

National
Qualifications
MODEL PAPER 1

**Mathematics
Paper 1
(Non-Calculator)**

Duration — 1 hour

Total marks — 40

You may NOT use a calculator.

Attempt ALL questions.

Use **blue** or **black** ink. Pencil may be used for graphs and diagrams only.

Write your working and answers in the spaces provided. Additional space for answers is provided at the end of this booklet. If you use this space, write clearly the number of the question you are attempting.

Square-ruled paper is provided at the back of this booklet.

Full credit will be given only to solutions which contain appropriate working.

State the units for your answer where appropriate.

Before leaving the examination room you must give this booklet to the Invigilator.

If you do not, you may lose all the marks for this paper.

FORMULAE LIST

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

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

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

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

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

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

Volume of a pyramid: $V = \frac{1}{3}Ah$

Standard deviation: $s = \sqrt{\frac{\Sigma(x - \bar{x})^2}{n-1}} = \sqrt{\frac{\Sigma x^2 - (\Sigma x)^2/n}{n-1}}$, where n is the sample size.

1. Evaluate

$$4\frac{1}{3} - 1\frac{1}{2}$$

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2. Expand and simplify

$$(3x - 2)(2x^2 + x + 5)$$

3

3. Change the subject of the formula to m .

$$L = \frac{\sqrt{m}}{k}$$

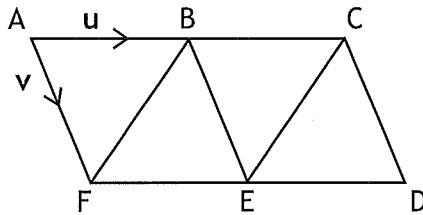
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4. The diagram shows a tiling of congruent triangles.

Vectors u and v are represented by \vec{AB} and \vec{AF} respectively.



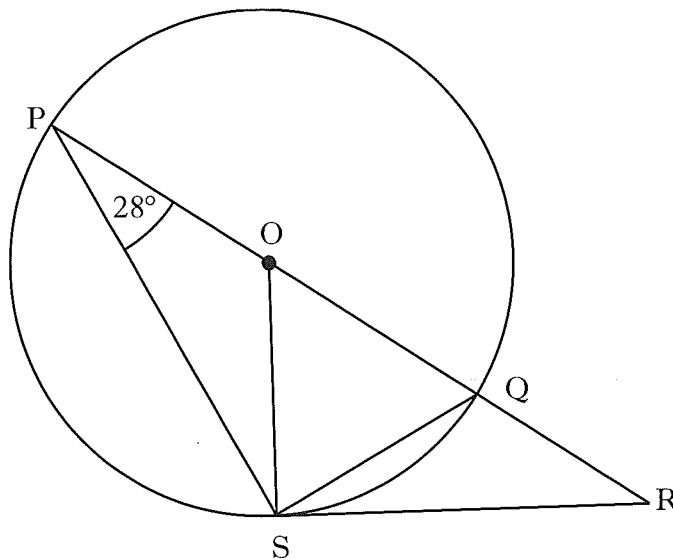
(a) Express \vec{AD} in terms of u and v .

(b) Express \vec{CE} in terms of u and v .

1

Total marks 2

5.



In the above diagram,

- O is the centre of the circle
- PQ is a diameter of the circle
- PQR is a straight line
- RS is a tangent to the circle at S
- angle QPS is 28° .

Calculate the size of angle QRS.

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6. Express $\frac{3y^2 - 6y}{y^2 + y - 6}$ in its simplest form.

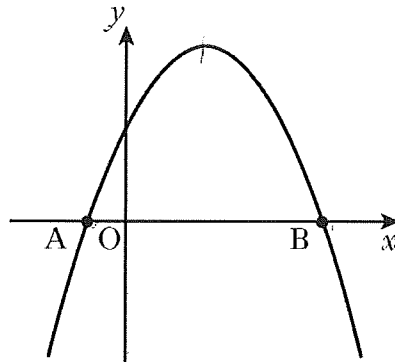
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7. Evaluate $9^{\frac{3}{2}}$.

2

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8. The diagram shows part of the graph of $y = 5 + 4x - x^2$.



$$y = 5 + 4x - x^2$$

A is the point (-1, 0).

B is the point (5, 0).

(a) State the equation of the axis of symmetry of the graph.

