Surname	Centre Number	Candidate Number
First name(s)		0

GCSE

C300U20-1

A21-C300U20-1

THURSDAY, 4 NOVEMBER 2021 – MORNING

MATHEMATICS – Component 2
Calculator-Allowed Mathematics
FOUNDATION TIER

2 hours 15 minutes

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

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 additional page 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.

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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. Complete each sentence using the best expression from the box below. [3]

impossible	unlikely	an even chance	likely	certain

(a) It is ..... that you had a birthday in 2016.

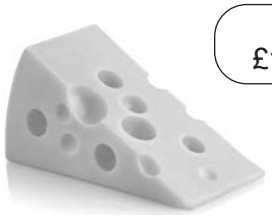
(b) It is ..... that it will rain somewhere in the UK on 5th November.

(c) Priti rolls a fair six-sided dice once.

It is ..... that she will roll a 4.

Examiner only

2.



Cheese
£10.80 for 1 kilogram

Grapes
£0.64 for 100 grams

Bread rolls
49p each

Jordan and Lucy are shopping for food.

(a) Jordan buys 0·5 kilograms of cheese, 300 grams of grapes and 4 bread rolls.
How much does Jordan pay? [2]

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Jordan pays .....

(b) Lucy buys 0·25 kilograms of cheese and 400 grams of grapes.
How much change should Lucy have if she pays with a £10 note? [3]

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Lucy's change is .....

Examiner only

3. *(a)*

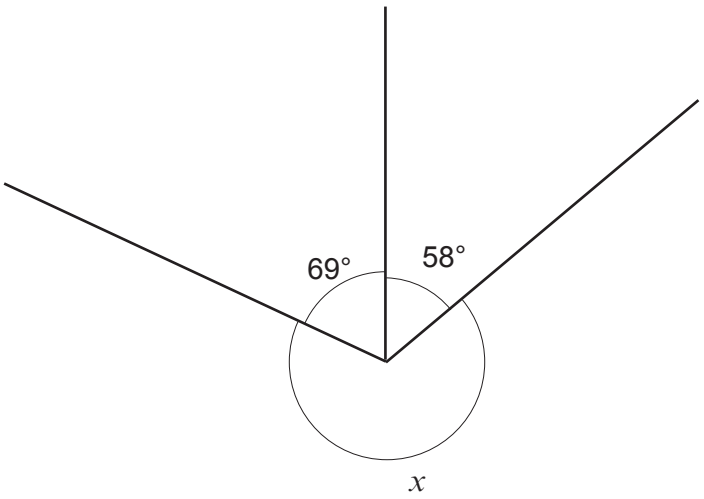

Diagram not drawn to scale

Calculate the value of x. [2]

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x = ... °

(b)

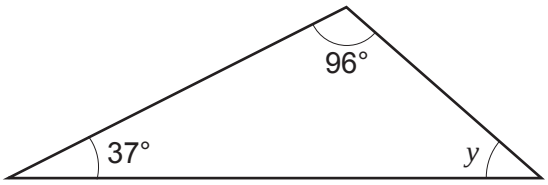

Diagram not drawn to scale

Calculate the value of y. [2]

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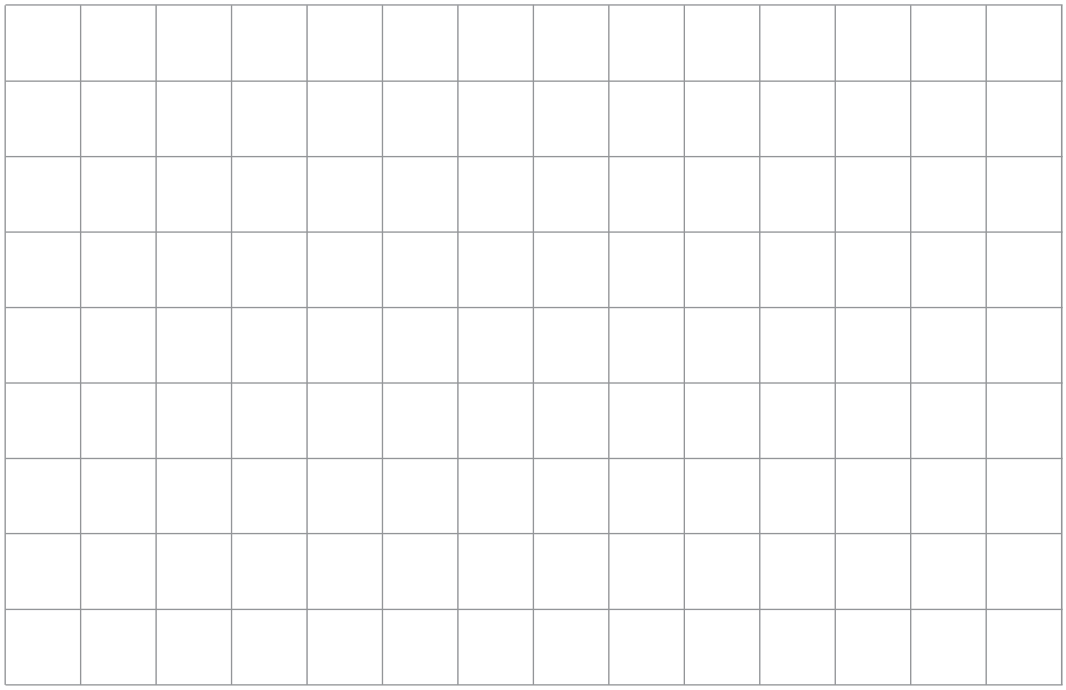
y = ... °

