OCR

Oxford Cambridge and RSA

Thursday 16 May 2024 – Morning

GCSE (9–1) Mathematics

J560/04 Paper 4 (Higher Tier)

Time allowed: 1 hour 30 minutes

H

You must have:
- the Formulae Sheet for Higher Tier (inside this document)

You can use:
- a scientific or graphical calculator
- geometrical instruments
- tracing paper

Please write clearly in black ink. **Do not write in the barcodes.**

Centre number [ ][ ][ ][ ][ ]   Candidate number [ ][ ][ ][ ]

First name(s) _____

Last name _____

INSTRUCTIONS
- Use black ink. You can use an HB pencil, but only for graphs and diagrams.
- Write your answer to each question in the space provided. You can use extra paper if you need to, but you must clearly show your candidate number, the centre number and the question numbers.
- Answer **all** the questions.
- Where appropriate, your answer should be supported with working. Marks might be given for using a correct method, even if your answer is wrong.
- Use the π button on your calculator or take π to be 3.142 unless the question says something different.

INFORMATION
- The total mark for this paper is **100**.
- The marks for each question are shown in brackets **[ ]**.
- This document has **20** pages.

ADVICE
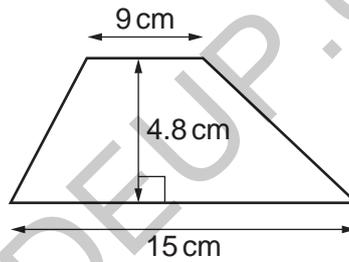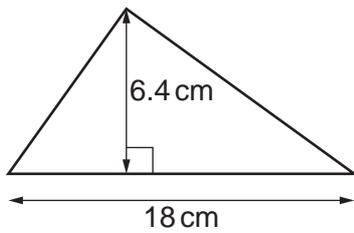- Read each question carefully before you start your answer.

OCR is an exempt Charity

Turn over

1 Work out.

$$\sqrt[3]{\frac{19.5^4 - 18^2}{1.45}}$$

Write your answer correct to **4** significant figures.

.... **[3]**

2 The diagram shows a triangle and a trapezium.

9 cm   **Not to scale**

6.4 cm   4.8 cm

18 cm   15 cm

Show that they have the same area. **[3]**

3 Four numbers are written, in ascending order, as algebraic expressions.

$a \qquad a+b \qquad a+2b \qquad 3a-b$

The mean of these four numbers is 27.
The range of these four numbers is 24.

Find the value of *a* and the value of *b*.
You must show your working.

$a =$ ....

$b =$ .... **[5]**

Turn over

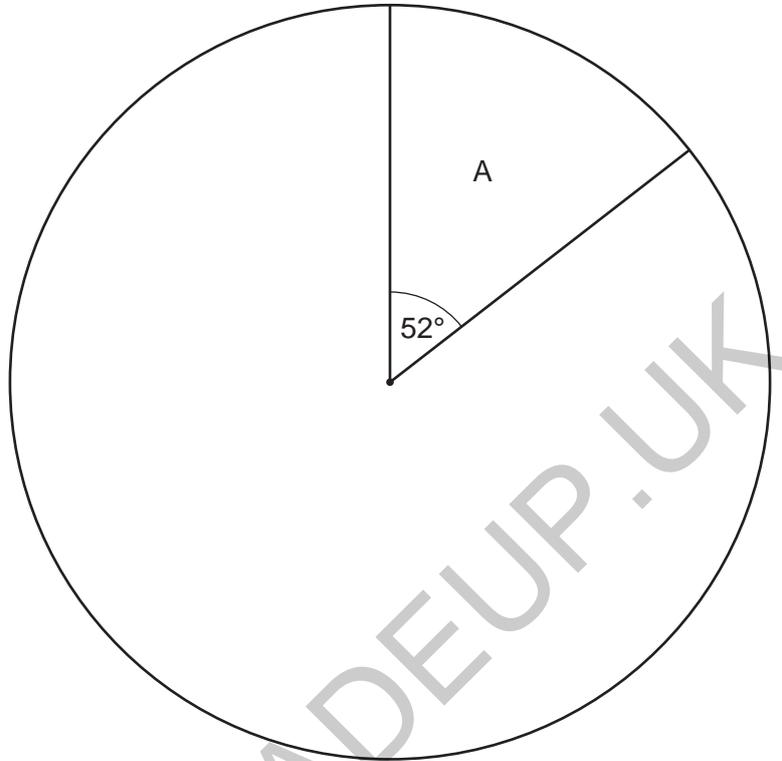**4** A school is deciding on a charity to support.
Each student at the school votes for one of four charities, A, B, C or D.
The results are to be shown in a pie chart.

