GCSE

wjec cbac

C300UB0-1

S24-C300UB0-1

eduqas
Part of WJEC

MONDAY, 3 JUNE 2024 – MORNING

MATHEMATICS – Component 2
Calculator-Allowed Mathematics
HIGHER TIER

2 hours 15 minutes

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** questions.

Write your answers in the spaces provided in this booklet. 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.

For Examiner's use only		
Question	Maximum Mark	Mark Awarded
1.	5	
2.	5	
3.	5	
4.	4	
5.	5	
6.	4	
7.	5	
8.	2	
9.	3	
10.	4	
11.	4	
12.	4	
13.	4	
14.	4	
15.	3	
16.	6	
17.	4	
18.	3	
19.	3	
20.	4	
21.	4	
22.	3	
23.	6	
24.	7	
25.	3	
26.	9	
27.	7	
Total	120	

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:

$$v = u + at$$

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

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

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Answer **all** questions.

1. 45 students took part in a 400 m race.
Their times, in seconds, were recorded.
The frequency diagram below shows the results.

The groups used are as follows:

$70 \leqslant$ time < 80, $80 \leqslant$ time < 90, $90 \leqslant$ time < 100, $100 \leqslant$ time < 110 and $110 \leqslant$ time < 120.
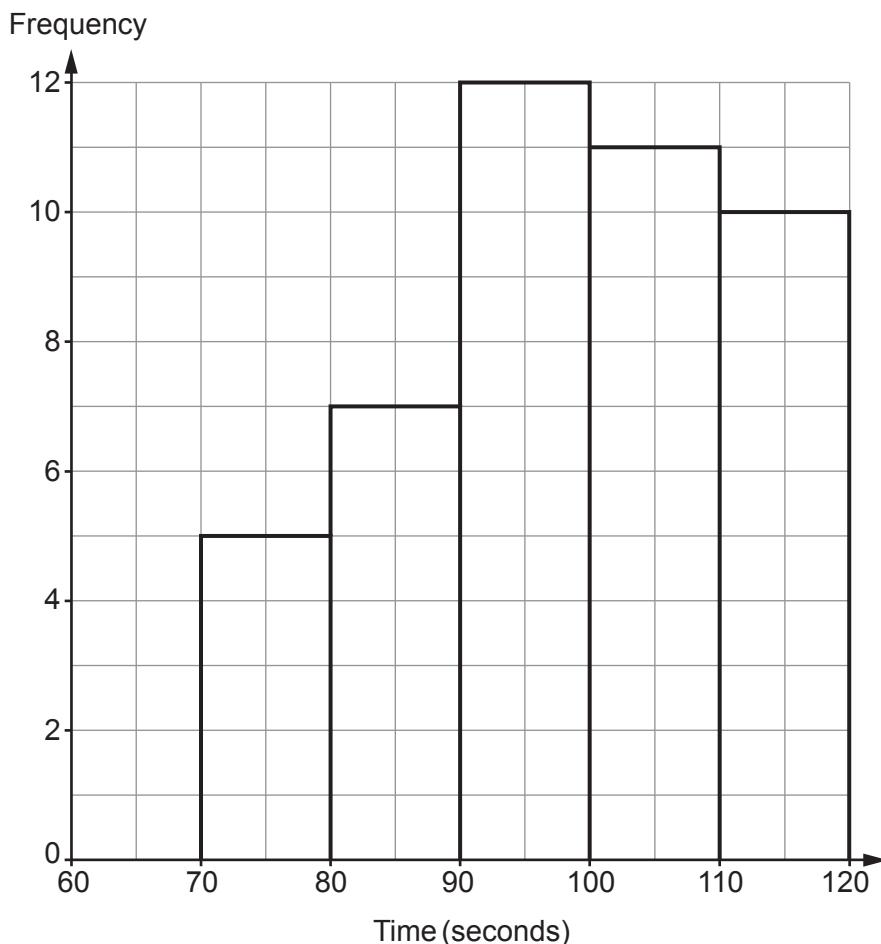
Calculate an estimate for the mean time it took to complete the race. [5]

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2. (a) Factorise $x^2 - 5x - 24$. [2]

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(b) Simplify $\left(3h^2\right)^3$. [2]

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(c) Represent the inequality $-2 < x \leqslant 3$ on the number line below. [1]

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3.
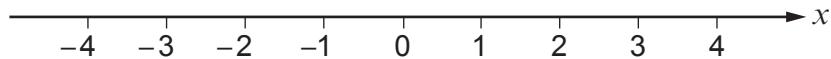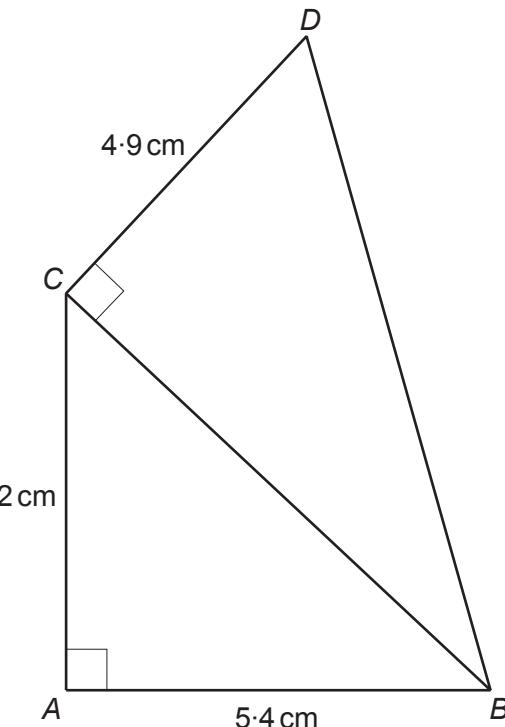
Diagram not drawn to scale

