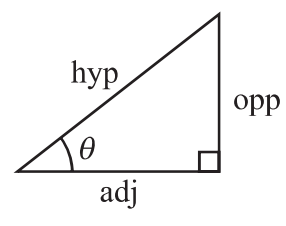
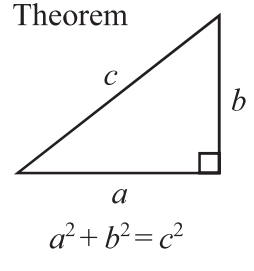


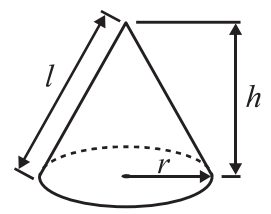
International GCSE MATHEMATICS FORMULAE SHEET – HIGHER TIER

Pythagoras' Theorem



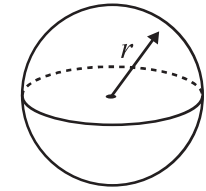
Volume of cone = $\frac{1}{3} \pi r^2 h$

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



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

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



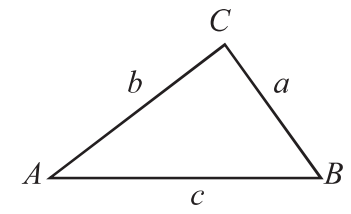
adj = hyp \times cos θ
opp = hyp \times sin θ
opp = adj \times tan θ

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

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

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

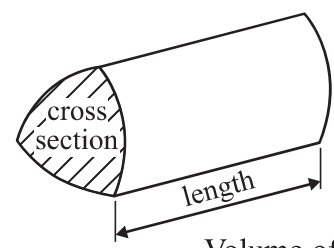
In any triangle ABC



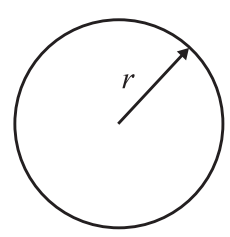
Sine rule: $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$

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

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



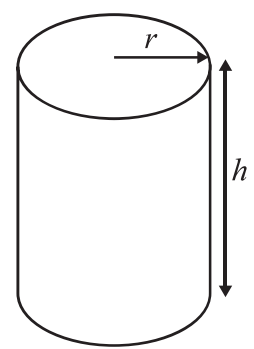
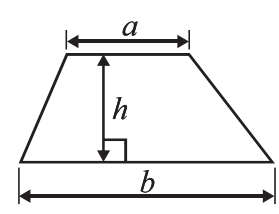
Volume of prism = area of cross section \times length



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 ONE questions.

Write your answers in the spaces provided.

You must write down all the stages in your working.

- 1** In January 2007 the population of Canada was 32 million.
7 million of these Canadian people spoke French as their first language.
- (a) Express 7 million as a percentage of 32 million.
Give your answer correct to 1 decimal place.

..... %
(2)

Between January 2007 and January 2009 the population of Canada increased by 4%.

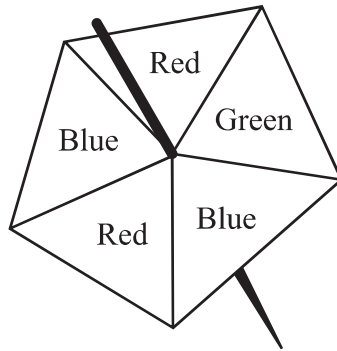
- (b) Increase 32 million by 4%.
Give your answer correct to the nearest million.

..... million
(3)

(Total for Question 1 is 5 marks)



2 Here is a fair 5-sided spinner.



Hans spins the spinner 30 times.

Work out an estimate for the number of times the spinner lands on Red.

.....

(Total for Question 2 is 2 marks)

3

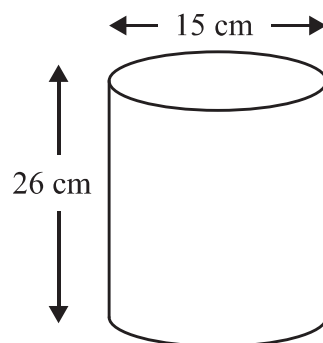


Diagram **NOT**
accurately drawn

A cylinder has a diameter of 15 cm and a height of 26 cm.

Work out the volume of the cylinder.