This pie chart shows the sector for charity A.
Twice as many students voted for charity C than charity B.
Twice as many students voted for charity D than charity C.

(a) (i) Show that the sector for charity B will have an angle of 44°. **[2]**
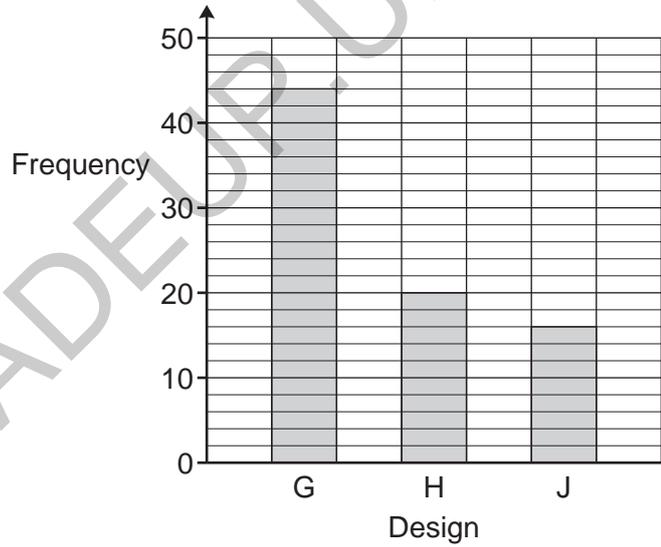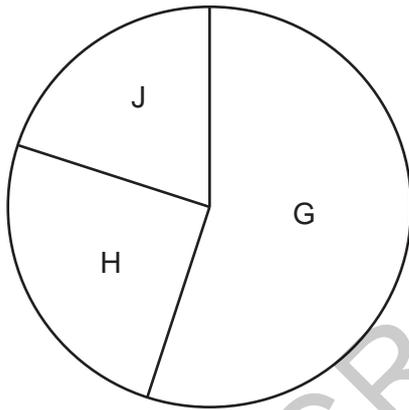
(ii) Complete the pie chart. **[3]**

(b) 39 students voted for charity A.

Calculate the total number of students at the school.

(b) .... **[2]**

(c) The school asks 80 of the students to choose a new logo from three designs G, H and J. The same results are shown in a pie chart and in a bar chart.

(i) Give one **advantage** of using the pie chart rather than the bar chart.

....

.... **[1]**

(ii) Give one **disadvantage** of using the pie chart rather than the bar chart.

....

.... **[1]**

Turn over

5 The same dog food is sold in three different sized packs.
The diagram shows the price of each pack.

700 g
for
£7.70

3 kg
for
£32.40

5 kg
for
£53.90
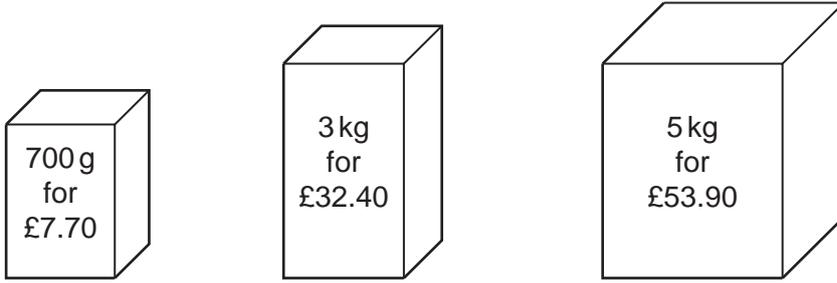
Which pack is the best value for money?
Show how you decide.