Examiner only

4. *(a)* (i) On the 1 cm square grid below, draw a rectangle that has an area of 24 cm^2. [1]



(ii) Write down the perimeter of the rectangle you have drawn in part (i). [1]

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..... cm

Examiner only

(b) The diagram shows a sketch of triangle *ABC*.

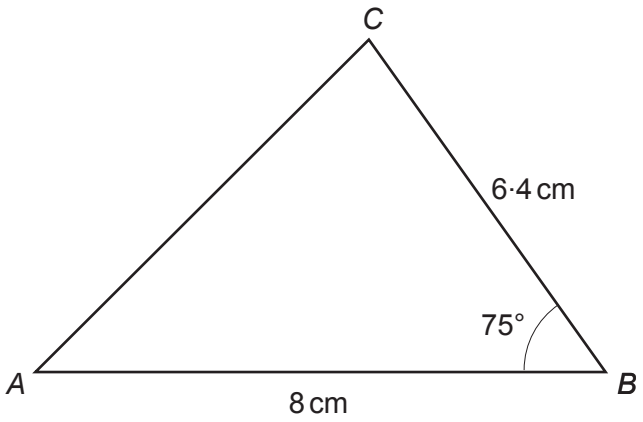

Diagram not drawn to scale

Use a ruler and protractor to complete an accurate drawing of triangle *ABC*.
AB has been drawn for you. [2]

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5. Paul always travels to and from work by bus.

Each day, he buys a return ticket costing £11.25.

The bus company also offers the following tickets.

Day ticket	Unlimited travel, all day	£8.35
Weekly ticket	Unlimited travel for 7 days	£30.50

(a) How much would Paul save each day by buying a day ticket? [1]

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(b) Paul usually works for 5 days a week.

How much would Paul save each week by buying a weekly ticket instead of return tickets? [2]

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(c) Next week, Paul will only be working for 3 days.

What is the cheapest way he can get to work next week and how much will it cost? [2]

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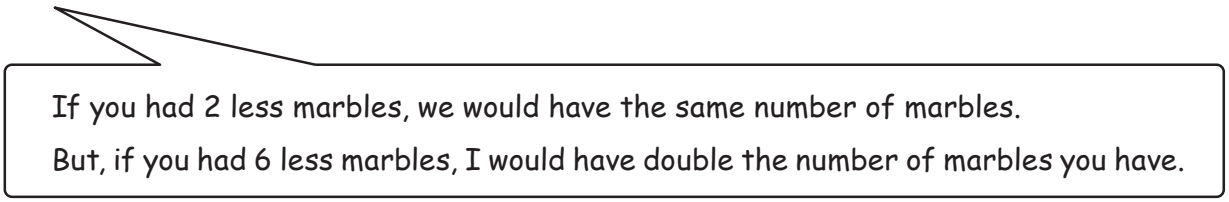
6. Ali and Beth have fewer than 12 marbles each.

Ali says to Beth:



How many marbles do they each have?
You must show all your working. [3]

Ali has ..... marbles and Beth has ..... marbles

Examiner only

7. *(a)* Simplify each of the following.

(i) $w \times w$ [1]

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(ii) $7x - 4 + x + 3$ [2]

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(b) Here is a formula.

$$v = \frac{k}{x}$$

(i) Find the value of v when k = 3·15 and x = 1·4. [1]

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v = ...

(ii) Find the value of k when v = 12 and x = 26. [2]

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k = ...

Examiner only

8. Tomas and Ada are making models.

(a) Tomas is making a model car using the ratio 1 : 18.