Give your answer correct to 3 significant figures.

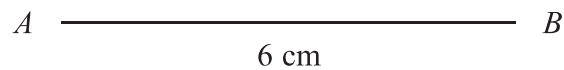
..... cm³

(Total for Question 3 is 3 marks)



- 4 The lengths of the sides of a rhombus are 6 cm.
The length of the longer diagonal of the rhombus is 10 cm.
 AB is a side of the rhombus.

Construct an accurate, full-size drawing of the rhombus.
You must show all construction lines.



(Total for Question 4 is 4 marks)



5 (a) Factorise $5a - 3a^2$

.....
(2)

(b) Expand

(i) $2(4 - 3w)$

(ii) $y^2(y + 10)$

.....
(3)

(c) $W = \frac{5.6a}{b^2}$

$a = 1.28$ $b = 0.8$

Work out the value of W .

$W =$
(2)

(Total for Question 5 is 7 marks)



- 6 (a) $\mathcal{E} = \{\text{Students in Year 12}\}$
 $G = \{\text{Students who study German}\}$
 $F = \{\text{Students who study French}\}$
 $M = \{\text{Students who study Maths}\}$

(i) $G \cap M = \emptyset$

Use this information to write a statement about the students who study German in Year 12

- (ii) Preety is a student in Year 12
 Preety $\notin F$.

Use this information to write a statement about Preety.

(2)

- (b) $A = \{2, 4, 6, 8, 10\}$
 $A \cap B = \{2, 4\}$
 $A \cup B = \{1, 2, 3, 4, 6, 8, 10\}$

List all the members of set B .

(2)

(Total for Question 6 is 4 marks)

Do NOT write in this space.



- 7 The table shows information about the numbers of text messages sent by 40 teenagers in one day.

Number of text messages	Number of teenagers	Mid-interval value	
0 to 2	3	1	
3 to 5	6	4	
6 to 8	10		
9 to 11	15		
12 to 14	5		
15 to 17	1		

- (a) Write down the modal class.

.....
(1)

- (b) (i) Work out an estimate for the mean number of texts sent by the 40 teenagers in one day.

.....
(5)

- (ii) Explain why your answer to part (b)(i) is an estimate.

.....
(Total for Question 7 is 6 marks)



- 8 A bag contains 60 beads.
 x of the beads are red and the rest are green.
 Altaaf takes at random a bead from the bag.

(a) State, in terms of x , the probability that Altaaf takes a red bead.

.....
 (1)

Altaaf puts his bead back in the bag.
 Another 20 **red** beads are added to those in the bag.
 The probability that Altaaf takes a red bead is now doubled.

(b) (i) Use this information to write down an equation in x
 and show that your equation can be expressed as $8x = 3(x + 20)$

(ii) Solve $8x = 3(x + 20)$
 Show your working clearly.

$x =$
 (5)

(Total for Question 8 is 6 marks)



9

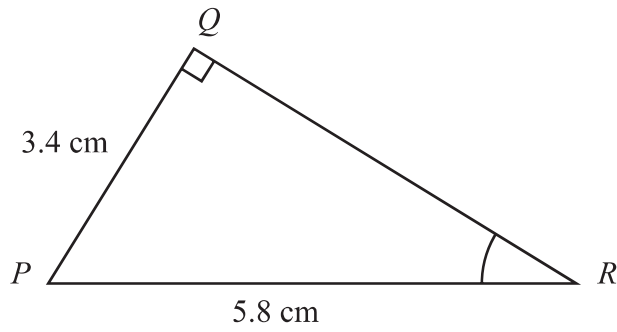


Diagram **NOT** accurately drawn

Triangle PQR has a right angle at Q .

$PQ = 3.4$ cm and $PR = 5.8$ cm.

- (a) Work out the size of angle QRP .
Give your answer correct to 1 decimal place.

.....
(3)

The length 5.8 cm, of PR , is correct to 2 significant figures.

- (b) (i) Write down the upper bound of the length of PR .

..... cm

- (ii) Write down the lower bound of the length of PR .

..... cm
(2)

(Total for Question 9 is 5 marks)



- 10** A bank pays compound interest of 6% per annum on its savings accounts.
Julia invests \$7500 for 3 years.

Calculate the total interest gained after 3 years.