ABC and *BCD* are right-angled triangles.
AB = 5·4 cm, *AC* = 7·2 cm and *CD* = 4·9 cm.

Calculate the area of triangle *BCD*. [5]

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Area of triangle *BCD* is .... cm^2

Turn over.

4. For her lunch, Gina sometimes eats a salad and sometimes drinks a coffee.
The probability she eats a salad for lunch on a given day is 0·4.
The probability she drinks a coffee on a given day is 0·25.
Eating a salad for lunch and drinking a coffee are independent.

(a) Complete the following tree diagram. [2]

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                                                    0·25          Gina drinks a
                                                                  coffee
                              Gina eats a salad
                              for lunch
              0·4                          ..............          Gina does not
                                                                   drink a coffee

                                                    ..............  Gina drinks a
                                                                    coffee
              ..............  Gina does not eat
                              a salad for lunch
                                           ..............          Gina does not
                                                                   drink a coffee
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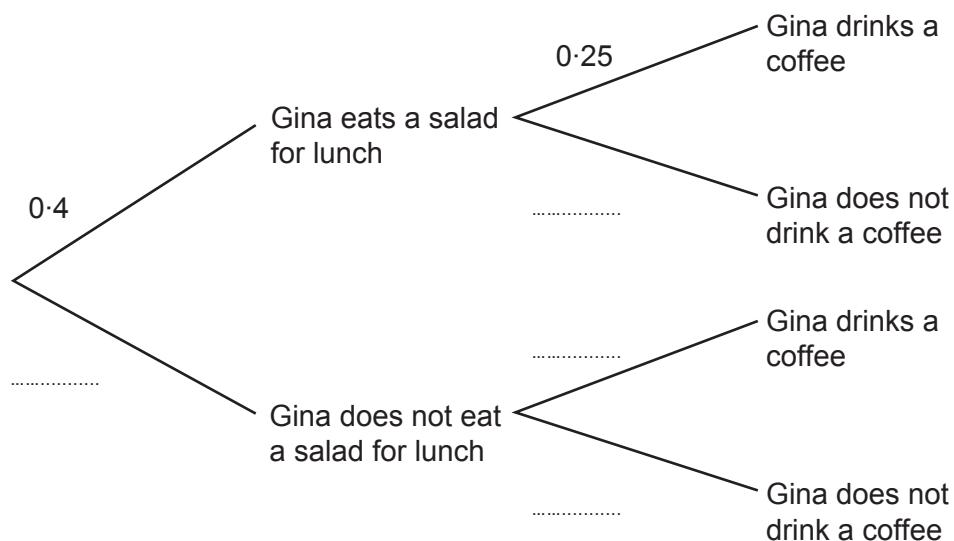
(b) Calculate the probability that, on a given day, Gina does not eat a salad for lunch but does drink a coffee. [2]

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5. When a ball is dropped, the maximum height it reaches after each bounce decreases.

Diagram not drawn to scale

Maddox says,

> Each time the ball bounces it reaches a height that is 55% of the maximum height reached on its previous bounce.

(a) The ball is dropped from a height of 4 m.

What height will the ball reach above the ground after its 7th bounce? [3]

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

(ii) What effect could your assumption have on your answer to part (a)? [1]

Turn over.

6. There are 50 people in a sports club.
Two of the sports the people can take part in are rowing and cycling.

Of these 50 people:
- 27 take part in rowing
- 32 take part in cycling
- 8 do not take part in rowing or cycling.

(a)   Complete the Venn diagram to show this information.   [2]

ε

Rowing   Cycling

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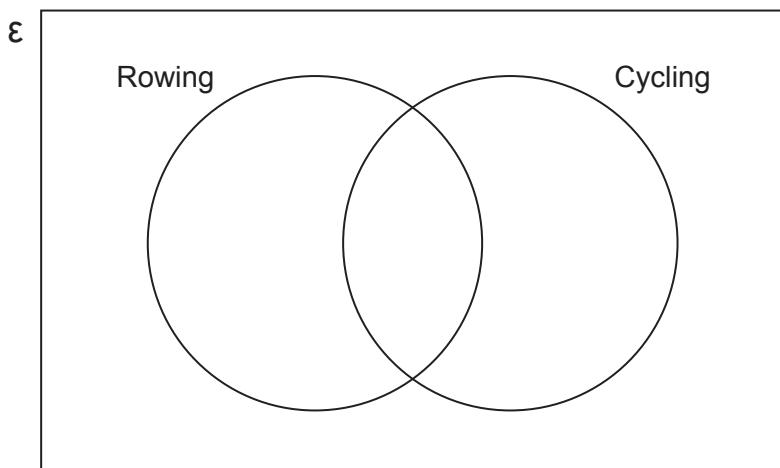
(b)   One person is chosen at random from the sports club.
Find the probability that they take part in rowing but not in cycling.   [2]