(i) A windscreen wiper on the model has a length of 2·8 cm.

What is the length of the windscreen wiper on the actual car? [1]

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..... cm

(ii) The maximum height of the actual car is 1·53 m.
Tomas tries to work out the maximum height of the model.
Here is his method.

1530 ÷ 18 = 85 cm

Is Tomas' method correct?

Yes ☐ No ☐

Explain how you decide. [1]

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.....

(b) Ada makes a model boat.
She then paints her model.

It takes her twice as long to make her model as it does to paint it.

(i) Complete the ratio. [1]

make : paint = ... : .....

(ii) Ada takes a total of 114 hours to make and paint her model.

How many hours does it take Ada to make her model? [2]

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Examiner only

9. The table shows some of the values of $y = x + 5$ for $-3 \leqslant x \leqslant 3$.

x	−3	−1	1	3
$y = x + 5$		4		8

(a) Complete the table above. [1]

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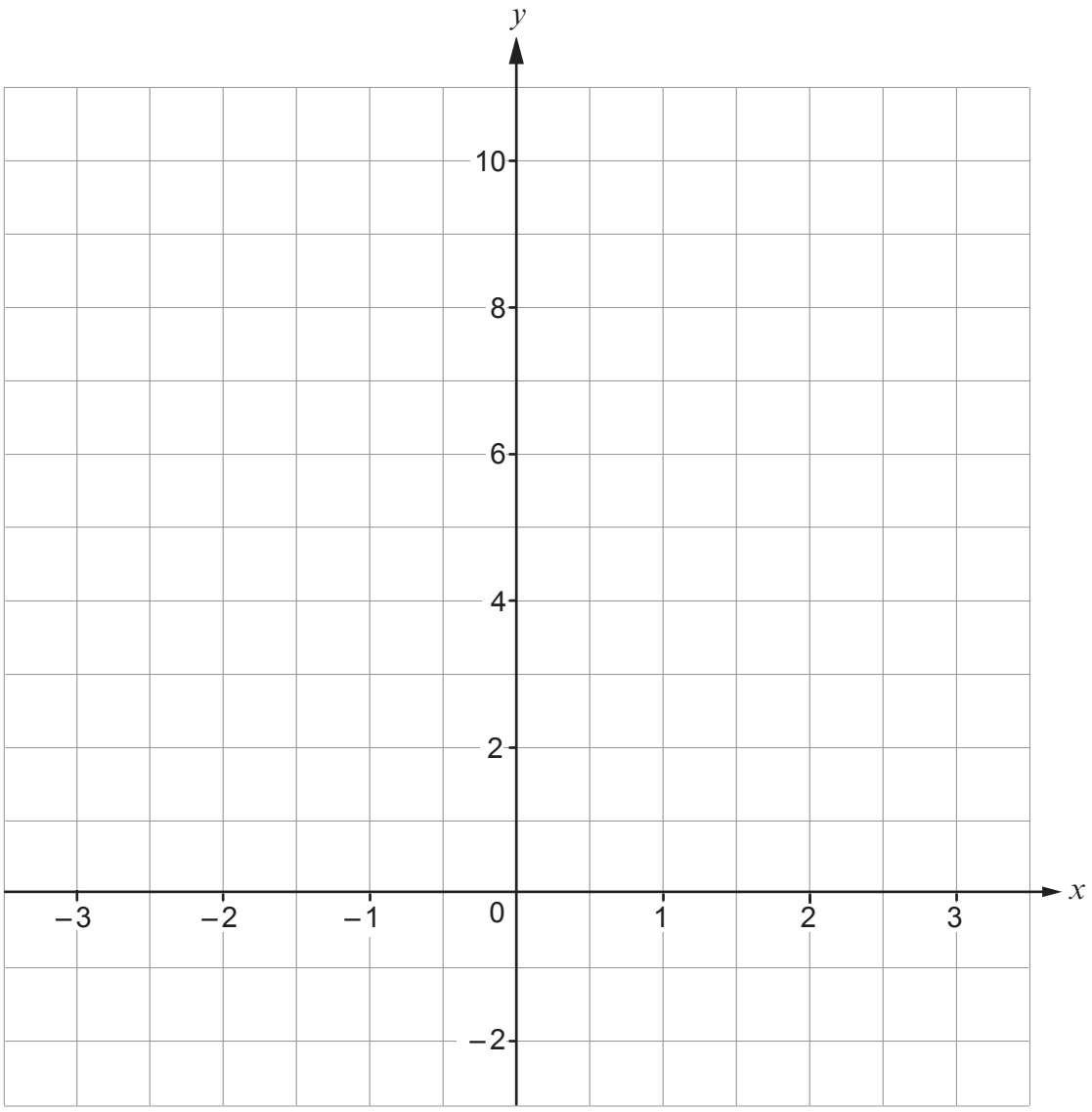
(b) On the grid below, draw the graph of $y = x + 5$ for $-3 \leqslant x \leqslant 3$. [2]



Examiner only

(c) Write down the coordinates of the y-intercept of the line $y = x + 5$. [1]

(..... , ...)

