



# Mathematics

## National 5 Practice Paper E

### Paper 1

Duration - 1 hour

Total marks - 40

- You may NOT use a calculator
- Attempt all the questions.
- Use **blue** or **black** ink.
- Full credit will only be given to solutions which contain appropriate working.
- State the units for your answer where appropriate.

## FORMULAE LIST

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

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

1. Evaluate

$$2\frac{1}{3} + \frac{5}{6} \text{ of } 1\frac{2}{5}$$

3

2. Multiply out the brackets and collect like terms.

$$(4x + 2)(x - 5) + 3x$$

3

3. In an experiment involving two variables, the following values for  $x$  and  $y$  were recorded.

$x$	1	2	3	4
$y$	4	2	0	-2

The results were plotted and a straight line was drawn through the points.

Find the gradient of the line and write down its equation.

3

4. Solve the equation

$$\frac{2}{x} + 9 = 16$$

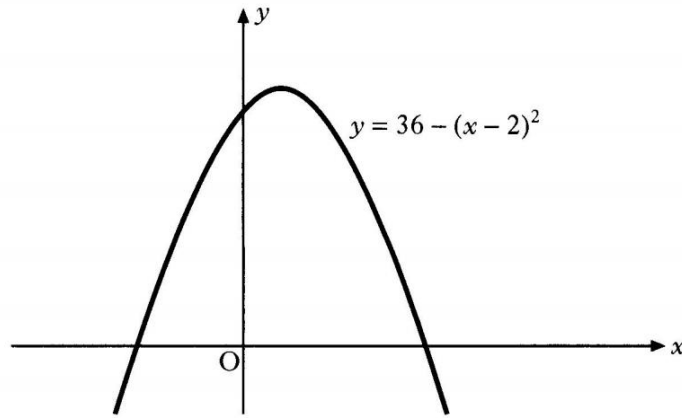
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5. Given  $2x^2 - 2x - 1 = 0$ , show that

$$x = \frac{1 \pm \sqrt{3}}{2}$$

4

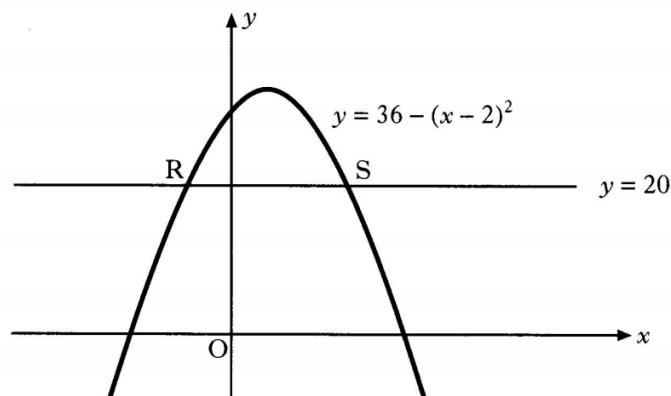
6. The diagram below shows part of the graph of  $y = 36 - (x - 2)^2$ .



- (a) State the coordinates of the maximum turning point. 2
- (b) State the equation of the axis of symmetry. 1

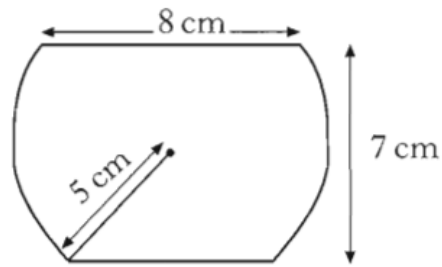
The line  $y = 20$  is drawn.

It cuts the graph of  $y = 36 - (x - 2)^2$  at R and S as shown below.



- (c) S is the point (6, 20). Find the coordinates of R. 2

7. A badge is made from a circle of radius 5 centimetres.  
Segments are taken off the top and bottom of the circle as shown.  
The straight edges are parallel.



The badge measures 7 centimetres from the top to the bottom.  
The top is 8 centimetres wide.

Calculate the width of the base.

5

8. Sketch the graph of  $y = \sin 2x^\circ$ ,  $0 \leq x \leq 360$ .

3

9. 
$$f(x) = 4\sqrt{x} + \sqrt{2}$$

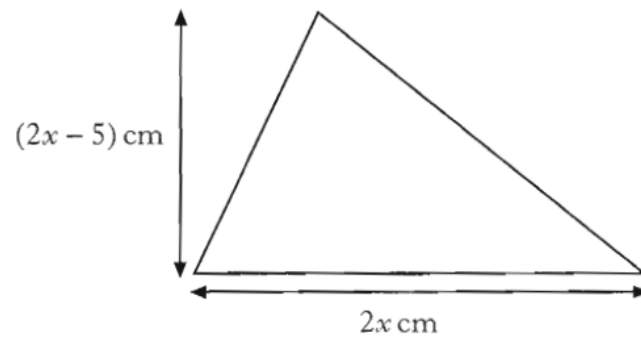
(a) Find the value of  $f(72)$  as a surd in its simplest form.

3

(b) Find the value of  $t$ , given that  $f(t) = 3\sqrt{2}$ .

3

10. The height of a triangle is  $(2x - 5)$  centimetres and the base is  $2x$  centimetres.



The area of the triangle is 7 square centimetres.

Calculate the value of  $x$ .

5

**[End of question paper]**