



GCSE



C300U20-1

THURSDAY, 3 NOVEMBER 2022 – MORNING

MATHEMATICS – COMPONENT 2

CALCULATOR – ALLOWED MATHEMATICS

FOUNDATION TIER

**2 hours 15 minutes plus your additional
time allowance**

**A CALCULATOR WILL BE REQUIRED
FOR THIS EXAMINATION**

Surname: _____

First name(s): _____

Centre Number: _____

Candidate Number: 0 _____

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

(Turn over)

ADDITIONAL MATERIALS

An additional Formulae Booklet.

A ruler, a protractor and a pair of compasses may be required.

ITEMS INCLUDED WITH QUESTION PAPER

A separate Formula List.

A separate Diagram Booklet.

Model for Question 17.

Cut out shapes for Question 2 (b).

The Diagram Booklet MUST be handed in to the invigilators and sent for marking.

(Turn over)

INSTRUCTIONS TO CANDIDATES

Use black ink, black ball – point pen, black felt tip or your usual method.

Write your name, centre number and candidate number in the spaces on the front cover.

Answer ALL questions.

Write your answers 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 questions(s) correctly.

Take π to be 3.142 or use the π button on your calculator.

(Turn over)

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.

(Turn over)

- 1. Enzo and Jane are taking a group of children to the beach for a day trip. They go to a shop to buy some items for the trip.**

The table below shows the prices for some items in the shop.

Bucket	£2.35
Beach ball	£3.20
Set of spades	£4.10
Toy duck	95p

continued on the next page . . .

(Turn over)

Question 1 continued

- 1. (a) Complete Enzo's bill provided for Question 1 (a) in the separate Diagram Booklet.**

[4 marks]

continued on the next page . . .

(Turn over)

Question 1 continued

- 1. (b) Enzo is given a 10% discount.
How much discount will he get?**

[1 mark]

continued on the next page . . .

(Turn over)

Question 1 continued

1. (c) Jane has £15 to spend.

**The shop has a special offer
on beach balls:**

‘Buy two get one free’

**What is the maximum number
of beach balls Jane can buy?**

(Turn over)

9

[2 marks]

(Turn over)

**2. (a) Write the number 340 205
in words.**

[1 mark]

continued on the next page . . .

(Turn over)

Question 2 continued

- 2. (b) Look at the diagram for Question 2 (b) in the separate Diagram Booklet.**

Shade $\frac{1}{3}$ of the shape shown.

Cut out triangles are available for this question.

[1 mark]

continued on the next page . . .

(Turn over)

Question 2 continued

**2. (c) What is the value of the 2
in the number 5.2614?**

Circle your answer.

$\frac{2}{1}$	$\frac{2}{100}$	$\frac{2}{10}$	2000	200
---------------	-----------------	----------------	------	-----

[1 mark]

continued on the next page . . .

(Turn over)

Question 2 continued

2. (d) Write these five numbers in order of size.

Start with the smallest.

6 -3 -5 3.6 3.45

--	--	--	--	--

Smallest

Largest

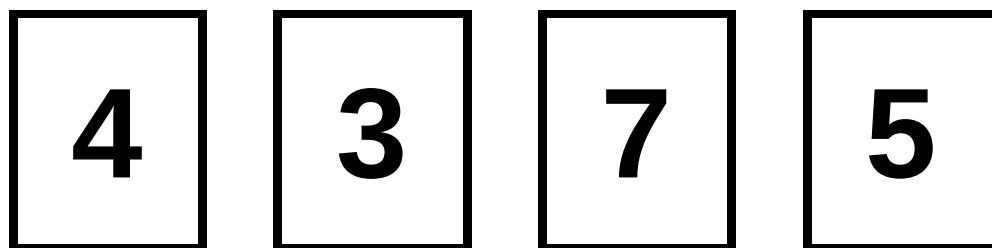
[1 mark]

continued on the next page . . .

(Turn over)

Question 2 continued

- 2. (e) Here are four cards with numbers on them.**



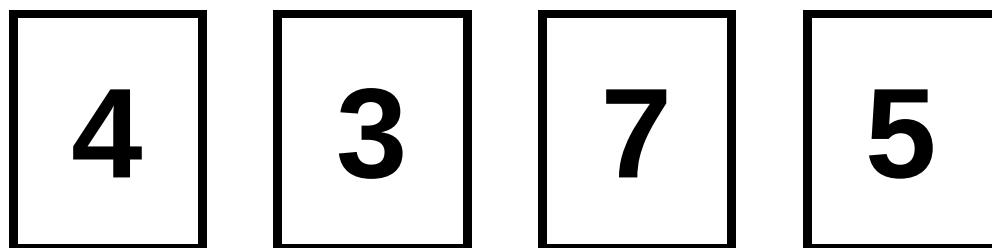
- (i) Write down the largest four – digit number that can be made by rearranging the cards.**

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[1 mark]
(Turn over)

Question 2 (e) continued

2. (e) Here are four cards with numbers on them.



**(ii) Write down the smallest
EVEN four – digit number
that can be made by
rearranging the cards.**

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[1 mark]
(Turn over)

- 3. Look at the diagram for Question 3 in the separate Diagram Booklet. The diagram shows two scales, scale 1 and scale 2.**

The scales are used to measure the mass of some fruit in grams.

- (a) What is the total mass of the fruit on each of the scales?**

Scale 1 = _____ grams

Scale 2 = _____ grams

[1 mark]

continued on the next page . . .

(Turn over)

Question 3 continued

3. (b) Calculate the mass of each pear and the mass of each banana.

Assume that:

- each pear has the same mass**
- each banana has the same mass.**

(Turn over)

Pear _____ **grams**

Banana _____ **grams**

[3 marks]

(Turn over)

4. (a) (i) One hundred tickets are sold in a raffle. A ticket is to be selected at random and the person with that ticket wins the prize. Sandra buys one of the tickets.

Circle the expression below that describes the chance that Sandra wins the prize in the raffle.

IMPOSSIBLE
UNLIKELY
AN EVEN CHANCE
LIKELY
CERTAIN

[1 mark]
(Turn over)

Question 4 (a) continued

- 4. (a) (ii) Henry has six pairs of shoes in his cupboard. He picks one shoe out at random.**

Circle the expression below that describes the chance that Henry picks out a shoe for his left foot.

IMPOSSIBLE
UNLIKELY
AN EVEN CHANCE
LIKELY
CERTAIN

[1 mark]

(Turn over)

Question 4 continued

**4. (b) Zac has a bag containing
12 marbles.**

**1 marble is green, 3 are red
and the rest are blue.**

**Zac chooses one marble
at random from the bag.**

continued on the next page . . .

(Turn over)

Question 4 (b) continued

**On the probability scale
provided for Question 4 (b) in
the separate Diagram Booklet,
label the points A, B and C
where:**

- A is the probability that
Zac chooses a red marble**
- B is the probability that
Zac chooses a yellow marble**
- C is the probability that
Zac chooses a marble that
is not green.**

[3 marks]

(Turn over)

- 5. Look at the diagram for Question 5 in the separate Diagram Booklet. The diagram shows nine shapes, A, B, C, D, E, F, G, H and I.**

Complete the following sentences.

Shapes _____ and _____ have only two lines of symmetry.

Shape _____ has rotational symmetry of order 4

Shapes _____ and _____ are congruent.

Shapes _____ and _____ are similar but not congruent.

(Turn over)

Question 5 continued

[4 marks]

(Turn over)

6. Look at the table for Question 6 in the separate Diagram Booklet.

The table shows part of a train timetable between Portsmouth Harbour and London Waterloo.

(a) Elise catches the 08:45 train from Portsmouth Harbour to London Waterloo.

How long should her train journey take?

(Turn over)

[2 marks]

continued on the next page . . .

(Turn over)

Question 6 continued

6. (b) Paul lives in Petersfield and works in Guildford.

He starts work at 10 a.m.

It takes him 15 minutes to walk from the train station to work.

Paul needs to arrive at work on time.

What is the time of the latest train from Petersfield he can take?

(Turn over)

[2 marks]

(Turn over)

- 7. Georgia is going on holiday to France. She takes one large suitcase and one piece of hand luggage.**

Look at the diagram for Question 7 in the separate Diagram Booklet. The diagram is a graph.

The graph can be used to convert between kilograms and pounds.

continued on the next page . . .

(Turn over)

Question 7 continued

**7. (a) (i) Georgia's suitcase has
a mass of 25 kg.**

**What is the mass of the
suitcase in pounds?**

[1 mark]

continued on the next page . . .

(Turn over)

Question 7 (a) continued

**7. (a) (ii) Her hand luggage has
a mass of 10 pounds.**

**What is the mass of her
hand luggage in kilograms?**

[1 mark]

continued on the next page . . .

(Turn over)

Question 7 continued

- 7. (b) Look at the formula for Question 7 (b) in the separate Diagram Booklet.**

A car hire company in France uses the formula shown to calculate costs in euros (€).

