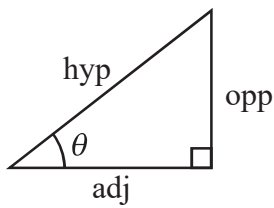
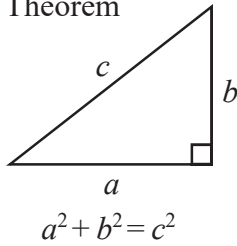


**International GCSE MATHEMATICS
FORMULAE SHEET – HIGHER TIER**

Pythagoras' Theorem

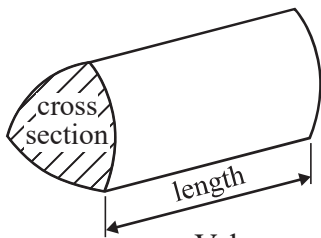


$$\begin{aligned} \text{adj} &= \text{hyp} \times \cos \theta \\ \text{opp} &= \text{hyp} \times \sin \theta \\ \text{opp} &= \text{adj} \times \tan \theta \end{aligned}$$

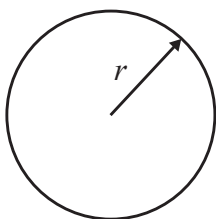
$$\text{or} \quad \sin \theta = \frac{\text{opp}}{\text{hyp}}$$

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

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

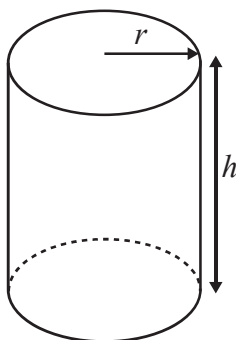


Volume of prism = area of cross section \times length



Circumference of circle = $2\pi r$

Area of circle = πr^2



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

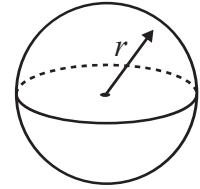
Curved surface area of cylinder = $2\pi r h$



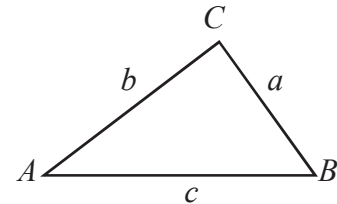
P 4 2 9 4 0 A 0 2 2 0

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

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



In any triangle ABC

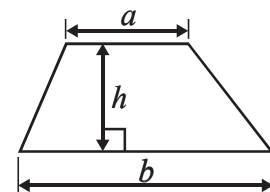


Sine rule: $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$

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

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

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



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 stages in your working.

- 1 Here is a list of the ingredients needed to make leek and potato soup for 6 people.

Leek and Potato Soup
Ingredients for 6 people
900 ml chicken stock
900 ml water
750 g leeks
350 g potatoes
350 g onions

- (a) Ainsley wants to make leek and potato soup for 13 people.

Work out the amount of chicken stock he needs.

..... ml
(2)

- (b) Delia makes leek and potato soup for a group of people.
She uses 1250 g of leeks.

Work out the number of people in the group.

.....
(2)

(Total for Question 1 is 4 marks)

Do NOT write in this space.



- 2 A plane flew from Frankfurt to Hong Kong.
The flight time was 10 hours 45 minutes.
The average speed was 852 km/h.

Work out the distance the plane flew.

..... km

(Total for Question 2 is 3 marks)

3

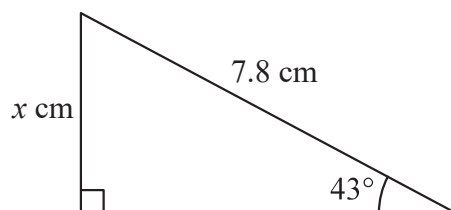


Diagram **NOT**
accurately drawn

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

$x =$

(Total for Question 3 is 3 marks)

Do NOT write in this space.



4 (a) Write $2^3 \times 2^4$ as a single power of 2

.....
(1)

(b) $280 = 2^n \times 5 \times 7$

Find the value of n .