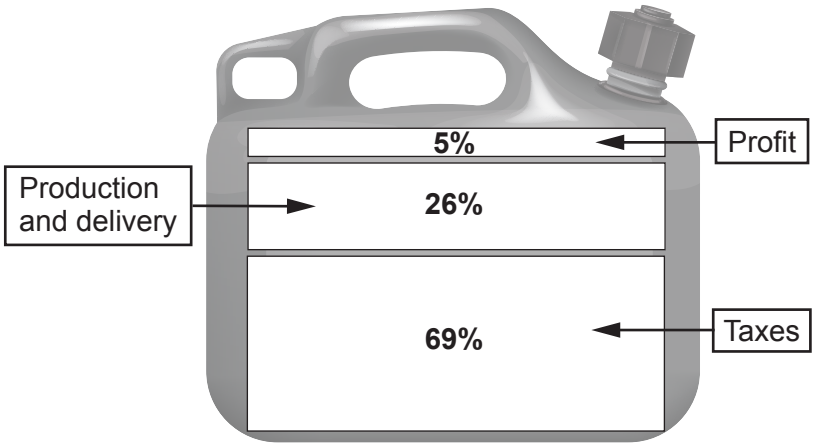
(d) Draw the graph of $x = 2$ on the grid on page 12. [1]

(e) Write down the coordinates of the point where the graphs $y = x + 5$ and $x = 2$ cross. [1]

(..... , ...)

Examiner only

10. *(a)* The price of one litre of the petrol sold at Podmore's filling station is made up as shown.



The price of one litre of petrol is 118p.

What exact amount is paid in taxes for each litre of petrol sold at Podmore's? [2]

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Exact amount paid in taxes ..... p for one litre

Examiner only

(b) Mr and Mrs Joshi are refuelling their cars at Jimson's filling station.

One litre of diesel costs £1.35.

Mr Joshi puts 51 litres of diesel in his car.
Mrs Joshi puts 48 litres of petrol in her car.

The **total** cost of Mr and Mrs Joshi's fuel is £130.29.

What is the cost of one litre of petrol at Jimson's filling station? [5]

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One litre of petrol costs £ .....

C300U201
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Examiner only

11. A supermarket sells bottles of the same shampoo in 3 sizes.

Which size of bottle offers the best value for money?

400 ml ☐ 700 ml ☐ 900 ml ☐

Show how you decide. [3]

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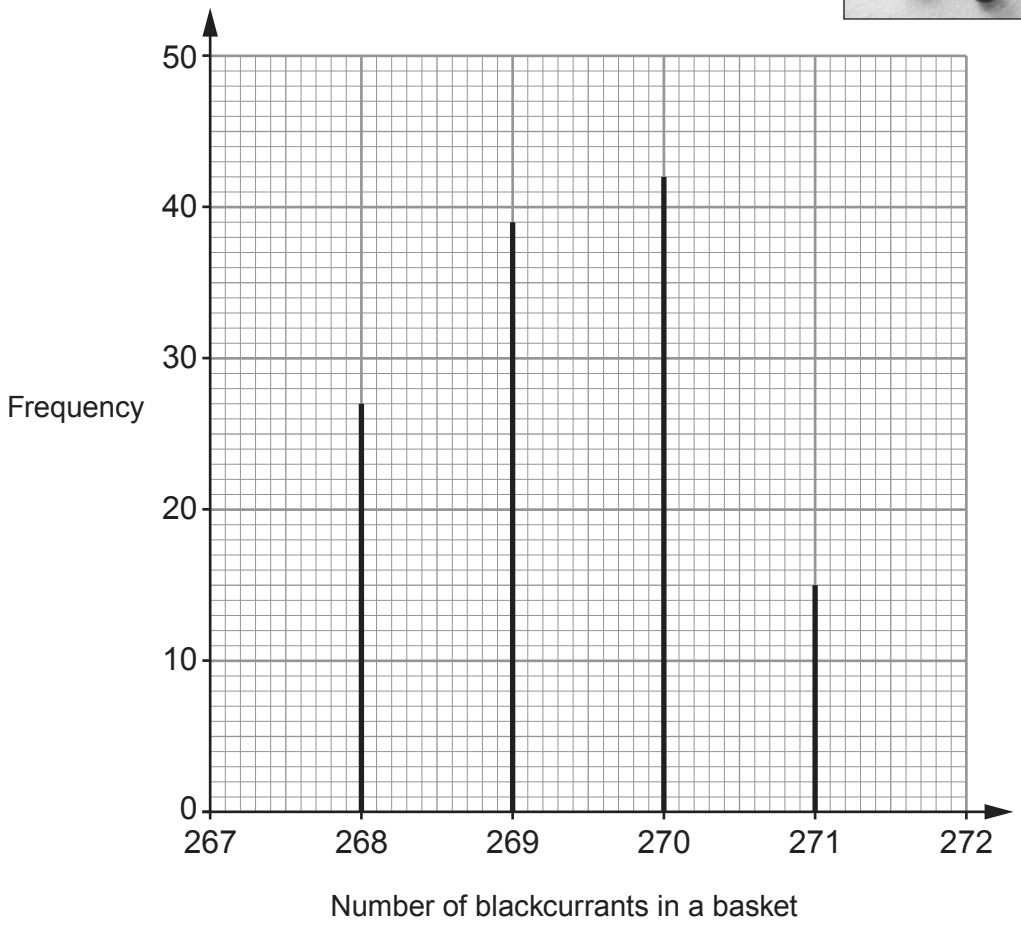
Examiner only

