working. [3]

LCM of 4, 5, 25 and 50 = 100

$\frac{1}{4} = \frac{25}{100}$ $\frac{1}{5} = \frac{20}{100}$ $\frac{7}{25} = \frac{28}{100}$

$\frac{13}{50} = \frac{26}{100}$

$\frac{26}{100}$ is closest to $\frac{25}{100} = \frac{1}{4}$

Answer $\dfrac{13}{50}$

5. Calculate **both** the area and the perimeter of a rectangle 6 cm long and 4·5 cm wide.

Use the answer spaces to clearly identify which is the area and which is the perimeter. You must give the correct units for each of your answers. [4]

$A = Lw$ $P = 6 + 4.5 + 6 + 4.5$
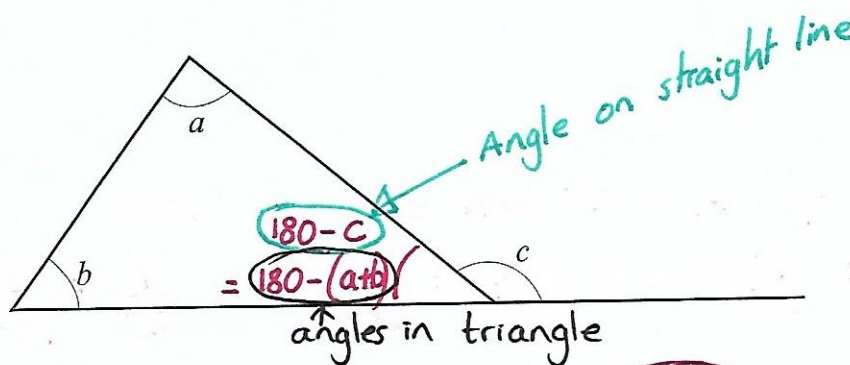$A = 6 \times 4.5$ $P = 21\,cm$
$A = 27\,cm^2$

Area = $27\,cm^2$ Perimeter = $21\,cm$

(3300U40-1) **Turn over.**

6. Circle the correct equation for each of the following.
All the lines shown are straight lines.

(a) [1]

Angle on straight line (handwritten)

$180 - c$ (circled, handwritten)

$= 180 - (a+d)$ (circled, handwritten)

angles in triangle (handwritten)

$a = b + c$ $b = c + a$ $b = a - c$ $c = a + b$ (circled) $c = a - b$

(b) [1]

d b (handwritten)
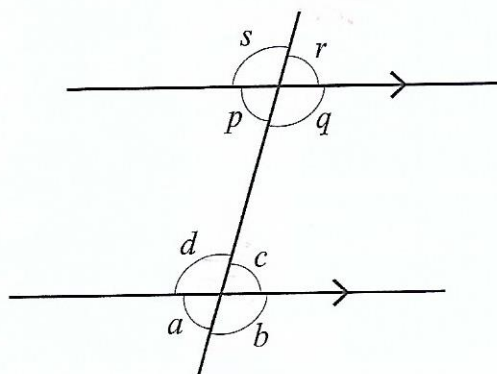
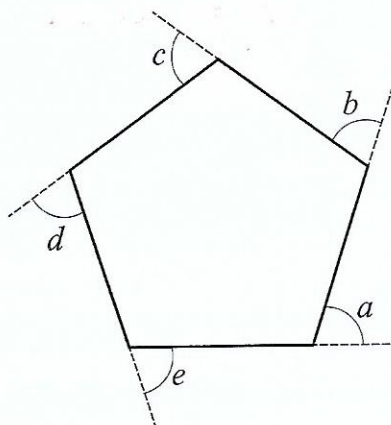$a + c + s + q = 360°$ (circled) $p + a = 180°$ $c = q$ $d = r$ $p + q + d + c = 180°$

(c) [1]

$\dfrac{a+b+c+d+e}{5} = 360°$ $a+b+c+d+e = \dfrac{360°}{5}$ $a+b+c+d+e = 180°$

$a+b+c+d+e = 540°$ $a+b+c+d+e = 360°$ (circled)

