✳ WORKED SOLUTIONS ✳

Surname		Centre Number	Candidate Number
First name(s)			0

wjec cbac

GCSE

C300U20-1

|||||| A19-C300U20-1

eduqas
Part of WJEC

THURSDAY, 7 NOVEMBER 2019 – MORNING

MATHEMATICS – Component 2
Calculator-Allowed Mathematics
FOUNDATION TIER

2 hours 15 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.
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(s) at the back of the booklet, taking care to number the question(s) correctly.
Take π as 3·142 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.
You are reminded of the need for good English and orderly, clear presentation in your answers.

For Examiner's use only		
Question	Maximum Mark	Mark Awarded
1.	5	
2.	4	
3.	2	
4.	4	
5.	4	
6.	7	
7.	5	
8.	7	
9.	8	
10.	6	
11.	6	
12.	5	
13.	11	
14.	7	
15.	4	
16.	3	
17.	3	
18.	4	
19.	3	
20.	8	
21.	7	
22.	7	
Total	120	

C300U201
01

Formula list

Area and volume formulae

Where r is the radius of the sphere or cone, l is the slant height of a cone and h is the perpendicular height of a cone:

$$\text{Curved surface area of a cone} = \pi r l$$

$$\text{Surface area of a sphere} = 4\pi r^2$$

$$\text{Volume of a sphere} = \frac{4}{3}\pi r^3$$

$$\text{Volume of a cone} = \frac{1}{3}\pi r^2 h$$

Kinematics formulae

Where a is constant acceleration, u is initial velocity, v is final velocity, s is displacement from the position when $t = 0$ and t is time taken:

$$v = u + at$$

$$s = ut + \frac{1}{2}at^2$$

$$v^2 = u^2 + 2as$$

1. A sign in a shop shows the cost of sending letters and parcels.

What are you sending?	Class	Cost
Small letter	1st	67p
	2nd	58p
Large letter	1st	£1.01
	2nd	79p
Small parcel	1st	£3.45
	2nd	£2.95
Medium parcel	1st	£5.75
	2nd	£5.05

Customers can choose 1st or 2nd class post for different sizes of letter or parcel.

(a) What is the cost of sending 5 small letters, using 1st class post? [1]

5 × 0·67 = £3·35

(b) Helen always uses first class post.
She makes a large letter into a small letter by folding it in half.

How much money does this save? [2]

1·01 − 0·67 = £0·34 or 34p

(c) Brad sends:
  • 3 small parcels using 2nd class post,
  • 2 medium parcels using 1st class post.

How much does Brad pay to send all 5 parcels? [2]

3 × £2·95 = £8·85
2 × £5·75 = £11·50 +
£20·35

Brad pays £ 20·35

2. *(a)* The diagram shows a circle with centre *O*.
P, *Q* and *R* are points on the circle.
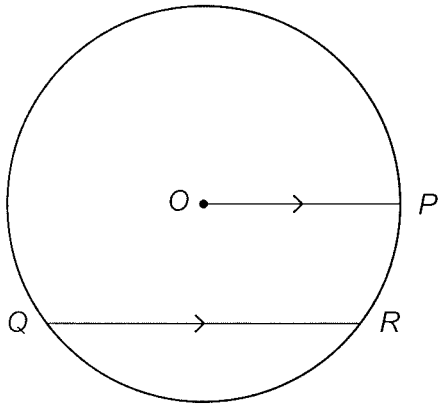
tangent   radius

area   chord

diameter   circumference

parallel   perpendicular

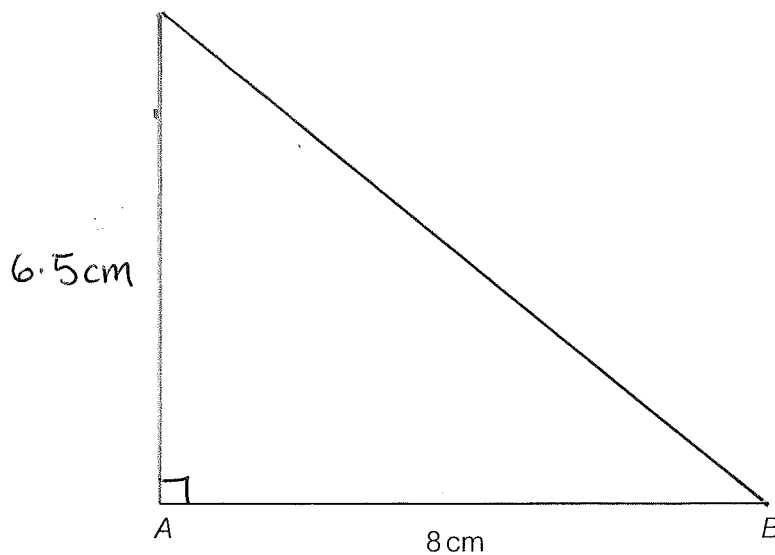Choose words from the box to complete these sentences.

(i) Line *OP* is a ....radius...........