12. Sandy grows fruit to sell from her market stall.

(a) The vertical line graph shows information about the baskets of blackcurrants Sandy sold last week.



(i) How many baskets of blackcurrants did Sandy sell last week? [1]

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(ii) What fraction of the baskets of blackcurrants Sandy sold last week contained more than 269 blackcurrants? [2]

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Examiner only

(b) Sandy sells her raspberries in boxes.
The frequency table shows the numbers of raspberries in 130 boxes.

Number of raspberries	Frequency
45	7
46	24
47	35
48	37
49	18
50	9

(i) Find the range of the number of raspberries in a box. [1]

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(ii) Find the median number of raspberries in a box. [2]

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(iii) Calculate the mean number of raspberries in a box. [3]

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(iv) Sandy says:

"The modal number of raspberries in a box is more than the mean number of raspberries in a box."

Is Sandy correct?

Yes ☐ No ☐

Show how you decide. [1]

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Examiner only

13. *(a)* Jon wants to draw a pie chart to show his leisure activities.

The table shows:
- all his leisure activities for last week,
- the percentage of leisure time he spends on some activities,
- the sizes of some of the angles for the pie chart, (rounded correct to the nearest whole number).

Activity	Percentage	Angle
Friends	28%	101°
Gym	43%	
PC Games		
Football	5%	18°
Other	9%	32°

(i) Jon spent 2 hours playing football last week.

Work out the total number of hours he spent on his leisure activities last week. [1]

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(ii) Complete the percentage column in the table above. [1]

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(iii) Complete the angle column in the table above. [2]

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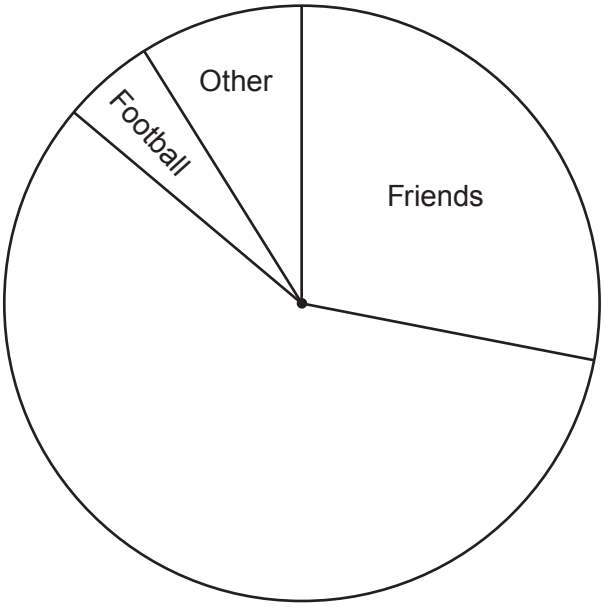
Examiner only

(iv) Complete the pie chart to show the information in the table. [1]



(b) Ricky draws a pie chart to show his leisure activities for the same week.

Last week, Ricky spent 6 hours playing golf.

Who spent more hours last week on leisure activities?