2

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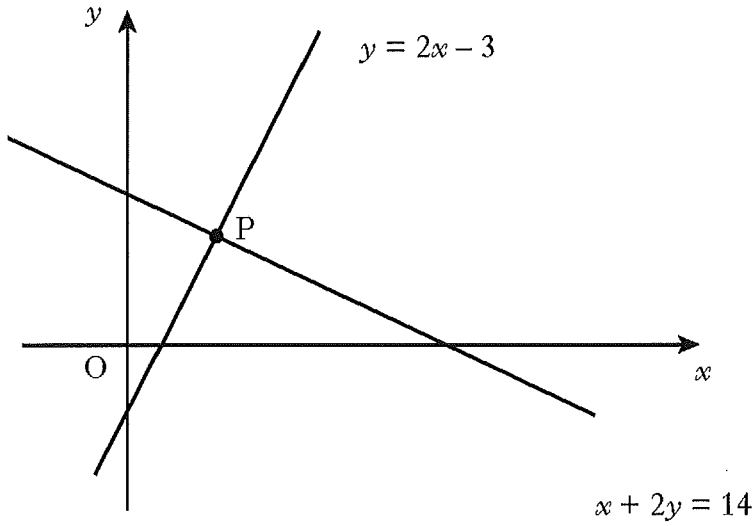
(b) Hence, find the maximum value of $y = 5 + 4x - x^2$.

2

Total marks 4

9. The graph below shows two straight lines.

- $y = 2x - 3$
- $x + 2y = 14$



The lines intersect at the point P.

Find, algebraically, the coordinates of P.

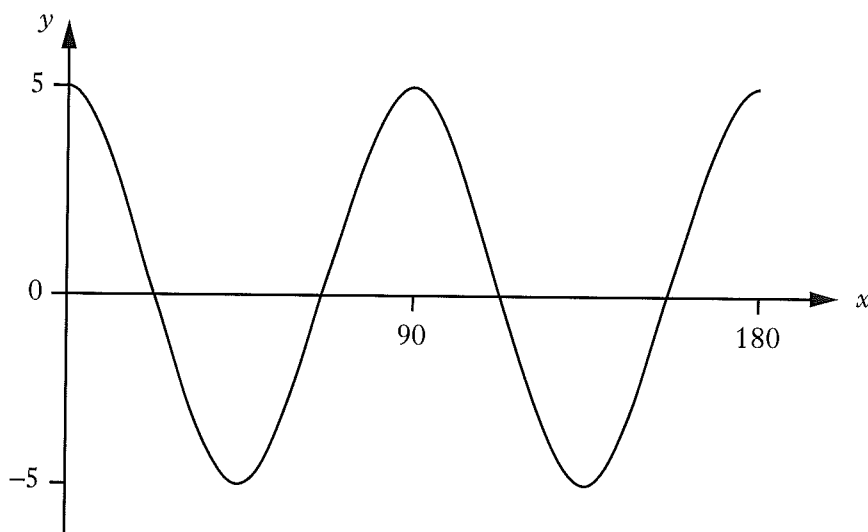
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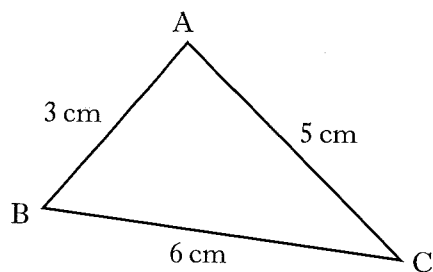
10. Part of the graph of $y = a \cos bx^\circ$ is shown in the diagram.



State the values of a and b .

2

- 11.



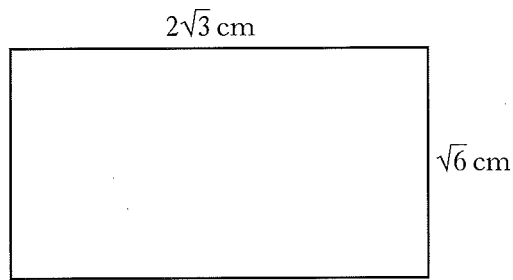
In triangle ABC, show that $\cos B = \frac{5}{9}$.

3

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12.



The rectangle above has length $2\sqrt{3}$ centimetres and breadth $\sqrt{6}$ centimetres.

Calculate the area of the rectangle.

Express your answer as a surd in its simplest form.

3

13. Simplify $\frac{3}{m} + \frac{4}{m+1}$.

3

14. Prove that the roots of the equation $2x^2 + 8x + 5 = 0$ are real and irrational.

4

[END OF MODEL PRACTICE PAPER]