(ii) Line *QR* is a ......chord........

(iii) Lines *OP* and *QR* are ......parallel...... . [2]

(b) *ABC* is a right-angled triangle in which:
- *AB* = 8 cm,
- angle *A* = 90°,
- *AC* = 6·5 cm.

Complete an accurate drawing of triangle *ABC*.
AB has been drawn for you. [2]

6·5 cm

A

8 cm

B

3. *(a)* The diagram shows a 2D shape made from squares.
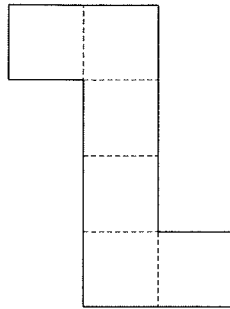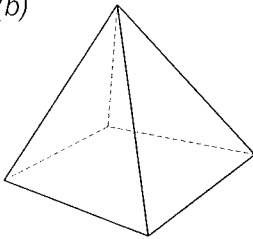
This shape is folded along each dotted line to make a 3D shape.

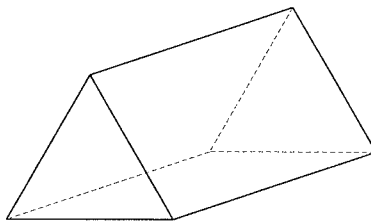Write down the name of this 3D shape. [1]

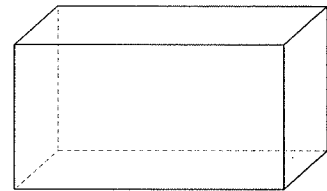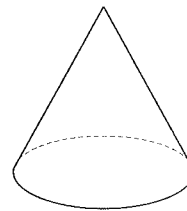.. Cube ....

(b)

A   B   C
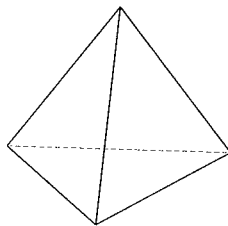
D   E

Which of the 3D shapes drawn above has 5 faces, 9 edges and 6 vertices?

Tick (✓) **one** box. [1]

A ☐   B ✓   C ☐   D ☐   E ☐
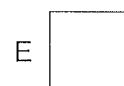
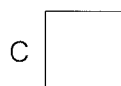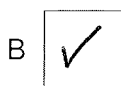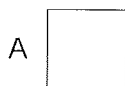**4.** Two sides of a square *EFGH* are shown on the 1 cm grid below.
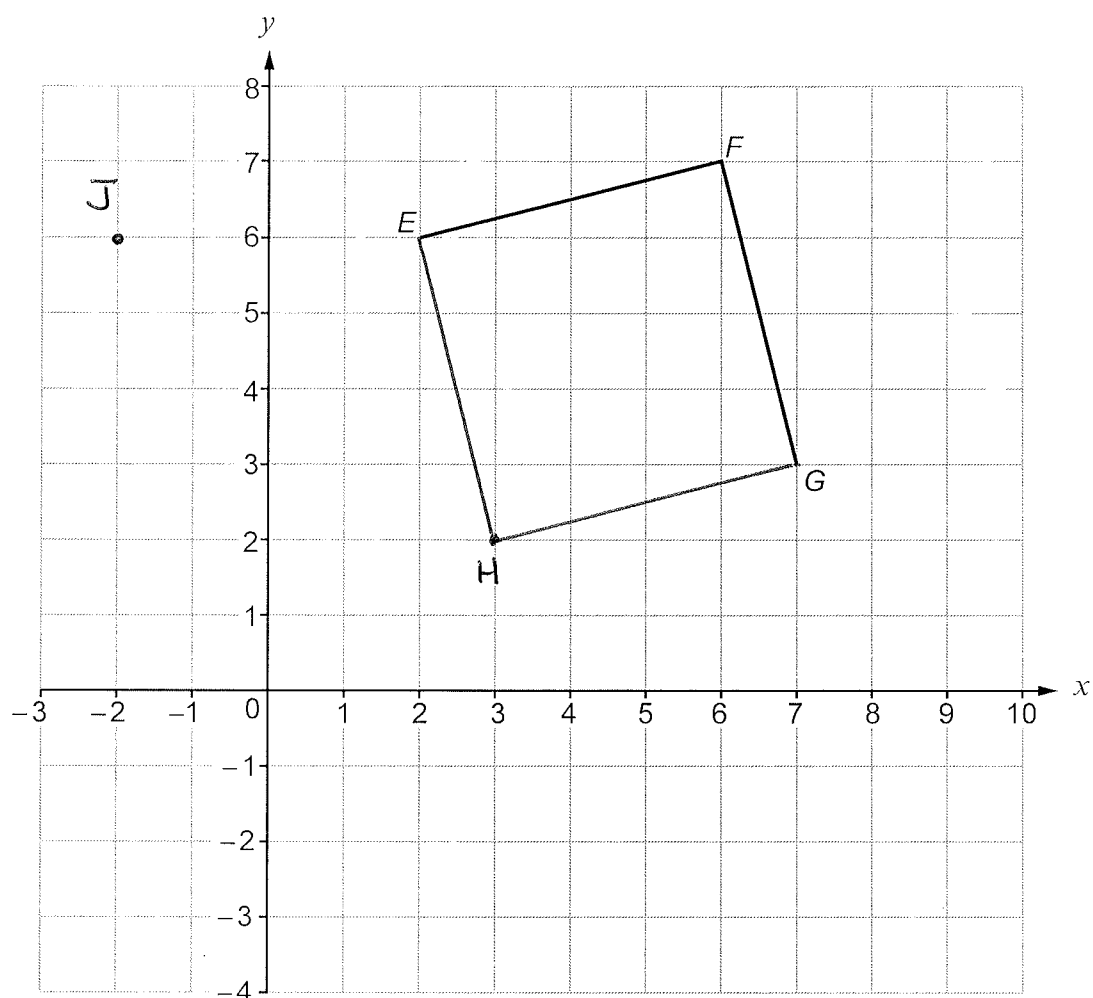
(a) Point *H* of the square is missing from the diagram.
Mark point *H* on the diagram.
Write down the coordinates of point *H*. [2]

