

X100/203

NATIONAL
QUALIFICATIONS
2010

FRIDAY, 21 MAY
2.05 PM – 3.35 PM

MATHEMATICS
INTERMEDIATE 2
Units 1, 2 and 3
Paper 2

Read carefully

- 1 **Calculators may be used in this paper.**
- 2 Full credit will be given only where the solution contains appropriate working.
- 3 Square-ruled paper is provided.



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: $\text{Area} = \frac{1}{2}ab \sin C$

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

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

Volume of a cylinder: $\text{Volume} = \pi r^2 h$

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

ALL questions should be attempted.

1. An industrial machine costs £176 500.

Its value depreciates by 4.25% each year.

How much is it worth after 3 years?

Give your answer correct to **three** significant figures.

4

2. Paul conducts a survey to find the most popular school lunch.

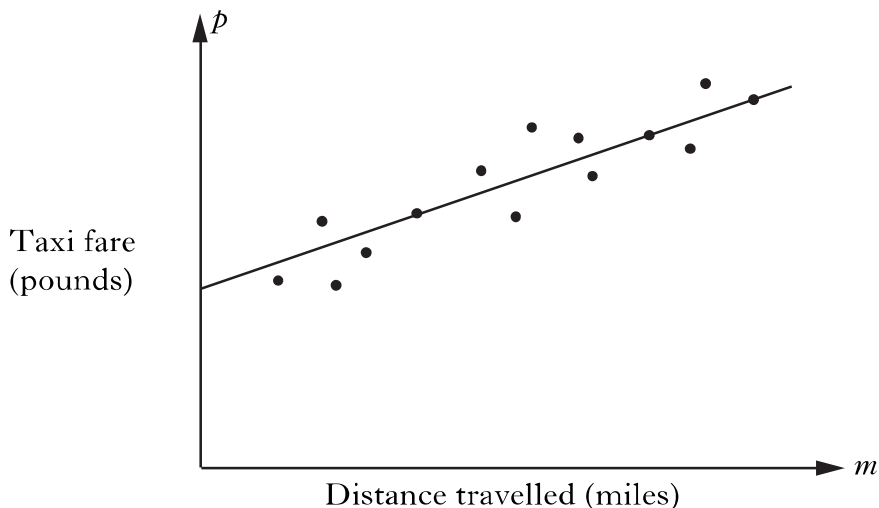
- 30 pupils vote for Pasta
- 40 pupils vote for Baked Potato
- 2 pupils vote for Salad

Paul wishes to draw a pie chart to illustrate his data. How many degrees must he use for each sector in his pie chart?

Do **not** draw the pie chart.

2

3. The scattergraph shows the taxi fare, p pounds, plotted against the distance travelled, m miles. A line of best fit has been drawn.



The equation of the line of best fit is $p = 2 + 1.5m$.

Use this equation to predict the taxi fare for a journey of 6 miles.

1

[Turn over

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

13 7 0 9 7 8 5

- (a) For this sample, calculate:

(i) the mean;

1

(ii) the standard deviation.

3

Show clearly all your working.

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

5. Solve algebraically the system of equations

$$2x - 5y = 24$$

$$7x + 8y = 33.$$

3

6. Express

$$\frac{s^2}{t} \times \frac{3t}{2s}$$

as a fraction in its simplest form.

2

7. Change the subject of the formula

$$P = 2(L + B)$$

to L .

2

8. Express

$$\sqrt{63} + \sqrt{28} - \sqrt{7}$$

as a surd in its simplest form.

3

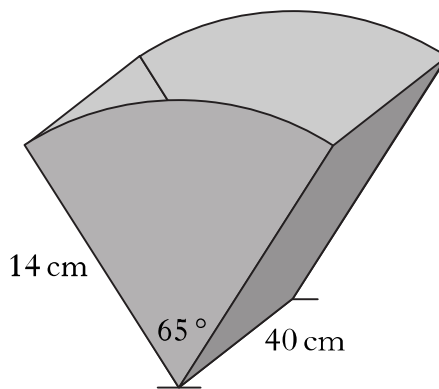
9. The ends of a magazine rack are identical.

Each end is a sector of a circle with radius 14 centimetres.

The angle in each sector is 65° .

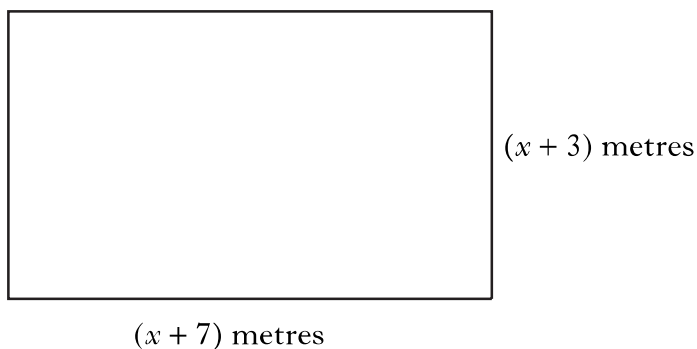
The sectors are joined by two rectangles, each with length 40 centimetres.

The exterior is covered by material.
What area of material is required?



4

10. The diagram below represents a rectangular garden with length $(x + 7)$ metres and breadth $(x + 3)$ metres.



(a) Show that the area, A square metres, of the garden is given by

$$A = x^2 + 10x + 21.$$

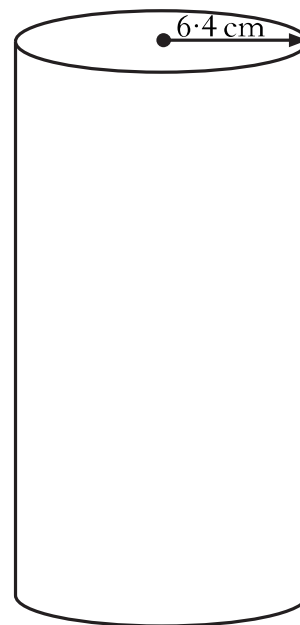
2

(b) The area of the garden is 45 square metres. Find x .

