Surname	TP Solutions	Centre Number	Candidate Number
First name(s)			0

GCSE

C300U20-1

A23-C300U20-1

FRIDAY, 10 NOVEMBER 2023 – MORNING

MATHEMATICS – Component 2
Calculator-Allowed Mathematics
FOUNDATION TIER

2 hours 15 minutes

For Examiner's use only		
Question	Maximum Mark	Mark Awarded
1.	7	
2.	3	
3.	5	
4.	4	
5.	3	
6.	4	
7.	6	
8.	3	
9.	4	
10.	6	
11.	5	
12.	4	
13.	5	
14.	9	
15.	5	
16.	4	
17.	4	
18.	4	
19.	3	
20.	4	
21.	5	
22.	5	
23.	8	
24.	4	
25.	6	
Total	120	

ADDITIONAL MATERIALS

An additional formulae sheet.

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 additional 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.

NOV23C300U20101

C300U201
01

CJ/GR*(A23-C300U20-1)

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:

Curved surface area of a cone = πrl

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

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

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:

$$v = u + at$$

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

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

Examiner only

1. The table below shows the costs to post letters and parcels.

	Cost of posting	
	1st class	2nd class
Small letter	95p	68p
Large letter	£1.45	£1.05
Parcel	£4.45	£3.35

Use costs from the table to answer the following.

(a) Maria posts one 2nd class small letter and one 1st class parcel.
What is the total cost of posting these two items? [2]

0.68 + 4.45 = £5.13 or 513p

(b) How much less does it cost to post three large letters 2nd class than to post three large letters 1st class? [2]

3 x 1.05 = 3.15 3 x 1.45 = 4.35

4.35 − 3.15 = £1.20

(c) Gareth spent £15.95 posting large letters 1st class.
How many letters did he post? [2]

15.95 ÷ 1.45 = 11 letters

(d) Lee has £3.50.
Does he have enough money to post five small letters?

Yes ☑ No ☐

Give the reason for your answer. [1]

5 x 0.95 = 4.75 5 x 0.68 = £3.40

He has enough if sending by second class.

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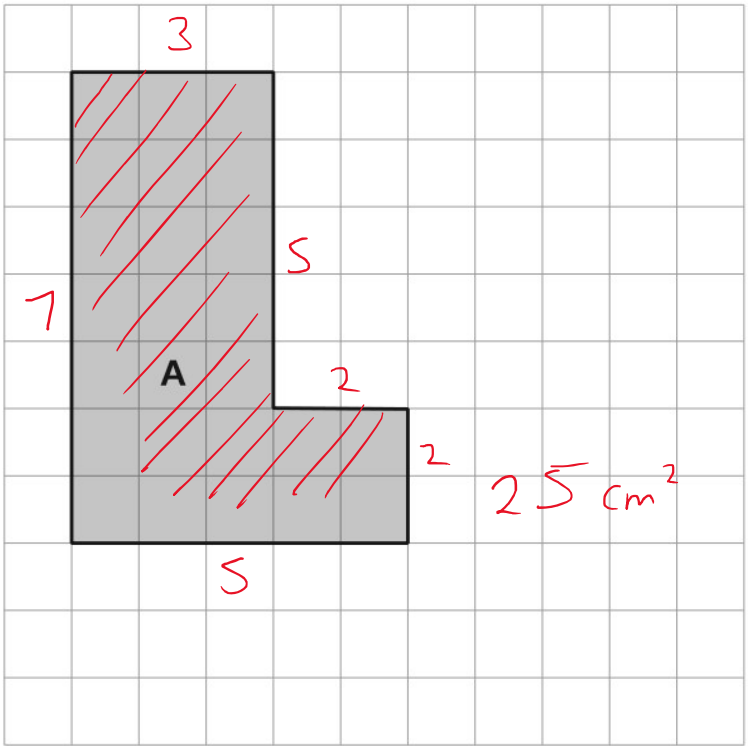
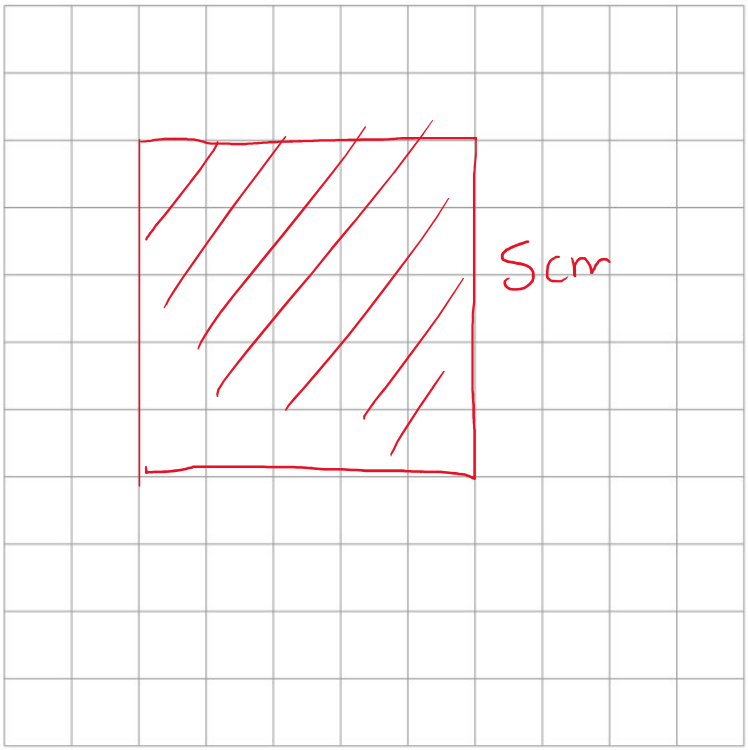
Examiner only

2. **Shape A** is shown on the 1 cm grid.