(**3** , **2**)

(b) Point *J* is the reflection in the *y*-axis of point *E*.
Mark point *J* on the diagram.
Write down the coordinates of point *J*. [2]

(**−2** , **6**)

5. (a) The diagram shows a rectangular wall.

Calculate the <u>area</u> of the wall.
Round your answer correct to the nearest $10\,m^2$. [3]

11·8 m

3·2 m
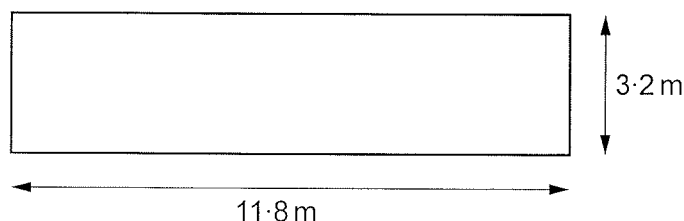
Diagram not drawn to scale

Area = L × W
= 11·8 × 3·2
= 37·76 m²
= 40 m² (to nearest 10 m²)

(b) The <u>area</u> of a different wall is <u>110 m²</u>.
Liesel wants to paint the wall. She uses paint from tins that each cover $25\,m^2$.

She calculates $110 \div 25 = 4\cdot4$ and says,

"I need to buy 4 tins of paint."   No 5 tins.

Is Liesel correct?

Yes ☐   No ✓

Explain how you decide. [1]

You need to round up not down
4 × 25 = 100 m² < 110 m² not enough
5 × 25 = 125 m²

       Turn over.

6. There are:
- 28 days in February, $28 \div 7 = 4$ weeks
- 52 weeks in a year.

(a) Emile is given £8.12 pocket money every week.

How much pocket money is Emile given in a whole year? [1]

$8 \cdot 12 \times 52 = £422 \cdot 24$

(b) For this year, Catrin is given £7.35 pocket money every week.

(i) How much pocket money is Catrin given in February? [2]

$7 \cdot 35 \times 4 = £29 \cdot 40$

(ii) Catrin multiplies the total for February by 12.

This method will not give the correct amount for the whole year.
Why not? [1]

February has less days than other months.
$4 \times 12 = 48$ weeks < 52 weeks/yr

(c) Each morning, Aled is given 95p pocket money.
He saves all his pocket money from 1st February until the 15th March.

Will Aled have saved enough money to pay £40 for a concert ticket on the evening of the 15th March?
You must show all your working. [3]

Total #days $= 28 + 15 = 43$ days.

$43 \times 0 \cdot 95 = £40 \cdot 85 \qquad > £40$

Yes, he will have enough money

7. This table shows minimum rates of pay in the UK for 2018.

Minimum wage	
Age (years)	Rate of pay (per hour)
Under 18	£4.20
18 – 20	£5.90
21 – 24	£7.38
25 and over	£7.83

(a) In 2018, Barry was 19 years old and earned the minimum wage per hour.

(i) Calculate the pay that Barry earned for working 23 hours. [1]

23 × £5.90 = £135.70

(ii) One week, Barry earned £218.30.

How many hours did Barry work for this week? [2]

218.30 ÷ 5.90 = 37 hours

(b) In 2018, Shanice was 22 years old and earned the minimum wage per hour. One week, Shanice worked for 32 hours and received a bonus of £25.

Calculate how much Shanice earned for this week. [2]

32 × £7.38 = £236.16
236.16 + 25 = £261.16

8. *(a)* The table and bar chart below show some information about the number of pets seen by a vet on Tuesday.

