

NEWINGTON COLLEGE



Year 11 Assessment 1:

2012

Term 1

MATHEMATICS

Time allowed - 1 hour

DIRECTIONS TO CANDIDATES:

- All questions may be attempted.
- In every question, show all necessary working.
- Marks may not be awarded for careless or badly arranged work.
- Approved silent calculators may be used.
- The answers to the four questions in this paper are to be returned in separate bundles clearly marked Question 1, Question 2, etc .
- Each bundle must show the candidate's computer number.
- Start each question on a new page.
- The questions are not necessarily arranged in order of difficulty. Candidates are advised to read the whole paper carefully at the start of the examination.
- Unless otherwise stated candidates should leave their answers in simplest exact form.

Outcomes to be Assessed :

- P3 Performs routine arithmetic and algebraic manipulation involving surds, simple rational expressions and trigonometric identities.

QUESTION ONE (9 Marks)

Marks

- (a) Evaluate $\frac{6.84 + 3.9^3}{\sqrt{15 - 7 + 4}}$, correct to 4 significant figures. 2
- (b)
- (i) Write 645.83×10^{-3} as a decimal number 1
- (ii) Write 3270 000 in scientific notation 1
- (iii) Evaluate $\frac{5.4 \times 10^{-7}}{6 \times 10^{-4}}$. Answer in scientific notation 1
- (c) Evaluate $\frac{(x^2)^4}{xy^3}$ when $x = 6$ and $y = \frac{1}{2}$ 2
- (d) Use algebraic techniques to express $0.\dot{2}8$ as a fraction in simplest terms. 2

QUESTION TWO (22 Marks) Start a new page

(a) Expand and simplify the following:

(i) $6 - 2(a + 4) - 3a$ 2

(ii) $\left(s + \frac{1}{s}\right)^2$ 2

(iii) $(10 + x)(4 - 2x)$ 1

(iv) $(3x + 7)(3x - 7)$ 1

(v) $(2x + 3)^3$ 2

(vi) $(x + y)(x^2 + 6xy + 10)$ 2

(b) Factorise:

(i) $6ab - 4a^2b^2$ 1

(ii) $a(a + 1) - (a + 1)^2$ 1

(iii) $5y - 15 + 10xy - 30x$ 2

(iv) $x^2 - 5x - 24$ 1

(v) $4a^2 - 9$ 1

(vi) $3t^3 - 27t$ 2

(vii) $8x^2 + 18x - 5$ 1

(viii) $a^3 + 64$ 1

(ix) $x^6 - 1$ 2

QUESTION THREE (14 Marks) Start a new page

(a) Simplify:

(i) $\frac{x^{\frac{1}{2}} \times x^{\frac{1}{2}}}{x}$ 2

(ii) $\left(\frac{2f}{f^6g}\right)^3$ 2

(iii) $3abc^2 \times 4b \times -2c$ 2

(iv) $\frac{10(pq)^2 \times 20p^{20}q^{14}}{(2p^6q^3)^2 \times 5p^5q}$ 3

(v) $\left(\frac{2x-y}{y+x}\right)^0$ 1

(b) Write without fractional or negative indices.

(i) b^{-2} 1

(ii) $(8y + 2z)^{\frac{1}{2}}$ 1

(c) Change to index form.

(iii) $x\sqrt{x}$ 1

(iv) $\frac{3}{4(x-y)^7}$ 1

QUESTION FOUR (10 Marks) **Start a new page**

(a) Simplify the following.