5 exterior angles add up to 360° (handwritten)

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7. Calculate the mean of these four time periods.
You must give your answer in hours and minutes. [4]

5 hours 20 minutes   2 hours 44 minutes   6 hours 18 minutes   4 hours 34 minutes

Mean = $\dfrac{\text{Total Time}}{4}$

$= \dfrac{5h\ 20m + 2h\ 44m + 6h\ 18m + 4h\ 34m}{4}$

$= \dfrac{17h\ 116m}{4}$

$= \dfrac{18h\ 56m}{4}$

$= \dfrac{1136\ \text{mins}}{4}$

$= 284\ \text{mins}$

18 hours
$= 18 \times 60$
$= 1080\ \text{mins}$

4 hrs = 4 × 60
$= 240\ \text{mins}$

Mean time = ...4...... hours ......44...... minutes

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8. *In this question, you will be assessed on the quality of your organisation, communication and accuracy in writing.*

Cube **A** and cuboid **B** are shown below.

5 cm

A

5 cm

5 cm

5 cm

B

5 cm

4 cm

4 cm
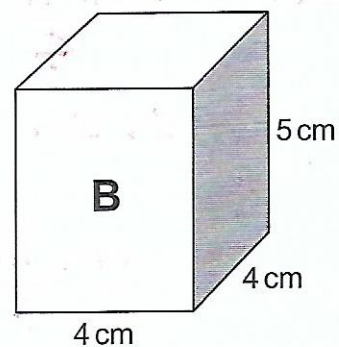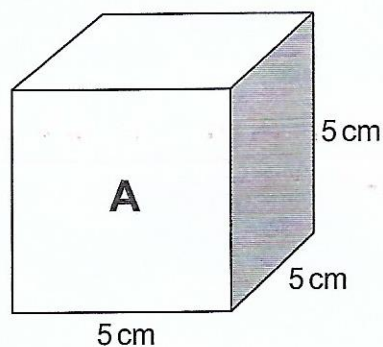
Diagrams not drawn to scale

Express the volume of **B** as a percentage of the volume of **A**.
You must show all your working.

[4 + 2 OCW]

$$\text{Vol } A = lbh \qquad \text{Vol } B = lbh$$
$$= 5 \times 5 \times 5 \qquad = 4 \times 4 \times 5$$
$$= 125 \, cm^3 \qquad = 80 \, cm^3$$

$$\therefore \quad \text{fraction needed} = \frac{80}{125}$$

$$= 0.64$$

$$\therefore \% \text{ needed} = 64\%$$

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9. The diagram below shows an ~~equilateral~~ triangle *ABC* with *AB* = $(4x − 7)$ cm.

All sides same

A

$(4x − 7)$ cm $\times$ $\times (4x-7)$

B   C

$(4x-7)$

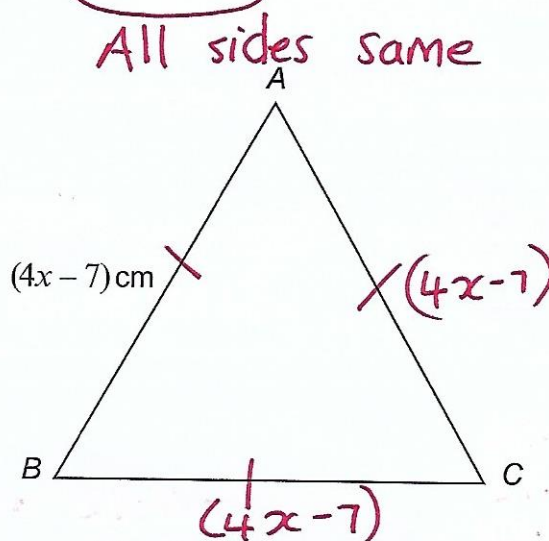*Diagram not drawn to scale*

The perimeter of the triangle is 27 cm.
Calculate the value of x.   [3]

$$4x - 7 + 4x - 7 + 4x - 7 = 27$$
$$12x - 21 = 27$$
$$12x = 27 + 21$$
$$12x = 48$$
$$x = \frac{48}{12}$$
$$x = 4 \text{ cm}$$

Turn over.