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7. Abdul is travelling from the UK to Brazil for a holiday.
Abdul has £825 to exchange for Brazilian reals (R$).
The exchange rate is £1 = 6.27R$.
The bank Abdul uses to exchange his money only has 50R$ notes.

What is the maximum amount of Brazilian reals Abdul can buy and what will this cost him in pounds?
Give your answer correct to the nearest penny.
You must show all your working. [5]

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8. Make R the subject of the formula $P = \sqrt[3]{RQ}$. [2]

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Turn over.

9. (a) Show that $2x(7x-8y)-3y(x-5y) \equiv 14x^2 -19xy +15y^2$. [2]

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(b) In part (a) the identity symbol ($\equiv$) has been used.
Explain why this has been used and not an equal sign. [1]

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10. The point *D* is equidistant from the lines *AB* and *BC*.
Point *D* is also equidistant from the points *B* and *C*.

Using only a ruler and a pair of compasses, **construct** suitable arcs and lines to show the
position of point *D*. [4]

A

B

C

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Turn over.
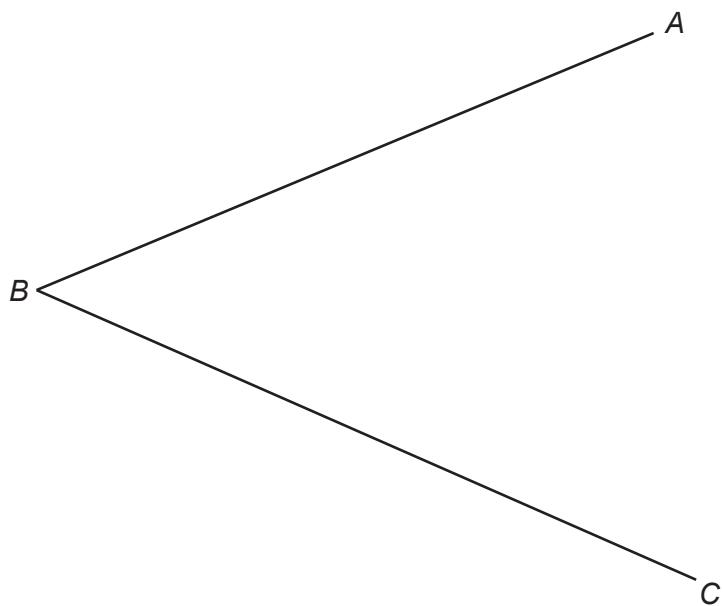
11.

Use:
$$\text{Pressure} = \frac{\text{Force}\,(N)}{\text{Area}\,(cm^2)}$$
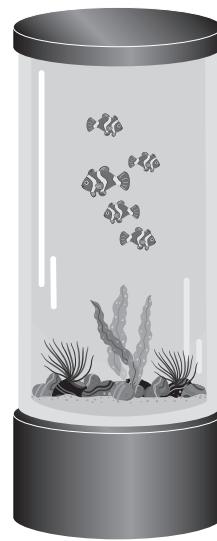
A cylindrical fish tank stands on horizontal ground.
The base of the fish tank has a radius of 24 cm.
All the base of the fish tank is in contact with the ground.

The fish tank exerts a pressure of 0·97 N/cm^2 on the ground.
What force is exerted on the ground by the fish tank? [4]

Force = ... N

12. The diagram below shows a vertical cliff which is 35 metres high.
Pierre is standing at point P.
From point P, the angle of elevation to the top of the cliff is 72°.

Cliff

35 m

Pierre

72°

P
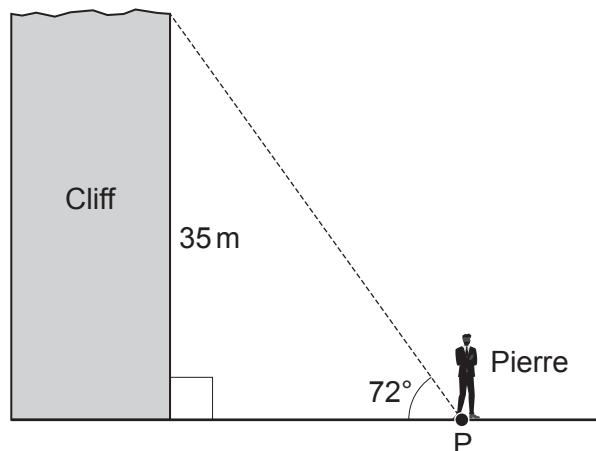
Diagram not drawn to scale

Pierre sees this warning sign.

