

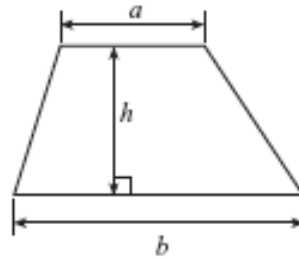
MATHEMATICS
UNIT 1: NON-CALCULATOR
HIGHER TIER

1 hour 45 minutes

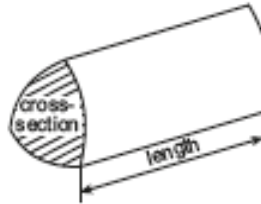
Question	Topic	Mark	Out of
1	Area of trapezium problem		4+2
2	Interior and exterior angles		4
3	Probability from a table		9
4	Inequalities		4
5	Nth term of sequences		5
6	Expanding double brackets and substitution		8
7	Drawing a graph from a table of values		7
8	Simultaneous equations		6
9	Rearranging formulas		6
10	Angles in a circle		4
11	Indices and surds		5
12	Graph transformations		5
13	Solving a problem involving speed and limits		4
14	Algebraic fraction		7
Total			80

Formula List - Higher Tier

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



Volume of prism = area of cross-section \times length



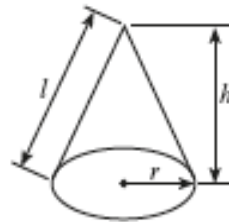
Volume of sphere = $\frac{4}{3}\pi r^3$

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



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

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

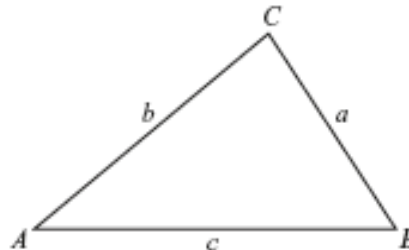


In any triangle ABC

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 = $\frac{1}{2}ab \sin C$



The Quadratic Equation

The solutions of $ax^2 + bx + c = 0$ where $a \neq 0$ are given by $x = \frac{-b \pm \sqrt{(b^2 - 4ac)}}{2a}$

Annual Equivalent Rate (AER)

AER, as a decimal, is calculated using the formula $\left(1 + \frac{i}{n}\right)^n - 1$, where i is the nominal interest rate per annum as a decimal and n is the number of compounding periods per annum.





3.

In a survey, a total of 392 pupils were chosen from years 7, 8 and 9 and asked the following question.

What is your favourite sport in this list?

football	rugby	swimming	cycling
			

The results are summarised in the table below.

Favourite sports					
Year	Football 	Rugby 	Swimming 	Cycling 	Total
7	45	38	23	15	121
8	32	64	14	28	138
9	26	46	34	27	133
Total	103	148	71	70	392

In each of the following parts, a pupil is selected at random.

(a) Calculate the probability of selecting a pupil whose favourite sport is swimming. [1]

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(b) Calculate the probability of selecting a Year 8 pupil. [1]

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(c) The pupil selected is in Year 8.
Calculate the probability that this pupil's favourite sport is cycling. [2]

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(d) The favourite sport of the selected pupil is football.
What is the probability that this pupil is in Year 7? [2]

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(e) The pupil selected is **not** in Year 7.
What is the probability that this pupil's favourite sport is **not** football? [3]

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4.

- (a) On the graph paper provided, draw the region which satisfies **all** of the following inequalities.

$$\begin{aligned}x + y &\geq 3 \\ y &\leq -2x + 6 \\ y &\leq 2\end{aligned}$$

Make sure that you clearly indicate the region that represents your answer. [3]

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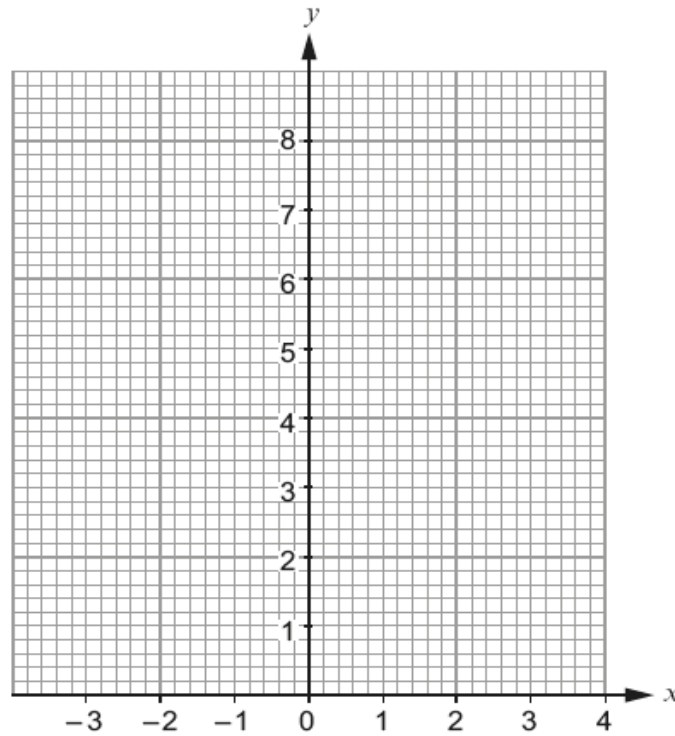
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- (b) Do each of the points listed in the table below lie within the region? Complete the table by stating yes or no. [1]

Point with coordinates	Lies within the region, yes or no?
(2, 1.5)	
(2, 2)	
(2, 2.5)	

5.