The .... pack because ....

....

.... **[3]**

6 A regular polygon has n sides.
The interior angle of the polygon is 15 times its exterior angle.

Find the value of n.

$n =$ .... **[4]**

7 Write the following in order of size, smallest first.

0.2 2^{-2} 2×10^{-2}

Show how you decide.

.... , ... , ... **[3]**
smallest

Turn over

8 The price of a television is increased by 35%.
In a sale, the new price of the television is decreased by r%.

The overall percentage increase in the price of the television is 16.1%.

Find the value of r.
You must show your working.

$r =$ .... **[5]**

9 Sasha and Taylor each have a stamp collection.

They organise their stamp collections according to where the stamps come from:
United Kingdom (UK), European Union (EU), Other.

The table shows the number of stamps in each collection and the ratio UK : EU : Other.

	Number of stamps	**Ratio UK : EU : Other**
Sasha's collection	1638	9 : 3 : 2
Taylor's collection	660	8 : 1 : 2

When they put the two stamp collections together, Sasha and Taylor claim that at least $\frac{2}{3}$ of all the stamps come from the UK.

Are they correct?
Show how you decide.

They are .... because ....

....

.... **[5]**

10   Here is a question and an incorrect solution.

Question:
You are given
$y \propto x$ and $y = 9$ when $x = 2$.

Find a formula linking x and y.

Solution:
$y \propto x$ so $y = x + c$
Substituting $y = 9$ and $x = 2$ gives
$9 = 2 + c$
$c = 7$
So, $y = x + 7$

Describe the error made and write out a correct solution.

The error is ....

....

A correct solution is ....

....

....

....

....

.... **[3]**
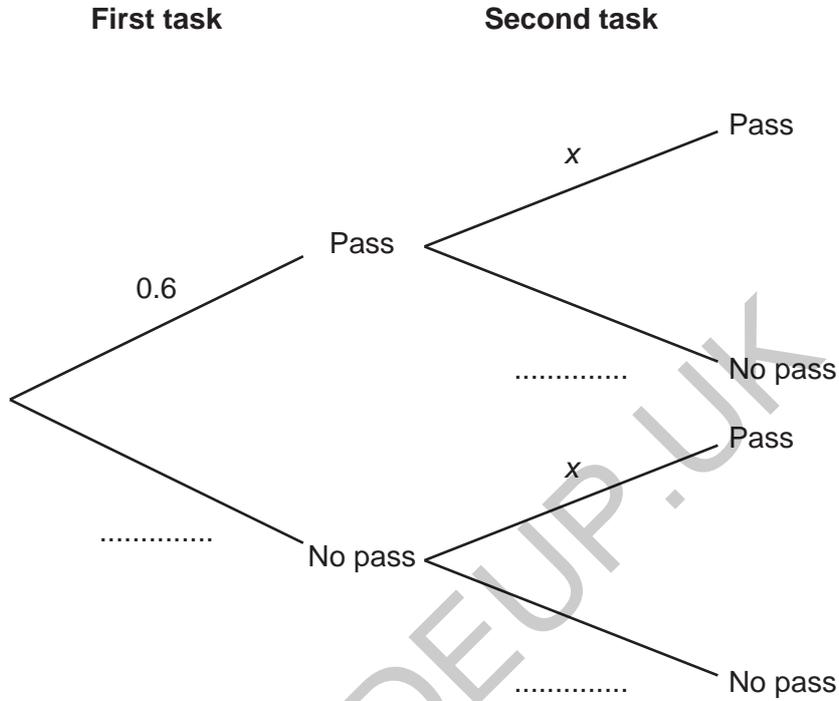
11 A student attempts two tasks.
The result of each task is either "Pass" or "No pass".