$n =$
(2)

(Total for Question 4 is 3 marks)

5 (a) Simplify $5c \times 4c$

.....
(1)

(b) Factorise $4x + x^2$

.....
(2)

(c) Work out the value of $y^3 + 5y$ when $y = 2$

.....
(2)

(Total for Question 5 is 5 marks)



6

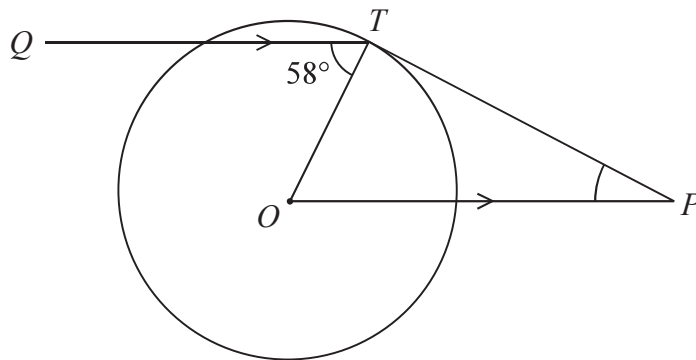


Diagram **NOT**
accurately drawn

T is a point on a circle, centre O .

Q is a point such that angle $QTO = 58^\circ$

P is the point such that OP is parallel to QT and PT is a tangent to the circle.

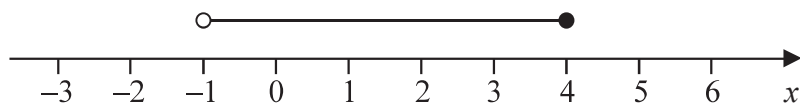
Work out the size of angle OPT .

(Total for Question 6 is 3 marks)

Do NOT write in this space.



7 (a)



An inequality is shown on the number line.

Write down this inequality.

.....
(2)

(b) (i) Solve the inequality $2(y - 3) \geq 1$

(ii) Write down the lowest **integer** which satisfies this inequality.

.....
(4)

(Total for Question 7 is 6 marks)

Do NOT write in this space.



- 8 A box contains 80 tea bags.
The table shows information about the weight of each tea bag.



Weight (w grams)	Number of tea bags
$2.8 < w \leq 2.9$	2
$2.9 < w \leq 3.0$	4
$3.0 < w \leq 3.1$	22
$3.1 < w \leq 3.2$	32
$3.2 < w \leq 3.3$	14
$3.3 < w \leq 3.4$	6

- (a) Work out the percentage of the 80 tea bags that weigh more than 3.1 grams.

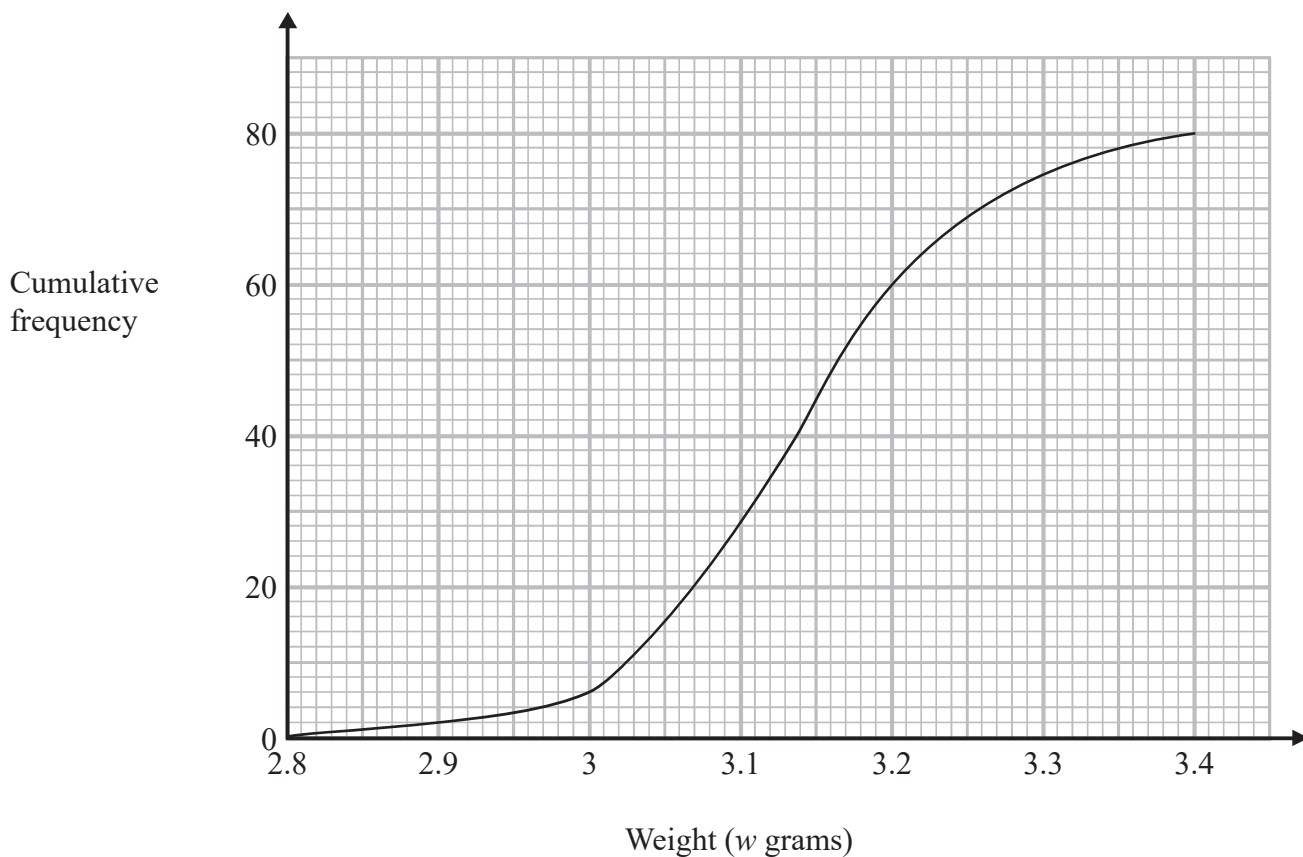
..... %
(2)