Warning!
Coastal Erosion.
It is not safe to stand within
10 m of the base of the cliff.

Is Pierre standing a safe distance from the base of the cliff? [4]

Yes ☐   No ☐

Show how you decide.

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13. A solution to the equation $2x^3 - 5x - 23 = 0$ lies between 2 and 3.
Use the method of trial and improvement to find the solution correct to 1 decimal place. [4]

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14. Solve $\dfrac{4x+5}{2} - \dfrac{x+1}{3} = \dfrac{5}{6}$.

You must show all your working. [4]

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15. A solid cone has a base radius of y cm.
The height of the cone is six times its radius.
The cone is made from material which has a density of 7 g/cm^3.
Write an expression for the mass of the cone in grams.
Give your answer, in terms of y and π, in its simplest form. [3]

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16. A video game company investigated how long, in minutes, one group of 10-year-old students and one group of 14-year-old students spent playing video games last Wednesday evening.

Diagrams displaying the results for each age group are shown below.

10-year-old students

14-year-old students

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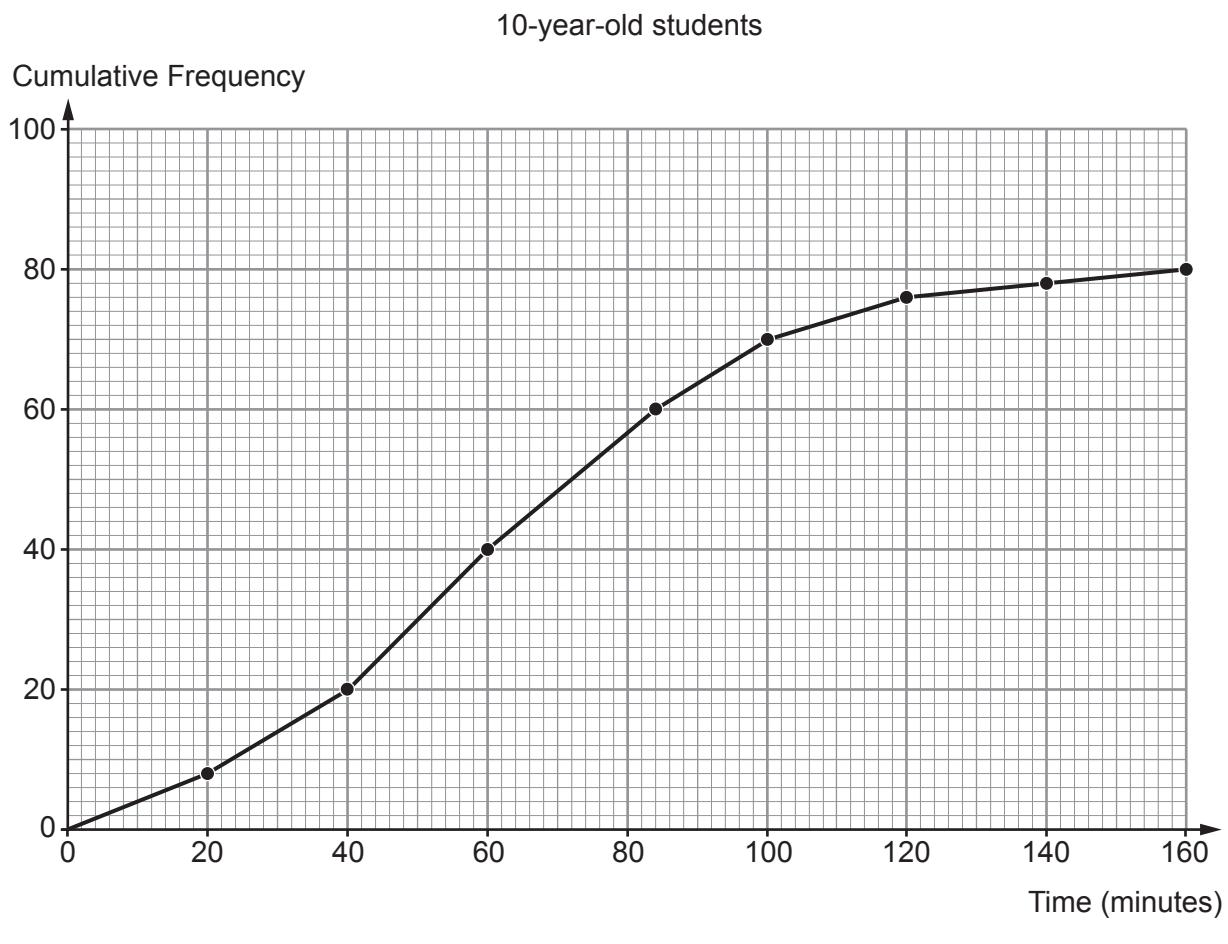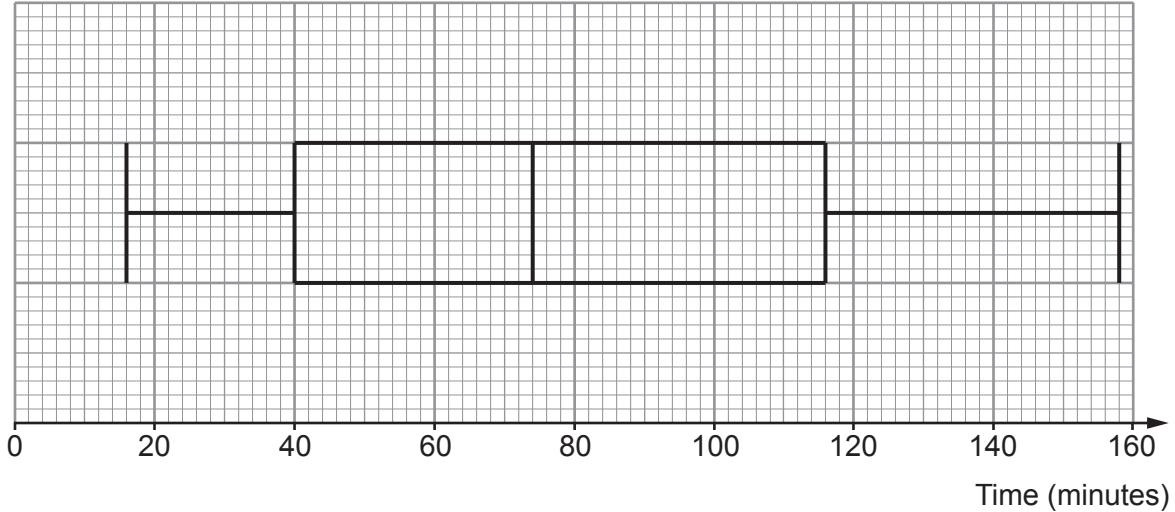
(a)   Lewis says,