Show clearly all your working.

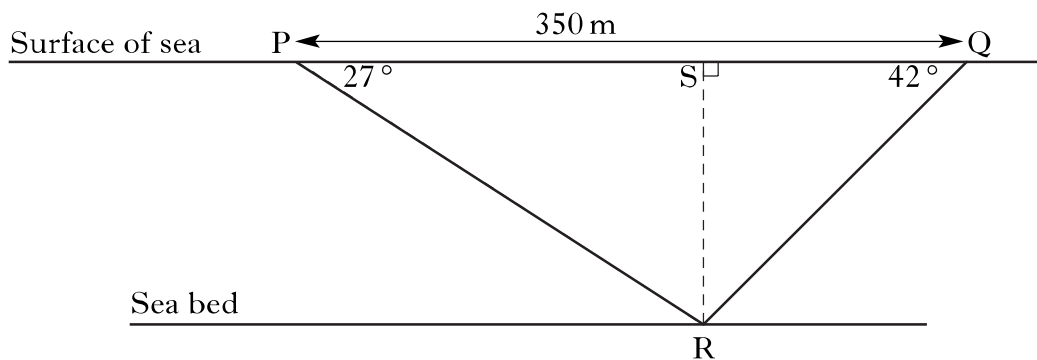
4

11. A cylindrical container has a volume of 3260 cubic centimetres.
 The radius of the cross section is 6.4 centimetres.
 Calculate the height of the cylinder.



3

12. Two ships have located a wreck on the sea bed.
 In the diagram below, the points P and Q represent the two ships and the point R represents the wreck.

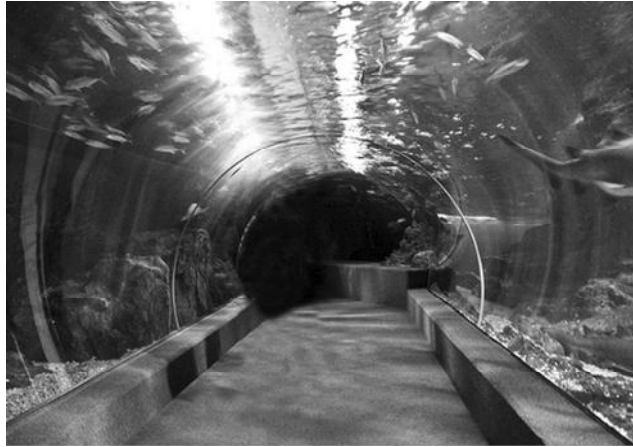


The angle of depression of R from P is 27° .
 The angle of depression of R from Q is 42° .
 The distance PQ is 350 metres.
 Calculate QS, the distance ship Q has to travel to be directly above the wreck.

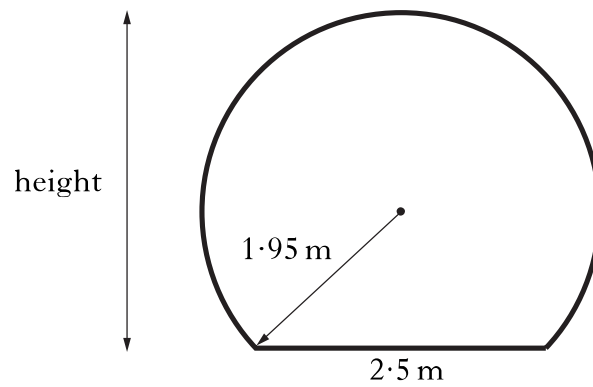
Do not use a scale drawing.

5

13. Ocean World has an underwater viewing tunnel.



The diagram below shows the cross-section of the tunnel. It consists of part of a circle with a horizontal base.



The radius of the circle is 1.95 metres and the width of the base is 2.5 metres.

Calculate the height of the tunnel.

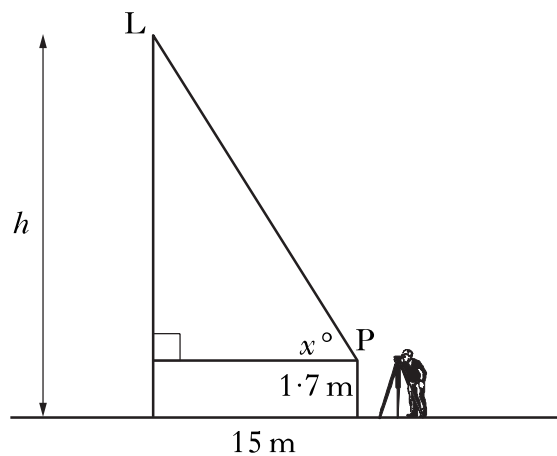
4

[Turn over for Question 14 on *Page eight*

14. A surveyor views a lift as it travels up the outside of a building.



In the diagram below, the point L represents the lift.



The height, h metres, of the lift above the ground is given by the formula

$$h = 15 \tan x^\circ + 1.7,$$

where x° is the angle of elevation of the lift from the surveyor at point P.

- (a) What is the height of the lift above the ground when the angle of elevation from P is 25° ? 2
- (b) What is the angle of elevation at point P when the height of the lift above the ground is 18.4 metres? 3

[END OF QUESTION PAPER]