\$

(Total for Question 10 is 3 marks)

- 11** Make y the subject of $3(y + 2x - 1) = x + 5y$

$y =$

(Total for Question 11 is 3 marks)



12 $ABCD$ and $APQR$ are two similar quadrilaterals.

- $PQ = 9$ cm.
- $BC = 6$ cm.
- $AD = 5$ cm.
- $QR = 12$ cm.

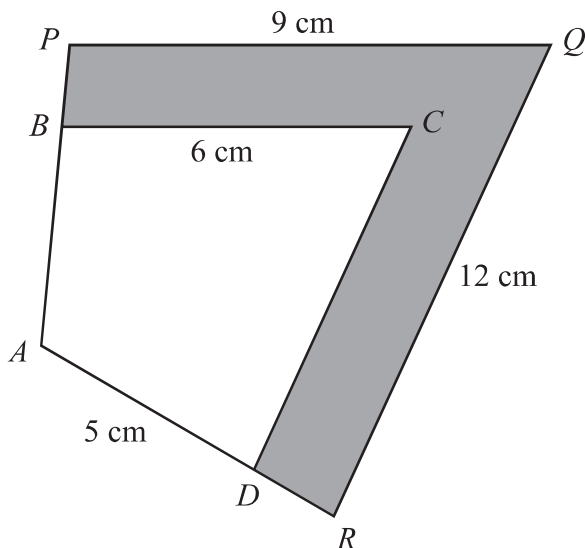


Diagram **NOT** accurately drawn

(a) Find the length of DC .

..... cm
(2)

(b) Find the length of AR .

..... cm
(2)

The area of the quadrilateral $ABCD$ is 32 cm².

(c) Calculate the area of the shaded region.

..... cm²
(3)

(Total for Question 12 is 7 marks)



13

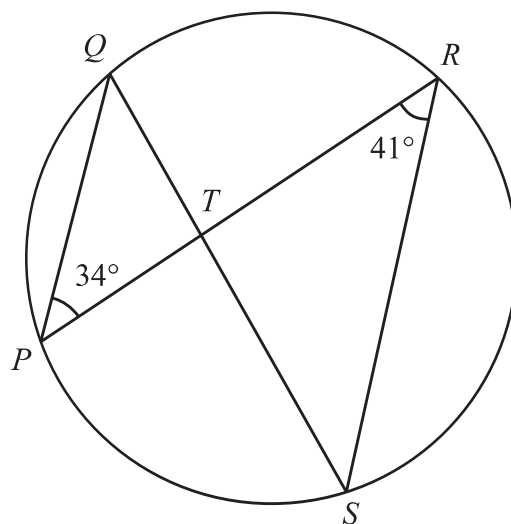


Diagram **NOT** accurately drawn

P, Q, R and S are points on the circumference of a circle.
 PR and QS intersect at T .
 Angle $QPR = 34^\circ$ and angle $PRS = 41^\circ$

(a) (i) Find the size of angle PQS .

..... °

(ii) Give a reason for your answer.

.....

 (2)

(b) (i) Find the size of angle PTS .

..... °

(ii) Explain why T cannot be the centre of the circle.

.....

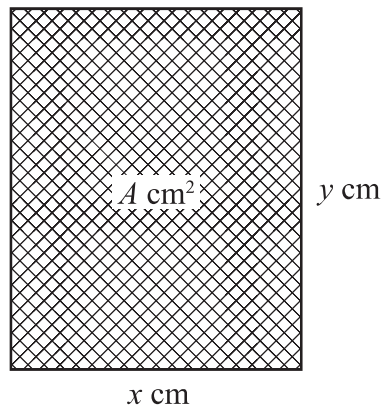
 (2)

(Total for Question 13 is 4 marks)



P 4 0 6 1 2 A 0 1 3 2 0

14



The diagram shows a rectangular photo frame of area $A \text{ cm}^2$.

The width of the photo frame is $x \text{ cm}$.

The height of the photo frame is $y \text{ cm}$.

The perimeter of the photo frame is 72 cm .

(a) Show that $A = 36x - x^2$

(3)

(b) Find $\frac{dA}{dx}$

(2)

(c) Find the maximum value of A .

$A = \dots\dots\dots$

(3)

(Total for Question 14 is 8 marks)



- 15 Two small magnets attract each other with a force, F newtons.
 F is inversely proportional to the square of the distance, d cm, between them.