(i) $\frac{5x+10y}{8x^2+16xy}$ 2

(ii) $\frac{5a}{3} - \frac{a^2+2}{a}$ 2

(iii) $\frac{9a^2-3a-2}{2a^2+9a-5} \div \frac{3a^2-17+10}{2a^2-11a+5}$ 3

(iv) $\frac{x^2}{4x^2+7x+3} + \frac{3x}{4x+3}$ 3

END OF PAPER

Question 1

$$a) \frac{6.84 + 3.9^3}{\sqrt{15-7+4}} = 19.09845823$$

$$= 19.10 \text{ to 4 sig. fig.}$$

$$b) 645.83 \times 10^{-3} = 0.64583$$

$$c) 3270000 = 3.27 \times 10^6$$

$$iii) \frac{5.4 \times 10^{-7}}{6 \times 10^{-4}} = 0.9 \times 10^{-3}$$

$$= 9 \times 10^{-4}$$

$$c) \frac{(x^2)^4}{x^2 y^3} = \frac{x^8}{x^2 y^3}$$

$$= \frac{x^6}{y^3}$$

$$= \frac{6^6}{(2)^3}$$

$$= 2239488$$

d) Let $x = 0.2\dot{8}$

$$x = 0.282828... \text{--- (1)}$$

$$100x = 28.2828... \text{--- (2)}$$

$$\textcircled{3} - \textcircled{1} \quad 99x = 28$$

$$x = \frac{28}{99}$$

$$\therefore 0.2\dot{8} = \frac{28}{99}$$

Question 2

$$a) i) 6 - 2(a+4) - 3a = 6 - 2a - 8 - 3a$$

$$= 2 - 5a$$

$$ii) (a + \frac{1}{a})^2 = (a + \frac{1}{a})(a + \frac{1}{a})$$

$$= a^2 + 2 + \frac{1}{a^2}$$

$$iii) (10+x)(4-2x) = 40 - 20x + 4x - 2x^2$$

$$= 40 - 16x - 2x^2$$

$$iv) (3x+7)(3x-7) = (3x)^2 - 7^2$$

$$= 9x^2 - 49$$

$$v) (2x+3)^3$$

$$= (2x+3)(2x+3)(2x+3)$$

$$= (2x+3)(4x^2 + 12x + 9)$$

$$= 2x(4x^2 + 12x + 9) + 3(4x^2 + 12x + 9)$$

$$= 8x^3 + 24x^2 + 18x + 12x^2 + 36x + 27$$

$$= 8x^3 + 36x^2 + 54x + 27$$

$$vi) (x+y)(x^2 + 6xy + 10y)$$

$$= x(x^2 + 6xy + 10y) + y(x^2 + 6xy + 10y)$$

$$= x^3 + 6x^2y + 10xy + x^2y + 6xy^2 + 10y^2$$

$$= x^3 + 7x^2y + 6xy^2 + 10xy + 10y^2$$

$$b) i) 6ab - 4a^2b^2 = 2ab(3 - 2ab)$$

$$ii) a(a+1) - (a+1)^2 = (a+1)[a - (a+1)]$$

$$= (a+1)(a - a - 1)$$

$$= -1(a+1)$$

$$iii) 5y - 15 + 10xy - 30x$$

$$= 5[y - 3 + 2xy - 6x]$$

$$= 5[(y-3) + 2x(y-3)]$$

$$= 5(y-3)(2x+1)$$

$$iv) x^2 - 5x - 24 = (x-8)(x+3)$$

$$P = -24$$

$$S = -5$$

$$F = -8, 3$$

$$v) 4a^2 - 9 = (2a)^2 - 3^2$$

$$= (2a-3)(2a+3)$$

$$vi) 3t^2 - 27t = 3t(t^2 - 9)$$

$$= 3t(t-3)(t+3)$$

$$vii) P = 8x - 5$$

$$= -40x^2$$

$$S = 18x$$

$$F = 20x, -2x$$

$$8x^2 + 18x - 5 = 8x^2 + 20x - 2x - 5$$

$$= 4x(2x+5) - 1(2x+5)$$

$$= (2x+5)(4x-1)$$

$$viii) a^3 + 16 = a^3 + 4^3$$

$$= (a+4)(a^2 - 4a + 16)$$

$$ix) x^6 - 1$$

$$= (x^3)^2 - 1^2$$

$$= (x^3 - 1)(x^3 + 1)$$

$$= (x-1)(x^2 + x + 1)(x+1)(x^2 - x + 1)$$

Question 3

$$a) i) \frac{x^{\frac{1}{2}} \times x^{\frac{1}{2}}}{x} = \frac{x^{\frac{1}{2} + \frac{1}{2}}}{x}$$