The probability of the student passing the first task is 0.6.
The probability of the student passing the second task is *x*.

(a) Complete the tree diagram.

First task **Second task**

[2]

(b) Write down the mathematical assumption that has been made about the two tasks.

.... **[1]**

(c) The probability of the student passing just one of these two tasks is 0.528.

Work out the value of *x*.

(c) *x* = ... **[4]**

Turn over

12 (a) P, Q, R and S are points on the circumference of a circle, centre O.
Angle SQR = 14° and angle SPQ = 62°.
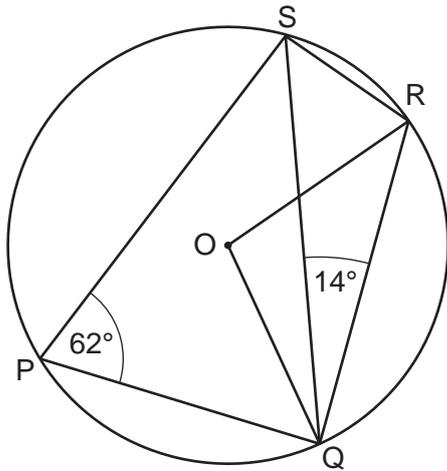
Not to scale
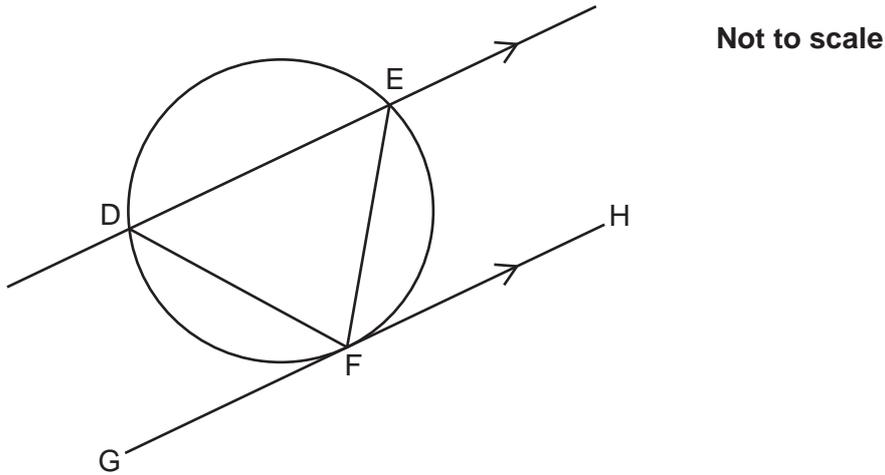
Find the size of angle ROQ.

(a) Angle ROQ = ...° **[3]**

(b) D, E and F are points on the circumference of a circle.

Not to scale

Line GH is a tangent to the circle at F.
Line DE is parallel to line GH.

Complete these statements to prove that triangle DEF is isosceles.
Give reasons for your statements.
You may not need all of the lines.

Angle .... = Angle .... because ....

....

Angle .... = Angle .... because ....

....

Angle .... = Angle .... because ....

....

Angle .... = Angle .... because ....

....

Angle .... = Angle .... because ....

....

Triangle DEF is isosceles because .... **[3]**

Turn over

13 Function A and function B are shown below.

Function A: Input ⟶ ⟨ + 2 ⟩ ⟶ ⟨ × 3 ⟩ ⟶ Output

Function B: Input ⟶ ⟨ × 5 ⟩ ⟶ ⟨ − 3 ⟩ ⟶ Output
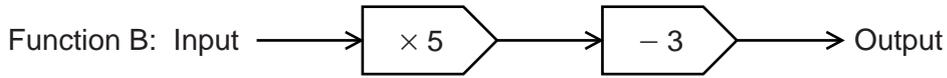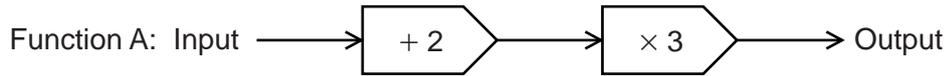
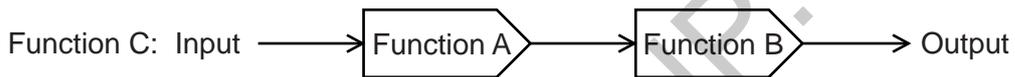**(a)** The **output** of function B is x.

