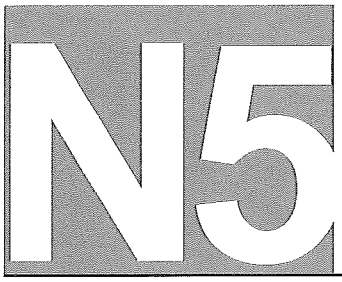

National
Qualifications
MODEL PAPER 1

# Mathematics
# Paper 2

Duration — 1 hour and 30 minutes

**Total marks — 50**

**You may 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.

HODDER GIBSON
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**FORMULAE LIST**

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

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

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

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

MARKS | DO NOT WRITE IN THIS MARGIN

1. Alistair buys an antique chair for £600.
   It is expected to increase in value at the rate of 4·5% each year.
   How much is it expected to be worth in 3 years? **3**

2. A rugby team scored the following points in a series of matches.

   13 7 0 9 7 8 5

   (a) For this sample calculate the mean and the standard deviation. **3**

   The following season the team appoints a new coach.
   A similar series of matches produces a mean of 27 and a standard deviation of 3·25.

   (b) Make two valid comparisons about the performance of the team under the new coach. **2**

**Total marks 5**

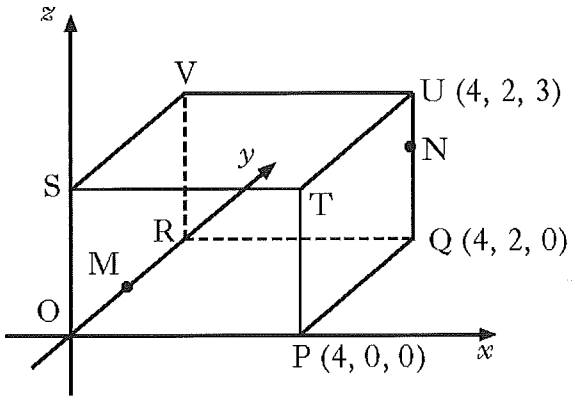
MARKS | DO NOT WRITE IN THIS MARGIN

**3.** The diagram shows a cuboid OPQR,STUV relative to the coordinate axes.

P is the point (4, 0, 0), Q is (4, 2, 0) and U is (4, 2, 3).

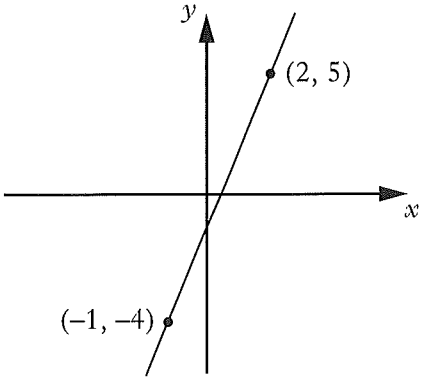
M is the midpoint of OR.

N is the point on UQ such that UN = $\frac{1}{3}$ UQ.




State the coordinates of M and N. **2**

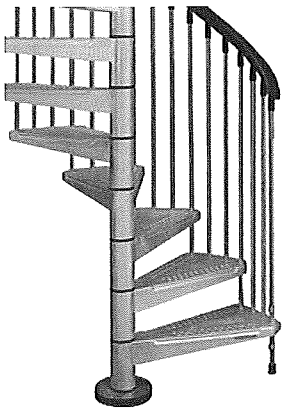
**4.** Find the equation of the straight line shown in the diagram.

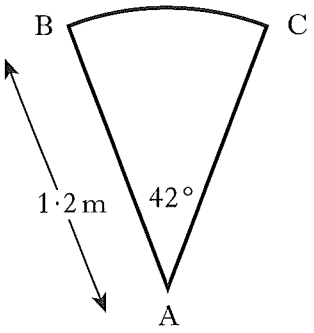



**3**

MARKS | DO NOT WRITE IN THIS MARGIN

**5.** A spiral staircase is being designed.






Each step is made from a sector of a circle as shown.