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Examiner only

10. A box contains many discs, identical in shape and size.
A picture of one of four Welsh castles is printed on each disc.

(a) A disc is chosen at random from the box.
Complete the table below to find the probability of choosing a disc showing Dinefwr Castle. [2]

Picture	Caernarfon Castle	Harlech Castle	Rhuddlan Castle	Dinefwr Castle
Probability	0·36	0·12	0·24	*0·28*

$$0·36$$
$$0·12$$
$$+0·24$$
$$\overline{0·72}$$

$$1 - 0·72 = 0·28$$

(b) In the box, there were 522 discs showing a picture of Caernarfon Castle.
How many of the discs showed a picture of Harlech Castle? [2]

$$0·36 \quad \equiv \quad 522$$
$$\searrow \div 3 \qquad \div 3$$
$$Harlech = 0·12 \equiv 174$$

11. *(a)* Calculate $\dfrac{145\cdot3}{(12\cdot4 - 9\cdot8)^3}$, giving your answer correct to 3 significant figures. [2]

....

....

(b) Calculate the reciprocal of 47, giving your answer correct to 4 decimal places. [2]

$$\frac{1}{47} = 0\cdot0213$$

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

(a) Which of the following values **cannot** be an external angle of a regular polygon? [1]

10°   18°   30°   (48°)   72°

If the polygon is regular then the external angle must be a factor of 360°. 48° is NOT.

(b) An arrow on a spinner is facing north.
It is turned clockwise through an angle of 1530°.
In which direction will the arrow now be facing? [1]

North   (East)   South   West   None of these

1530 ÷ 360 = 4·25 ∴ 4¼ revs

∴ after 4 revs North
4¼ revs EAST

(c) Point *A* is on a bearing of 100° from point *B*.
What is the bearing of point *B* from point *A*? [1]

260°   100°   (280°)   180°   80°

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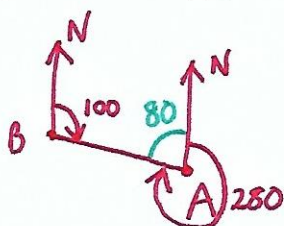**13.** A solution of the equation

$$x^3 - 7x - 51 = 0$$

lies between 4 and 5.

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

$\underline{x = 4.5}$

$LHS = 4.5^3 - 7(4.5) - 51 = +8.625$ TOO BIG

$\underline{x = 4.3}$

$LHS = 4.3^3 - 7(4.5) - 51 = -2.993$ TOO SMAL

$\underline{x = 4.4}$

$LHS = 4.4^3 - 7(4.4) - 51 = +3.384$ TOO BIG

$\underline{x = 4.35}$

$LHS = 4.35^3 - 7(4.35) - 51 = +0.863$ TC B

4.4 TOO BIG

4.35 TOO BIG

4.3 TOO SMALL

$\therefore x = 4.3$ to 1 d.p.

14. *(a)* The highest common factor (HCF) of 30 and 75 is the square root of a number. What is the number? [2]

HCF of 30 and 75 is 15
    (2×15)   (5×15)

∴ 15 is the square root of a number.

∴ $15^2 = 225$

∴ Number = 225

(b) The cube root of 32·768 is $33\frac{1}{3}$ % of a number.

What is the number? [2]

$\sqrt[3]{32·768} = 3·2$

∴ 3·2 is 33⅓ % of a number

∴ Number = 3 × 3·2

= 9·6

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Turn over.

