

Write your name here

Surname

Other names

**Edexcel
International GCSE**

Centre Number

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Candidate Number

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Mathematics A**Paper 3HR****Higher Tier**

Friday 10 May 2013 – Afternoon

Time: 2 hours

Paper Reference

4MA0/3HR**You must have:**

Ruler graduated in centimetres and millimetres, protractor, compasses, pen, HB pencil, eraser, calculator. Tracing paper may be used.

Total Marks

Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Without sufficient working, correct answers may be awarded no marks.
- Answer the questions in the spaces provided
– *there may be more space than you need.*
- **Calculators may be used.**
- You must **NOT** write anything on the formulae page.
Anything you write on the formulae page will gain NO credit.

Information

- The total mark for this paper is 100.
- The marks for **each** question are shown in brackets
– *use this as a guide as to how much time to spend on each question.*

Advice

- Read each question carefully before you start to answer it.
- Check your answers if you have time at the end.

Turn over ►

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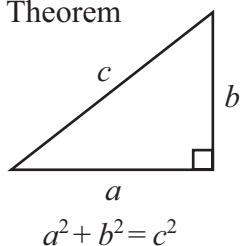


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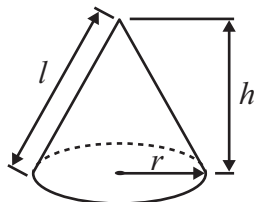
**International GCSE MATHEMATICS
FORMULAE SHEET – HIGHER TIER**

Pythagoras' Theorem



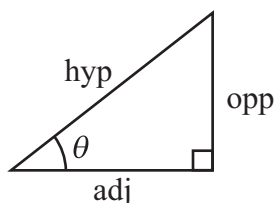
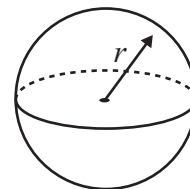
Volume of cone = $\frac{1}{3} \pi r^2 h$

Curved surface area of cone = $\pi r l$



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

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



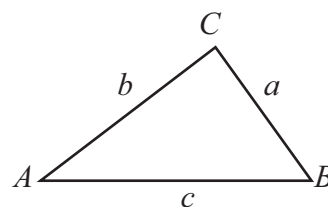
adj = hyp \times cos θ
opp = hyp \times sin θ
opp = adj \times tan θ

or $\sin \theta = \frac{\text{opp}}{\text{hyp}}$

$\cos \theta = \frac{\text{adj}}{\text{hyp}}$

$\tan \theta = \frac{\text{opp}}{\text{adj}}$

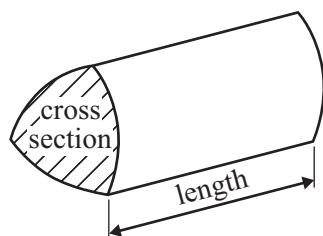
In any triangle ABC



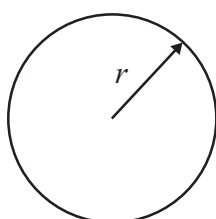
Sine rule: $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$

Cosine rule: $a^2 = b^2 + c^2 - 2bc \cos A$

Area of triangle = $\frac{1}{2} ab \sin C$



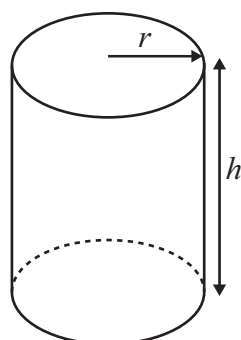
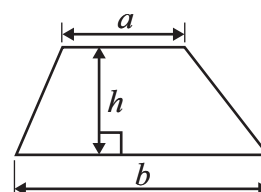
Volume of prism = area of cross section \times length



Circumference of circle = $2 \pi r$

Area of circle = πr^2

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



Volume of cylinder = $\pi r^2 h$

Curved surface area of cylinder = $2 \pi r h$

The Quadratic Equation

The solutions of $ax^2 + bx + c = 0$, where $a \neq 0$, are given by

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$



Answer ALL TWENTY FIVE questions.

Write your answers in the spaces provided.

You must write down all stages in your working.

- 1** A box contains some coloured cards.
Each card is red or blue or yellow or green.
The table shows the probability of taking a red card or a blue card or a yellow card.

| Card | Probability |
|--------|-------------|
| Red | 0.3 |
| Blue | 0.35 |
| Yellow | 0.15 |
| Green | |

George takes at random a card from the box.