(a) On the grid below, draw a **square** that has the same area as **shape A**. [1]

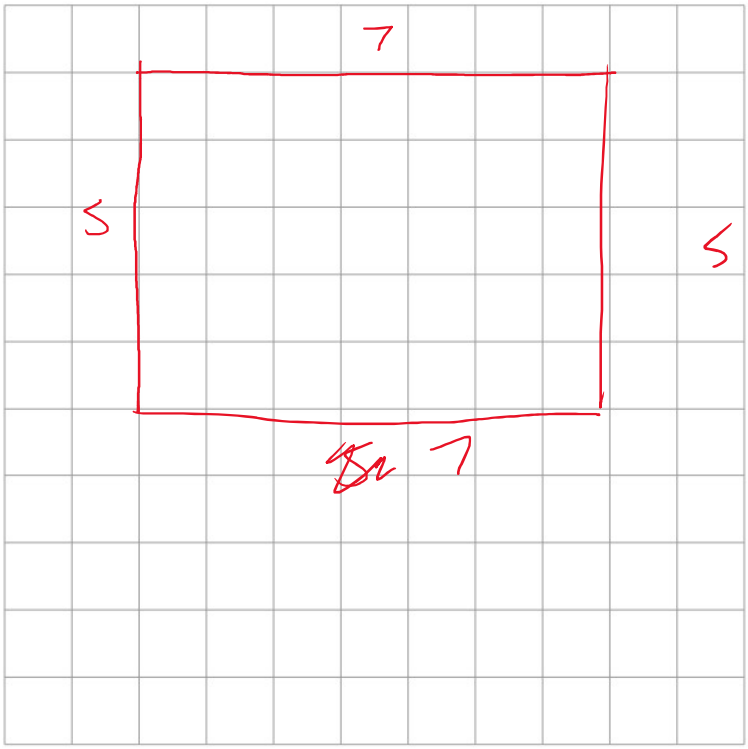


Examiner only

(b) (i) Work out the perimeter of **shape A**. [1]

3 + 5 + 2 + 2 + 5 + 7 = 24 cm

(ii) On the grid below, draw a **rectangle** that has the same perimeter as **shape A**. [1]



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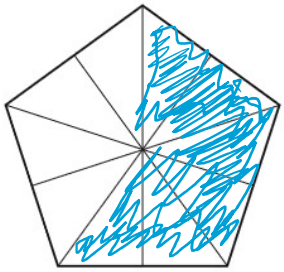
Examiner only

3. (a) Write the number six million five hundred and twenty thousand in figures. [1]

6,520,000

(b) Shade $\frac{3}{5}$ of the shape below. [1]

$= \frac{6}{10}$ ×2



(c) Rearrange these five boxes to create a calculation with an answer of 8. [1]

4	6	24	+	÷

Write your calculation in the boxes below.

24	÷	6	+	4	=	8

(d) Write 465784

(i) correct to the nearest 10, [1]

465784 = 465780

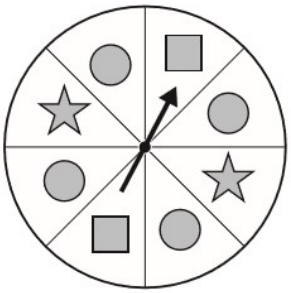
(ii) correct to the nearest 1000. [1]

465784 = 466000

Examiner only

4. Two fair spinners are shown below.

Spinner A



Spinner B

(a) Each spinner is spun once.

Circle the expression that best describes the chance of each of the following events occurring.

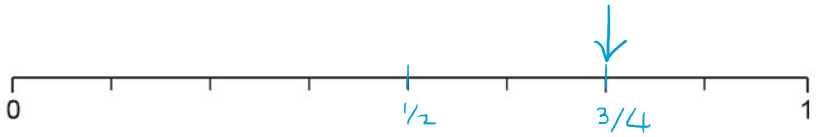
(i) Spinner A lands on a circle. [1]

impossible **unlikely** **even chance** **likely** **certain**

(ii) Spinner B lands on a square. [1]

impossible **unlikely** **even chance** **likely** **certain**

(b) Spinner B is spun once.
What is the probability it lands on a star? $= \frac{6}{8} = \frac{3}{4}$
Mark your answer with an arrow (↓) on the the probability scale below. [1]



(c) A different spinner, spinner C, is spun once.

The probability that spinner C lands on a star is $\frac{3}{16}$.

What is the probability that spinner C does **not** land on a star? [1]

$\frac{13}{16}$

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5. (a) Calculate the value of x. [1]