- (i) Georgia decides to hire a car for 8 days.**

Insurance will cost her €95

Calculate the cost of Georgia's car hire.

(Turn over)

[2 marks]

continued on the next page . . .

(Turn over)

Question 7 (b) continued

7. (b) (ii) Meena is also hiring a car from the same company.

She has €270 to spend on car hire.

Insurance will cost her €126

She wants to hire the car for as many days as possible.

For how many whole days can Meena afford to hire the car?

(Turn over)

35

[3 marks]

(Turn over)

- 8. Malik is planning a birthday party for 25 children. He can choose either a swimming party or an adventure centre party.**

Look at the information provided for Question 8 in the separate Diagram Booklet. The information shows the costs for each party.

Malik works out the total cost for each party. He chooses the cheaper of the parties.

continued on the next page . . .

(Turn over)

Question 8 continued

Which party does Malik choose?

Swimming Party

☐

Adventure Centre Party

☐

You must show all your working.

Swimming Party

(Turn over)

Adventure Centre Party

(Turn over)

[7 marks]

(Turn over)

9. Rochelle is training for a marathon. For each of the last five weeks she has recorded how many miles she has run.

- Rochelle runs a whole number of miles each week.**
- Her median is 23 miles.**
- Her mode is 29 miles.**
- Her range is 8 miles.**

How many miles in total has Rochelle run in the last five weeks? You may use the boxes below to help you.

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(Turn over)

Question 9 continued

(Turn over)

42

**Total number of miles Rochelle
has run** _____

[5 marks]

(Turn over)

10. Look at the diagram for Question 10 in the separate Diagram Booklet.

The diagram shows two pie charts.

Two different companies use pie charts to show the proportion of male and female employees.

(a) Jamie says,

“Company A has more female employees than Company B.”

Give a reason why he may be incorrect.

(Turn over)

[1 mark]

continued on the next page . . .

(Turn over)

Question 10 continued

- 10. (b) Calculate the difference
between the PERCENTAGE of
male employees in Company A
and the PERCENTAGE of
male employees in Company B.**

(Turn over)

46

[3 marks]

(Turn over)

- 11. A shop sells the same breakfast cereal in two different – sized boxes.**

A 500 g box of cereal costs £2.21

A 900 g box of cereal costs £3.78

Which box is the better value for money?

500 g

900 g

You must show all your working.

(Turn over)

(Turn over)

[2 marks]

(Turn over)

12. (a) Simplify $10c \div 2$

[1 mark]

continued on the next page . . .

(Turn over)

Question 12 continued

12. (b) Solve $4x - 5 = 2$

[2 marks]

continued on the next page . . .

(Turn over)

Question 12 continued

12. (c) Expand $7(h - 6)$

[1 mark]

(d) Factorise $6y + 4$

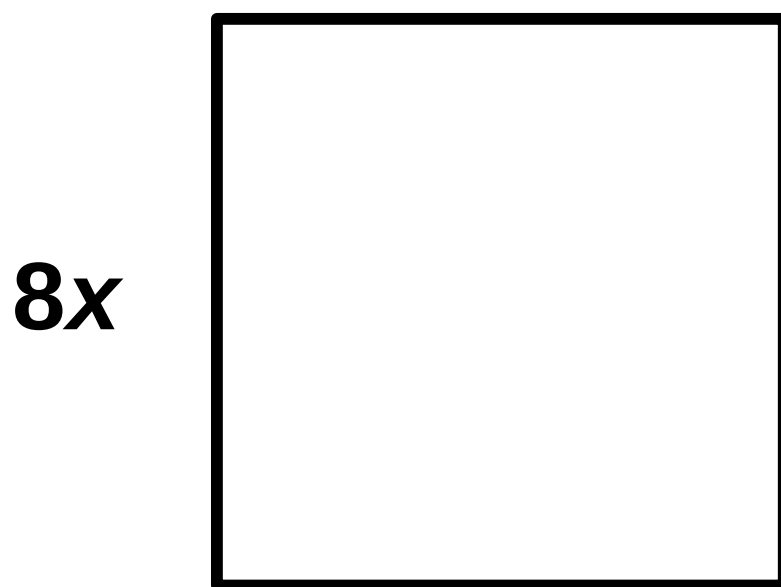
[1 mark]

continued on the next page . . .

(Turn over)

Question 12 continued

- 12. (e) The diagram below is a square.
The diagram is NOT drawn
to scale.**



- (i) Find an expression for the
perimeter of the square.
Simplify your answer.**

(Turn over)

[2 marks]

**12. (e) (ii) Find an expression for the
area of the square.
Simplify your answer.**

[2 marks]

(Turn over)

13. Look at the diagram for Question 13 in the separate Diagram Booklet.

The diagram shows two fair spinners, spinner 1 and spinner 2.

Hubert plays a game.

He spins the two fair spinners shown.

Hubert calculates a score.

He SQUARES the number on spinner 1 and MULTIPLIES it by the number on spinner 2.

continued on the next page . . .

(Turn over)

Question 13 continued

**13. (a) Look at the table for
Question 13 (a) in the separate
Diagram Booklet.**

**Complete the table to show
all the possible scores.**

[2 marks]

continued on the next page . . .

(Turn over)

Question 13 continued

**13. (b) To win the game Hubert must
score MORE THAN 9**

He plays the game 108 times.

**How many times would you
expect him to win?**

(Turn over)

[3 marks]

(Turn over)

14. Lynda cycles 31.5 km from home to work each day.

(a) One day, her journey to work takes her 1 hour and 45 minutes.

Calculate her average speed in km/h.

(Turn over)

[2 marks]

continued on the next page . . .

(Turn over)

Question 14 continued

14. (b) Lynda cycles home following the same route.

She leaves work at 4 p.m.

Her average speed on this journey is 15 km/h.

At what time does Lynda arrive home?

You must show all your working.

(Turn over)

[4 marks]

(Turn over)

15. Look at the diagram for Question 15 in the separate Diagram Booklet. The diagram is NOT drawn to scale.

In the diagram, the angles $3x^\circ$, 152° , 126° and $2y^\circ$ are shown.

Find the value of x and the value of y .

(Turn over)

64

$x =$ _____

$y =$ _____

[3 marks]

(Turn over)

16. Calculate the value of $\frac{\sqrt{1456}}{1.3^3 - 0.7}$

**Give your answer correct to
1 decimal place.**

[2 marks]

(Turn over)

17. Ask for the model for Question 17.

The model is NOT made to scale.

The model represents a tank.

**Tobias has a tank in the shape
of a cuboid.**

**It has length 40 cm, width 25 cm
and depth 32 cm.**

**He uses a jug with a capacity
of 2 litres to fill the tank.**

**Tobias fills the jug to the top with
water and pours it into the tank.**

**He repeats the process until the
tank is full.**

continued on the next page . . .

(Turn over)

Question 17 continued

**How many times does Tobias fill
the jug?**

(Turn over)

Tobias fills the jug _____ times.

[5 marks]

18. Nathan and Lucy make and sell wooden items for gardens.

(a) Nathan makes and sells benches, tables and tool sheds. Last year, the profit he made from selling these items was in the following ratio.

benches : tables : tool sheds

2 : 3 : 7

continued on the next page . . .

(Turn over)

Question 18 (a) continued

**18. (a) (i) What fraction of his profit
did Nathan make from
selling benches and tables?**

[1 mark]

continued on the next page . . .

(Turn over)

Question 18 (a) continued

18. (a) (ii) His total profit was £18 072

**How much profit did
Nathan make from the sale
of tool sheds?**

(Turn over)

[2 marks]

continued on the next page . . .

(Turn over)

Question 18 continued

**18. (b) Lucy makes and sells planters.
Each planter costs Lucy £32
to make. Each one that she
sells makes a PROFIT of £80**

**What is Lucy's profit from
the sale of one planter as
a percentage of the cost to
make the planter?**

(Turn over)

74

[2 marks]

(Turn over)

19. The table below gives a summary of the masses, m grams, of 30 buzzards.

Mass, m (grams)	Frequency
$600 \leq m < 700$	8
$700 \leq m < 800$	7
$800 \leq m < 900$	4
$900 \leq m < 1000$	11

continued on the next page . . .

(Turn over)

Question 19 continued

19. (a) Moeen uses the midpoint of each group to calculate an estimate of the mean mass of these buzzards.

He does this correctly.

Calculate Moeen's answer.

(Turn over)

[3 marks]

continued on the next page . . .

(Turn over)

Question 19 continued

19. (b) Deeta decides to estimate the mean mass of these buzzards. She uses the values 600, 700, 800 and 900 rather than the midpoints.

Explain why her method is unlikely to give a good estimate of the mean mass.

(Turn over)

79

[1 mark]

(Turn over)

20. Debbie collects data about a group of 20 people.

Her data is:

- **the total number of years for which they have owned a pet**
- **the number of visits they have each made to their doctor in the last year.**

Look at the diagram for Question 20 in the separate Diagram Booklet.

