St Aloysius' College
Year 9 5.3 Term 3 Mathematics Assessment
Tuesday 18th September 2018

Time allowed: 40 minutes
Total Marks: 54

NAME: .....
TEACHER: **ADA** **JWL/SRO** **GON** **IMO**

Instructions:
- Approved calculators may be used.
- All necessary working is to be shown.
- Marks may be deducted for careless or poorly arranged work.

Indices and Surds — *26 marks*

1. Simplify **fully**: (give your answer in index form with **positive indices** where appropriate)

Questions	Answer	Marks
(a) $2b^2 \times 3a$	$6ab^2$	1
(b) $\frac{x^5}{x^2y^5}$	$\frac{x^3}{y^5}$	1
(c) $\left(m^2\right)^3 \times \left(n^{-3}\right)^2$	$m^6 \times n^{-6} = \frac{m^6}{n^6}$	2
(d) $2x^{-3}y^4$	$\frac{2y^4}{x^3}$	1
(e) $(9x)^{\frac{1}{2}}$	$3x^{\frac{1}{2}}$	1
(f) $2x^0 + (3x)^0$	$2 + 1 = 3$	1
(g) $\frac{\sqrt{x}}{\sqrt[3]{x}}$	$\frac{x^{1/2}}{x^{1/3}} = x^{1/2 - 1/3} = x^{\frac{1}{6}}$	2
(h) $(4x^2y^3)^2 \div -2xy$	$\frac{16x^4y^6}{-2xy} = -8x^3y^5$	1

2. Solve for x:

(a) $2^x = \frac{1}{8}$ $2^x = 2^{-3}$ $x = -3$ 1

(b) $64^x = 4$ $4^{3x} = 4$ $3x = 1$ $x = \frac{1}{3}$ 1

(c) $\sqrt{5^x} = \frac{1}{125}$ $\left(5^{\frac{1}{2}}\right)^x = \frac{1}{5^3}$ $5^{\frac{x}{2}} = 5^{-3}$ $\frac{x}{2} = -3$ 2

$x = -6$

3. Write these numbers in scientific notation:

(a) 123 000 1.23×10^5 1

(b) 123×10^{-5} 1.23×10^{-3} 1

4. Simplify the following:

(a) $\sqrt{6} \times \sqrt{2}$ $\sqrt{12} = 2\sqrt{3}$ 1

(b) $\frac{\sqrt{80}}{\sqrt{16}}$ $\sqrt{5}$ 1

(c) $\sqrt{50} + \sqrt{27}$ $5\sqrt{2} + 3\sqrt{3}$ 1

5. Simplify $\frac{(5m^4n^{-3})^2}{m^{-1}n^2} \div \frac{5(m^{-1}n)^{-2}}{mn^{-4}}$ 3

$= \frac{25m^8n^{-6}}{m^{-1}n^2} \times \frac{mn^{-4}}{5m^2n^{-2}}$

$= \frac{5m^9n^{-10}}{m}$

$= 5m^8n^{-10}$

$= \frac{5m^8}{n^{10}}$

6. Three billion (3 000 000 000) cells die in your body each minute. Write down in index form how many cells die in 2000 seconds. **2**

$\frac{3\times10^9\times2\times10^3}{60} = \frac{10^{12}}{10} = 10^{11}$

7. Given that $2^x = a$, express 2^{2x-1} in terms of a. **2**

$2^{2x-1} = (2^x)^2 \times 2^{-1}$

$= a^2 \times 2^{-1} = \frac{a^2}{2}$

St Aloysius' College
Year 9 5.3 Term 3 Mathematics Assessment
Tuesday 18th September 2018