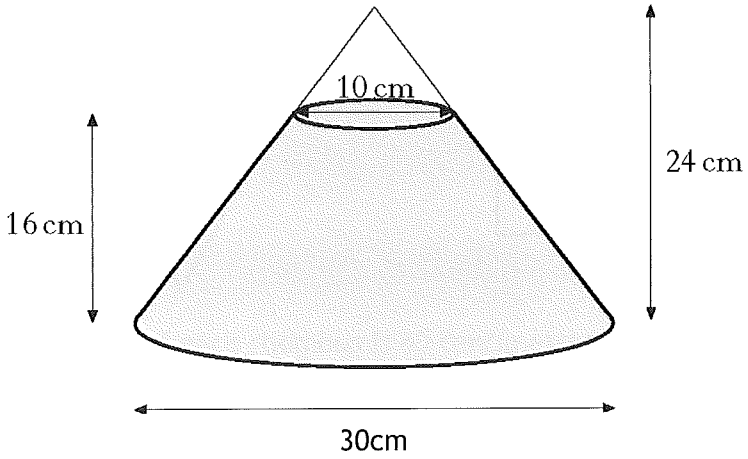
The radius is 1·2 metres.

Angle BAC is 42°.

For the staircase to pass safety regulations, the arc BC must be at least 0·9 metres.

Will the staircase pass safety regulations? 4

**6.** A glass ornament is in the shape of a cone partly filled with coloured water.




The cone is 24 centimetres high and has a base of diameter 30 centimetres.

The water is 16 centimetres deep and measures 10 centimetres across the top.

What is the volume of the water?

Give your answer **correct to 2 significant figures.** 5

MARKS | DO NOT WRITE IN THIS MARGIN

**11.** $f(x) = 3\sin x^o, \quad 0 \le x \le 360$.

(a) Find $f(270)$. **1**

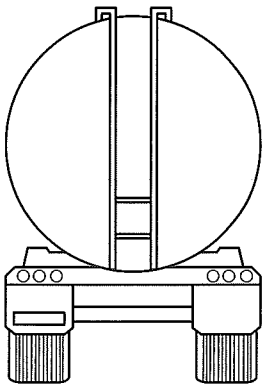
(b) $f(t) = 0 \cdot 6$.

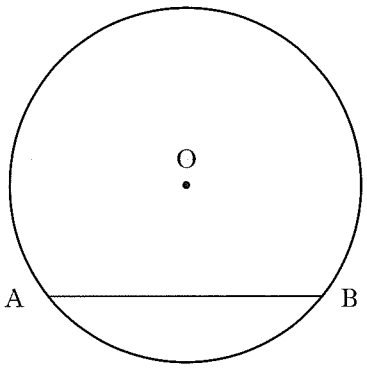
Find the two possible values of $t$. **4**

**Total marks 5**

**12.** A tanker delivers oil to garages.

The tanker has a circular cross-section as shown in the diagram below.





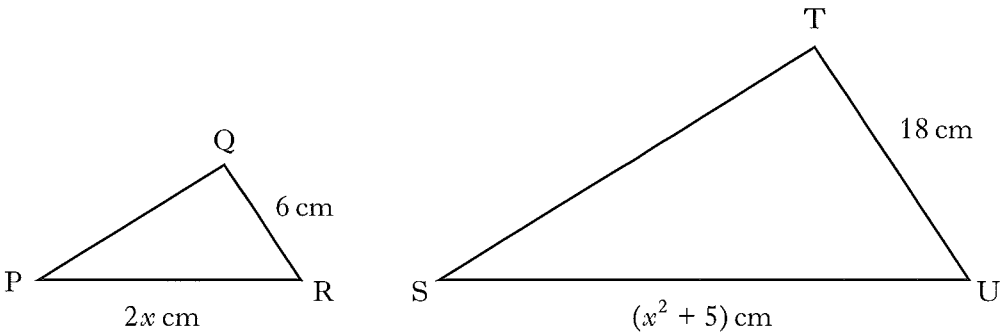

The radius of the circle, O, is 1·9 metres.

The width of the surface of the oil, represented by AB in the diagram, is 2·2 metres.

Calculate the depth of the oil in the tanker. **4**

MARKS | DO NOT WRITE IN THIS MARGIN

**13.** Triangles PQR and STU are mathematically similar.
The scale factor is 3 and PR corresponds to SU.




(a) Show that $x^2 - 6x + 5 = 0$. **2**

(b) Given that QR is the shortest side of triangle PQR, find the value of $x$. **3**

**Total marks 5**

**[END OF MODEL PRACTICE PAPER]**

ADDITIONAL SPACE FOR ANSWERS