Write an algebraic expression, in terms of x, for the inverse of function B.

(a) .... **[2]**

(b) Function C is shown below as a composite function.

Function C: Input ⟶ ⟨ Function A ⟩ ⟶ ⟨ Function B ⟩ ⟶ Output

Complete the diagram below using two arithmetic operations to show function C as a single function.

Function C: Input ⟶ ⟨ .... ⟩ ⟶ ⟨ .... ⟩ ⟶ Output
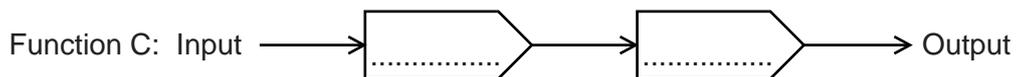
[4]

14 The diagram shows a circle, centre O and radius 52 cm.

Not to scale

(Diagram labels: A, B, O, T, 52 cm, 72 cm)
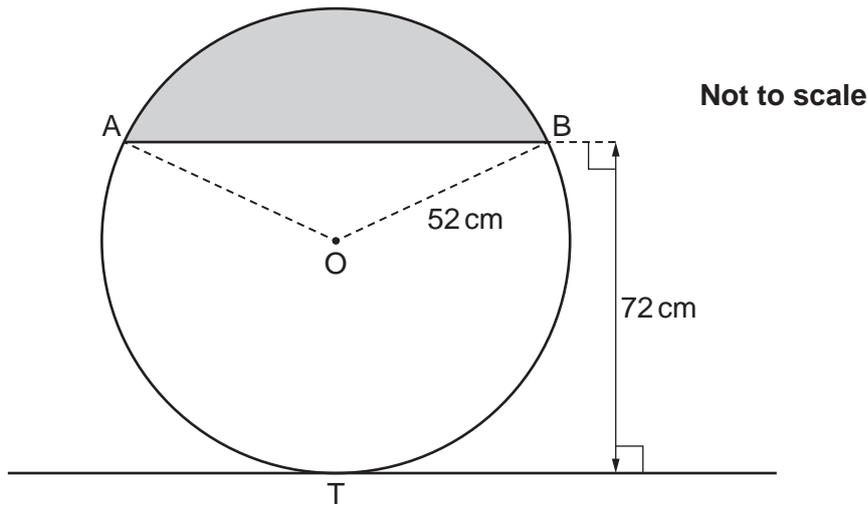
AB is a chord of the circle.
The line through T is a tangent to the circle.

The chord is parallel to the tangent.
The perpendicular distance between the chord and the tangent is 72 cm.

Calculate the area of the shaded segment.
You must show your working.

.... cm^2 **[6]**

Turn over

15 (a) Solve by factorisation.

$$3x^2 + 10x - 8 = 0$$

(a) $x =$ .... or $x =$ .... **[3]**

(b) Write $x^2 + 8x + 11$ in the form $(x + a)^2 - b$.

(b) .... **[3]**

(c) (i) Write down the coordinates of the turning point of the graph $y = (x - 3)^2 + 8$.

(c)(i) (........................... , ...) **[2]**

(ii) Describe the **single** transformation which maps the graph of $y = x^2$ onto the graph of $y = (x - 3)^2 + 8$.

(ii) .... **[2]**

16 A lift can travel at a maximum speed of 9.83 m/s, correct to 3 significant figures.
The lift travels a distance of 174 m, correct to the nearest metre, between the ground floor and the top floor of a building.

(a) Use the above information to work out the shortest possible time for the lift to travel between the ground floor and the top floor.
You must show your working.