The diagram is a scatter graph.

The scatter graph shows her results and her attempt to draw a line of best fit for the data.

continued on the next page . . .

(Turn over)

Question 20 continued

**20. (a) Make a criticism of Debbie's
line of best fit.**

[1 mark]

continued on the next page . . .

(Turn over)

Question 20 continued

20. (b) Debbie says,

**“BECAUSE THERE IS A
NEGATIVE CORRELATION,
owning a pet for longer
CAUSES people to need to
visit the doctor less often.”**

Is Debbie correct?

Yes ☐

No ☐

Explain how you decide.

(Turn over)

83

[1 mark]

(Turn over)

21. Janet invests £5000 in a savings account for 9 years. She makes no further payments into or out of her account in this time.

For the first 5 years, her investment earns 2% compound interest per year. After this, the interest rate decreases to 1.3% compound interest per year.

How much is Janet's investment worth at the end of the 9 years?

(Turn over)

[illegible]

[4 marks]

(Turn over)

**22. (a) Circle the correct conversion
of 7 m^3 to cm^3**

0.000 07	0.07	700
	70 000	7 000 000

[1 mark]

continued on the next page . . .

(Turn over)

Question 22 continued

22. (b) Look at the diagram for Question 22 (b) in the separate Diagram Booklet. The diagram is NOT drawn to scale.

The diagram shows a shape made from a trapezium and a circle.

The parallel sides of the trapezium are tangents to the circle. The diameter of the circle is 30 cm.

continued on the next page . . .

(Turn over)

Question 22 (b) continued

The ratio of the white area to the SHADED area is as follows.

White area : shaded area

$$1 : k$$

Find the value of k .

Show all your working and give your answer correct to 1 significant figure.

(Turn over)

(Turn over)

91

[illegible]

[6 marks]
(Turn over)

23. (a) Solve $5y + 4 = 2y + 6$

This image shows a single page of white paper with horizontal blue or grey ruling lines. The lines are evenly spaced and run across the width of the page, leaving small margins at the top and bottom. There is no handwriting or printed text on the page.

[2 marks]

continued on the next page . . .

(Turn over)

Question 23 continued

23. (b) Solve $4x - 3 > 17$

This image shows a blank sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

[2 marks]

(Turn over)

Question 23 continued

23. (c) Solve the following simultaneous equations. Use an algebraic (not graphical) method.

$$5x - 2y = 16$$

$$x - y = 5$$

You must show all your working.

(Turn over)

(Turn over)

[3 marks]

(Turn over)

24. Look at the diagram for Question 24 in the separate Diagram Booklet.

The diagram is NOT drawn to scale.

The diagram shows a rhombus, $ABCD$.

AC and BD intersect at E .

The length of AC is 12 cm.

Angle BCE is 35°

Find the perimeter of $ABCD$.

(Turn over)

[illegible]

(Turn over)

= _____ cm

END OF PAPER

TOTAL 120 MARKS

(Turn over)

[illegible]

(Turn over)

[illegible]

(Turn over)

[illegible]

(Turn over)

[illegible]

C300U20-1

THURSDAY, 3 NOVEMBER 2022 – MORNING

MATHEMATICS – COMPONENT 2
CALCULATOR–ALLOWED MATHEMATICS
FOUNDATION TIER

**The Diagram Booklet MUST
be handed in to the invigilators
and sent for marking.**

Diagram Booklet

Surname: _____

First name(s): _____

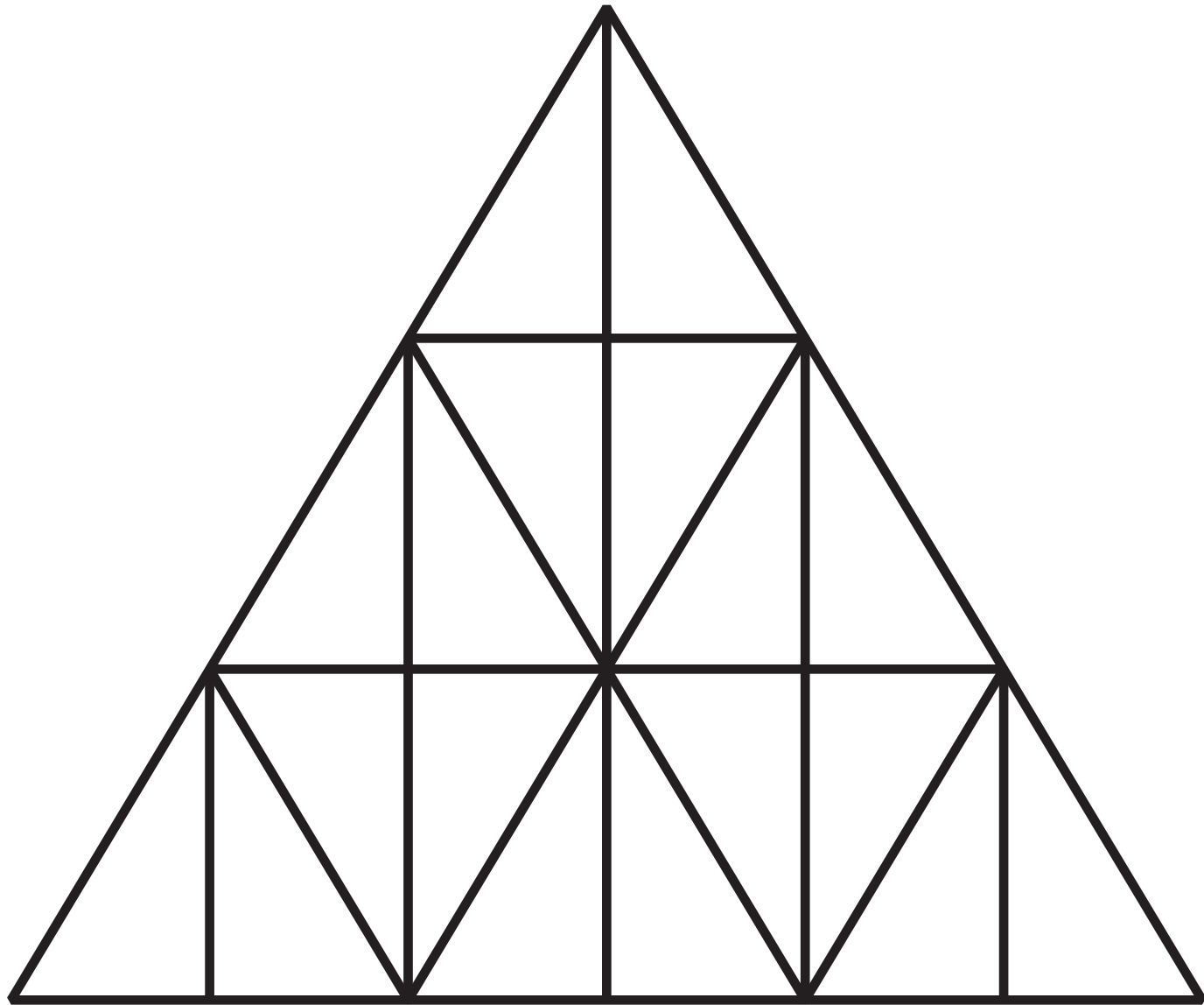
Centre Number: _____

Candidate Number: 0 _____

Question 1 (a)