"14-year-olds spend longer, on average, playing video games than 10-year-olds."

Is Lewis correct?

Yes ☐   No ☐

Use information from the diagrams to justify your answer.   [1]

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(b)   Complete the following sentences using information from the diagrams.

(i)   The percentage of **14-year-old** students that spent less than 40 minutes playing

video games last Wednesday evening was .... %.   [1]

(ii)   The percentage of **10-year-old** students that spent more than 120 minutes

playing video games last Wednesday evening was .... %.   [2]

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(c)   Compare the inter-quartile range of the times each age group spent playing video games last Wednesday evening.
What conclusions can you draw about the length of time 10-year-olds and 14-year-olds spent playing video games last Wednesday evening?   [2]

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Turn over.

17. Noah and Jenny play a game.
Each shoots an arrow at a target.
The arrow is removed from the target after each shot.

For each of their shots:

- Noah hits the target with a probability of $\frac{1}{5}$.

- Jenny hits the target with a probability of $\frac{3}{10}$.

Noah and Jenny take it in turns to shoot an arrow at the target.
In the game, Noah shoots the first arrow.
When one of them hits the target the game ends and that person wins the game.

(a) Calculate the probability that Jenny wins the game on her first shot. [2]

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(b) Calculate the probability that Noah wins the game on his second shot. [2]

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18. Kian went for a run.
The route he runs is 3000 metres, **correct to the nearest 100 metres**.
He ran the route in a time of 720 seconds, **correct to the nearest 10 seconds**.

Calculate Kian's **greatest** possible average speed for this run.
Give your answer in metres per second.
You must show all your working. [3]

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Kian's greatest possible average speed is .... metres per second.

Turn over.