- (b) Work out an estimate for the total weight of the 80 tea bags.
Use halfway values of 2.85 grams, 2.95 grams, ...

..... grams
(3)



Here is a cumulative frequency graph for the weights of the 80 tea bags.



(c) Use the graph to find an estimate for the number of tea bags which weighed more than 3.25 grams.

.....
(2)

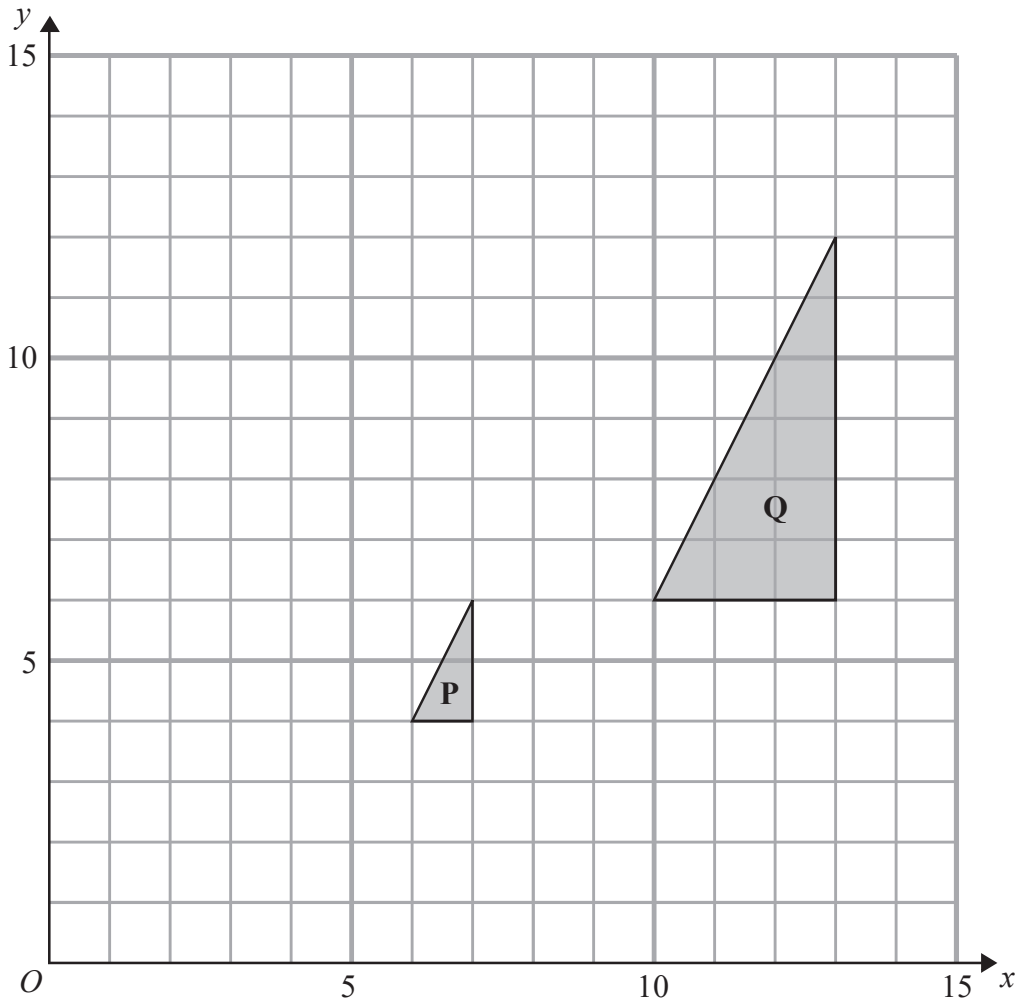
(d) Use the graph to find an estimate for the interquartile range of the weights of the tea bags.