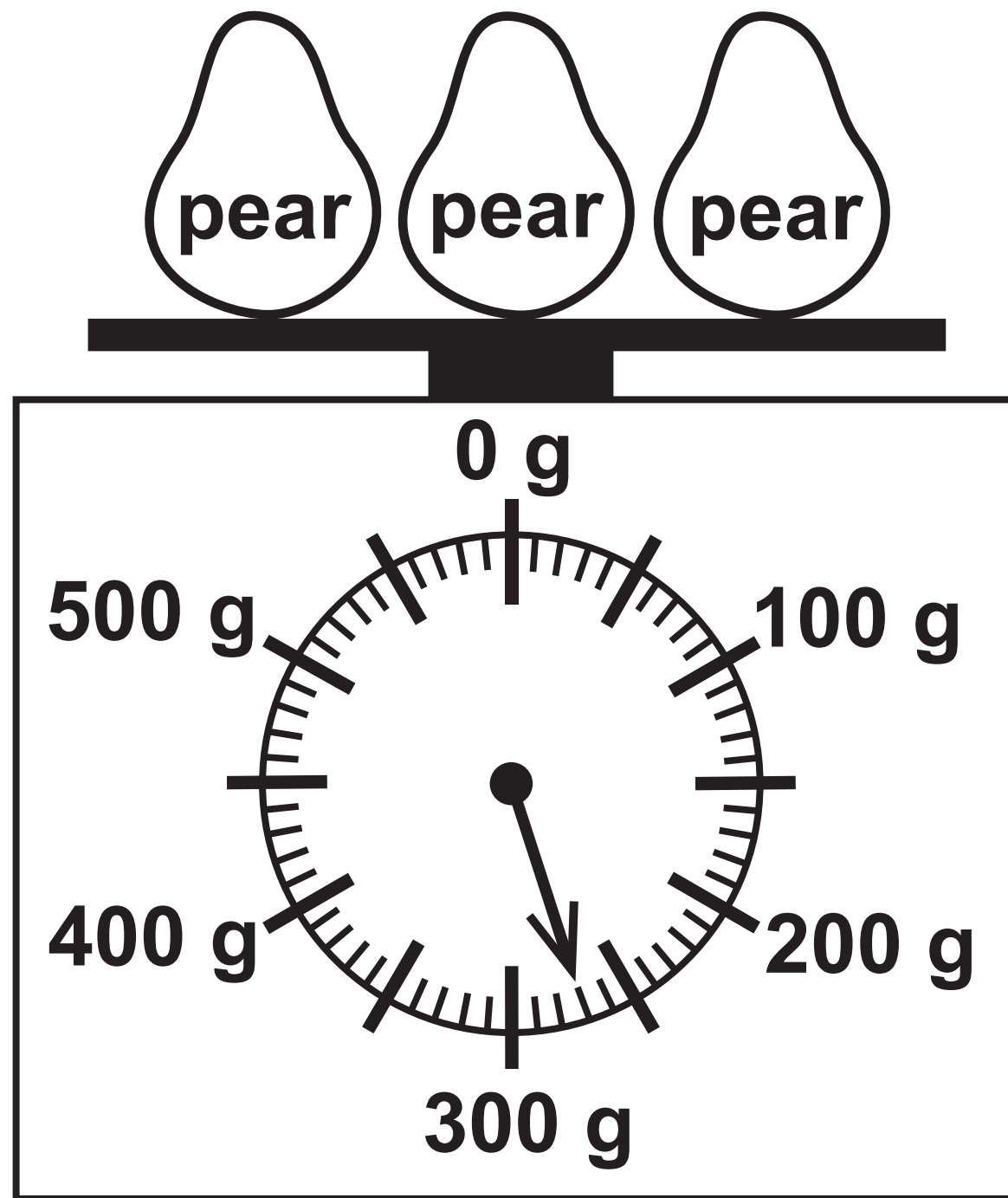
ENZO'S BILL	
15 Buckets	£ _____
_____ Sets of spades	£ 12.30
17 Toy ducks	£ _____
TOTAL	£ _____

Question 2 (b)

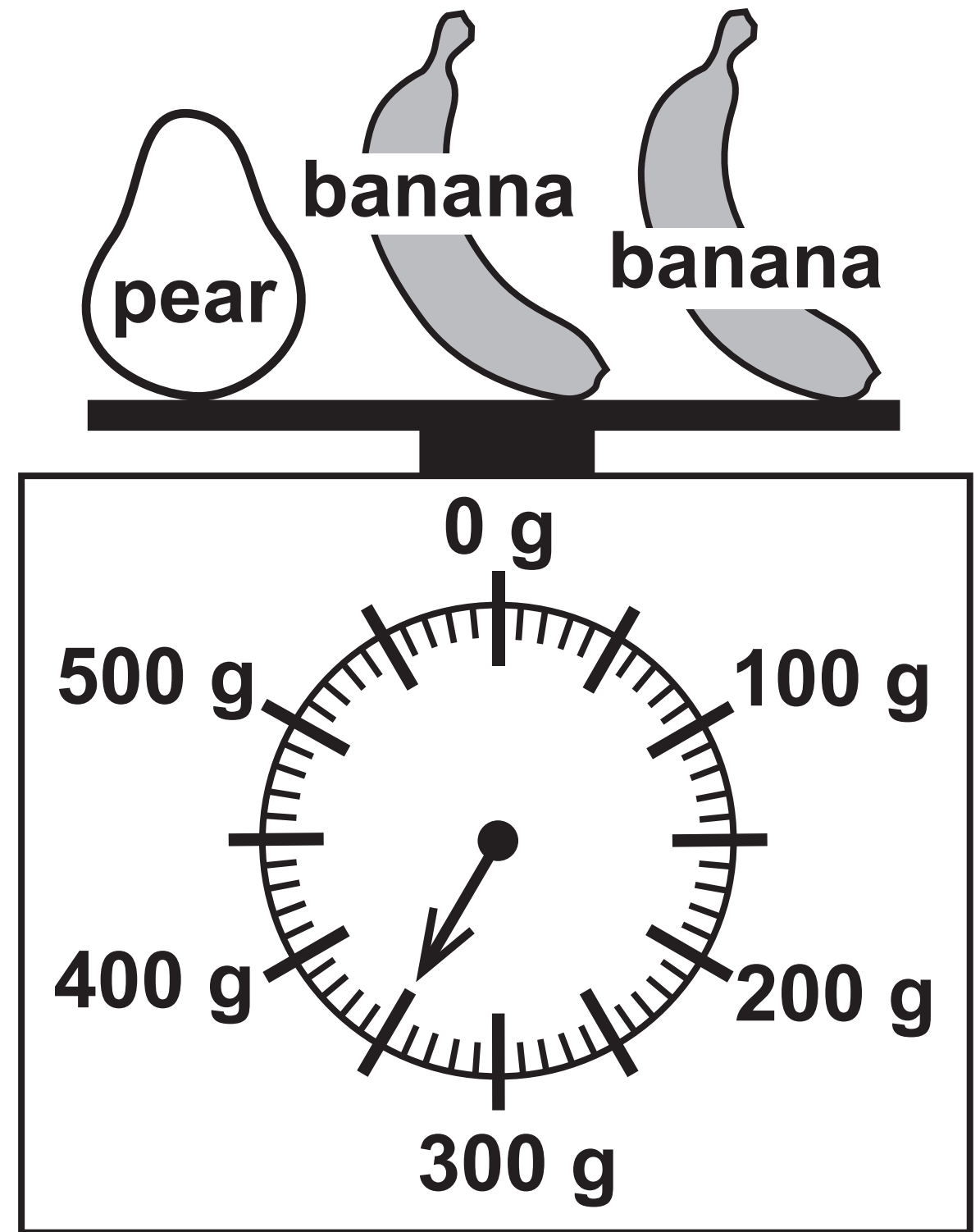


Question 3

Scale 1



Scale 2

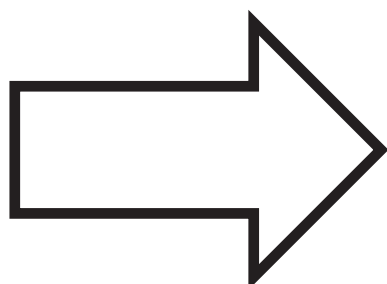


Question 4 (b)