Jon ☐ Ricky ☐

Show how you decide. [2]

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Examiner only

14. Omar used the following recipe to make a drink to sell at a school fete.

For each glass of drink:

- use the juice of 1 orange,
- use $\frac{1}{8}$ of the juice of 1 grapefruit,
- add enough lemonade to fill the glass to 300 ml.

He squeezed:

- 68 ml of juice from each orange,
- 232 ml of juice from each grapefruit.

Omar sold 72 glasses of his drink.
The bottles of lemonade Omar used each contained 2 litres.

(a) How many bottles of lemonade did Omar need to open?
You must show all your working. [5]

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Examiner only

(b) All the lemonade was donated, so cost Omar nothing.
He only paid for the fruit that he used.

The oranges cost £1.08 for a bag of 6.
The grapefruit cost 56p each.

Omar made 60% profit on each glass he sold.

What was the selling price of each glass of Omar's drink? [4]

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Selling price of each glass .....

Examiner only

15. The diagram shows a vegetable plot in the shape of a trapezium.

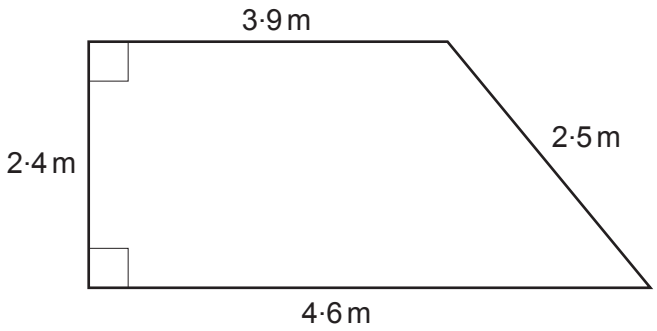

Diagram not drawn to scale

It costs £1.35 per m^2 to treat the plot with fertiliser.

Show that it costs less than £14 to treat the plot with fertiliser. [4]

Examiner only

16. The speed of a boat is measured in knots (nautical miles per hour).

Use:
1 knot = 1·852 km/h
0·625 mph = 1 km/h

A search and rescue team has a speedboat and a jet ski.
Both vehicles set off from the same boathouse at the same time to rescue a sailor.

The speedboat travels at a constant speed of 50 knots.
The jet ski travels at a constant speed of 65 mph.

The sailor is rescued by the faster vehicle 15 minutes after it left the boathouse.

Which vehicle rescued the sailor and how many kilometres did it travel from the boathouse? [4]

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Rescue vehicle was .....

which travelled ..... km

Examiner only

17. *(a)* Solve $6x - 1 = 5 + x$. [2]

(b) Abby, Ben and Ceri are solving a puzzle.

Abby takes x seconds.
Ben takes 5 seconds more than Abby.
Ceri takes twice as long as Ben.

Ceri takes 116 seconds to solve the puzzle.

Use an algebraic method to find how long Abby takes to solve the puzzle.

You must show all your working. [3]

Abby takes ..... seconds

Examiner only

18. Tori's grandfather buys a gold coin for her on the day she is born.
The coin costs £130.
The value of the coin is expected to increase by 6% each year.

What value is the coin expected to have on Tori's 10th birthday?
Give your answer correct to the nearest penny. [3]

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Expected value of the coin £ .....

Examiner only

19. The circumference of a circle is 40·841 cm.

Find the area of this circle.
You must show all your working. [4]

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Area of circle = ... cm^2

Examiner only

20. A tram company sells all-day tickets.

1 adult ticket and 4 child tickets cost a total of £16.30.
2 adult tickets and 3 child tickets cost a total of £19.10.

Use an algebraic method to find the total cost of 3 adult tickets and 1 child ticket. [5]

Total cost of 3 adult tickets and 1 child ticket = £ .....

Examiner only

21. *(a)* The diagram shows the side view of a design for a ramp to a building.

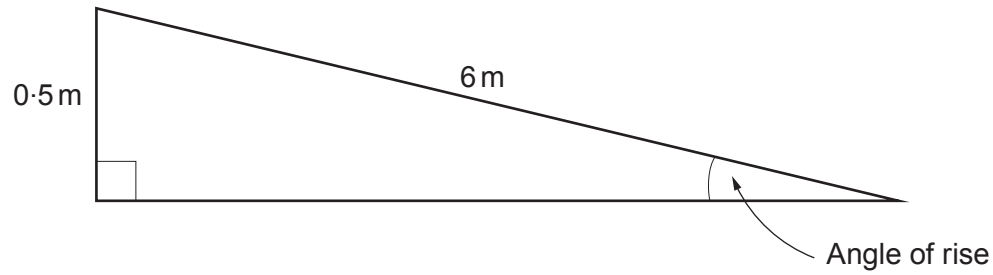

Diagram not drawn to scale

For the design to be approved, the angle of rise must not be more than 4·8°.