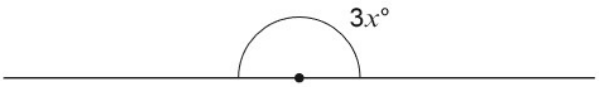


Diagram not drawn to scale

$3x = 180$

$\div 3$ $x = 60$ $\div 3$

$x =$ 60°

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

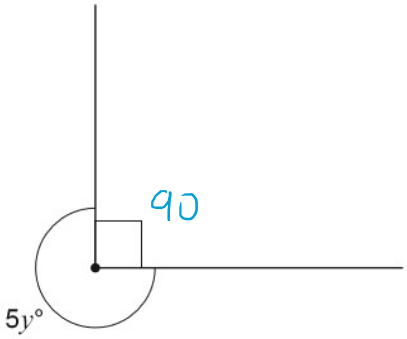


Diagram not drawn to scale

$5y + 90 = 360$

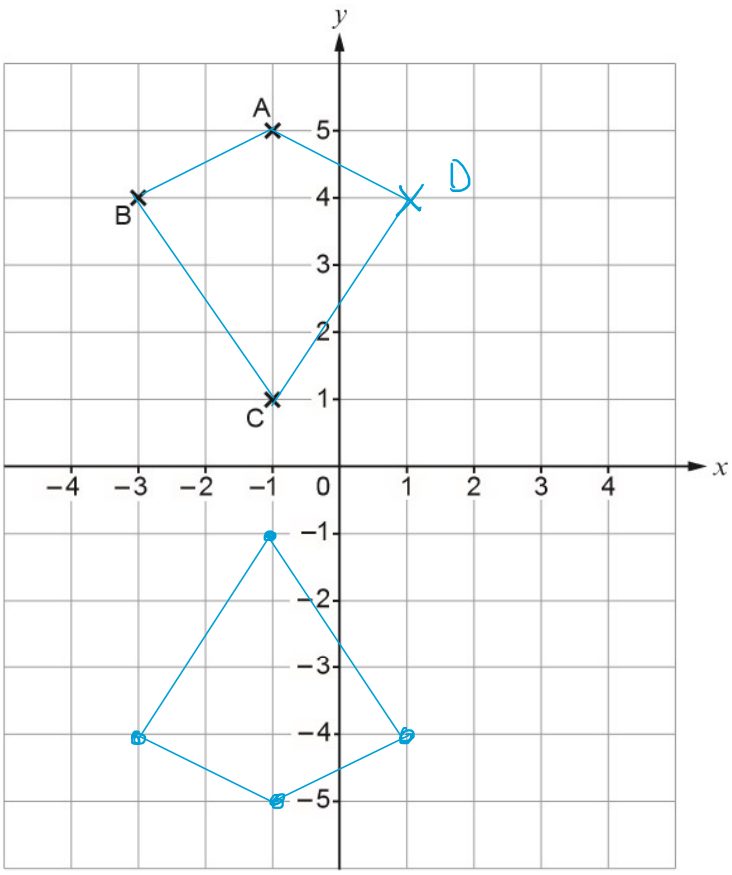
-90 $5y = 270$ -90

$\div 5$ $y = 54$ $\div 5$

$y =$ 54°

Examiner only

6. ABCD is a kite.
Three of its vertices have been plotted on the grid below.



(a) Plot point D on the grid to complete the kite. [1]

(b) Write down the coordinates of point D. [1]

D = (1 , 4)

(1, 4)

(c) Draw a reflection of the kite ABCD in the x axis. [2]

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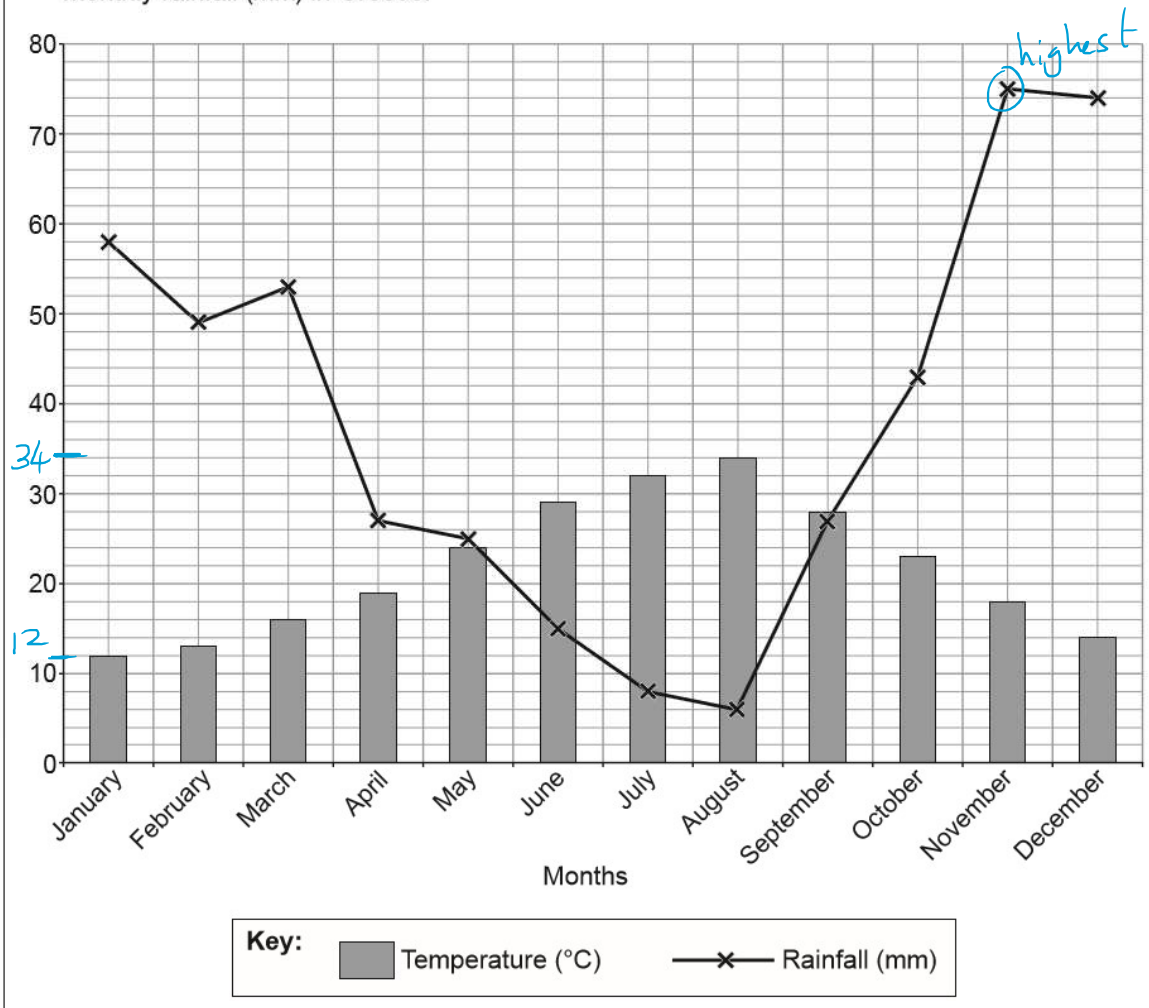
Examiner only