- (a) Work out the probability that George takes a green card.

.....
(2)

George replaces his card in the box.
Anish takes a card from the box and then replaces the card.
Anish does this 40 times.

- (b) Work out an estimate for the number of times Anish takes a yellow card.

.....
(2)

(Total for Question 1 is 4 marks)

Do NOT write in this space.



- 2 Wendy travelled on the Eurostar train from St Pancras station to the Gare du Nord station. The Eurostar train travelled a distance of 495 km. The journey time was 2 hours 15 minutes.

Work out the average speed of the Eurostar train in kilometres per hour.

..... km/h

(Total for Question 2 is 3 marks)

- 3 The table shows information about the time, in minutes, spent on homework by each of 32 pupils in one night.

| Time (t minutes) | Number of pupils |
|---------------------|------------------|
| $0 < t \leq 20$ | 7 |
| $20 < t \leq 40$ | 16 |
| $40 < t \leq 60$ | 3 |
| $60 < t \leq 80$ | 6 |

- (a) Calculate the percentage of the 32 pupils who spent more than 60 minutes on their homework.

..... %
(2)

- (b) Calculate an estimate for the total time spent on homework by the 32 pupils.

..... minutes
(3)

(Total for Question 3 is 5 marks)



4 (a) Expand $6(3a - 2b + c)$

.....
(1)

(b) Factorise $t^2 - 10t$

.....
(2)

(c) Solve $x = \frac{7 - 2x}{3}$

Show clear algebraic working.

$x =$
(3)

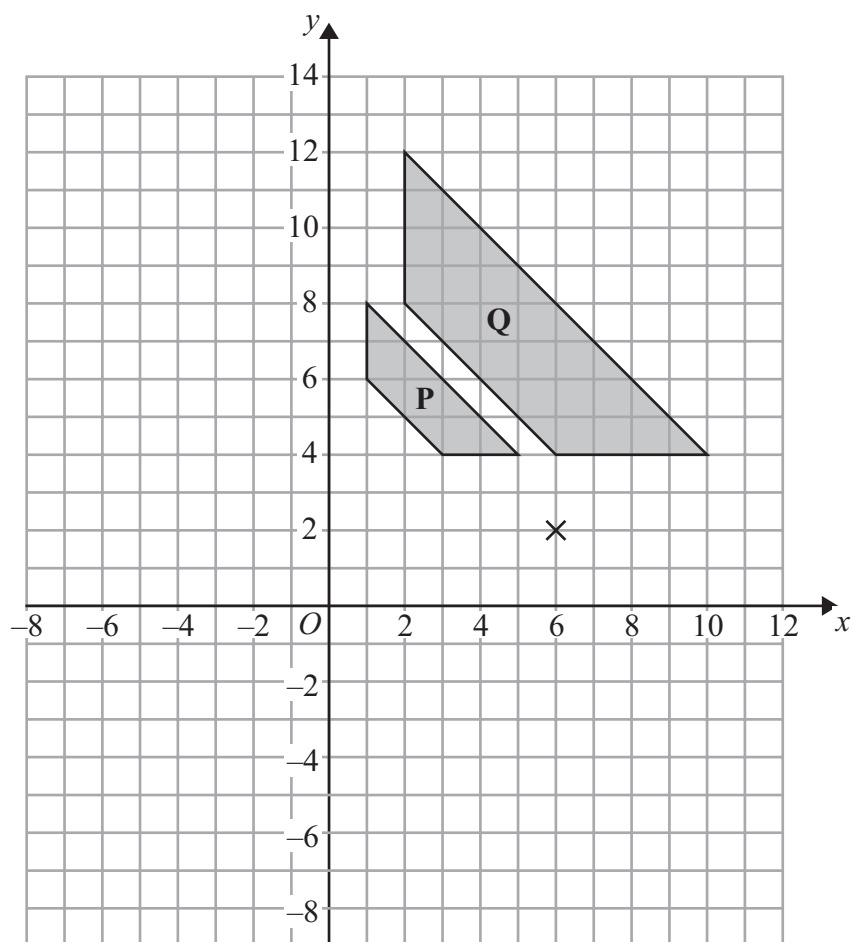
(Total for Question 4 is 6 marks)

5 Show that $\frac{4}{9} - \frac{1}{6} = \frac{5}{18}$

(Total for Question 5 is 2 marks)



6



- (a) Describe fully the single transformation that maps shape **P** onto shape **Q**.