$$= \frac{x^1}{x}$$

$$= 1$$

$$ii) \left(\frac{2f}{f^6g}\right)^3 = \left(\frac{2}{f^5g}\right)^3$$

$$= \frac{2^3}{f^{15}g^3}$$

$$= \frac{8}{f^{15}g^3}$$

$$iii) 3abc^2 \times 4b \times -2c = 12ab^2c^2 \times -2c$$

$$= -24ab^2c^3$$

$$iv) \frac{10(pq)^8 \times 20p^{20}q^{14}}{(2p^6q^3)^2 \times 5p^5q}$$

$$= \frac{10p^2q^2 \times 20p^{20}q^{14}}{4p^{12}q^6 \times 5p^5q}$$

$$= \frac{200p^{22}q^{16}}{20p^{17}q^7}$$

$$= 10p^5q^9$$

$$v) \left(\frac{2x-y}{y+x}\right)^0 = 1$$

$$b) \text{ i) } b^{-2} = \frac{1}{b^2}$$

$$\text{ii) } (8y+2z)^{\frac{1}{2}} = \sqrt{(8y+2z)}$$

$$\begin{aligned} \text{c) i) } x\sqrt{x} &= x \times \sqrt{x} \\ &= x^1 \times x^{\frac{1}{2}} \\ &= x^{1+\frac{1}{2}} \\ &= x^{\frac{3}{2}} \end{aligned}$$

$$\begin{aligned} \text{ii) } \frac{3}{4(x-y)^7} &= \frac{3}{4} \frac{1}{(x-y)^7} \\ &= \frac{3}{4} (x-y)^{-7} \end{aligned}$$

Question 4

$$\begin{aligned} \text{i) } \frac{5x+10y}{8x^2+16xy} &= \frac{5(x+2y)}{8x(x+2y)} \\ &= \frac{5}{8x} \end{aligned}$$

$$\begin{aligned} \text{ii) } \frac{5a}{3} - \frac{(a^2+2)}{a} &= \frac{5a^2-3(a^2+2)}{3a} \\ &= \frac{5a^2-3a^2-6}{3a} \\ &= \frac{2a^2-6}{3a} \\ &= \frac{2(a^2-3)}{3a} \end{aligned}$$

$$\begin{aligned} \text{iii) } \frac{9a^2-3a-2}{2a^2+9a-5} &\div \frac{3a^2-17a+10}{2a^2-11a+5} \\ &= \frac{(3a-2)(3a+1)}{(2a-1)(a+5)} \div \frac{(3a-2)(a-5)}{(2a-1)(a-5)} \\ &= \frac{(3a-2)(3a+1)}{(2a-1)(a+5)} \times \frac{(2a-1)(a-5)}{(3a-2)(a-5)} \\ &= \frac{(3a+1)}{(a+5)} \end{aligned}$$

$$\begin{aligned} \text{iv) } \frac{x^2}{4x^2+7x+3} + \frac{3x}{4x+3} \\ &= \frac{x^2}{(4x+3)(x+1)} + \frac{3x}{(4x+3)} \\ &= \frac{x^2+3x(x+1)}{(4x+3)(x+1)} \\ &= \frac{x^2+3x^2+3x}{(4x+3)(x+1)} \\ &= \frac{4x^2+3x}{(4x+3)(x+1)} \\ &= \frac{x(4x+3)}{(4x+3)(x+1)} \\ &= \frac{x}{(x+1)} \end{aligned}$$