



Gosford High School

2009

Preliminary

Higher School Certificate

Advanced Mathematics

Assessment Task 1

Time Allowed – 60 minutes

Remember to start each new question on a new page

Students must answer questions using a blue/black pen and/or a sharpened B or HB pencil.

Approved scientific calculators may be used

Students need to be aware that

- * 'bald' answers may not gain full marks.
- * untidy and/or poorly organised solutions may not gain full marks.

Section 1: Algebra (38 marks)

1) Simplify $2x - 2(4 - 6x)$ (1)

2) Expand $(2x + 3)^2$ (1)

3) Simplify $(3t - 1)^0$ (1)

4) Simplify $\frac{6a^5b^2}{18a^2b}$ (1)

5) Simplify leaving your answer with negative indices $\frac{x^6 \div x^2}{x^{10}}$ (1)

6) Simplify $(8x^{-6})^{\frac{2}{3}}$, expressing your answer without fractional or negative indices. (1)

8) Write without negative indices

a) $2x^{-3}$ (1)

b) $(2x)^{-3}$ (1)

8) Simplify leaving your answer with negative indices $\frac{(m^{-3})^2}{m^{-2}}$ (2)

9) Rewrite using fractional and negative indices $\frac{2}{\sqrt[5]{(x+7)^3}}$ (1)

10) Evaluate $\frac{(a^2b)^3}{a^4b^2}$
if $a = \frac{1}{2}$ and $b = \frac{8}{3}$ (2)

11) Evaluate to 3 decimal places $\frac{\sqrt{a^2 - b^2}}{\sqrt{a+b}}$
if $a = 16$ and $b = 9$ (2)

12) Factorise $9x^2 + 15x - 6$ (1)

13) Factorise $x^3 - 8a^3$. (1)

14) Factorise $6x^2 - 7x - 20$ (1)

15) Solve $\frac{4x-5}{3} = 2x$ (1)

16) Solve $\frac{x+5}{2} + \frac{7}{4} = \frac{x}{3}$ (2)

17) Factorise $9x^2 - 16y^2 + 12ax - 16ay$. (2)

18) Expand $(x^3 - 3)(x^2 - 2x + 1)$ (2)

19) Simplify $\frac{x^2 - 6x + 9}{x^2 - 25} \div \frac{x^2 - 5x + 6}{x^2 + 3x - 10}$ (3)

20) Simplify $\frac{(y^x)^x}{y^x}$ (1)

21) Simplify $(\sqrt{c})^y \times (\sqrt{c})^{y+6}$ (1)

22) Simplify $3^{2x+3} \div 3^{1-2x}$ (1)

23) Simplify $(\sqrt{2})^{2x+4}$ (1)

24) Factorise $(x+3)^4 - 81$ (3)

25) Expand and simplify
 $\left(\sqrt{4^{\frac{3}{2}}} + \sqrt{2}\right)\left(\sqrt{4^{\frac{3}{2}}} - \sqrt{2}\right)$ (2)

26) Simplify $\frac{2}{3x^2 - 27} - \frac{1}{x^2 - 3x}$ (3)

27) Solve for x : $\frac{5x-5}{3} - \frac{2x+1}{4} = 10$ (3)

28) The orbital speed of a satellite around a planet is given by $v = \sqrt{\frac{gR^2}{r}}$

Make r the subject of the formula. (2)

29) Solve for x : $\frac{1}{1 + \frac{1}{1 + \frac{1}{x}}} = 2$ (3)

Section 2: Arithmetic (22marks)

- 1) Evaluate $\sqrt{(16^2 - 5^2)}$,
correct to 4 significant figures. (1)
- 2) Write 0.05% as a decimal. (1)
- 3) Write 4.009 as a
i) fraction. (1)
ii) percentage. (1)
- 4) On Thursday an asteroid passed within
 6×10^7 metres of the Earth. It was
travelling at 31 752 000 metres per second.
Write this speed in scientific notation correct
to 3 significant figures. (1)
- 5) Evaluate $|-42|$ (1)
- 6) Evaluate $|4 - |-3 - 2||$ (1)
- 7) Evaluate $|-8| \times |-3| \times \left|-\frac{1}{2}\right|$ (1)
- 8) Arrange from smallest to largest
 $0.5\dot{2}$, 0.52 , $\frac{2}{3}$, 60% , $\frac{6}{11}$, $0.5\dot{2}$ (1)
- 9) Calculate to 2 decimal places
 $\frac{1.25 + 6 \times 2.6}{12.12 - 5.89}$ (1)
- 10) Evaluate the following giving your answer in
scientific notation accurate to 3 significant
figures
 $\frac{6.1 \times 10^4 \times 3.2 \times 10^7}{3.2 \times 10^{12}}$. (2)
- 11) Jacob spends $\frac{3}{11}$ of his income on petrol every
month. If he spends \$432 on petrol per month
what is his income? (1)
- 12) Evaluate $|a - ab - bc|$
if $a = 6, b = -2$ and $c = 4$. (2)
- 13) Express the following recurring decimals as
simplified fractions
i) $0.\dot{7}$ (1)
ii) $8.0\dot{3}\dot{2}$ (2)
- 14) An average human hair is 1.7×10^{-5} metres
thick. If these hairs are placed side by side,
how many hairs would be required to cover a
distance of 2.54 centimetres. (2)
- 15) A light bulb company estimates that 3.5% of
its light bulbs are defective. If the
manufacturer makes 1225 faulty light bulbs,
how many light globes did the company
make? (2)