Frequency

Type of pet	Frequency
Cat	14
Dog	16
Rabbit	8
Bird	12
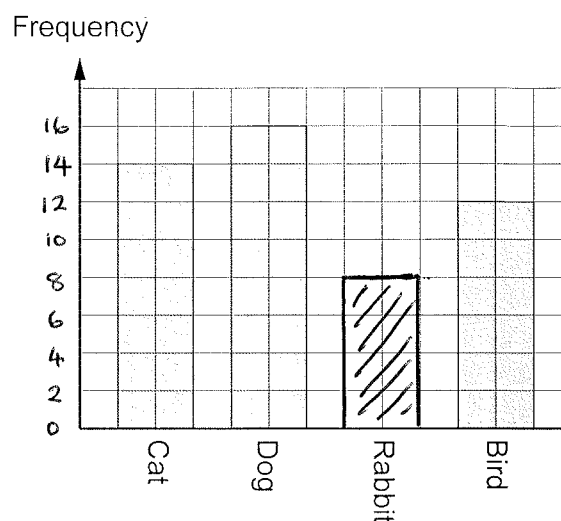
(i) Using the information above, complete the table and draw the bar for rabbit. [3]

(ii) Which is the modal type of pet? [1]

(most common)   Dog

(b) The table below shows the number of pets seen by the vet on Wednesday.

Type of pet	Frequency
Cat	10
Dog	17
Rabbit	9
Bird	12
Total	**48**

(i) The vet decides to show this information in a pie chart.

Calculate the angle used to show the cats. [2]

$360 \div 48 = 7.5°$ per animal

$7.5 \times 10 = 75°$ //

(ii) A pet is chosen at random from the pets that were seen on Wednesday.

What is the probability that this pet is a dog? [1]

$\dfrac{17}{48}$ //

 Turn over.

9. *(a)* (i) Simplify $9a - 1 - 6a + 8$. [2]

$9a - 6a = 3a$

$-1 + 8 = 7$

$3a + 7$ //

(ii) Expand $3(x + 2)$. [2]

$3x + 6$

(b) Solve each of the following.

(i) $x + 6 = 15$ [1]

$\begin{array}{cc} -6 & -6 \end{array}$

$x = 9$

(ii) $\frac{y}{7} = 6$ [1]

$\begin{array}{cc} \times 7 & \times 7 \end{array}$

$y = 42$

(c) $v = u + at$

Find v when $u = -2$, $a = 6$ and $t = 3$. [2]

$V = (-2) + (6)(3)$

$V = -2 + 18$

$V = 16$

10. *(a)* A newspaper headline states,

'63% of households in Barville owe money'

What percentage of households do not owe money? [1]

100 - 63 = 37%

(b) The households of Churchton owe a total of £8 100 043.

Write 8 100 043 in words. [1]

Eight million, one hundred thousand and forty-three

(c) There are 3650 households in Lowtown.
48% of these households owe an average of £3400.

Calculate the total amount of money owed by these households. [3]

$\frac{48}{100}$ × 3650 = 1752 households

1752 × 3400 = £5 956 800

(d) There are 49 000 households in Hamborough.
21 425 households are **not** in debt.

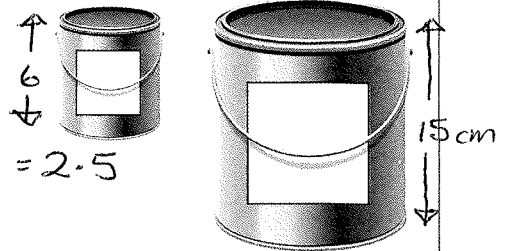What fraction of households in Hamborough **are** in debt? [1]

49000 - 21425 = 27575   households not in debt

OR

$\frac{27575}{49000}$ = $\frac{1103}{1960}$

11. *(a)* A factory sells paint in different size tins.

The square label on a small tin has a height of 6cm.
The square label on a large tin has a height of 15cm.

$$\text{Scale factor} = \frac{15}{6} = 2.5$$

Complete this statement:

The large label is an enlargement of the small label

using a scale factor of **2.5**

Diagram not drawn to scale

6

15cm

[1]

(b) The factory makes orange paint by mixing yellow paint and red paint.

On Monday, they use 66 litres of yellow paint and 99 litres of red paint.
On Tuesday, they use 264 litres of yellow paint.

How many litres of red paint must be used on Tuesday to make the same colour of orange? [2]

$$Y : R \qquad\qquad \frac{264}{66} = 4$$

Monday   66 : 99

$\downarrow$×4 : $\downarrow$×4

Tuesday   264 : 396   396 litres of red paint

(c) Three friends buy some paint.

- Murphy buys 5 litres of paint.
- Jane buys 3 times as much paint as Murphy. $5 \times 3 = 15\ell$
- Alexei buys half as much paint as Jane. $15 \div 2 = 7.5\ell$
- Paint costs £4.95 for half a litre.