7. The graph below shows the average maximum daily temperature (°C) and the average monthly rainfall (mm) in Greece.



(a) (i) Which month has the highest rainfall? [1]

November

(ii) Calculate the difference in average maximum daily temperature between the warmest month and the coolest month. [2]

34 − 12 = 22 °C

(iii) Courtney wants to go on holiday to Greece.
She does not want the average maximum daily temperature to be over 30°C and hopes for as little rain as possible.

Which month would be the most suitable for Courtney to go to Greece? [1]

June

Examiner only

(b) The formula shown below can be used to convert between temperatures in degrees Fahrenheit (F) and temperatures in degrees Celsius (C).

$$F = 1{\cdot}8C + 32$$

On a particular day in Greece, the temperature was 25°C.
Use the formula to convert this temperature to degrees Fahrenheit (F). [2]

$F = 1.8(25) + 32$

$= 77\ F$

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Examiner only

8. Alex and Louise buy some cereal bars and drinks at a shop.
The image below shows the items that Alex and Louise bought and their total cost.

Assume that:

- each cereal bar is identical
- each drink is identical.

Find the cost of one cereal bar and the cost of one drink. [3]

$5 \div 4 = 1.25$

$5.60 - 1.25 = 4.35$

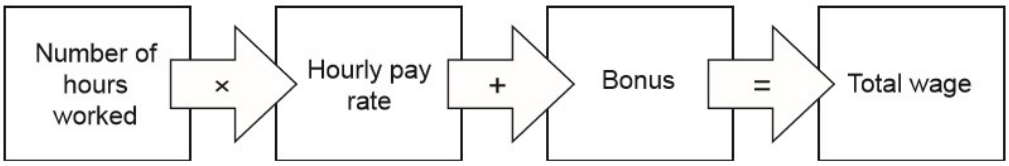
$4.35 \div 3 = 1.45$

One cereal bar costs £1.25 One drink costs £1.45

Examiner only

9. The manager of a shop calculates the wages of her staff at the end of each week.
She uses this diagram.

Weekly wages



Hourly pay rates	
Junior sales assistant	£10.42
Senior sales assistant	£11.50

(a) Hamza is a junior sales assistant.
Last week he worked for 25 hours and had a bonus of £80.

What was Hamza's total wage last week? [2]

25 x 10·42 = 260·5

260·5 + 80 = 340·5

£340·50

(b) Julie is a senior sales assistant.
Last week her total wage was £271 including a bonus of £64.

How many hours did Julie work last week? [2]

271 − 64 = 207

207 ÷ 11·5 = 18

18 hours

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Examiner only

10. Jarrad won £3000 in a competition.

(a) He spent £500 and gave 37% of the remaining money to charity.
This was shared equally between five different charities.

How much did each charity receive? [4]

$3000 - 500 = 2500$

$0.37 \times 2500 = 925$

$925 \div 5 = 185$

Each charity received £185

(b) Jarrad saves £600 of the £3000.
What percentage of the £3000 does Jarrad save? [2]

$\frac{600}{3000} \times 100 = 20$

Jarrad saves 20 % of the £3000.

Examiner only

11. (a) Simplify each of the following.

(i) $a + 7b + 5a - 9b$ [2]

$6a - 2b$ $6a + -2b$ (1)

(ii) $6w \div 2w$ [1]

$\frac{6w}{2w} = 3$

(b) Amanda buys 5 bags of apples. Each bag contains n apples.
She gives away 2 apples from **each bag**.

Write an expression for the total number of apples Amanda has left. [2]

$5(n-2) = 5n - 10$

$n-2$ $n-2$ $n-2$ $n-2$ $n-2$

C300U201
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Examiner only

12. The Cowell family are planning a holiday to Spain for seven days.

They can either pay for a package deal or pay for return flights, accommodation and food separately.

The costs are shown below.

Pay Separately

Return flights, accommodation, and food are free for children under 2 years old.

Return flights ← there and back
£352 per person

Accommodation
£43 per person, per day

Food
£85 per person, for seven days

On the holiday there will be two adults and two children.
The children are aged 8 and 1 years old.
They each require return flights, accommodation and food.

The Cowell family wish to choose the cheaper option.

Which option should they choose?

Package Deal ☐ Pay Separately ☑

Show how you decide. [4]

Pay for 2 adults + 1 child

Flights → 352 x 3 = 1056

Acc → 3 x 43 x 7 = 903

Food → 3 x 85 = 255 +

2214

2214 is less than

2300 so pay separately

Examiner only

13. (a) Three fair coins are thrown at the same time.

(i) Complete the table to list all the different possible outcomes. The first row has been completed for you. [2]

Coin 1	Coin 2	Coin 3
H	**H**	**H**
T	H	H
H	T	H
H	H	T
T	T	H
T	H	T
H	T	T
T	T	T

You may not need all the lines in the table.

(ii) Write down the probability that the outcome is three heads. [1]

1/8

(b) When four fair coins are thrown at the same time, the probability that the outcome is two heads and two tails is 0·375.

