Year 12 AS/A level Further Maths Baseline Test

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 $\dfrac{x^2 - 2x - 3}{x^2 + 2x + 1}$ **(3 marks)**

  b $\dfrac{x^2 - 25}{x^2 + 6x + 8} \div \dfrac{x^2 - 2x - 15}{x^2 - 16}$ **(4 marks)**

2   The line l is a tangent to the circle $x^2 + y^2 = 20$ at the point $P(2, 4)$.

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

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

4   **a** Write $3x^2 - 12x + 7$ 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 $y = 3x^2 - 12x + 7$ **(1 mark)**

5   Prove algebraically that the product of three consecutive **odd** numbers is always
   an odd number.   **(4 marks)**

6   The functions g and f are defined as $g(x) = \dfrac{2x}{4 - x}$ and $f(x) = 3x - 1$

   Given that $x \neq 4$, 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 $y = -\dfrac{1}{2}x + 3$ and intersects the x- and y-axes at the 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 $P(-1, -2)$.   **(2 marks)**

   The line l_2 intersects l_1 at the point C.

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

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8   A triangle ABC has side lengths $AB = 10$ cm, $BC = 15$ cm and $AC = 8$ cm.

   a Find the size of the largest angle, giving your anwer to 2 decimal places.   **(3 marks)**

   b Find the area of the triangle, giving your anwer to 2 decimal places.   **(2 marks)**

9   **a** Sketch the graph of $y = \cos x$ for $-180 \leqslant x \leqslant 360°$, showing the points where the graph cuts the axes.   **(2 marks)**

   b Hence find the exact values of x in the interval $-180 \leqslant x \leqslant 360°$ for which

$$\cos x = -\frac{\sqrt{3}}{2}$$
   (3 marks)

This is the end of the test.