Calculate the total cost of the paint. [3]

$$M : J : A \qquad \text{Total}$$
$$5 : 15 : 7.5 \qquad 27.5\ell$$

$$27.5 \times 4.95 \times 2 = £272.25$$

The total cost of the paint is £ **272.25**

12. In the diagram, triangle *ABC* is isosceles.

AC and *DE* are parallel, $B\hat{A}C = 72°$ and $A\hat{C}D = 37°$.
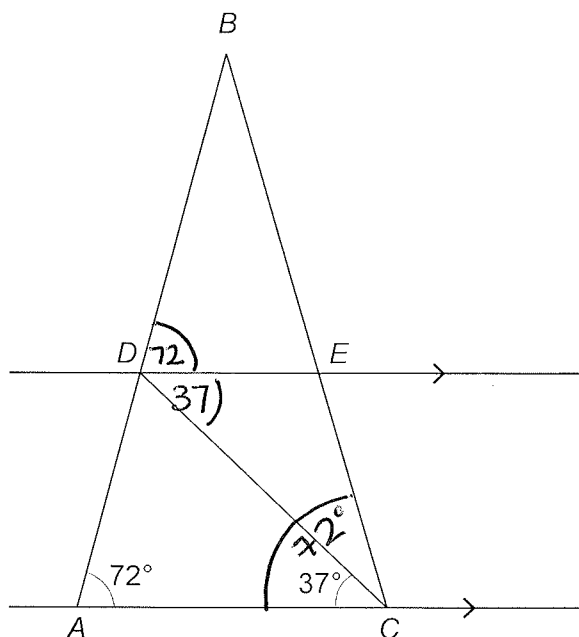
B

D 72
37

72°   37°

A   C

Diagram not drawn to scale

(a) Find the size of each of the following angles.

(i) $B\hat{D}E$ = 72° [1]

corresponding angles (B$\hat{A}$C) are equal

(ii) $C\hat{D}E$ = 37° [1]

alternate angles (A$\hat{C}$D) are equal

(iii) $A\hat{B}C$ = 36° [2]

ACB = 72   Base angles in isosceles △ are equal
72+72 = 144
180 - 144 = 36° = A$\hat{B}$C   Angles in △ = 180°

(b) Write the mathematical name of quadrilateral *ACED*. [1]

Trapezium   (1 pair of parallel sides)

(C300U20-1)   **Turn over.**

13. *(a)* A train from Leicester to London has:
- 1 first class carriage with 48 seats, $\times 1 = 48$
- 4 standard class carriages, each with 72 seats. $\times 4 = 288$

The train manager notes that:

- $\frac{3}{4}$ of the first class seats are taken,

- $\frac{5}{8}$ of the standard class seats are taken,

- no passengers are standing.

The train manager thinks that the train is more than $\frac{2}{3}$ full.

Is the train manager correct?
You must show all your working. [7]

1ˢᵗ Class   Std Class   Total Seats

Seats Available   48   72×4 = 288   288+48 = 336

Booked Seats $\frac{3}{4} \times 48 = 36$ $\frac{5}{8} \times 288 = 180$ 36+180 = 216 //

$\frac{2}{3} \times 336 = 224 \quad > \quad 216$

The train manager is wrong.

Tick (✓) the appropriate box.

The train manager is correct ☐   The train manager is not correct ☑

(b) The distance by rail from Leicester to London is 100 miles.

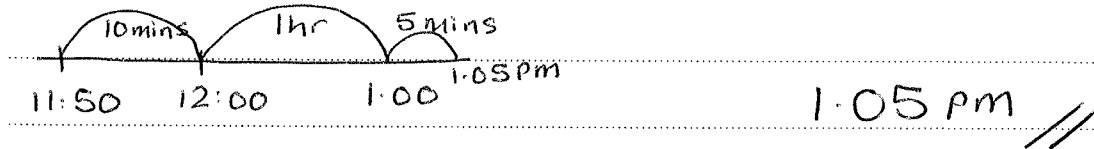(i) Assume that the train travels at an average speed of 80 mph.

Calculate the arrival time in London of a train that leaves Leicester at 11:50 a.m.

[3]

$$T = \frac{D}{S} = \frac{100}{80} = 1 \cdot 25 \text{ hours}$$

$$= 1 \text{ hr } 15 \text{ mins}.$$

10 mins · 1 hr · 5 mins

11:50 · 12:00 · 1:00 · 1:05 pm

$1 \cdot 05 \, pm$

(ii) The train actually travelled slower than the assumed 80 mph.
How would this affect the arrival time? [1]

The arrival time would be later.

14. *(a)* Estate agents help people sell their houses.
They charge people for the help that they provide.

Bilal plans to sell his house for £146 000.
He has a choice of these two estate agents:

Blue Blocks Estate Agent
Fixed Charge £1420 + 20% VAT

Sell 'em Fast Estate Agent
Charge 1·25% of the selling price

Bilal wants to pay as little as possible to the estate agent.

Which estate agent should Bilal choose?
You must show all your working. [4]

Blue Blocks.

$$\text{VAT} \quad \frac{20}{100} \times 1420 = £284$$

$$\text{Total charge} = 1420 + 284 = £1704 \quad //$$

Sell'em Fast

$$\frac{1·25}{100} \times 146000 = £1825 \quad //$$

Bilal should choose ......Blue Blocks......