(a) .... s **[4]**

(b) Explain why your answer to **part (a)** may not be possible to achieve.

....

.... **[1]**

17 The box plot shows the distribution of the waiting time of cars at a road junction.
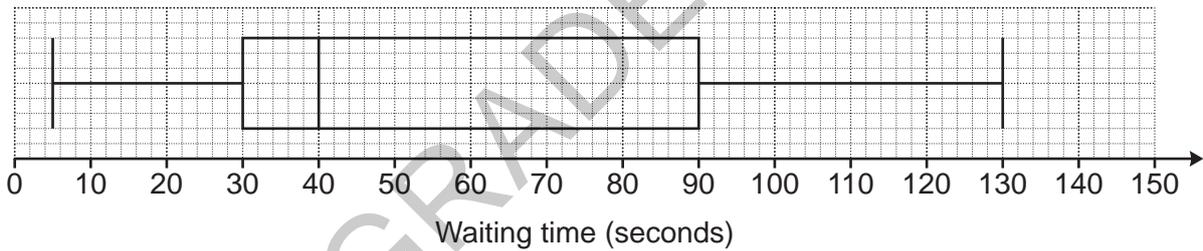
(a) Write down the median waiting time.

(a) .... s **[1]**

(b) What percentage of the waiting times were less than 30 seconds?

(b) .... % **[1]**

(c) Given that a randomly chosen car waited for more than 30 seconds, write down the probability that the car waited for more than 90 seconds.