(3)

- (b) On the grid, rotate shape **Q** 180° about the point (6, 2).
Label the new shape **R**.

(2)

(Total for Question 6 is 5 marks)

Do NOT write in this space.



7 $M = 3x^2 - nx$

(a) Work out the value of M when

$x = -2$ and $n = 5$

$M = \dots\dots\dots$
(2)

(b) Work out the value of n when

$M = 12$ and $x = 4$

$n = \dots\dots\dots$
(3)

(Total for Question 7 is 5 marks)

Do NOT write in this space.



- 8 (a) $A = \{s, u, p, e, r\}$
 $B = \{c, o, m, p, u, t, e, r\}$

List the members of the set

(i) $A \cap B$

.....

(ii) $A \cup B$

.....

(2)

- (b) $X = \{\text{prime numbers}\}$
 $Y = \{\text{factors of 12}\}$

Is it true that $X \cap Y = \emptyset$?

Tick (✓) the appropriate box.

Yes

No

☐
☐

Explain your answer.

.....

(1)

(Total for Question 8 is 3 marks)

- 9 (a) Simplify, leaving your answers in index form,

(i) $6^5 \times 6^2 \times 6$

.....

(ii) $(9^7)^2$

.....

(2)

(b) $\frac{5^n \times 5^3}{5^6} = 5^4$

Find the value of n .

$n =$

(2)

(Total for Question 9 is 4 marks)



10 The diagram shows the path of an athlete on a running track.

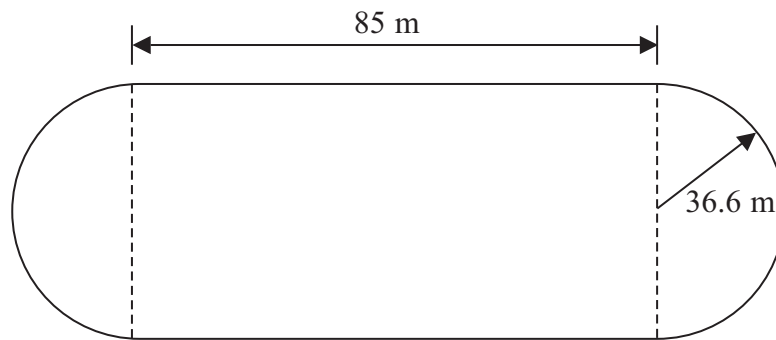


Diagram **NOT**
accurately drawn

The path consists of two straight lengths and a semicircle at each end.
Each straight length is 85 metres.
Each semicircle has a radius of 36.6 metres.

Calculate the area enclosed by the path.
Give your answer correct to 3 significant figures.

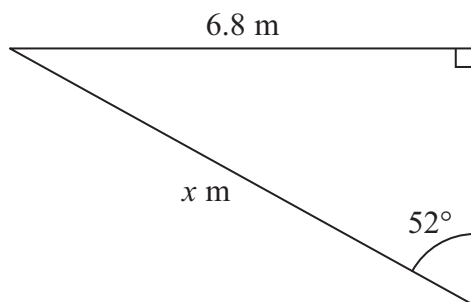
..... m²

(Total for Question 10 is 4 marks)

Do NOT write in this space.



11

Diagram **NOT**
accurately drawn

Calculate the value of x .
Give your answer correct to 3 significant figures.

 $x = \dots\dots\dots$ **(Total for Question 11 is 3 marks)**

12 (a) Write as an ordinary number

(i) 4.2×10^6

 $\dots\dots\dots$

(ii) 3.82×10^{-4}

 $\dots\dots\dots$ **(2)**

(b) Here are three numbers written in standard form.
Arrange these numbers in order of size.
Start with the smallest number.