15. *PQR* is a right-angled triangle, as shown below.
PQ = 1·41 m and *PR* = 0·89 m.
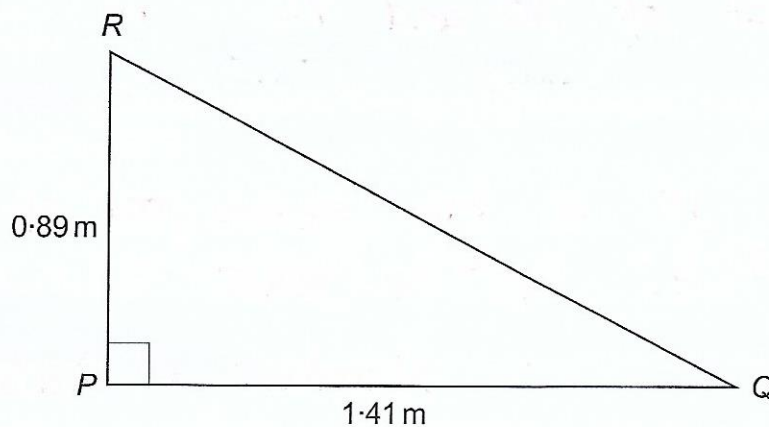
R

0·89 m

P

1·41 m

Q

Diagram not drawn to scale

Calculate the length of *QR*. [3]

$$h^2 = a^2 + b^2$$
$$QR^2 = 0.89^2 + 1.41^2$$

$$QR^2 = 0.7921 + 1.9881$$

$$QR^2 = 2.7802$$
$$QR = 1.667 \text{ M}$$

(3300U40-1)

16. Visitors to the top of Snowdon can either walk up the mountain or take the mountain railway from Llanberis.
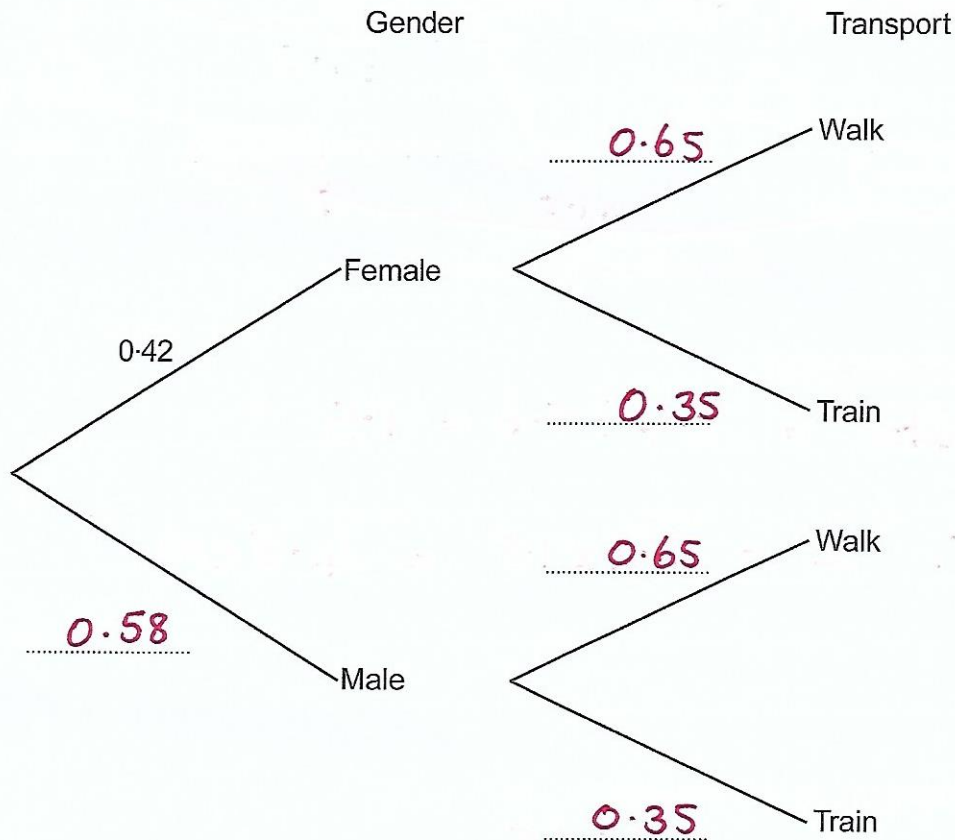On a particular day, a visitor to the top of Snowdon is chosen at random.
The probability that this person is female is 0·42.
The probability that this person took the train is 0·35.

The decision to walk or take the train is independent of gender.