19. Enlarge the shape shown on the grid below by a scale factor of –2.
Use (1, 2) as the centre of enlargement. [3]

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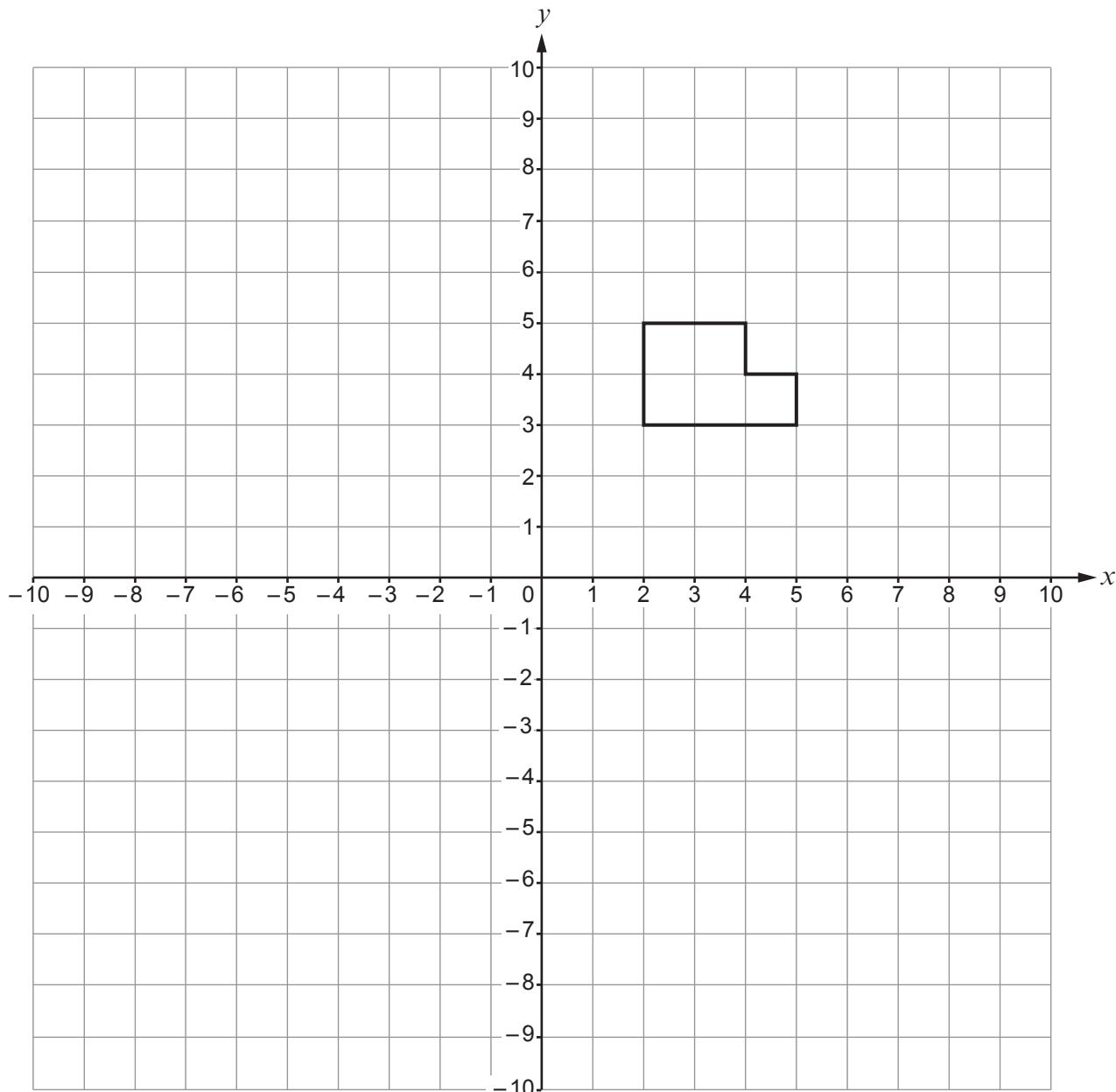
20. The diagram shows points *R*, *S* and *T* on the circumference of a circle with centre *O*.
The lines *QR* and *QT* are both tangents to the circle.
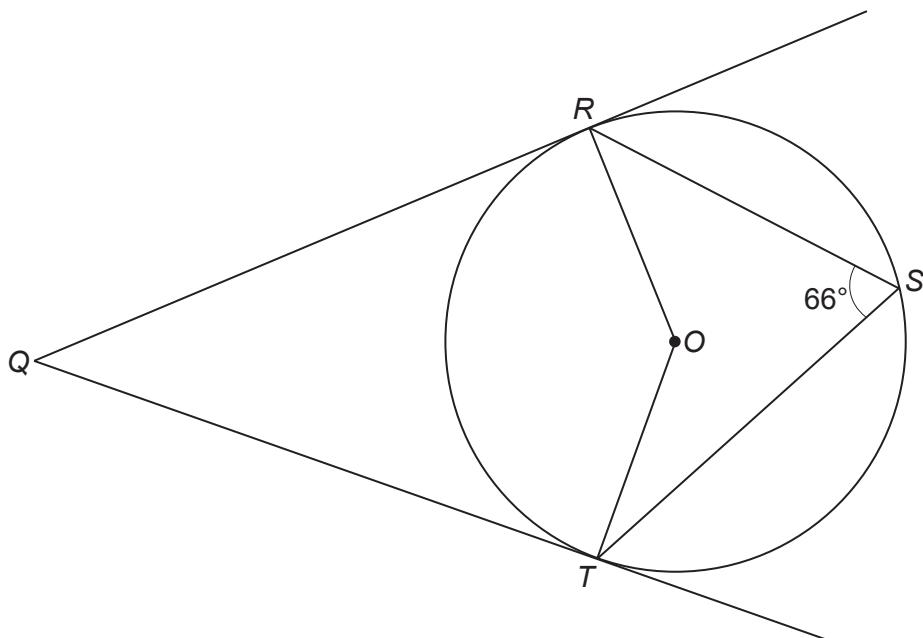
Diagram not drawn to scale

Show that $R\hat{Q}T = 48°$.
Give a reason for each step of your answer. [4]

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21. Simplify $\dfrac{4x^2 - 25}{6x^2 - 15x}$. [4]

22. A line, L, passes through the point (–1, 5) and is perpendicular to $y = \dfrac{1}{2}x + 5$.
Find the equation of the line L.
Give your answer in the form $ax + by + c = 0$. [3]