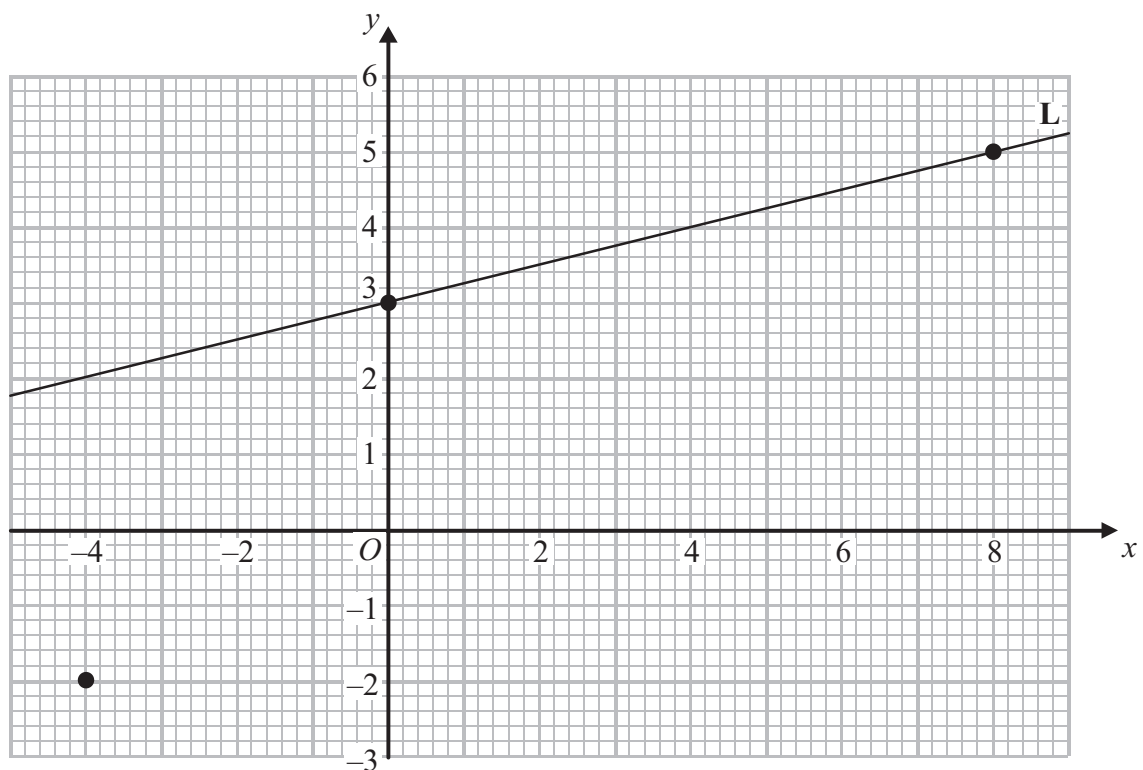
5.6×10^{-7}

8.6×10^{-9}

5.64×10^{-8}

 $\dots\dots\dots$ **(2)****(Total for Question 12 is 4 marks)**

- 13 The points with coordinates $(0, 3)$ and $(8, 5)$ lie on the straight line **L**.



- (a) Work out the gradient of **L**.

.....
(2)

- (b) Write down an equation of **L**.

.....
(1)

- (c) Find an equation of the line which is parallel to **L** and which passes through the point $(-4, -2)$

.....
(2)

(Total for Question 13 is 5 marks)



14 Triangles ABC and ACD are similar.

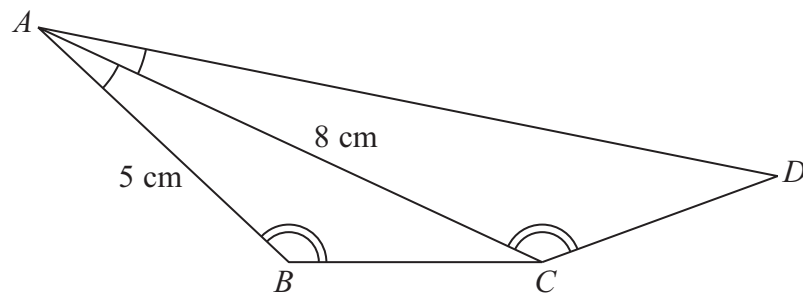


Diagram **NOT**
accurately drawn

Angle $BAC = \text{angle } CAD$.
Angle $ABC = \text{angle } ACD$.
 $AB = 5 \text{ cm}$ and $AC = 8 \text{ cm}$.

(a) Calculate the length of AD .

..... cm
(2)

The area of triangle ABC is 12 cm^2

(b) Calculate the area of triangle ACD .