When $d = 2$, $F = 12$

- (a) Express F in terms of d .

.....
(3)

- (b) Calculate the value of F when $d = 5$

$F =$
(1)

- (c) Calculate the value of d when $F = 3$

$d =$
(2)

(Total for Question 15 is 6 marks)



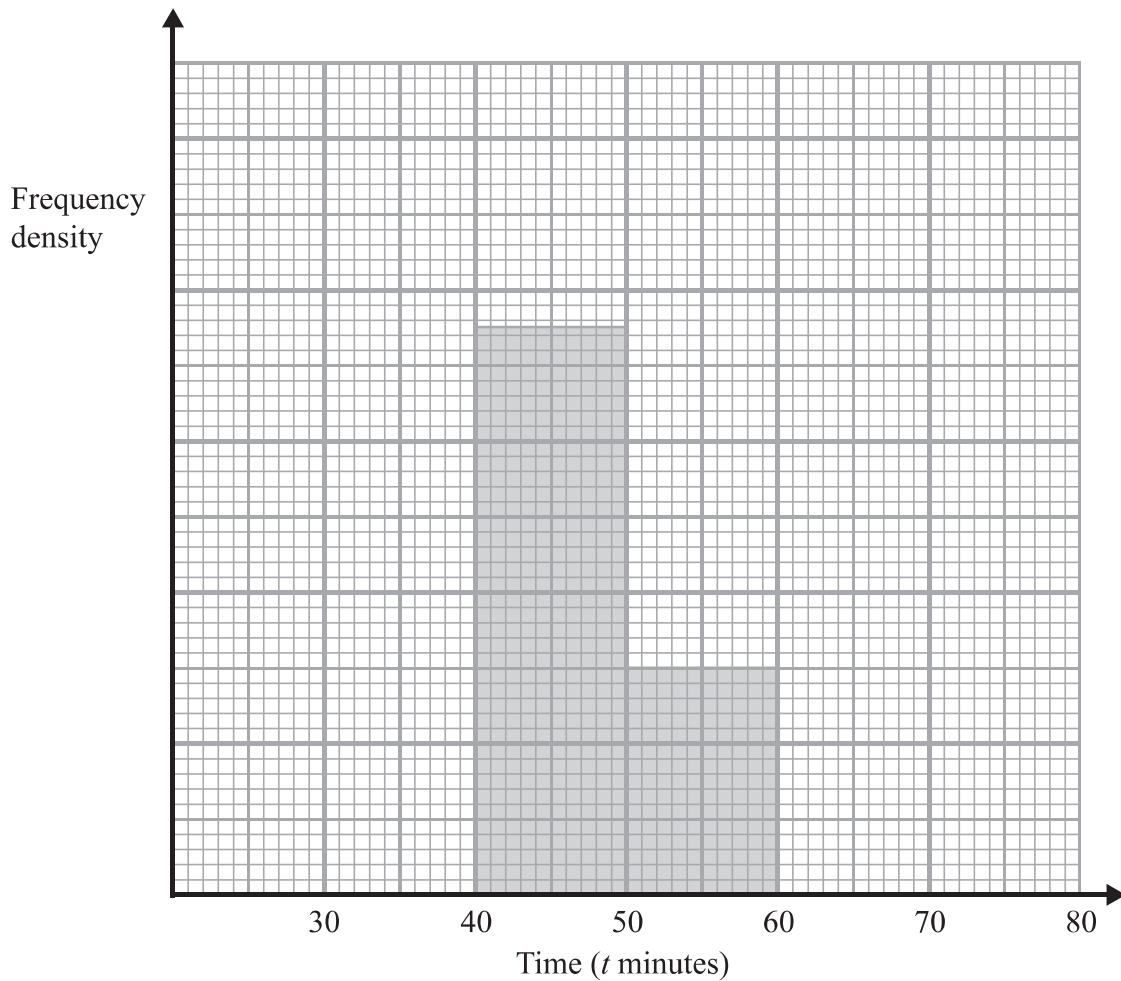
16 The incomplete table shows information about the times, in minutes, that runners took to complete a race.