Use calculations to show that the design should be approved. [3]

Examiner only

(b)

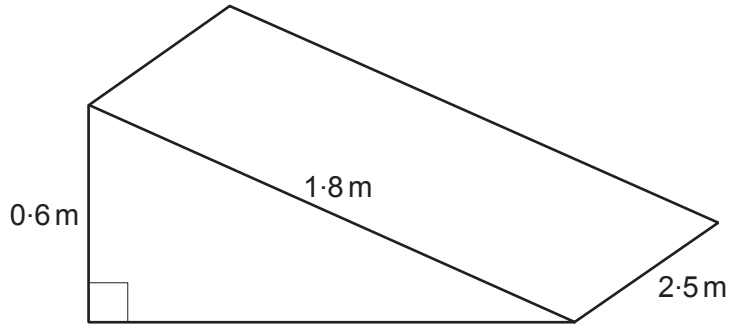

Diagram not drawn to scale

The diagram shows a concrete ramp to a different building.
It was not approved and needs to be completely removed.

The ramp is a triangular prism and is 2·5 m wide.

How many cubic metres of concrete will need to be removed?
You must show all your working. [5]

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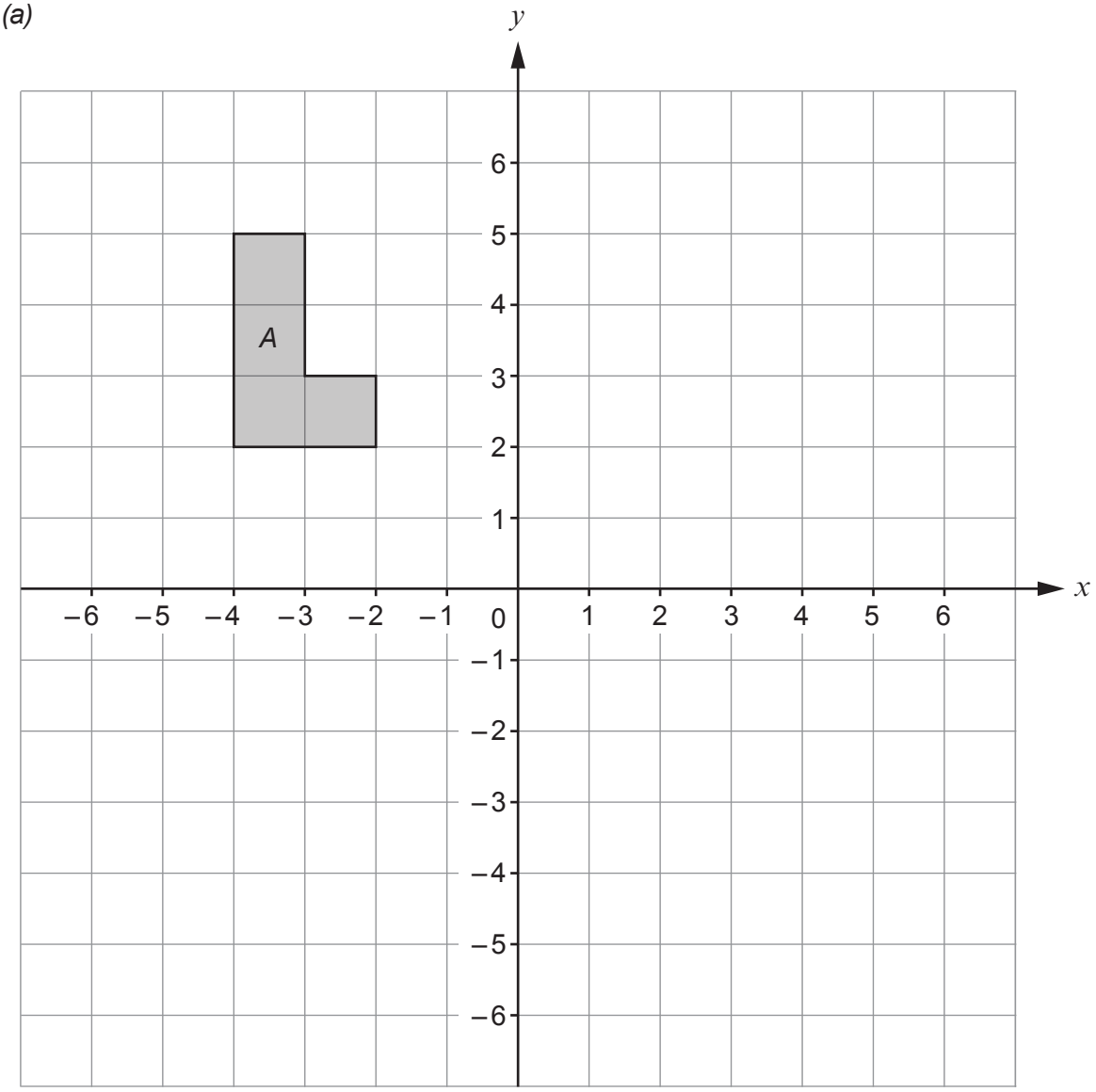
22. *(a)*