Year 11 2009 Mathematics

Section 1: Algebra

- 1) $2x - 8 + 12x = 14x - 8$
- 2) $4x^2 + 12x + 9$
- 3) $a^3 b^3$
- 4) $\frac{1}{3} a^3 b^3$
- 5) x^{-6}
- 6) $\left(\frac{8}{x^6}\right)^{-\frac{2}{3}} = \left(\frac{2}{x^2}\right)^{-2}$
 $= \frac{x^4}{4}$
- 7) a) $\frac{2}{x^3}$
 b) $\frac{1}{8x^3}$
- 8) m^{-4}
- 9) $2(x+7)^{\frac{3}{5}}$
- 10) $\frac{a^6 b^3}{a^4 b^2} = a^2 b$
 $= \frac{1}{4} \times \frac{8}{3}$
 $= \frac{2}{3}$
- 11) $\frac{\sqrt{a+b} \sqrt{a-b}}{\sqrt{a+b}} = \sqrt{a-b}$
 $= \sqrt{7}$
- 12) $(9x-3)(x+2)$
- 13) $(x-2a)(x^2+2ax+4a^2)$
- 14) $(2x-5)(3x+4)$
- 15) $4x-5=6x$
 $x = -\frac{5}{2}$
- 16) $\frac{2x+5+7}{4} = \frac{x}{3}$
 $6x+36=4x$
 $x = -18$
- 17) $(3x+4y)(3x-4y)+4a(3x-4y)$
 $= (3x-4y)(3x+4y+4a)$
- 18) $x^5 - 2x^4 + x^3 - 3x^2 + 6x - 3$
- 19) $\frac{(x-3)^2}{(x+5)(x-5)} \times \frac{(x+5)(x-2)}{(x-2)(x-3)}$
 $= \frac{x-3}{x-5}$

$$20) \int_{x-3}^{x^2-3} y^{\frac{1}{2} \times (2y+6)} = \int_{x-3}^{x^2-3} y^2$$

$$21) \int_{x-3}^{x^2-3} y^2 = \int_{x-3}^{x^2-3} y^2$$

$$22) 3^{2x+3-(1-2x)} = 3^{2+4x}$$

$$23) 2^{x+2}$$

$$24) ((x+3)^2 - 9)((x+3)^2 + 9)$$

$$= ((x+3)-3)((x+3)+3)(x^2+6x+18)$$

$$= x(x+6)(x^2+6x+18)$$

$$25) 4^{\frac{3}{2}} - 2 = 2^3 - 2$$

$$= 6$$

$$26) \frac{2}{3(x-3)(x-3)} - \frac{1}{x(x-3)} = \frac{2-1(x+3)}{x(x-3)(x+3)}$$

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

$$27) 20x - 20 - 6x - 3 = 120$$

$$14x = 143$$

$$x = \frac{143}{14}$$

$$28) \sqrt{2} = \frac{9R^2}{\sqrt{2}}$$

$$r = \frac{9R^2}{\sqrt{2}}$$

$$29) 1 = 2 + \frac{2}{1+\frac{1}{x}}$$

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

$$x + 1 = 2x + 2 + 2x$$

$$x + 1 = 4x + 2$$

$$x = -\frac{1}{3}$$

Section 2: Arithmetic

1) 15.20

2) 0.0005

3) i) $\frac{4009}{1000}$

ii) 400.9%

4) 3.18×10^7

5) 42

6) 1

7) 12

8) 0.52, 0.52, $\frac{6}{11}$, 0.52, 60%, $\frac{3}{2}$

9) 2.70

10) 6.10×10^{-1}

11) $\frac{1}{11} = 143$

income = \$1573

12) $|6 - 6 \times -2 - -2 \times 4| = 26$

13) i) let $x = 0.77...$

$$10x = 7.77$$

$$9x = 7$$

$$x = \frac{7}{9}$$

ii) let $x = 8.03232...$

$$100x = 803.23232...$$

$$99x = 795.2$$

$$x = \frac{7952}{990}$$

$$= \frac{3976}{495}$$

14) $0.0254 \div (1.7 \times 10^{-5})$

$$= 1494 \text{ round up to } 1495$$

15) 3.5% of #made = 1225

$$\#made = 35000$$