Time (t minutes)	$30 \leq t < 35$	$35 \leq t < 40$	$40 \leq t < 50$	$50 \leq t < 60$	$60 \leq t < 80$
Number of runners	12	20		12	16

(a) Use the histogram to calculate the number of runners who took between 40 and 50 minutes to complete the race.

.....
(2)

(b) Complete the histogram for the remaining results.



(2)



Runners who achieved a time between 37 and 48 minutes to complete the race were each awarded a silver medal.

(c) Calculate an estimate of the number of runners awarded silver medals.

.....
(2)

(Total for Question 16 is 6 marks)

17 Show that the recurring decimal $0.1\dot{7} = \frac{8}{45}$

(Total for Question 17 is 2 marks)



18

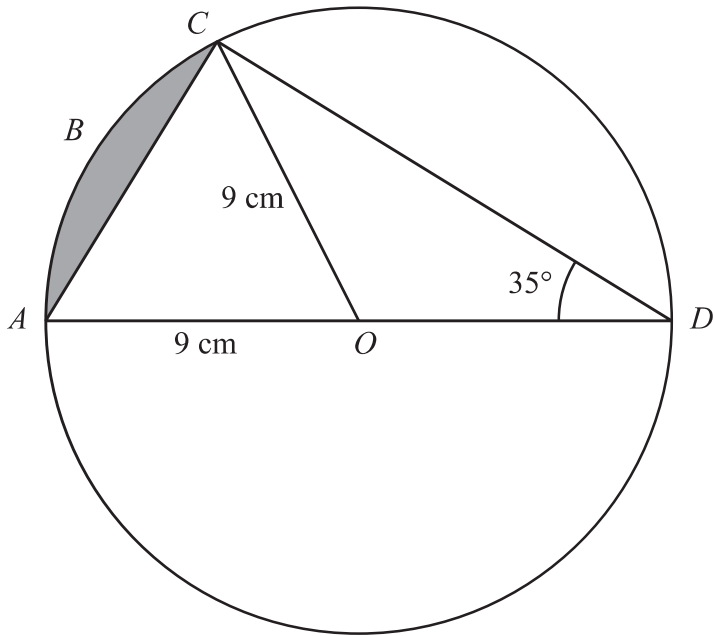


Diagram **NOT** accurately drawn

AOD is a diameter of a circle, with centre O and radius 9 cm .
 ABC is an arc of the circle.
 AC is a chord.
 Angle $ADC = 35^\circ$

Calculate the area of the shaded segment.
 Give your answer correct to 3 significant figures.

..... cm^2

(Total for Question 18 is 6 marks)



- 19 Show that $\frac{\sqrt{3} + \sqrt{27}}{\sqrt{2}}$ can be expressed in the form \sqrt{k} where k is an integer.
State the value of k .

$$k = \dots\dots\dots$$

(Total for Question 19 is 3 marks)

- 20 Simplify fully $\frac{4}{x} + \frac{3}{2-x}$

(Total for Question 20 is 3 marks)



21

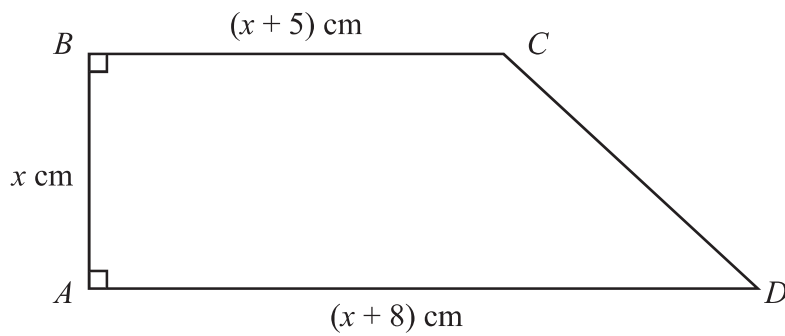


Diagram **NOT**
accurately drawn

The diagram shows a trapezium $ABCD$ with AD parallel to BC .

$AB = x$ cm, $BC = (x + 5)$ cm and $AD = (x + 8)$ cm.

The area of the trapezium is 42 cm².

(a) Show that $2x^2 + 13x - 84 = 0$

(2)

(b) Calculate the perimeter of the trapezium.

..... cm

(5)

(Total for Question 21 is 7 marks)

TOTAL FOR PAPER IS 100 MARKS