(b) Stamp duty is a tax that is paid when houses are purchased (bought).

For houses purchased up to £925 000, the stamp duty is calculated as follows:
- 0% on the first £125 000 of the purchase price,
- 2% on the next £125 000 of the purchase price,
- 5% on the next £675 000 of the purchase price.

An example to calculate the stamp duty on a house with a purchase price £275 000.

Example
House purchased for £275 000, the stamp duty is calculated as follows:

0% on the first	£125 000	£ 0
2% on the next	£125 000	£2500
5% on the next	£ 25 000	£1250
Total stamp duty on	£275 000	£3750

Mr Evans is asked to pay stamp duty of £12 000 when he buys a new house.
He pays £380 000 for his new house.

Is the stamp duty he is asked to pay correct?
You must show all your working. [3]

Correct ☐   Incorrect ✓

0% on first £125 000   £ 0
2% on next £125 000   £2500
5% on next £130 000   £6500
                       _____
Total stamp duty on   £380 000   £9000

15. The shape below is made from two rectangles.
All the lengths are in cm.

$3y + 4$

$3x + 4$

$9y + 4$

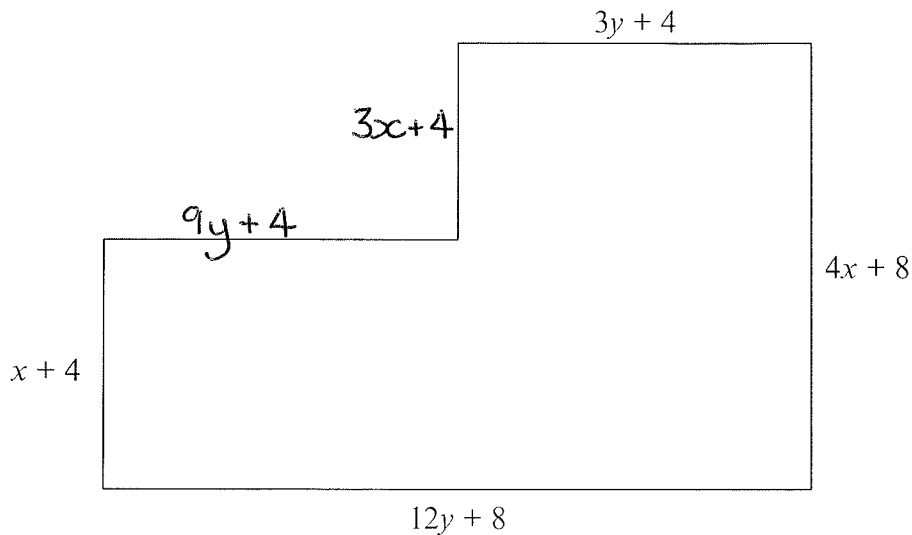$4x + 8$

$x + 4$

$12y + 8$

Diagram not drawn to scale

(a) Write an expression for the perimeter of the shape.
Simplify your expression. [3]

OR

$2(12y+8) + 2(4x+8)$

$24y+16 + 8x + 16$

$24y + 8x + 32$

$12y+8+4x+8+3y+4+3x+4$
$+9y+4 +x+4$

$24y + 8x+32$

(b) Use the highest possible number to complete the following sentence. [1]

'The expression for the perimeter is a multiple of ......**8**...... '

$24y + 8x + 32 = 8(3y + x + 4)$

16. 25 years ago, Raveena's grandparents invested £500 for her in an account paying 3·4% compound interest per annum.
No extra money was paid in and no money was withdrawn during these 25 years.

Raveena has decided to withdraw all the money in the account after 25 years.

How much should Raveena receive?
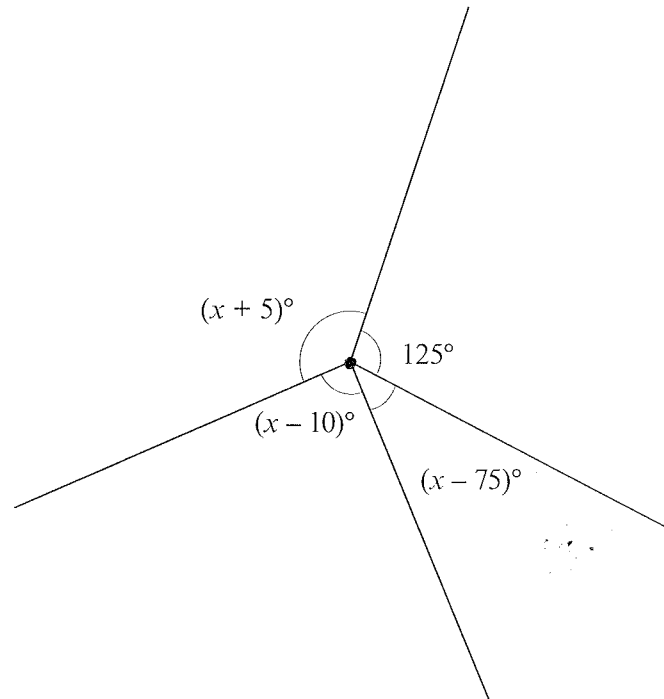Give your answer correct to the nearest penny.
You must show all your working. [3]

$$100\% + 3 \cdot 4\% = 103 \cdot 4\% = \frac{103 \cdot 4}{100} = 1 \cdot 034$$

$$500 \times 1 \cdot 034^{25} = £1153 \cdot 41$$

17.