..... cm^2
(2)

(Total for Question 14 is 4 marks)

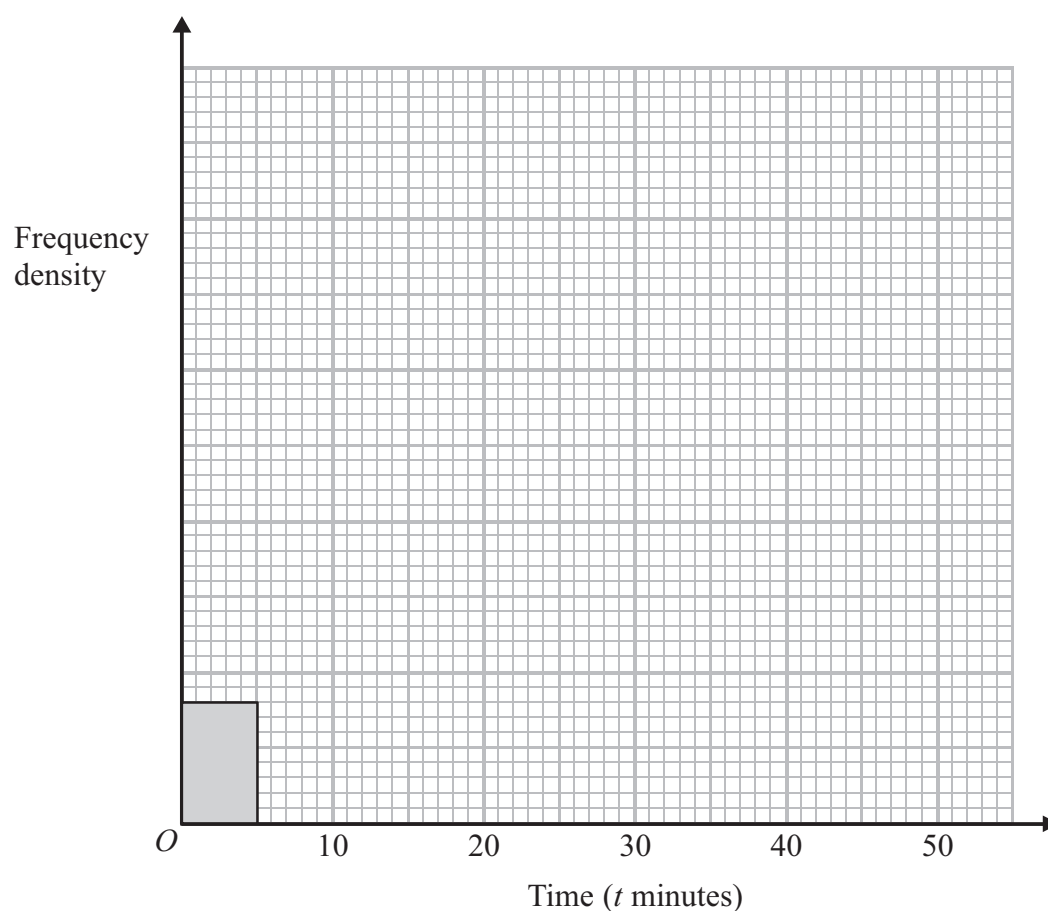
Do NOT write in this space.



- 15 The table shows information about the times, in minutes, that some people took to complete a sudoku puzzle.

| | | | | |
|---------------------|----------------|-----------------|------------------|------------------|
| Time (t minutes) | $0 < t \leq 5$ | $5 < t \leq 20$ | $20 < t \leq 30$ | $30 < t \leq 50$ |
| Number of people | 4 | 18 | 34 | 30 |

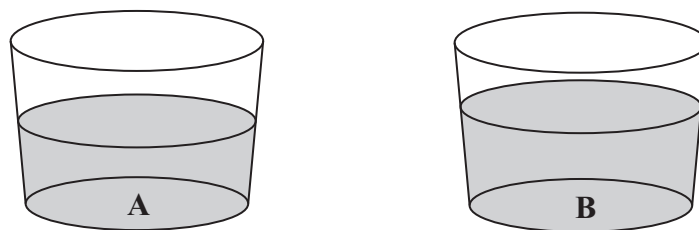
Complete the histogram for this information.



(Total for Question 15 is 3 marks)



16



Glass **A** contains 122 millilitres of water, correct to the nearest millilitre.

Glass **B** contains 168 millilitres of water, correct to the nearest millilitre.

Calculate the upper bound of the difference, in millilitres, between the volume of water in glass **A** and the volume of water in glass **B**.

..... millilitres

(Total for Question 16 is 2 marks)

17 Make n the subject of the formula

$$t = \sqrt{\frac{n+3}{n}}$$

$n =$

(Total for Question 17 is 4 marks)



- 18 Boris and Nigel play games of chess against each other in a match.
In each game, Boris wins or Nigel wins or the game is a draw.

