Immanuel College

Specimen paper for entry into Year 12

Mathematics

NON-CALCULATOR

Time allowed: 1 hour

Total Marks: 48

Answer ALL questions

on lined paper

1. Simplify these expressions.

a $\dfrac{x^6 \times x^2}{x^5}$ **(1 mark)**

b $(3x^4)^2$ **(1 mark)**

c $\dfrac{4x^{\frac{1}{3}}}{(16x^{-3})^{\frac{3}{4}}}$ **(3 marks)**

2. Solve $2x^3 \times 3x^2 = 6144$ **(2 marks)**

3. Find the value of *x*. **(2 marks)**

$x^{-\frac{2}{3}} = \dfrac{1}{25}$

4.

a Write $\sqrt{448}$ **in the form** $a\sqrt{7}$**, where *a* is an integer.** **(1 mark)**

b Expand and simplify $(3-\sqrt{5})(2+3\sqrt{5})$**.** **(2 marks)**

c Simplify $\dfrac{4-2\sqrt{3}}{5+\sqrt{3}}$ **giving your answer in the form** $a+b\sqrt{c}$**, where *a*, *b* and *c* are rational numbers.** **(3 marks)**

5. The area of a triangle is given as $(16+4\sqrt{5})$ **cm².**

The base of the triangle is $(7-\sqrt{5})$ **cm, and the perpendicular height is** $(p+q\sqrt{5})$ **cm.**

Find the values of *p* and *q*. **(4 marks)**

6. Expand and simplify these expressions.

a $4(2x+3y)$ **(1 mark)**

b $(3x-1)(4x+3)$ **(2 marks)**

c $(x+1)^2(x-3)$ **(3 marks)**

7. Fully factorise these expressions.

a $3x-12xy$ **(1 mark)**

b x^2-5x+6 **(1 mark)**

8. Solve these equations.

a $2x+15=7$ **(1 mark)**

b $x^2-11x+10=0$ **(2 marks)**

c $3x^2-7x+3=0$ **(2 marks)**

9. Solve these pairs of simultaneous equations.

a $3x + y = 2$ **(3 marks)**
$4x - y = -9$

b $y = 4x + 3$ **(3 marks)**
$2y = 2x + 3$

c $x - y = 1$ **(4 marks)**
$x^2 + y^2 = 13$

10. Solve these inequalities.

a $3x + 5 \leqslant 12$ **(1 mark)**

b $4x - 3 > 9x - 7$ **(2 marks)**

c $x^2 + x - 56 \leqslant 0$ **(2 marks)**

11. The function f is defined as $f(x) = x^2 - 7$

Find the value of $f(-3)$. **(1 mark)**