

# Year 12 AS/A level Further Maths Baseline Test - Sample

## Instructions

- The time for the test is 1 hour.
- Answer **all** questions.

## Information

- The total mark for this paper is 48.
- The marks for each question are shown in brackets  
*-use this as a guide as to how much time to spend on each question.*

## Advice

- Read each question carefully before you start to answer it.
- Keep an eye on the time.
- Try to answer every question.
- Check your answers if you have time at the end.

1 Simplify these expressions as far as possible.

a  $\frac{x^2 - 3x - 10}{x^2 + 4x + 4}$  (3 marks)

b  $\frac{x^2 - 36}{x^2 + x - 12} \div \frac{x^2 - 4x - 12}{x^2 - 9}$  (4 marks)

2 The line  $l$  is a tangent to the circle  $x^2 + y^2 = 13$  at the point  $P(3, 2)$ .

The tangent intersects the  $y$ -axis at point  $A$ . Find the area of the triangle  $OPA$ . (5 marks)

3 Expand and simplify  $(2\sqrt{p} - 3\sqrt{q})(2\sqrt{p} + \sqrt{q})$  (3 marks)

4 a Write  $3x^2 - 9x + 5$  in the form  $a(x + b)^2 + c$  (3 marks)

b Hence, or otherwise, write down the coordinates of the turning point of the graph of  $y = 3x^2 - 9x + 5$ . (1 mark)

5 Prove algebraically that the sum of the squares of two consecutive **odd** integers is always an even number. (4 marks)

6 The functions  $g$  and  $f$  are defined as  $g(x) = \frac{3x}{3+x}$  and  $f(x) = 2x - 5$

Given that  $x \neq -3$ , find the value(s) of  $x$  such that  $g(x) = f(x)$ , giving your answer(s) to 2 decimal places. (6 marks)

7 The line  $l_1$  has equation  $y = -\frac{1}{4}x + 5$  and intersects the  $x$ - and  $y$ -axes at points  $A$  and  $B$  respectively.

a Find the exact length of the line segment  $AB$ . (3 marks)

b Find the equation of the line  $l_2$  perpendicular to  $l_1$  which passes through the point  $P(1, -3)$ .

The line  $l_2$  intersects  $l_1$  at the point  $C$ . (2 marks)

c Find the midpoint of the line segment  $AC$ . (4 marks)

- 8 A triangle  $ABC$  has side lengths  $AB = 12$  cm,  $BC = 7$  cm and  $AC = 9$  cm.
- a Find the size of the largest angle, giving your answer to 2 decimal places. (3 marks)
- b Find the area of the triangle, giving your answer to 2 decimal places. (2 marks)
- 9 a Sketch the graph of  $y = \sin x$  for  $0 \leq x \leq 540^\circ$ , showing the points where the graph cuts the axes. (2 marks)
- b Hence find the exact values of  $x$  in the interval  $0 \leq x \leq 540^\circ$  for which  $\sin x = \frac{1}{\sqrt{2}}$  (3 marks)

**This is the end of the test.**