If the same four coins are thrown 136 times, how many times would you expect to get the outcome two heads and two tails? [2]

0·375 × 136 = 51

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Examiner only

14. (a) The amount of electricity and gas used in a home is measured in units.

In the first week of May, the Singh family used 56 units of electricity and 245 units of gas.
The cost per unit of electricity is 32p.
The total cost for the units of electricity and gas the Singh family used in the first week of May was £39.97.

What is the cost of one unit of gas? [4]

$56 \times 32 = 1792 = 17.92$

$39.97 - 17.92 = 22.05$

$22.05 \div 245 = 0.09$

One unit of gas costs £0.09 or 9p

Examiner only

(b) The Singh family are calculating their electricity bill for the 30 days of June.

- They use 210 units of electricity in June.
- The cost per unit of electricity is 32p.
- They pay a fixed charge of 28p per day.
- VAT at 5% is added to the total of these costs.

Calculate the total cost of the Singh family's electricity bill for June. [5]

$210 \times 0.32 = 67.2$

$30 \times 0.28 = 8.4 +$

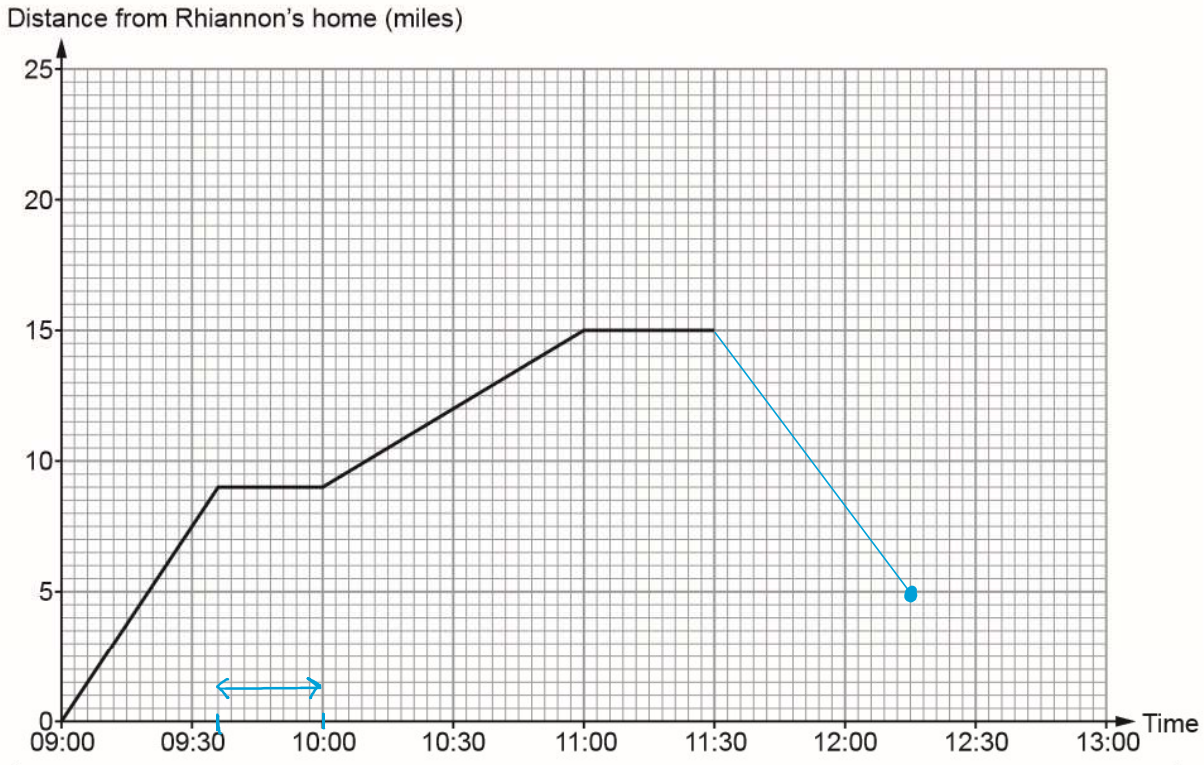
75.6

$75.6 \times 1.05 = 79.38$

The total cost of the Singh family's electricity bill for June is £79.38

Examiner only

15. Rhiannon cycled from her home to a park.
She cycled 15 miles along a straight road.
The graph shows her journey.



30 mins ÷ 10 = 3 mins

(a) On her journey to the park, Rhiannon had a puncture.
How long did Rhiannon stop to repair the puncture? [1]

8 x 3 = 24 mins

(b) Rhiannon was, on average, travelling faster before she had a puncture than after she had a puncture.
Without calculating any speeds, explain how you can tell this from the graph. [1]

steeper line before

Examiner only

(c) (i) Rhiannon left the park at 11:30 and cycled back along the same road to a friend's house that is 5 miles from her home.
This journey took 45 minutes.
Draw this journey on the graph. [1]

(ii) Calculate the average speed of Rhiannon's journey from the park to her friend's house.
Give your answer in miles per hour. [2]