When a player wins a game, he wins the match.

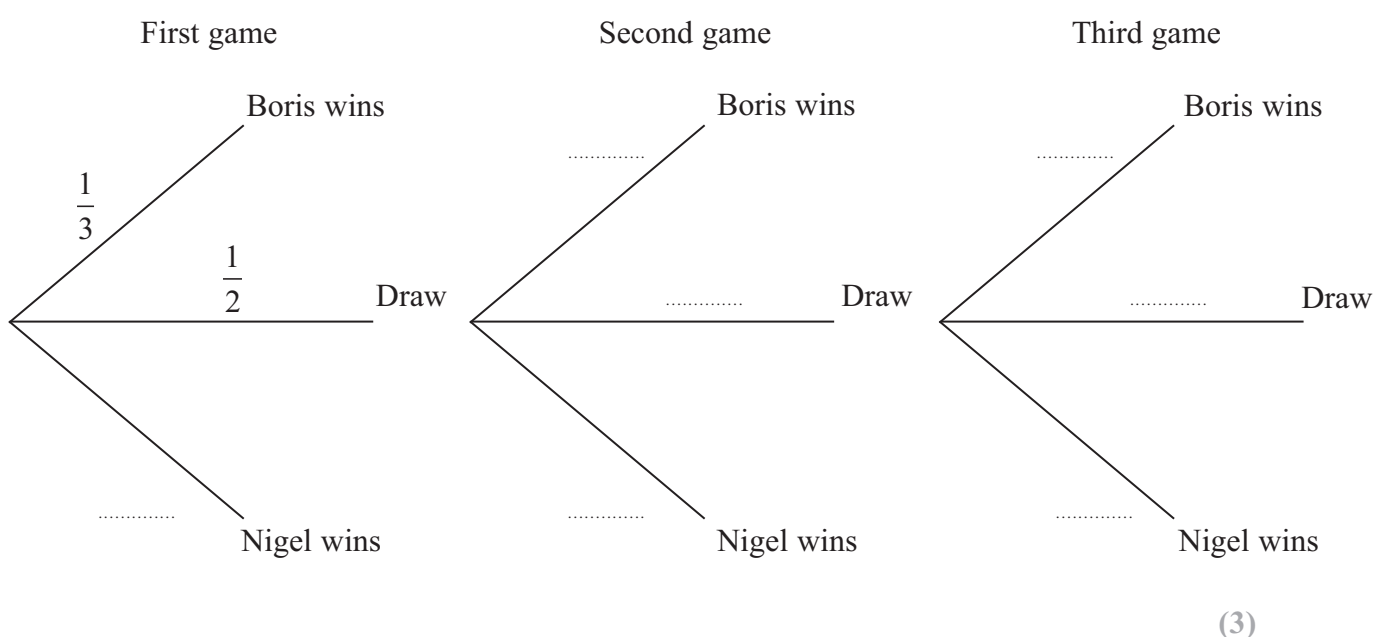
When a game is a draw, the players play another game against each other.

Boris and Nigel play a maximum of 3 games.

The probability that Boris wins a game is $\frac{1}{3}$

The probability that a game is a draw is $\frac{1}{2}$

- (a) Complete the probability tree diagram.



- (b) Calculate the probability that Boris wins the match.

(3)

(Total for Question 18 is 6 marks)



- 19 A particle is moving in a straight line which passes through a fixed point O .
The displacement, s metres, of the particle from O at time t seconds is given by

$$s = 10 + 9t^2 - t^3$$

- (a) Find an expression for the velocity, v m/s, of the particle at time t seconds.

$$v = \dots\dots\dots \text{seconds} \quad (2)$$

- (b) Find the time at which the acceleration of the particle is zero.

$$\dots\dots\dots \text{seconds} \quad (2)$$

(Total for Question 19 is 4 marks)

- 20 PTR and QTS are chords of a circle.