p and **q** are translation vectors with

$$\mathbf{p} = \begin{pmatrix} 3 \\ -5 \end{pmatrix} \text{ and } \mathbf{q} = \begin{pmatrix} 1 \cdot 5 \\ 2 \end{pmatrix}.$$

Shape *A* is mapped to shape *B* using $\mathbf{p} + 2\mathbf{q}$.

(i) Find the column vector which translates shape *A* to shape *B*. [2]

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Examiner only

(ii) Draw and label shape *B* on the grid on page 32. [2]

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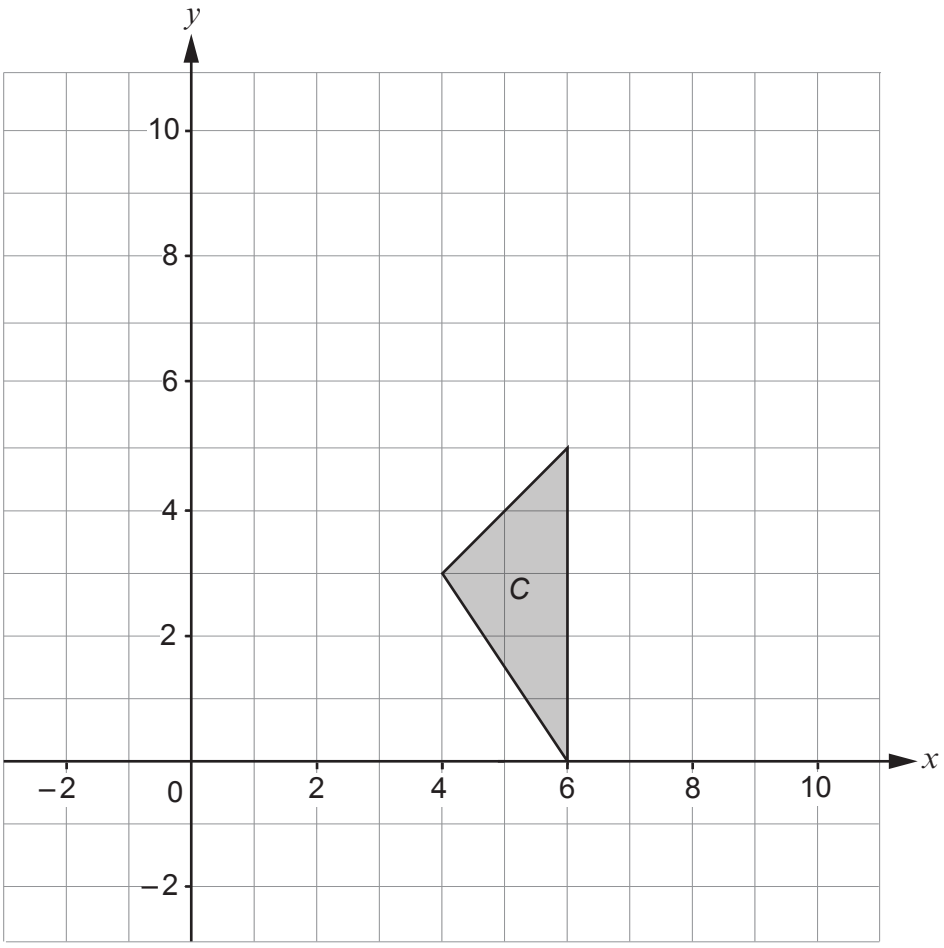
(b) Triangle *C* has vertices with coordinates (4, 3), (6, 5), (6, 0).
After a **single** transformation, the vertices of triangle *C* are mapped to (3, 4), (5, 6), (0, 6).

Describe the transformation. [2]

You may use this grid to help you.



Transformation: .....

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.....

Examiner only

23. *(a)* Expand and simplify $(x-6)(7x+5)$. [3]

(b) Factorise $y^2 + 2xy$. [1]

END OF PAPER

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

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