..... grams
(2)

(Total for Question 8 is 9 marks)



9



(a) Describe fully the single transformation which maps triangle **P** onto triangle **Q**.

.....

.....

(3)

(b) On the grid, translate triangle **Q** by the vector $\begin{pmatrix} -8 \\ 2 \end{pmatrix}$

Label the new triangle **R**.

(1)

(c) Describe fully the single transformation which maps triangle **R** onto triangle **P**.

.....

.....

(2)

(Total for Question 9 is 6 marks)



- 10** Serena bought a car that had a value of \$16 000
At the end of each year, the value of her car had depreciated by 15%.
Calculate the value of her car at the end of 3 years.

\$.....

(Total for Question 10 is 3 marks)

11 Solve $\frac{6x - 1}{4} - \frac{5 - 2x}{2} = 1$

Show clear algebraic working.

$x =$

(Total for Question 11 is 4 marks)



12

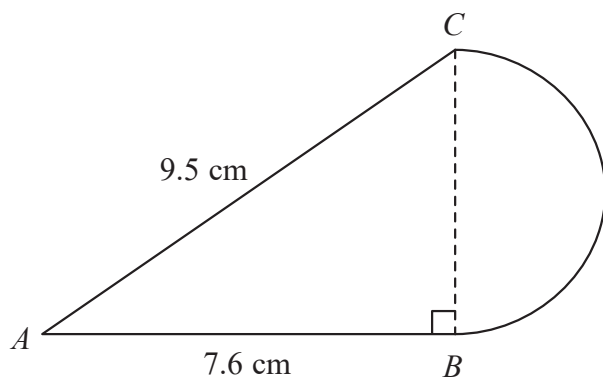


Diagram **NOT**
accurately drawn

The diagram shows a shape made from triangle ABC and a semicircle with diameter BC .
Triangle ABC is right-angled at B .
 $AB = 7.6$ cm and $AC = 9.5$ cm.

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

..... cm²

(Total for Question 12 is 5 marks)

12



P 4 2 9 4 0 A 0 1 2 2 0

13 A box contains 20 nails.

The table shows information about the length of each nail.

Length of nail (mm)	25	30	40	50	60
Number of nails	1	8	4	5	2



(a) Viraj takes at random one nail from the box.

Find the probability that the length of the nail he takes is

(i) 50 mm or 60 mm,

.....

(ii) less than 35 mm.

.....

(4)

(b) Jamila puts all 20 nails into a bag.

She takes at random one of the nails and records its length.

She replaces the nail in the bag.

She then takes at random a second nail from the bag and records its length.

Calculate the probability that the two nails she takes

(i) each have a length of 60 mm,

.....

(ii) have a total length of 80 mm.

.....
(5)

(Total for Question 13 is 9 marks)



14 D is directly proportional to t^2
 When $t = 4$, $D = 8$

(a) Find a formula for D in terms of t .