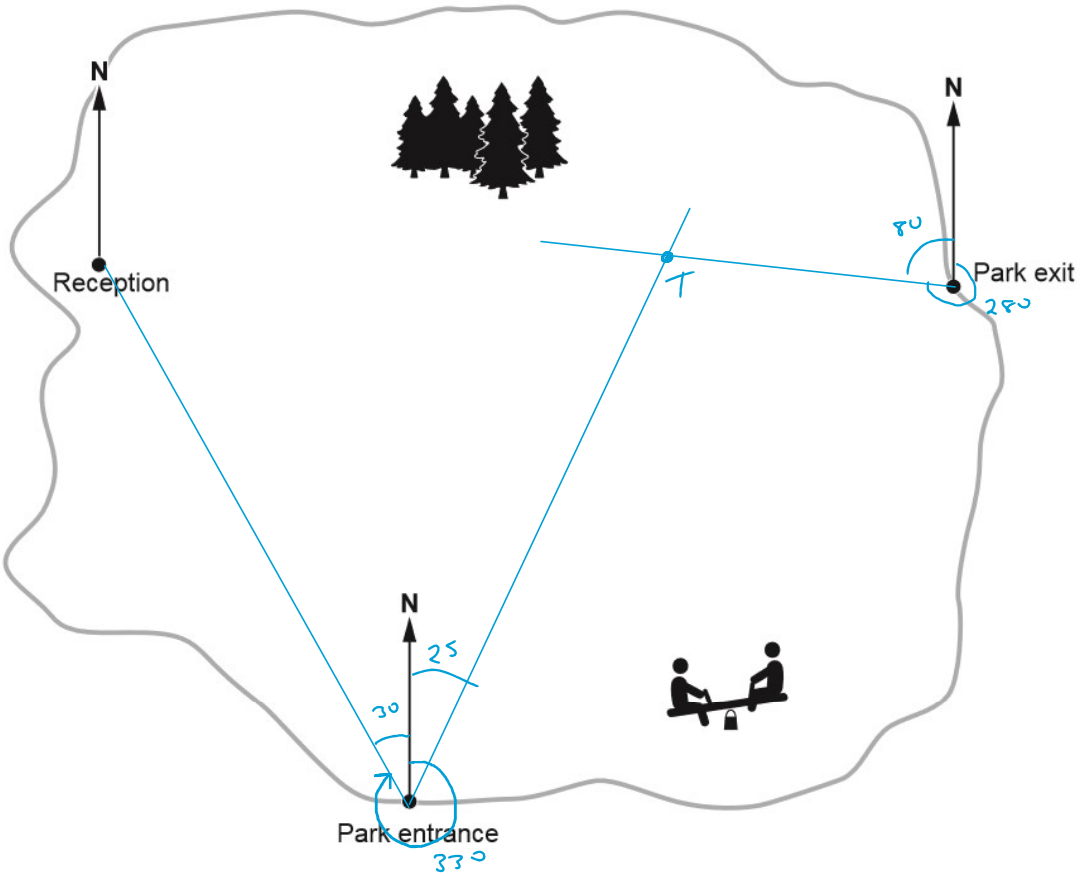
Time = 45 mins = 0.75 hrs

Distance = 10 miles

$\text{Speed} = \frac{D}{T} = \frac{10}{0.75} = 13.\dot{3}$ mph

Examiner only

16. This is a map of a holiday park.



(a) Measure and write down the bearing of the Reception from the Park entrance. [1]

330°

(b) Amir is camping at the holiday park.
His tent is on a bearing of 025° from the Park entrance and 280° from the Park exit.

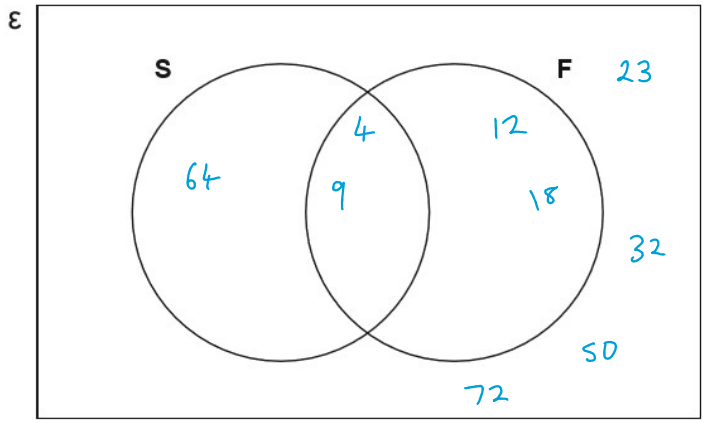
Mark with a T, the position of Amir's tent on the map. [3]

Examiner only

17. The universal set (ε) contains the numbers 4, 9, 12, 18, 23, 32, 50, 64 and 72.

S is the set of square numbers.
F is the set of factors of 36.

(a) Show this information on the Venn diagram below. [2]