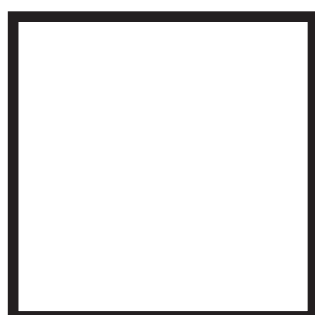


Question 5

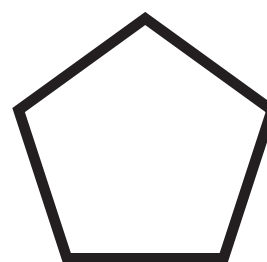
Shape A



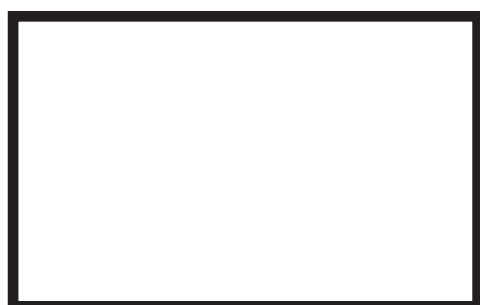
Shape B



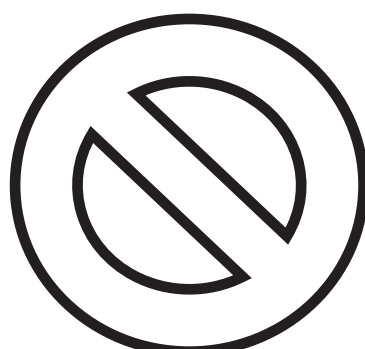
Shape C



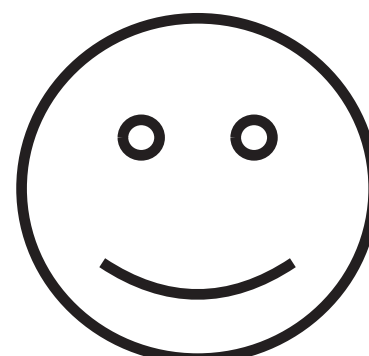
Shape D



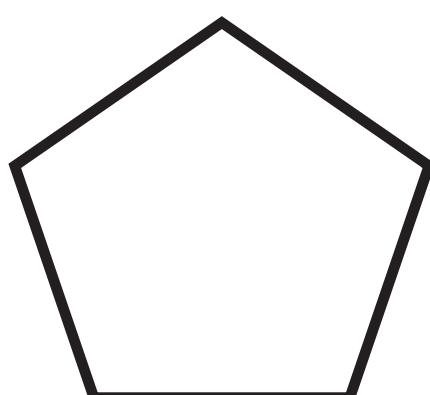
Shape E



Shape F



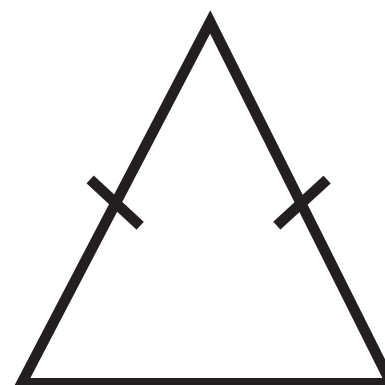
Shape G



Shape H



Shape I



Question 6

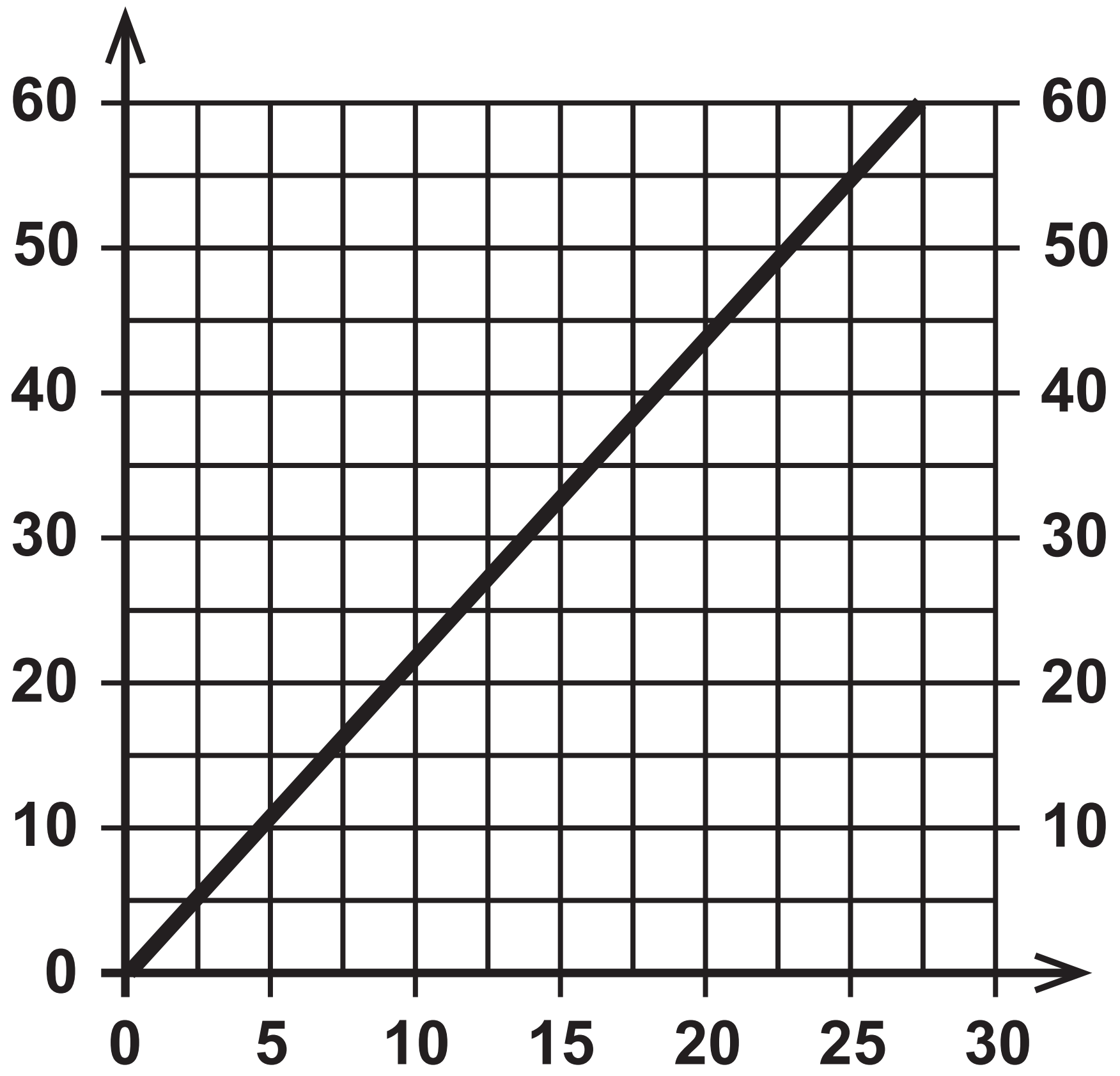
Table

TRAIN TIMES: PORTSMOUTH HARBOUR TO LONDON WATERLOO

Portsmouth Harbour	07:14	07:45	08:15	08:45	09:15
Petersfield	07:45	08:17	08:47	09:17	09:47
Haslemere	07:59	08:31	09:01	09:31	10:00
Guildford	08:17	08:49	09:18	09:48	10:18
London Waterloo	08:56	09:30	09:55	10:29	10:52

Question 7

Pounds (lb)



Kilograms (kg)

Question 7 (b)

Formula

Car hire cost = €11.25 × number of days car hire + insurance

Question 8

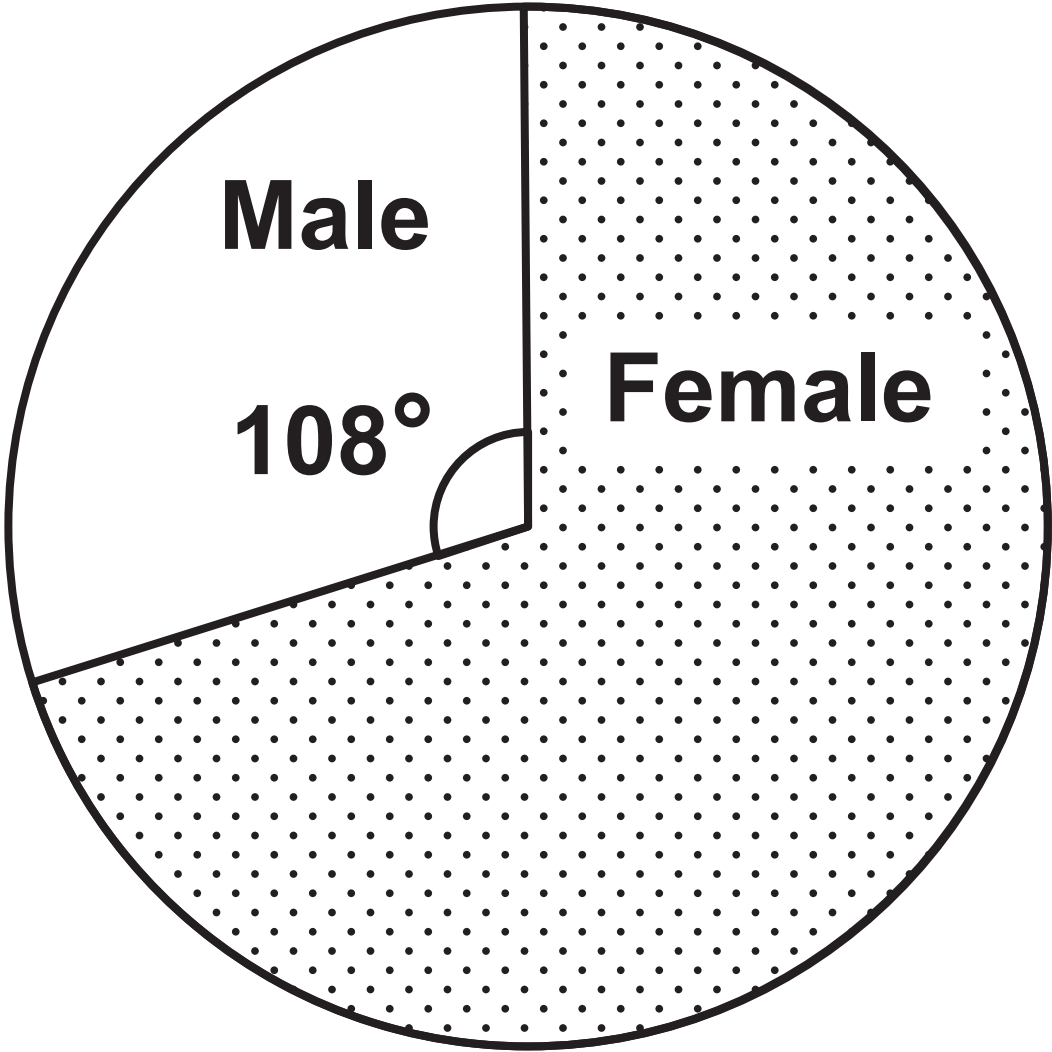
Information

SWIMMING PARTY
£320 for 20 children. £7.25 for each additional child.
SPECIAL OFFER: $\frac{1}{3}$ off the total cost of the party.