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Examiner
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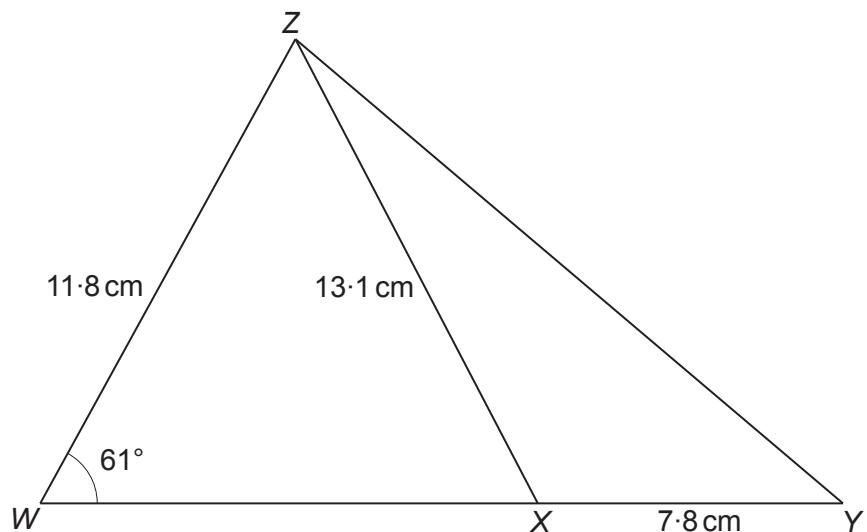
Diagram not drawn to scale

WXY is a straight line.

Calculate the length of *YZ*. [6]

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Turn over.

24. Hollie makes wooden horses that are mathematically similar.
Two of these horses are shown below.

16 cm   10 cm
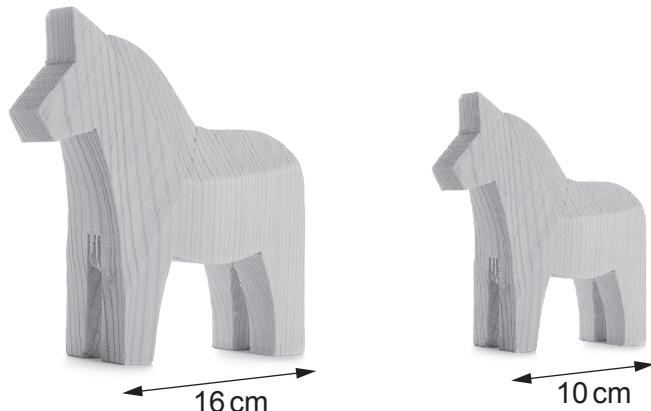
Diagram not drawn to scale

The large horse has a total surface area of 640 cm^2.

Hollie uses spray paint to cover the total surface area of each horse.
One can of spray paint covers an area of 9300 cm^2 and costs £8.45.

Calculate the cost of buying the **least** number of cans of spray paint required to cover 30 large horses and 50 small horses. [7]

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25. The diagram shows:

- the circle with equation $x^2 + y^2 = 32$
- a tangent to the circle. The tangent passes through $(a, 0)$ and $(0, a)$.

Calculate the value of a. [3]

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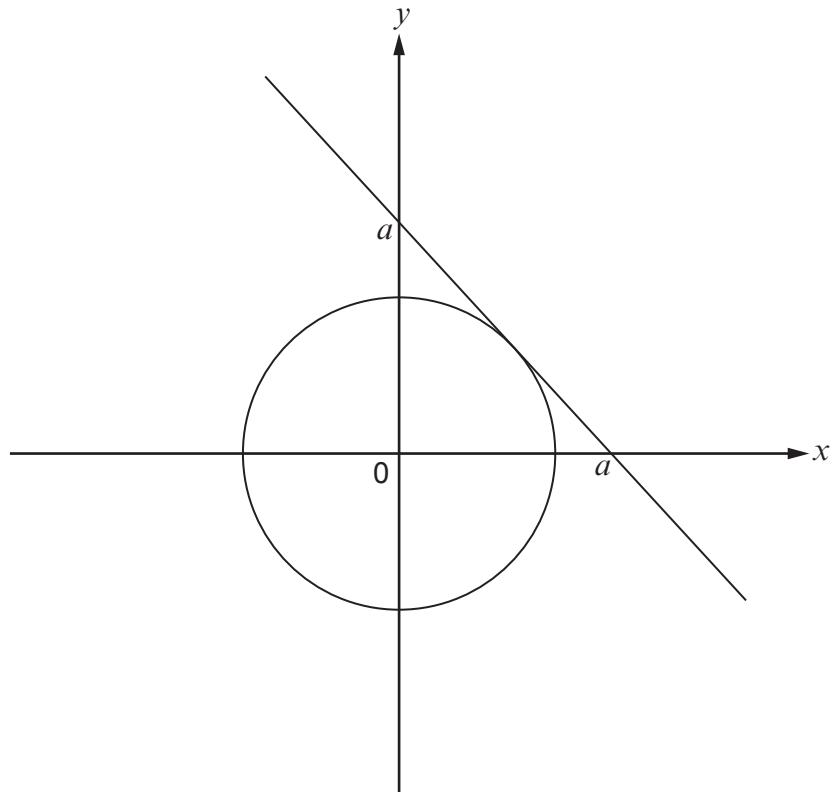
26. One of the attractions at a theme park is a roller coaster.