(c) .... **[1]**
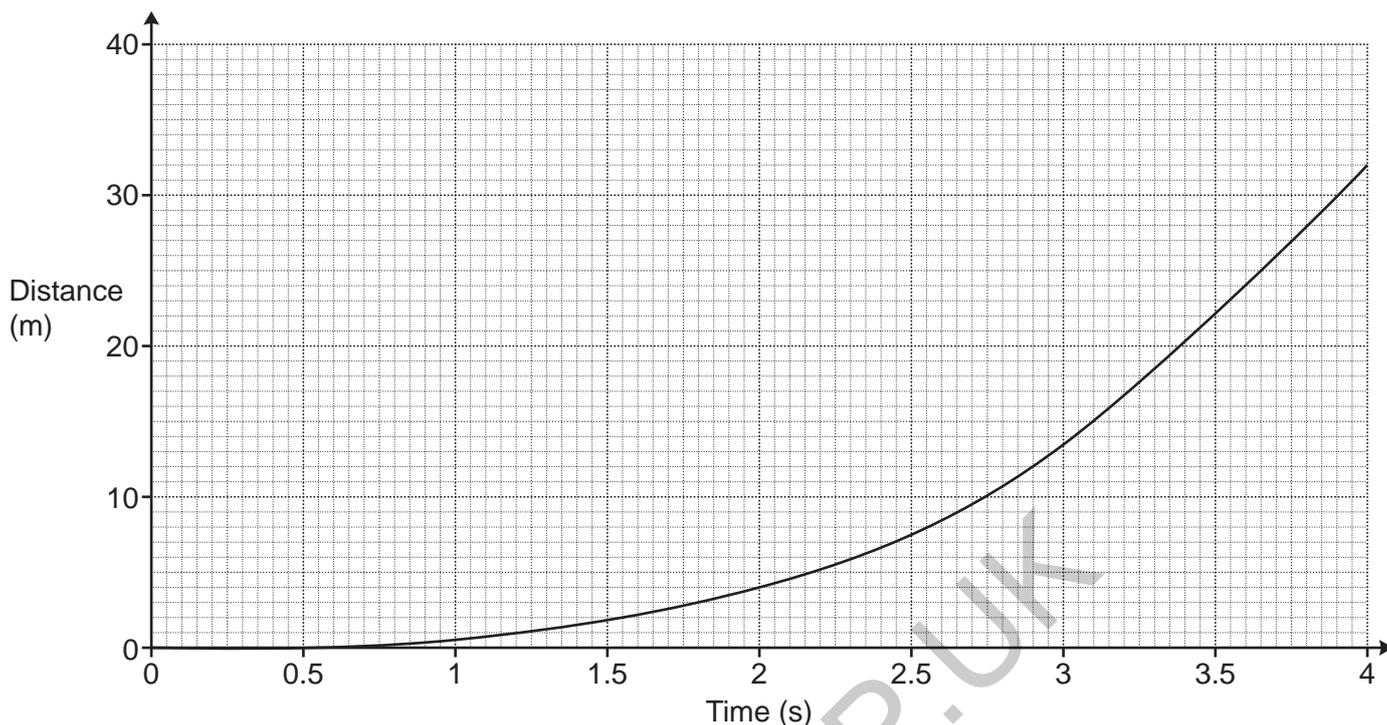
Turn over

18 (a) The graph shows the speed of an object during the first 20 seconds of its motion.
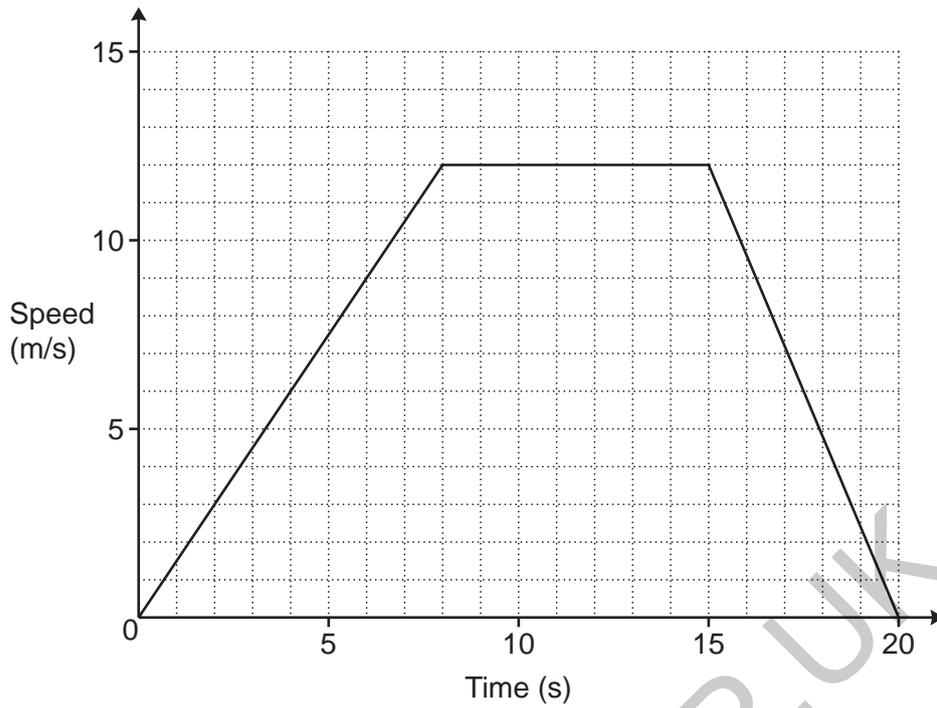
Calculate the distance travelled by the object during the 20 seconds.

(a) .... m **[3]**

(b) The graph shows the distance travelled by an object during the first 4 seconds of its motion.

(i) Work out the average speed of this object between 2 and 4 seconds.

(b)(i) .... m/s **[2]**

(ii) Use the graph to estimate the speed of this object at 3 seconds.
You must show working to support your estimate.

(ii) .... m/s **[3]**

(iii) What happens to the speed of this object during these 4 seconds of motion.
Explain how you know.

The speed ....

I know this because ....

.... **[1]**

Turn over for question 19

19 Show that $\dfrac{\sqrt{3}+2}{\sqrt{48}-6}$ can be written in the form $\dfrac{a+b\sqrt{3}}{6}$.

You must show each step in your working. **[5]**

END OF QUESTION PAPER

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