(a) Complete the tree diagram shown below. [3]

Gender   Transport

                                              _0·65_ ⟋ Walk
                        ⟋ Female ⟨
                 0·42   _0·35_ ⟍ Train

            ⟨
                 _0·58_   _0·65_ ⟋ Walk
                        ⟍ Male ⟨
                                              _0·35_ ⟍ Train

(b) The person chosen at random receives a gift voucher.
What is the probability that this person is female and travelled up the mountain by train? [2]
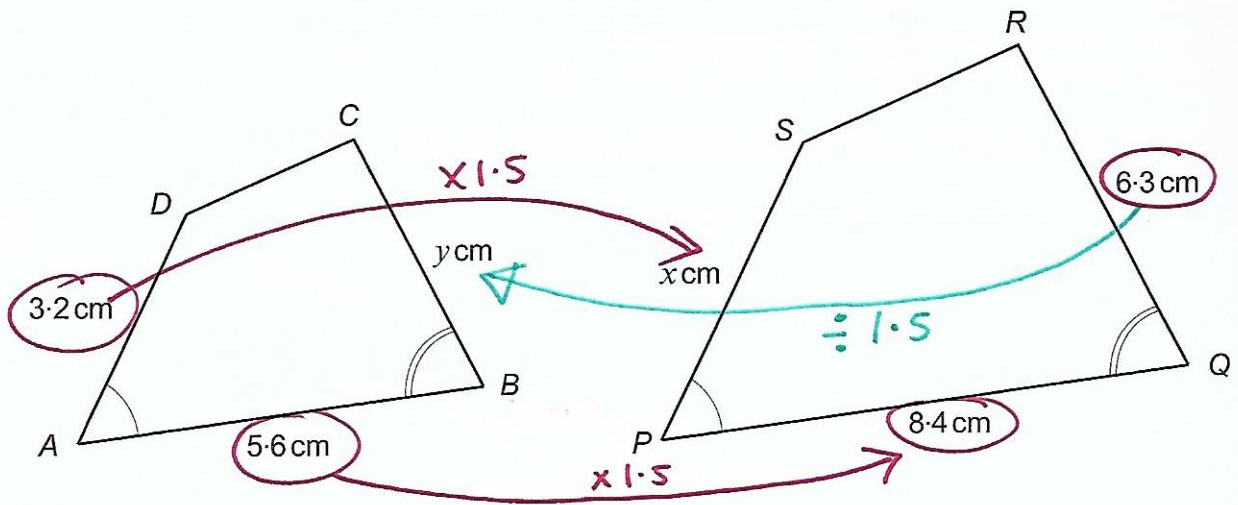
P(F and T)

= 0·42 × 0·35

= 0·147

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17. The diagrams below show two similar shapes, *ABCD* and *PQRS*.

×1·5

y cm

x cm

3·2 cm

÷1·5

6·3 cm

5·6 cm

8·4 cm

×1·5

Diagrams not drawn to scale

(a) Calculate the value of x. [2]

$$SFactor = 8\cdot4 \div 5\cdot6 = 1\cdot5$$

$$\therefore \quad x = 3\cdot2 \times 1\cdot5 = 4\cdot8\,cm$$

(b) Calculate the value of y. [2]

$$y = 6\cdot3 \div 1\cdot5$$

$$y = 4\cdot2\,cm$$

(c)   Explain clearly why the following statement cannot be true.   [2]

'The length of *CD* is 3·9 cm and the length of *RS* is 6·5 cm'.

$$6·5 \div 3·9 \neq 1·5$$

6·5 ÷ 3·9   does not equal   1·5

(3300U40-1)   **Turn over.**

18. A rectangle of length 12 cm and width $(2x - y)$ cm has an area of 72 cm^2.

12 cm

$(2x - y)$ cm
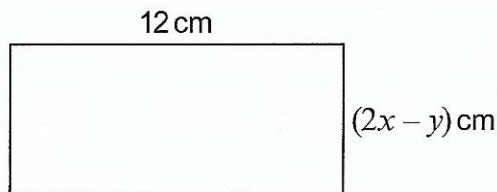
Diagram not drawn to scale

KLMN is a kite where *KL* = $3x$ cm and *LM* = y cm.