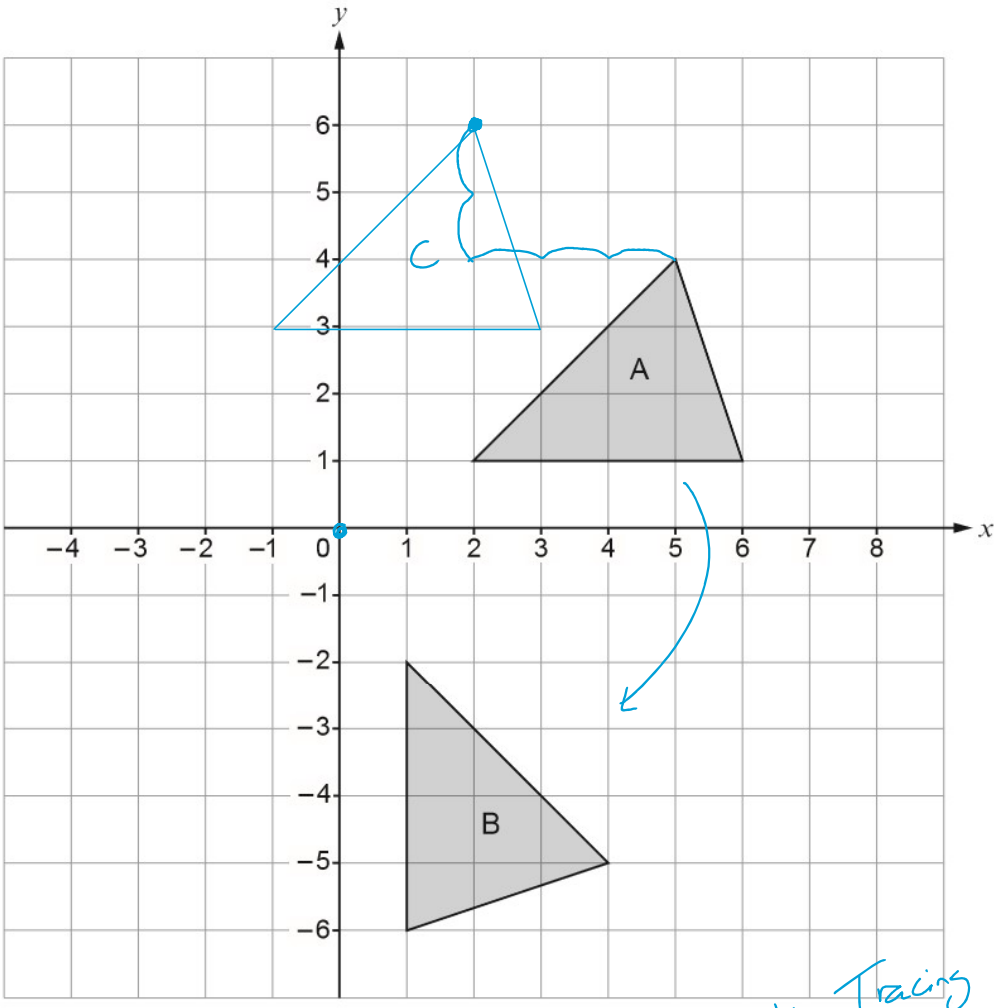
(b) A number is selected at random from the universal set (ε).

Find the probability that the number selected is a factor of 36 but **not** a square number. [2]

$\frac{2}{9}$

Examiner only

18. The grid below shows triangle A and triangle B.



Use Tracing Paper

(a) Describe fully the single transformation that maps triangle A onto triangle B. [2]

Rotation of 90° clockwise about (0,0)

(b) Translate triangle A using the vector $\begin{pmatrix} -3 \\ 2 \end{pmatrix}$, label it C. [2]

Examiner only

19. Shortbread biscuits are made from flour, butter and sugar.
Their masses are in the ratio 4 : 3 : 2 respectively.

(a) What fraction of a shortbread biscuit is made up of sugar? [1]

$\frac{2}{4+3+2} = \frac{2}{9}$

(b) 1400 g of flour is used to make a batch of shortbread biscuits.
How many grams of butter is used for this batch of shortbread biscuits? [2]

F : B : S

4 : 3 : 2) x 350

1400 ÷ 4 = 350 1400 : 1050 : 700

1050 g of butter.

Examiner only

20. Lucy bought a car 9 years ago for £12250.

The car depreciated in value by 18% in the **first** year.
In each of the following years, her car depreciated by 15% of its previous year's value.

By how much has the car decreased in value in the last 9 years? [4]

100 − 18 = 82

12250 × 0·82 = 10045

100 − 15 = 85

$10045 \times 0.85^8 = 2737.17$

12250 − 2737·17 = 9512·83

Lucy's car has decreased in value by £9512·83

Examiner only

21. Regan caught 70 fish on a fishing trip.
He measured the length of each of the fish in centimetres.

The table shows his results.

Length, l (centimetres)	mid point	Number of fish	
$60 \leqslant l < 65$	62.5	x 19	= 1187.5
$65 \leqslant l < 70$	67.5	x 17	= 1147.5
$70 \leqslant l < 75$	72.5	x 23	= 1667.5
$75 \leqslant l < 80$	77.5	x 10	= 775
$80 \leqslant l < 85$	82.5	x 1	= 82.5
			+
			4860

(a) Calculate an estimate for the mean length of these fish. [4]

4860 ÷ 70 = 69.4 cm

(b) Regan thinks that the median length of fish is in the group $70 \leqslant l < 75$.
Is Regan correct?

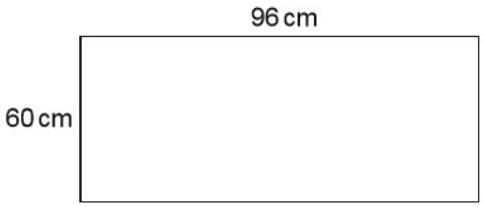
Yes ☐ No ☑

Give the reason for your answer. [1]

(70+1) ÷ 2 = 35.5th value
would be in 65 - 70 interval (19+17 = 36)

Examiner only

22. Jan has a large piece of card.
The card has width 60 cm and length 96 cm.



She uses a machine to cut identical circles out of the card.
Each circle has a radius of 6 cm.

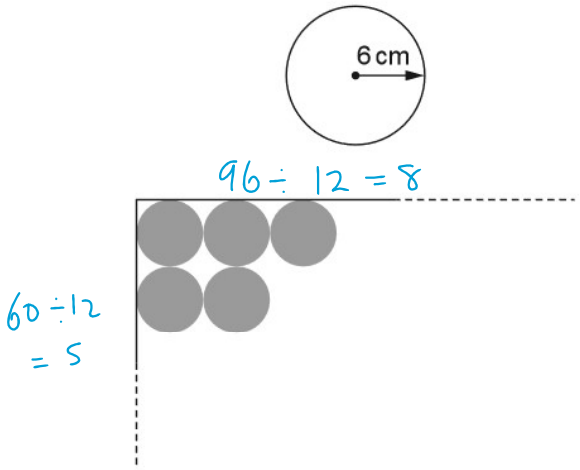


Diagram not drawn to scale

Jan has cut five circles as shown on the diagram above.
She continues in this way to cut as many circles as possible from the card.