.....
 (3)

(b) Find the positive value of t when $D = 50$

$t =$
 (2)

(Total for Question 14 is 5 marks)

15

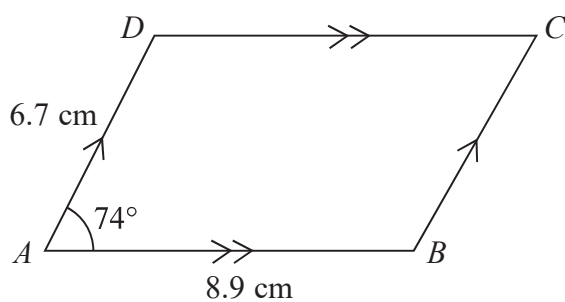


Diagram NOT accurately drawn

$ABCD$ is a parallelogram.
 $AB = 8.9$ cm.
 $AD = 6.7$ cm.
 Angle $BAD = 74^\circ$

Calculate the area of parallelogram $ABCD$.
 Give your answer correct to 3 significant figures.

..... cm^2

(Total for Question 15 is 3 marks)



16 Given that y is positive, make y the subject of $y = \sqrt{ay^2 + n}$

Show clear algebraic working.

$$y = \dots\dots\dots$$

(Total for Question 16 is 5 marks)

17 Given that $(5 - \sqrt{x})^2 = y - 20\sqrt{2}$ where x and y are positive integers, find the value of x and the value of y .

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

$$y = \dots\dots\dots$$

(Total for Question 17 is 3 marks)



18 (a) $x = 9 \times 10^{2m}$ where m is an integer.

Find, in standard form, an expression for \sqrt{x}

.....
(2)

(b) $y = 9 \times 10^{2n}$ where n is an integer.

Find, in standard form, an expression for $y^{\frac{3}{2}}$

Give your answer as simply as possible.

.....
(3)

(Total for Question 18 is 5 marks)

19 Factorise completely $(12x - y)^2 - (4x - 3y)^2$

.....
(Total for Question 19 is 2 marks)



20 f is the function $f(x) = 2x + 5$

(a) Find $f(3)$

.....
(1)

(b) Express the inverse function f^{-1} in the form $f^{-1}(x) =$

$f^{-1}(x) =$
(2)

g is the function $g(x) = x^2 - 25$

(c) Find $g(-3)$

.....
(1)

(d) (i) Find $gf(x)$
Give your answer as simply as possible.

$gf(x) =$

(ii) Solve $gf(x) = 0$

.....
(5)

(Total for Question 20 is 9 marks)



21

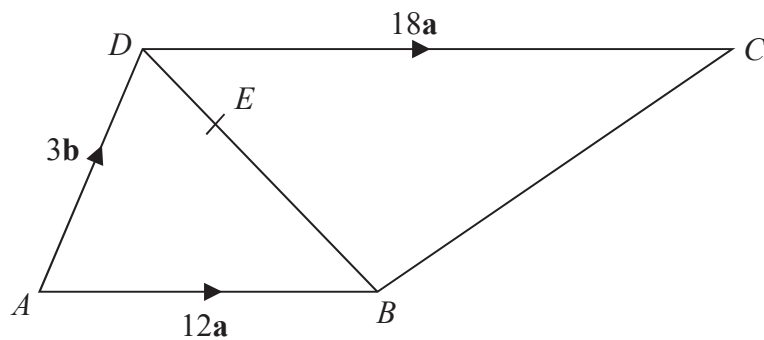


Diagram **NOT** accurately drawn

$ABCD$ is a trapezium.
 AB is parallel to DC .

$$\vec{AB} = 12\mathbf{a}$$

$$\vec{AD} = 3\mathbf{b}$$

$$\vec{DC} = 18\mathbf{a}$$

E is the point on the diagonal DB such that $DE = \frac{1}{3}DB$.

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

(i) \vec{DB}

(ii) \vec{DE}

(iii) \vec{AE}

.....

.....

.....

(3)



(b) Show by a vector method that BC is parallel to AE .

(2)

(Total for Question 21 is 5 marks)

TOTAL FOR PAPER IS 100 MARKS

Do NOT write in this space.