Diagram not drawn to scale

Write an equation in terms of x and solve it.
You must show all your working. [3]

Angles around a point = $360°$

$x + 5 + x - 10 + x - 75 + 125 = 360$

$3x + 45 = 360$

$\quad\quad -45 \quad\quad -45$

$\dfrac{3x}{3} = \dfrac{315}{3}$

$x = 105$

$x = \underline{105°}$

18. The table below gives information from the Highway Code on stopping distances for cars.

Speed	Stopping distance in metres = Thinking distance + Braking distance (Thinking distance is given first, followed by Braking distance)
20 mph	6 m 6 m
30 mph	9 m 14 m
40 mph	12 m 24 m
50 mph	15 m

64 km/h (written beside 40 mph)

Remember 50 mph is 80 km/h.

The stopping distances given in the Highway Code assume good driving conditions and alert drivers.

When a driver is tired and the road is wet, the thinking distance increases by 30% and the braking distance increases by 20%.

A tired driver travels at 64 km/h in wet driving conditions.

Calculate their stopping distance in metres. [4]

$$\div 10 \left(\frac{80 \text{ km/h} = 50 \text{ mph}}{8 \text{ km/h} = 5 \text{ mph}} \right) \div 10$$

$$\times 8 \left(\frac{8 \text{ km/h} = 5 \text{ mph}}{64 \text{ km/h} = 40 \text{ mph}} \right) \times 8$$

Thinking distance in wet = $12 \times 1.3 = 15.6$ m

Braking distance $= 24 \times 1.2 = 28.8$ m

Stopping distance $= 15.6 + 28.8$

$= 44.4$ m //

Turn over.

19. Expand and simplify $(2x - 7)(3x - 8)$. [3]

$6x^2 - 16x - 21x + 56$

$6x^2 - 37x + 56$

20. *(a)* In Queenbridge, the mean daily snowfall for a week was 1·6 cm.
If there had been 1 cm more snowfall on each day, what would the mean daily snowfall have been? [1]

$$1·6 + 1 = 2·6 \text{ cm}$$

(b) In Sansburg, the snowfall for each of the first 10 days in January was measured.
The results are summarised in the table below.

Daily snowfall, s in cm	Midpt		Number of days		Total (cm)
$1·5 \leqslant s < 2·5$	2	×	4	=	8
$2·5 \leqslant s < 3·5$	3	×	2	=	6
$3·5 \leqslant s < 4·5$	4	×	1	=	4
$4·5 \leqslant s < 5·5$	5	×	0	=	0
$5·5 \leqslant s < 6·5$	6	×	3	=	18
			10		36

Calculate an estimate for the mean daily snowfall for these 10 days. [4]

$$\text{Mean} = \frac{36}{10} = 3·6 \text{ cm}$$

(c) During the first 5 days of February, the mean snowfall in Awezell was 4·7 cm.
On 6th February the snowfall was 23·9 cm.

Calculate the mean snowfall for the first 6 days of February. [3]

$$\text{Total snowfall (first 5 days)} = 4·7 \times 5 = 23·5 \text{ cm}$$

$$\text{Total snowfall (first 6 days)} = 23·5 + 23·9 = 47·4 \text{ cm}$$

$$\text{Mean} = \frac{47·4}{6} = 7·9$$

7·9 cm

21. *(a)* Shireen has a new shed.

The walls of the shed are vertical.
The shed stands on horizontal ground.
The uniform cross-section has one line of symmetry.