NAME: .....
TEACHER: **ADA** **JWL/SRO** **GON** **IMO**

Quadratic expressions and algebraic fractions *28 marks*

1. Expand the following:

(a) $2ab(3a-5)$ $6a^2b - 10ab$ **1**

(b) $(x+2y)^2$ $x^2 + 4xy + 4y^2$ **1**

2. Factorise the following:

(a) $4a+12b$ $4(a+3b)$ **1**

(b) $12a^2b-18ab^2$ $6ab(2a-3b)$ **1**

(c) x^2-25y^2 $(x-5y)(x+5y)$ **1**

(d) x^2-5x+4 $(x-1)(x-4)$ **2**

(e) $10x^2+9x-9$ $(5x-3)(2x+3)$ **2**

3. Simplify the following:

(a) $\frac{12x-3}{6}$ $\frac{3(4x-1)}{6} = \frac{4x-1}{2}$ **1**

(b) $\frac{1}{m-n}+\frac{1}{n-m}$ $= \frac{1}{m-n} - \frac{1}{m-n} = 0$ **1**

(c) $\frac{ax+bx-2a-2b}{a^2+ab} \times \frac{a}{x^2-4} = \frac{x(a+b)-2(a+b)}{a(a+b)} \times \frac{a}{(x-2)(x+2)}$ 3

$= \frac{(a+b)(x-2)}{a(a+b)} \cdot \frac{a}{(x-2)(x+2)}$

$= \frac{1}{x+2}$

(d) $\frac{3}{x-2}+\frac{4}{x+3} = \frac{3(x+3)+4(x-2)}{(x-2)(x+3)}$ 3

$= \frac{3x+9+4x-8}{(x-2)(x+3)}$

$= \frac{7x+1}{(x-2)(x+3)}$

4. Solve for x:

(a) $\frac{x}{2}+\frac{x}{3}=4$ $\frac{3x}{6}+\frac{2x}{6}=4$ $\frac{5x}{6}=4$ 2

$5x=24$ $x=\frac{24}{5}=4\frac{4}{5}=4.8$

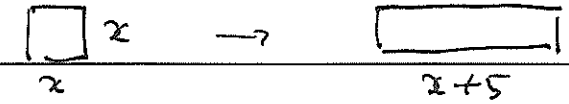
(b) $\frac{x-1}{x+2}=\frac{x-3}{x+4}$ $(x+4)(x-1)=(x+2)(x-3)$ 3

$x^2-x+4x-4=x^2-3x+2x-6$

$3x-4=-x-6$

$4x=-2$ $x=-\frac{1}{2}$

5. If one side of a square is increased by 5 *cm* and another is decreased by 5 *cm*, a rectangle is formed whose area is $56\,cm^2$. Find the side of the original square. 3

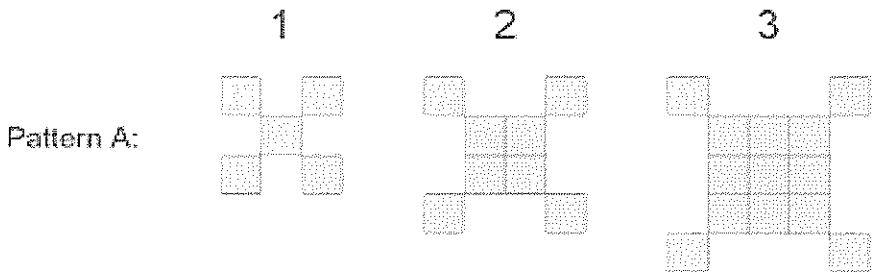


$(x+5)(x-5) = 56$

$x^2 - 25 = 56$

$x^2 = 81 \Rightarrow x = 9\ cm \quad (x > 0)$

6. Write a rule for the number of '*s*' squares in this pattern of '*t*' tiles 1



$s = t^2 + 4$

7. Find the simplest expression for this sum. 2

$$(a-5)^2 + (a-4)^2 + \ldots + a^2 + \ldots + (a+4)^2 + (a+5)^2$$

$a^2 - 10a + 25 + a^2 - 8a + 16 + \ldots + a^2 + \ldots + a^2 + 8a + 16 + a^2 + 10a + 25$

$= 11a^2 + 2 \times (1^2 + 2^2 + 3^2 + 4^2 + 5^2)$

$= 11a^2 + 110$

End of Assessment