The graph shows the velocity of the roller coaster, in metres per second, for the first 14 seconds.

Velocity (m/s)
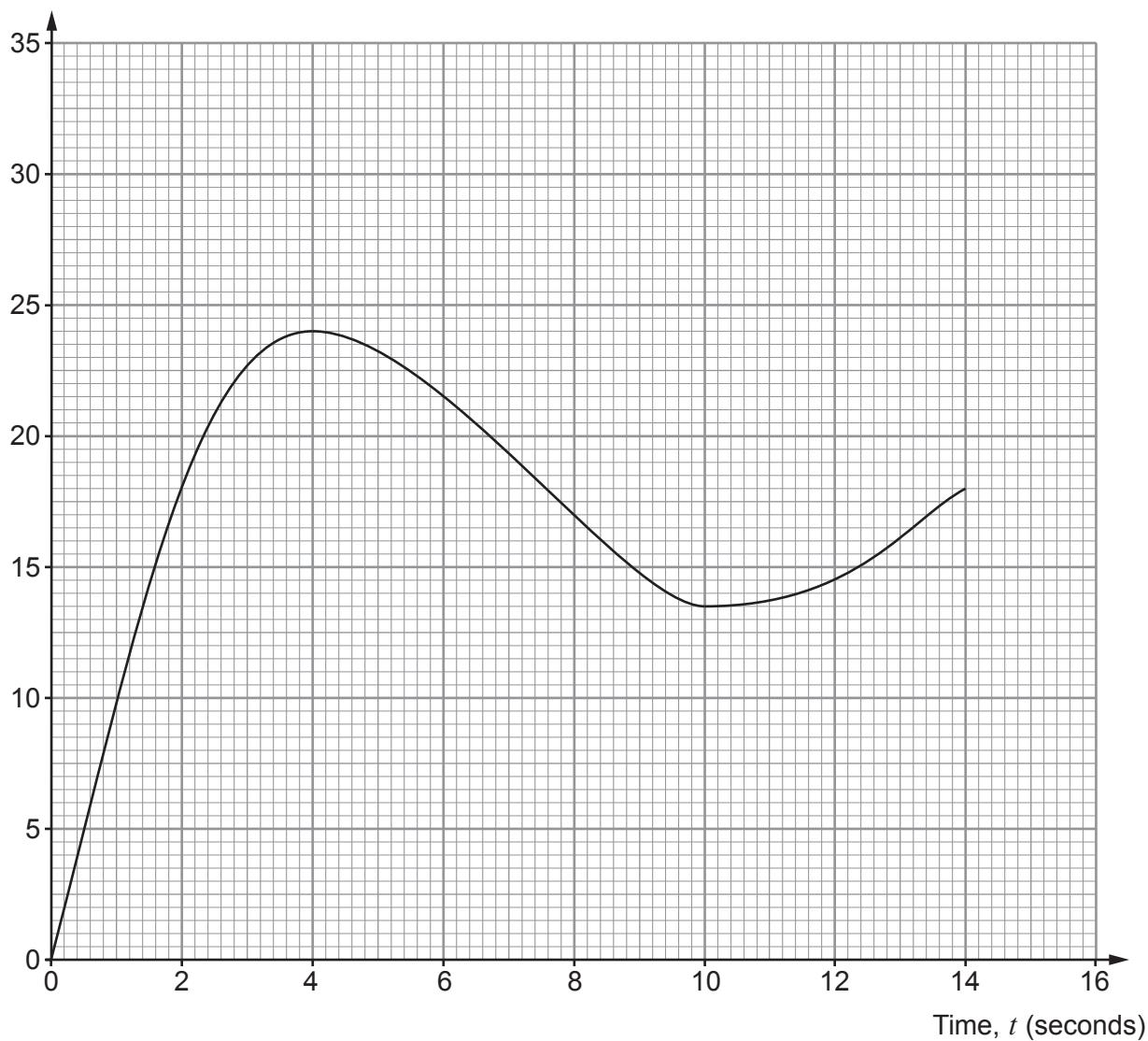
(a)   Calculate, in **kilometres per hour**, the velocity of the roller coaster at time t = 4 seconds. [2]

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Velocity is .... kilometres per hour.

(b) Calculate an estimate for the acceleration of the roller coaster at time t = 2 seconds. Give your answer in m/s^2. [3]

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(c) Describe the acceleration of the roller coaster between t = 4 and t = 10 seconds. [1]

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(d) Use **five** vertical strips of equal width to calculate an estimate for the distance the roller coaster travelled between t = 4 and t = 14 seconds. Give your answer in metres. [3]

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Turn over.

27. Find the coordinates of the points of intersection of the curve $3x^2 + 2y^2 = 12$ and the line $y = x - 3$.
Give your solutions correct to 1 decimal place.

You must show all your working. [7]

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END OF PAPER

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