(a) What is the maximum number of circles Jan can cut out of the card? [1]

5 × 8 = 40

Examiner only

(b) Jan cuts out the maximum number of circles from the card.
What area of card is left over? [4]

Circles area = $40 \times \pi \times r^2 = 40 \times \pi \times 6^2$

$= 1440\pi \text{ cm}^2$

Card area = $96 \times 60 = 5760 \text{ cm}^2$

Left over = $5760 - 1440\pi$

$= 1236.106579$

Area of card left over 1236 cm^2

Examiner only

23. (a) Expand and simplify $(x+3)(x+7)$. [2]

$x^2 + 7x + 3x + 21$

$= x^2 + 10x + 21$

(b) Solve $7x+6=4x+7$. [2]

$-4x \quad -4x$

$3x+6=7$

$-6 \quad -6$

$3x=1$

$\div 3 \quad \div 3$

$x=\frac{1}{3}$

(c) Factorise y^2-400. [1]

$(y+20)(y-20)$

(d) Solve the following simultaneous equations. [3]

$7x-3y=26$ ①

$x+y=3$ ②

You must show all your working.

② × 3 $3x+3y=9$

$7x-3y=26$ +

$10x=35$

$x=3.5$

$x+y=3$

$3.5+y=3$

$y=-0.5$

$x = 3.5$ $y = -0.5$

Examiner only

24. The two shapes below are similar.

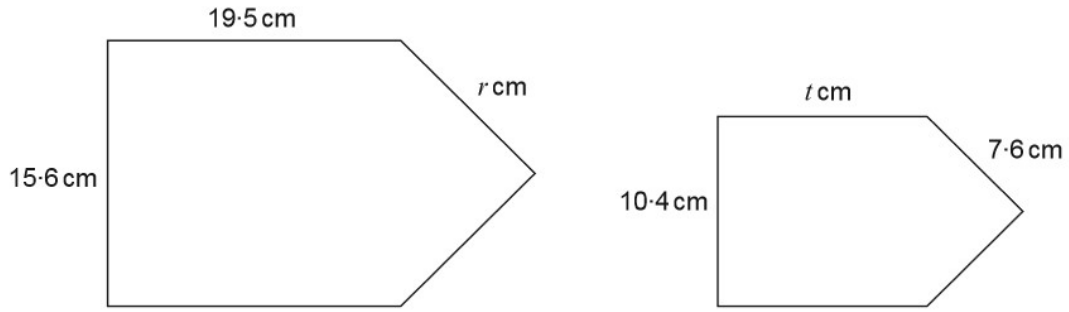


Diagram not drawn to scale

Find the value of r and the value of t. [4]

15.6 ÷ 10.4 = 1.5 (scale factor)

r = 7.6 × 1.5 = 11.4

t = 19.5 ÷ 1.5 = 13

r = 11.4 t = 13

Examiner only

25. Vaughan cycles down a track from the top of a mountain to the bottom.
The track goes down at an angle of 48° to the horizontal.
Vaughan is 800 feet above ground level.

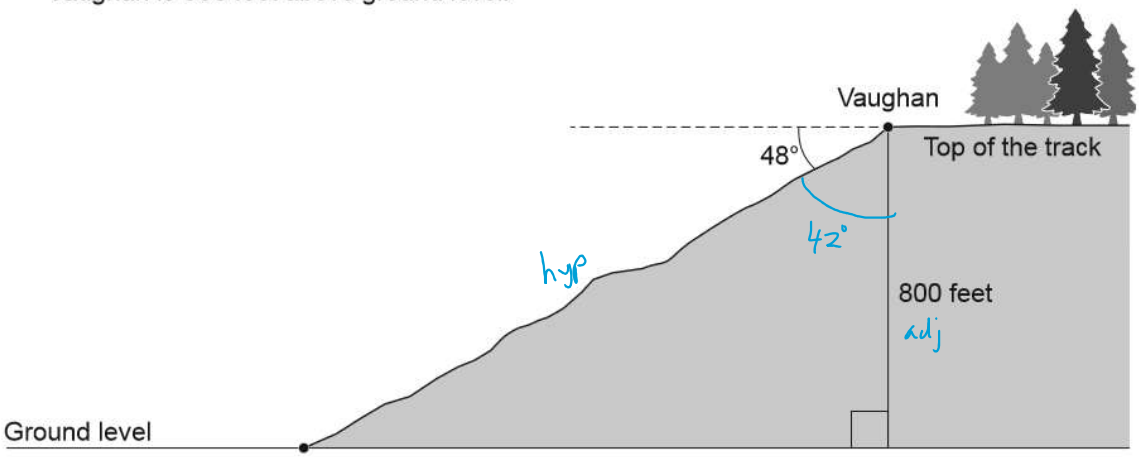


Diagram not drawn to scale

(a) Vaughan cycles from the top of the track to the bottom of the track.
What distance has he cycled? [4]

$90 - 48 = 42$ $\cos\theta = \frac{A}{H} \rightarrow \cos 42 = \frac{800}{H}$

$H = \frac{800}{\cos 42} = 1076.5$

The distance Vaughan has cycled is 1076.5 feet.

(b) (i) State an assumption you have made in answering part (a). [1]

The track is flat.

(ii) If your assumption is not correct, what effect would this have on your answer to part (a)? [1]

It would be an underestimate, he would have actually cycled further.

END OF PAPER

 (C3000U20-1)

Question number	Additional page, if required. Write the question number(s) in the left-hand margin.

Examiner only

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