- (a) The n th term of a sequence is $5n^2 - 3n$.
Write down the first three terms of the sequence. [2]

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- (b) Find the 20th term of the sequence with n th term $4n - n^2$. [1]

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- (c) Find the n th term of the sequence 2, 8, 18, 32, 50, 72 ... [2]

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6.

(a) Expand and simplify $(2x + 7)(3x - 1)$. [3]

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(b) Simplify $\frac{(x+3)^{12}}{(x+3)^4}$. [1]

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(c) It is known that $y = kx^2$, and that when $x = 3$, $y = -36$.
Calculate the value of y when $x = 5$. [4]

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7.

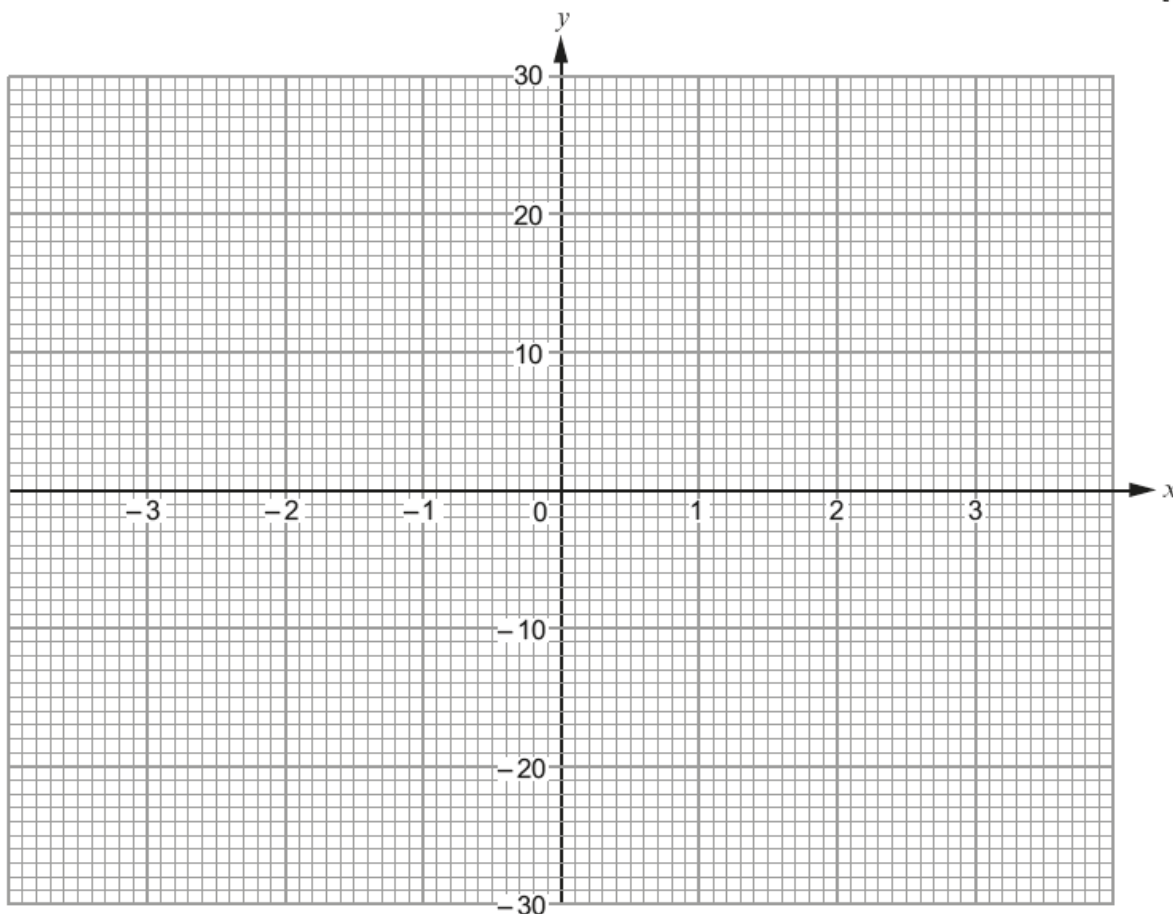
The table below shows some values of $y = x^3 - 3x + 4$ for values of x from -3 to 3 .

x	-3	-2	-1	0	1	2	3
$y = x^3 - 3x + 4$	-14		6	4	2	6	

(a) Complete the table above. [2]

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(b) On the graph paper below draw the graph of $y = x^3 - 3x + 4$ for the values of x from -3 to 3 . [2]



(c) Use your graph to write down the coordinates of the two points where the gradient is zero. [2]

(.....,) (.....,)

(d) Use your graph to write down the solution of the equation $x^3 - 3x + 4 = 0$. [1]

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10.