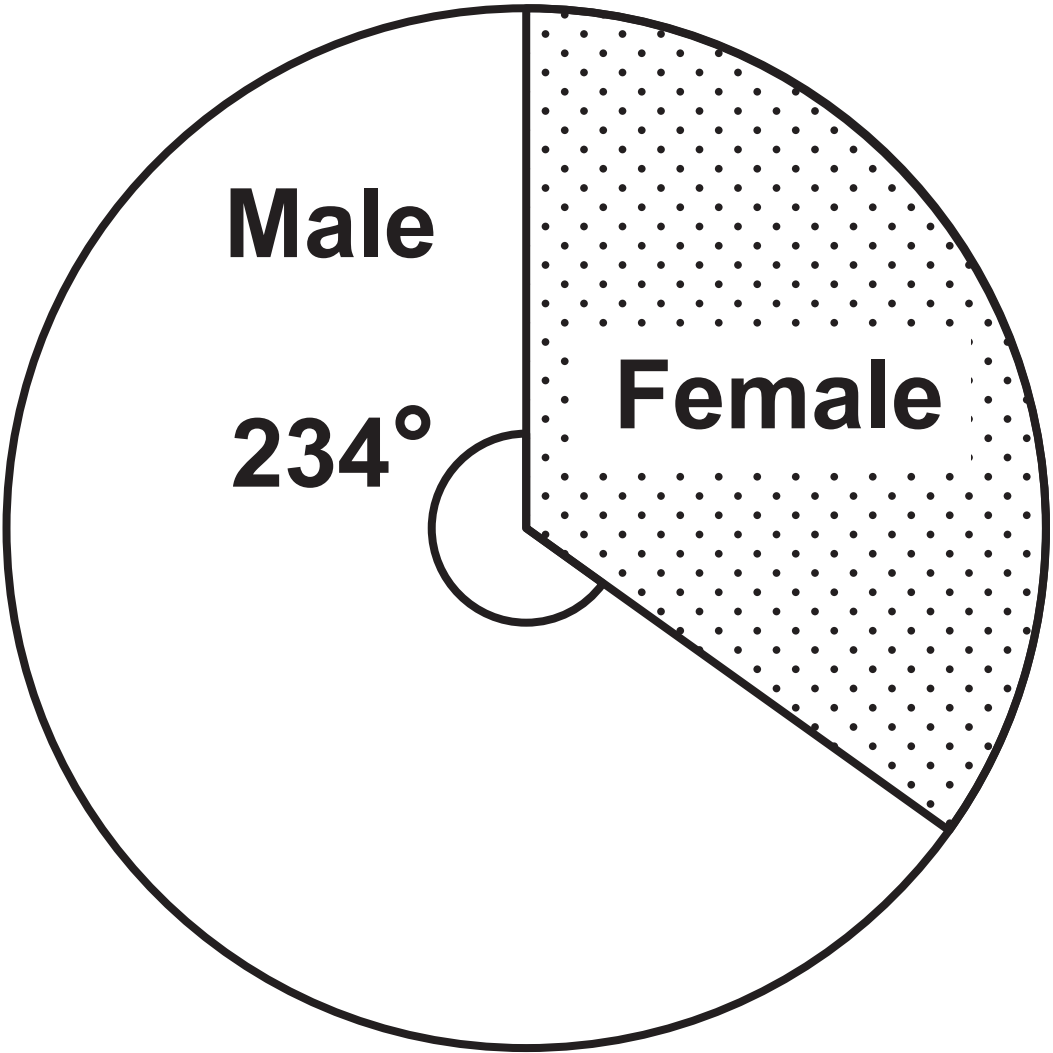
ADVENTURE CENTRE PARTY
£13.60 per child. 15% off the total cost for groups of more than 20 children.

Question 10

COMPANY A

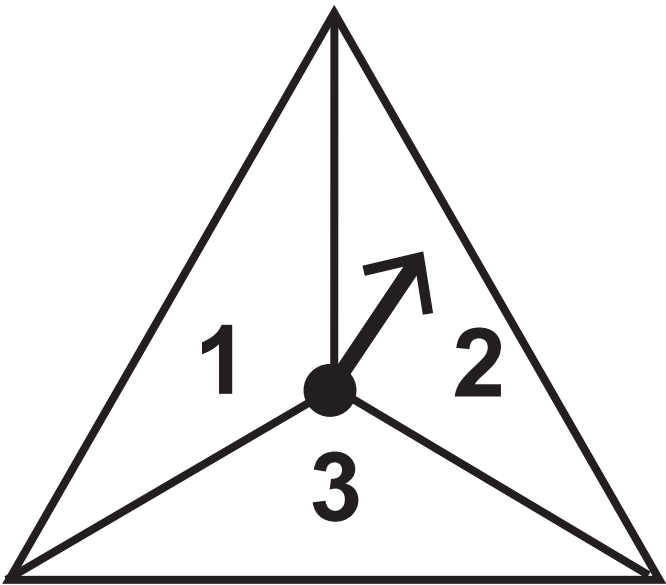


COMPANY B

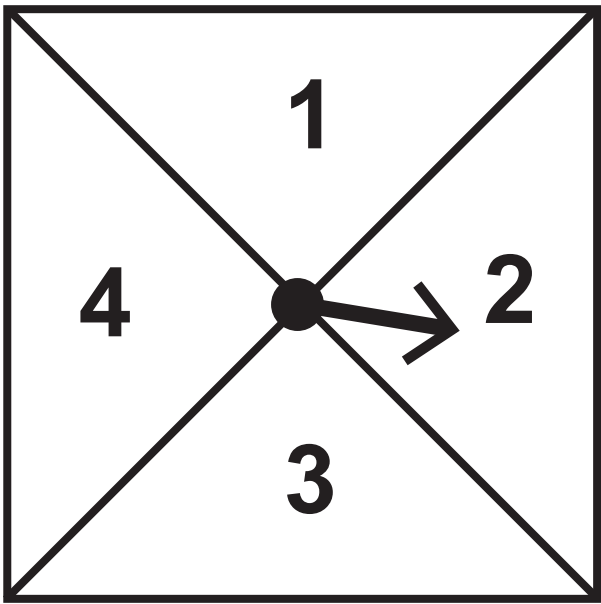


Question 13

Spinner 1



Spinner 2



Question 13 (a)