$$PT = 3 \text{ cm.}$$

$$ST = 10 \text{ cm.}$$

$$RT = 15 \text{ cm.}$$

$$QT = x \text{ cm.}$$

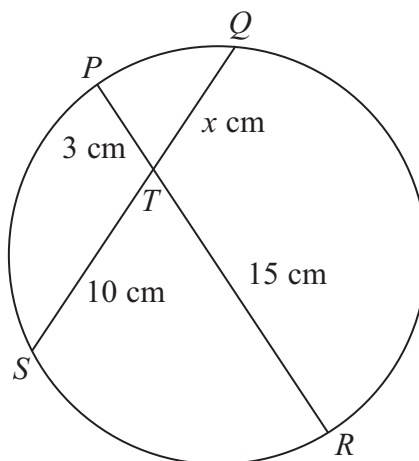


Diagram **NOT**
accurately drawn

Calculate the value of x .

$$x = \dots\dots\dots$$

(Total for Question 20 is 2 marks)



- 21** A bag contains x counters.
 7 of the counters are blue.
 Sam takes at random a counter from the bag and does not replace it.
 Jill then takes a counter from the bag.
 The probability they both take a blue counter is 0.2

- (a) Form an equation involving x .
 Show that your equation can be expressed as $x^2 - x - 210 = 0$

(2)

- (b) Solve $x^2 - x - 210 = 0$
 Show clear algebraic working.

(3)

(Total for Question 21 is 5 marks)

22 $(\sqrt{a} + \sqrt{8a})^2 = 54 + b\sqrt{2}$

- a and b are positive integers.
 Find the value of a and the value of b .
 Show your working clearly.

 $a =$ $b =$

(Total for Question 22 is 3 marks)



23

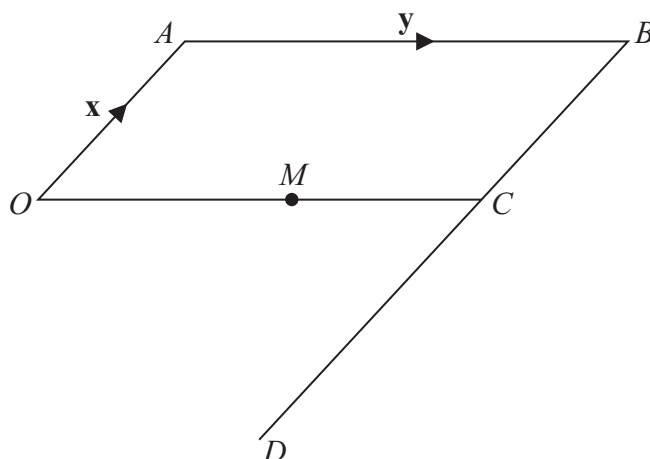


Diagram **NOT**
accurately drawn

$OABC$ is a parallelogram.

BCD is a straight line.

$BD = 3BC$.

M is the midpoint of OC .

$\vec{OA} = \mathbf{x}$ $\vec{AB} = \mathbf{y}$

(a) Find, in terms of \mathbf{x} and \mathbf{y} ,

(i) \vec{AM}

(ii) \vec{OD}

(2)

(b) Use your answers to (a)(i) and (ii) to write down two different geometric facts about the lines AM and OD .

(2)

(Total for Question 23 is 4 marks)



- 24 The diagram shows a cube $ABCDEFGH$.
The sides of the cube are of length 5 cm.

Calculate the size of the angle between the diagonal AH and the base $EFGH$.
Give your answer correct to 1 decimal place.

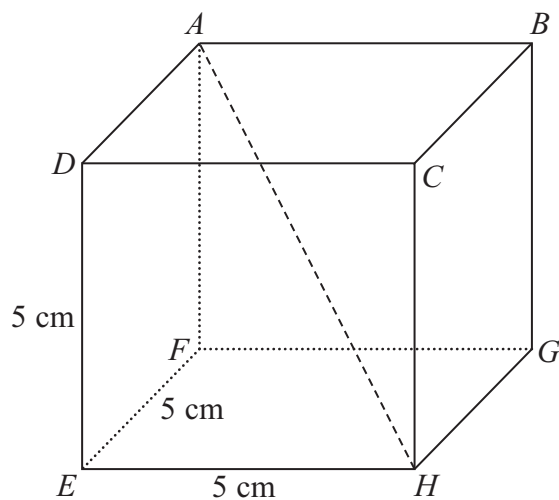


Diagram **NOT**
accurately drawn

(Total for Question 24 is 4 marks)



25 Solve the simultaneous equations

$$x^2 + y^2 = 26$$

$$y = 3 - 2x$$

Show clear algebraic working.

.....
(Total for Question 25 is 6 marks)

TOTAL FOR PAPER IS 100 MARKS