(a)

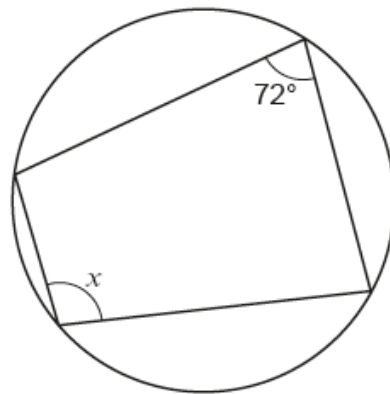


Diagram not drawn to scale

Calculate the size of the angle x in the diagram above.

[1]

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$x = \dots\dots\dots^\circ$

- (b) The diagram below shows a circle with centre O .
 A , B and C are points on the circumference of the circle.
The tangent, PAH , touches the circle at A .
 OBH is a straight line.

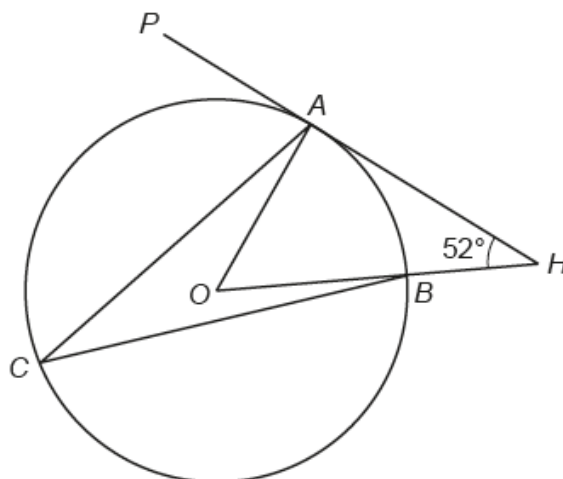


Diagram not drawn to scale

Given that $\hat{A}HB = 52^\circ$, calculate $\hat{A}CB$.
You must show your working.

[3]

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11.

(a) Evaluate 26^0 . [1]

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(b) Express $8^{-\frac{2}{3}}$ as a fraction. [2]

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(c) Simplify $\sqrt{288}$. [2]
Write your answer in surd form.

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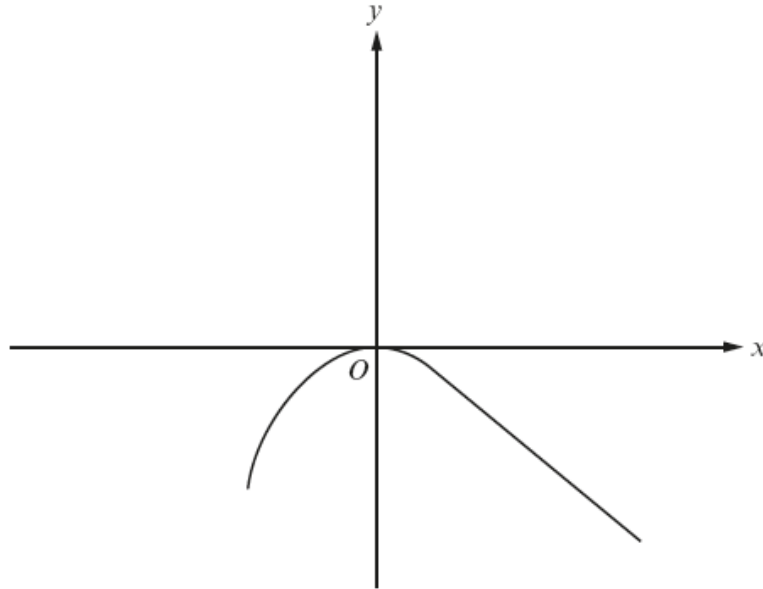
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12.

- (a) The diagram below shows a sketch of $y = f(x)$.
On the same diagram, sketch the curve $y = f(x + 3)$.
Mark clearly the coordinates of the point where this curve touches an axis. [2]



- (b) The diagram below shows another sketch of $y = f(x)$.
On the same diagram below
- sketch the curve $y = -f(x)$, then
 - sketch the curve $y = -f(x) + 2$.

Mark clearly the coordinates of the point where the curve $y = -f(x) + 2$ meets the y-axis. [3]