K

$3x$ cm

L

y cm

N

M

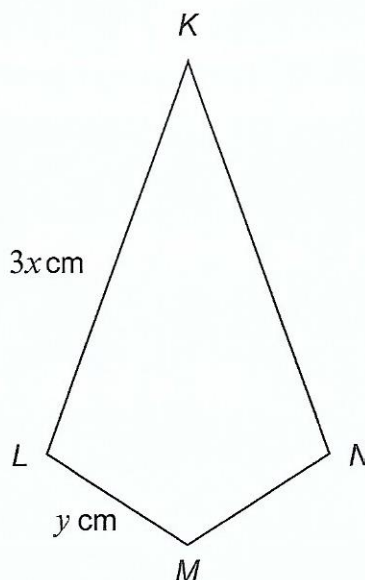*Diagram not drawn to scale*

The perimeter of the kite *KLMN* = 33 cm.

Calculate the values of x and y.

You must show all your working.
Do not use a trial and improvement method.

[5]

Rectangle

$A = lw$

$72 = 12(2x - y)$

$\div 12$

$6 = 2x - y$ —— ①

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kite

$$P = 3x + y + y + 3x$$

$$33 = 6x + 2y \qquad — \quad ②$$

$$6x + 2y = 33 \quad —② \quad \times 1$$

$$2x - y = 6 \quad —① \quad \times 2$$

$$6x + 2y = 33$$

$$4x - 2y = 12$$

ADD $\quad 10x \qquad = 45$

$$x = \frac{45}{10}$$

$$x = 4.5 \text{cm}$$

$$\therefore \quad \text{From} \quad ①$$

$$6 = 2(4.5) - y$$

$$y = 9 - 6$$

$$y = 3 \text{ cm}$$

(3300U40-1)

Turn over.

19. *ABC* and *CDE* are two right-angled triangles.

In triangle *ABC*, *AB* = 6·5 cm and *BC* = 10·4 cm.
In triangle *CDE*, *CE* = 9·4 cm.

$B\hat{C}E$ = 22°.
$A\hat{C}B = x°$.
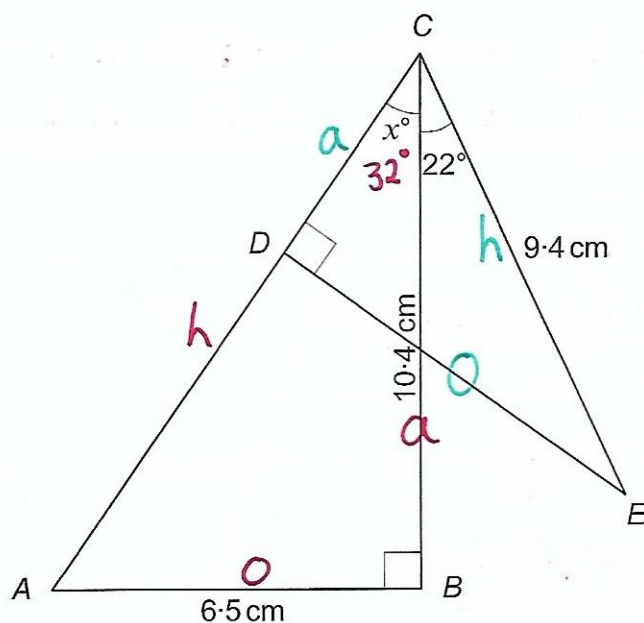

Diagram not drawn to scale

(a)   Calculate the value of x.   [3]

Use △ ABC

$$\tan x = \frac{6.5}{10.4}$$

$$\tan x = 0.625$$

$$x = 32°$$

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(b) Hence find the length of *DE*. [3]

Use △ CDE $\hat{C}$ = 32 + 22 = 54°

$$\sin x = \frac{O}{h}$$

$$\sin 54° = \frac{DE}{9.4}$$

$$9.4 \sin 54° = DE$$

$$7.6 \text{ cm} = DE.$$

END OF PAPER

(3300U40-1)