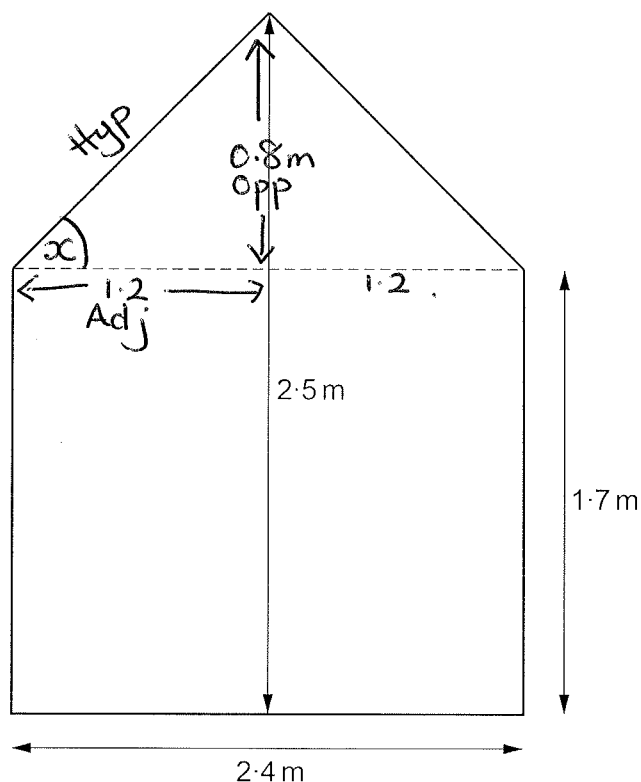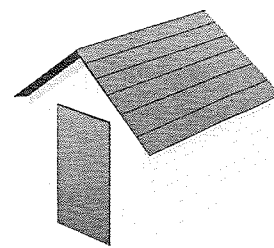The diagram below shows some of the measurements
of the cross-section.

Hyp

0.8m
Opp

x

1.2
Adj

1.2

2.5 m

1.7 m

2.4 m

Diagram not drawn to scale

Calculate the size of the angle between the roof of the shed and the horizontal. [4]

$2.5 - 1.7 = 0.8$

$2.4 \div 2 = 1.2$

$\text{Tan } x = \dfrac{0.8}{1.2}$

$x = \text{Tan}^{-1}\left(\dfrac{0.8}{1.2}\right) = 33.69....$

$= 33.7° \quad (1dp)$

(b) Petra has a ~~mathematically similar shed.~~ $\longrightarrow$ enlarged by a scale factor.
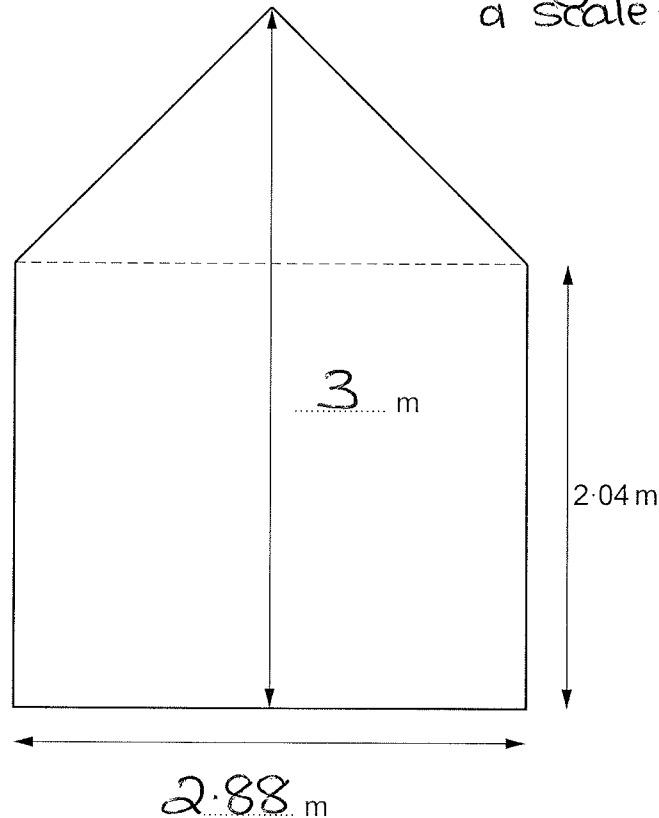

3 m

2·04 m

2·88 m

Diagram not drawn to scale

Calculate the two missing measurements on the diagram above.
You must show all your working. [3]

Scale factor = $\dfrac{2\cdot04}{1\cdot7}$ = 1·2

Base   2·4 × 1·2 = 2·88 m

Height   2·5 × 1·2 = 3 m

22. *(a)*

Recipe for scones

Ratio of ingredients

flour : butter : sugar

70 : 17 : 10

Nadeen has 102 g of butter and plenty of flour and sugar.
Nadeen uses all this butter to make scones.

Calculate the quantity of flour and sugar Nadeen needs. [3]

F : B : S   1 part
Ratio 70 : 17 : 10 $\frac{102}{17} = 6g$
       ↓×6   ↓×6
Qty. 420g : 102g : 60g

Flour ......420...... g

Sugar ......60...... g

(b)

Nutrition per scone				
kcal	fat	carbohydrates	fibre	protein
2 × 268 = 536	10 g	41 g	1 g	6 g

Nadeen has been recommended to eat 2200 kcal per day.
She eats two scones for lunch.
Her breakfast was 390 kcals.

What percentage of the recommended daily kcals does Nadeen have **left** for meals later in the day?
Give your answer correct to the nearest 0.01%. [4]

Total kcals (breakfast/lunch) = 390 + 536 = 926 kcals

Left = 2200 - 926 = 1274 kcals

$\frac{1274}{2200}$ × 100 = 57·90 % = 57·91%

END OF PAPER

For continuation only.

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