Table

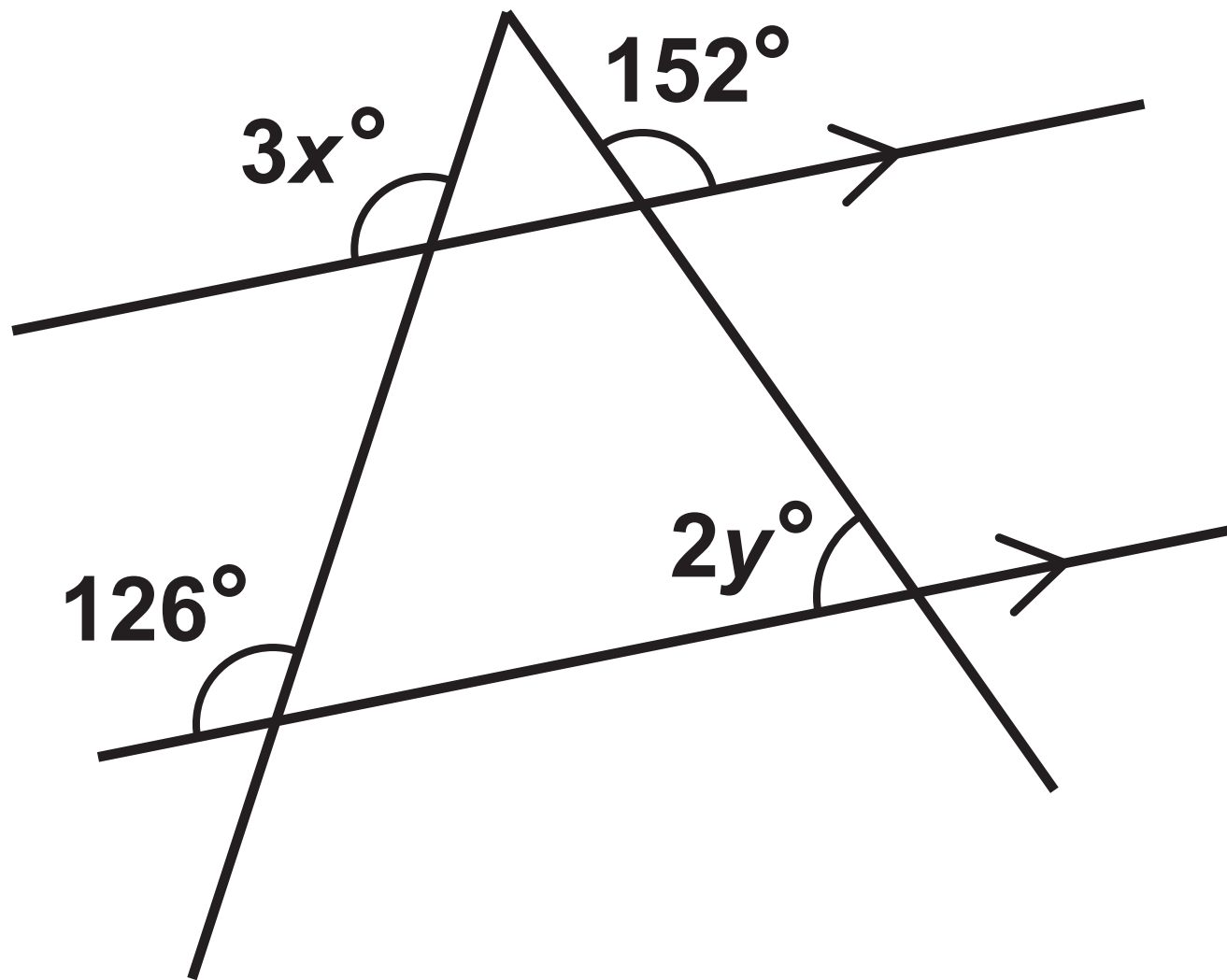
SPINNER 2

SPINNER 1

	1	2	3	4
1	1			
2				16
3	9			

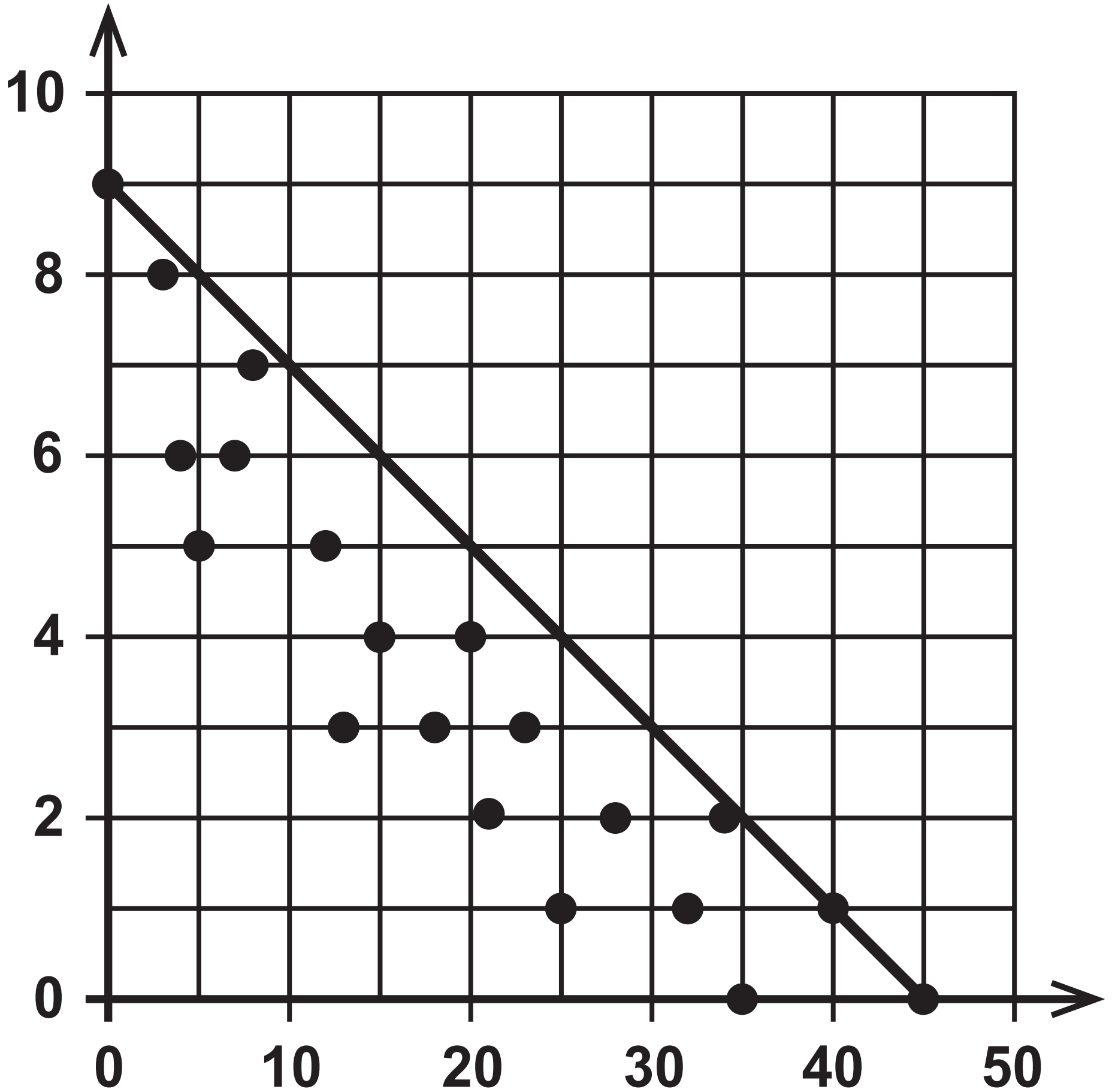
Question 15

Diagram NOT drawn to scale



Question 20

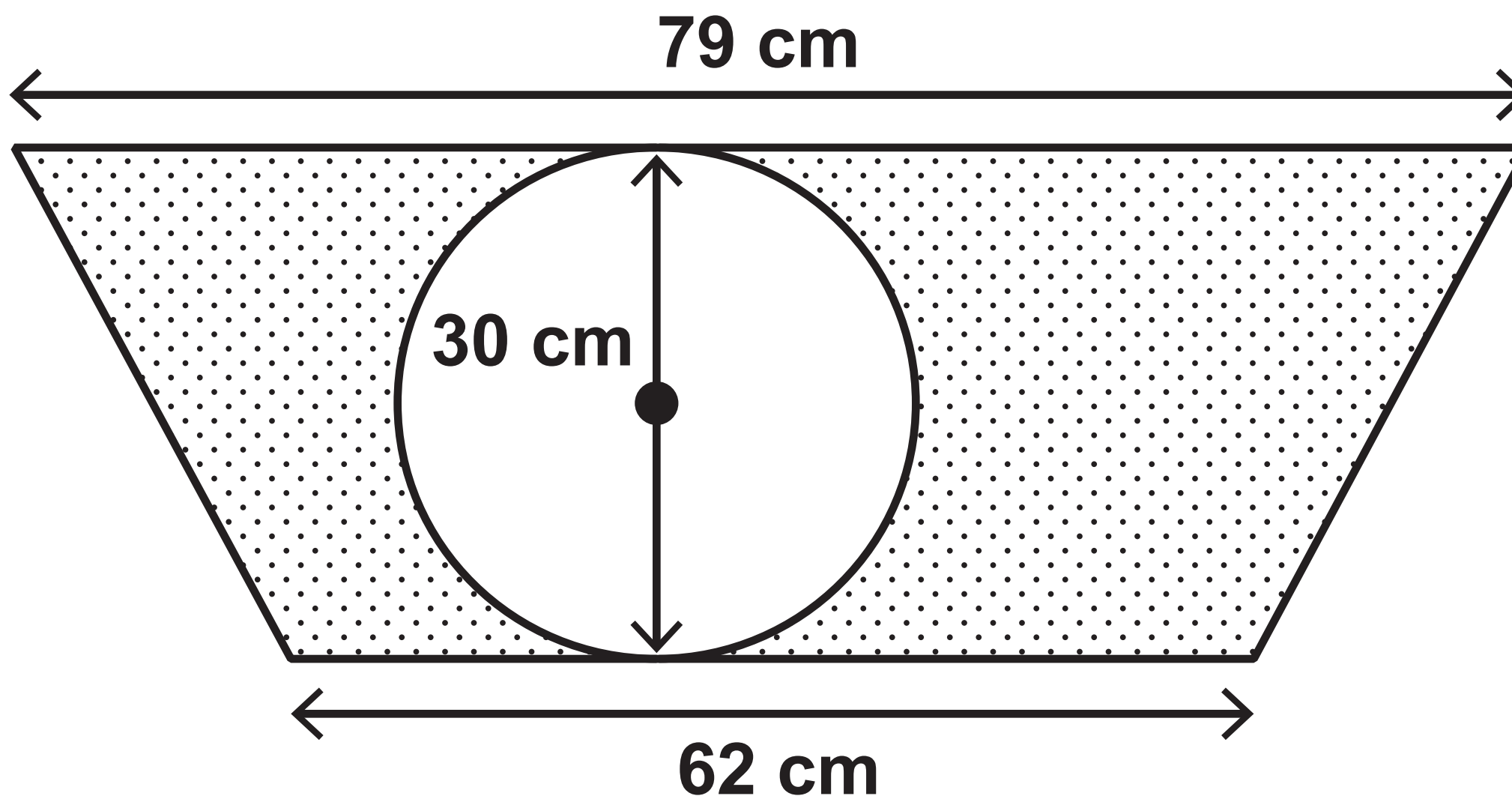
Number of visits
to the doctor



Total number of years
of pet ownership

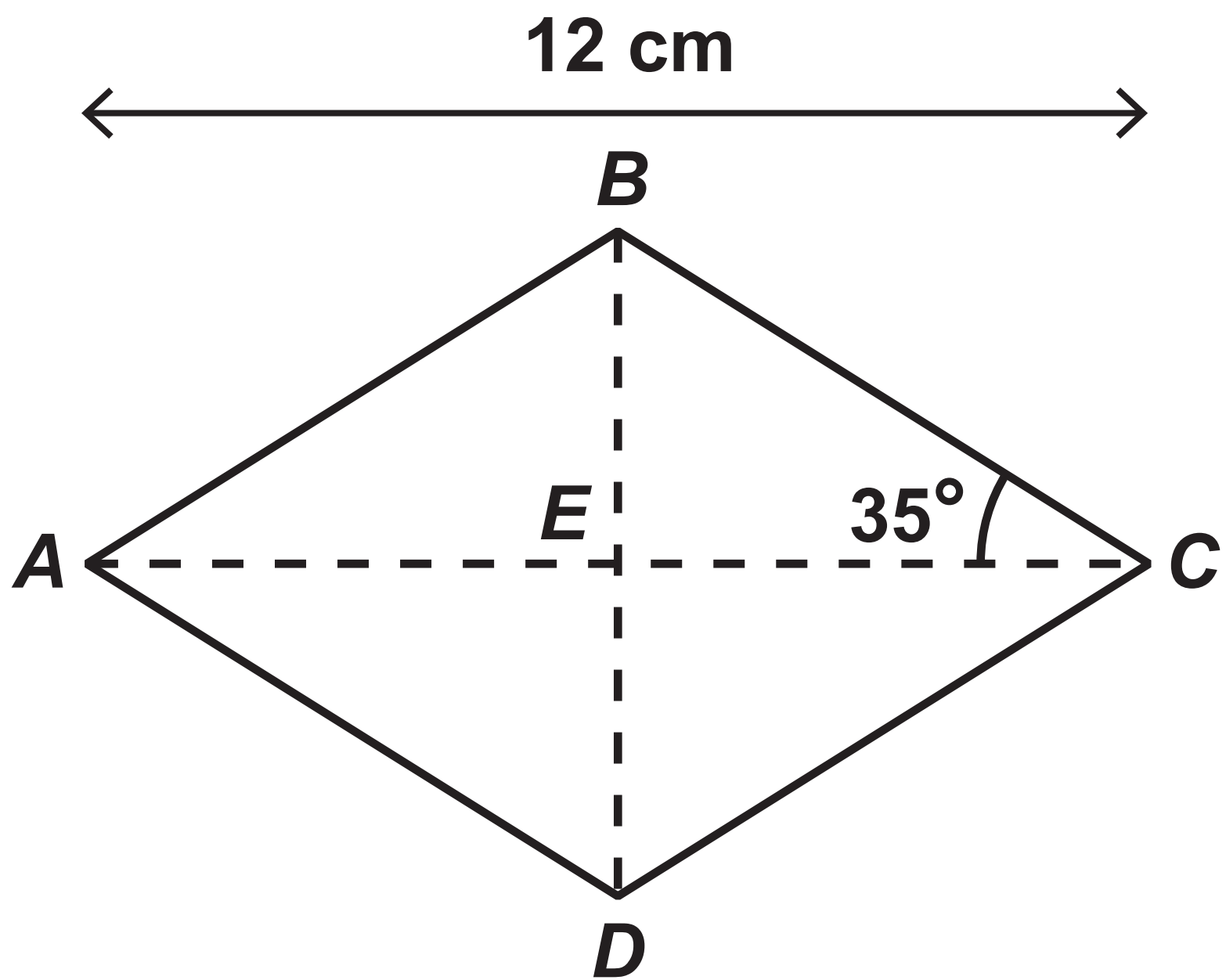
Question 22 (b)

Diagram NOT drawn to scale



Question 24

Diagram NOT drawn to scale



**FORMULA LIST
FOUNDATION TIER
AND HIGHER TIER
GCSE**

You must not write on these formulae pages.

Anything you write on these formulae pages will gain NO credit.

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 = $\pi r l$

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:

$$v = u + at$$

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

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

C300U20-1A

THURSDAY, 3 NOVEMBER 2022 – MORNING

MATHEMATICS

FOUNDATION TIER

Additional Formulae

PERIMETER, AREA AND VOLUME

Where a and b are the lengths of the parallel sides and h is their perpendicular separation:

$$\text{Area of a trapezium} = \frac{1}{2}(a + b)h$$

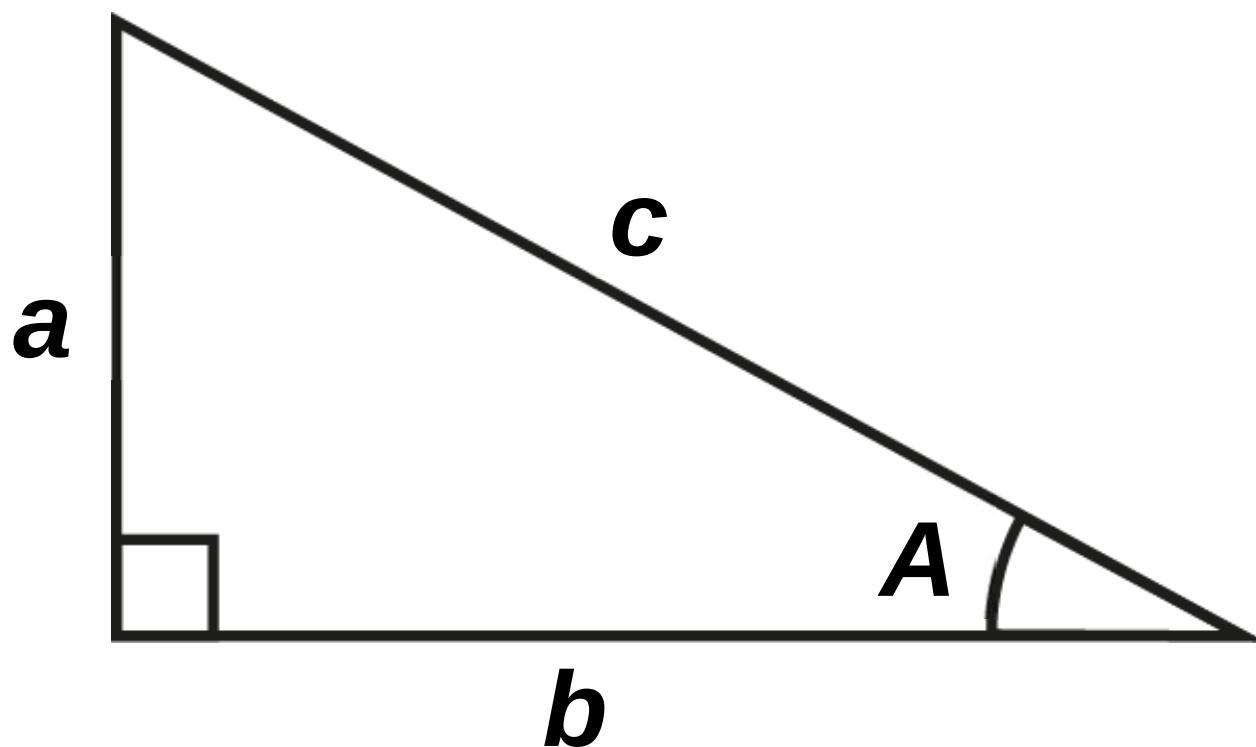
Volume of a prism =
area of cross section $\times$ length

Where r is the radius and
 d is the diameter:

$$\text{Circumference of a circle} = 2\pi r = \pi d$$

$$\text{Area of a circle} = \pi r^2$$

PYTHAGORAS' THEOREM AND TRIGONOMETRY



In any right – angled triangle where a , b and c are the length of the sides and c is the hypotenuse:

$$a^2 + b^2 = c^2$$

In any right – angled triangle ABC where a , b and c are the length of the sides and c is the hypotenuse:

$$\sin A = \frac{a}{c} \quad \cos A = \frac{b}{c} \quad \tan A = \frac{a}{b}$$

COMPOUND INTEREST

Where P is the principal amount,
 r is the interest rate over a given period
and n is number of times that the
interest is compounded:

$$\text{Total accrued} = P \left(1 + \frac{r}{100} \right)^n$$

PROBABILITY

Where $P(A)$ is the probability of
outcome A and $P(B)$ is the probability
of outcome B :

$$P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$$