Gosford High School

Year 11

2008
Preliminary
Higher School Certificate

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.

Question 1 (20 Marks)

(a) Write 32 as a percentage of 56 (correct to the nearest percent) (1)

(b) The population of the world is approximately 6700 million (or $6 \cdot 7$ billion) people.
Write this population using scientific notation. (1)

(c) Find $\sqrt[5]{6 \cdot 3 \times 10^6}$ correct to the nearest whole number (2)

(d) Evaluate $\sqrt{\dfrac{3^2+4^2}{12^2+5^2}}$ (1)

(e) $-12,\ \sqrt{-6}\ ,\ \dfrac{3}{7},\ 2.\dot{5},\ 0,\ \sqrt{8},\ 12.5,\ 33\dfrac{1}{3}\%,\ \pi,\ |14|\ ,7^{-3}$

From the above set of numerals list the set of

(i) Rational Numbers (2)

(ii) Irrational Numbers (1)

(f) Write $0 \cdot 5\dot{1}\dot{8}$ as a simplified proper fraction (3)

(g) Write $\dfrac{-5+\sqrt{17}}{8}$ correct to 2 decimal places (1)

(h) A store's sale price advertises 15% off the marked price of all suits.
If Angus pays \$153 for his suit what was the marked price of the suit. (2)

(i) Write (i) $0 \cdot 00316$ correct to 1 significant figure (1)

(ii) 108964091 correct to 4 significant figures (1)

(j) Simplify $\sqrt{(-4)^2} - |-3| \times |9-4|$ (1)

(k) Gold, a very soft metal, can be hammered into flat sheets of thickness $1 \cdot 02 \times 10^{-4}$ mm.
How many sheets are needed to make a pile 1cm thick? (answer to the nearest sheet) (2)

(l) Evaluate $\dfrac{3 \cdot 6 \times 10^{16}}{2 \cdot 4 \times 10^{11} \times 1 \cdot 2 \times 10^{9}}$, writing your answer as a decimal (1)

Question 2 (15 Marks)

(a) $\sqrt{60}$ lies between which two consecutive integers? (1)

(b) Find the value of m if $8\sqrt{2} = \sqrt{m}$ (1)

(c) Simplify $\dfrac{5\sqrt{294}}{35\sqrt{3}}$ (2)

(d) Simplify $4\sqrt{32} \times 5\sqrt{75}$ (2)

(e) Simplify $\sqrt{200} - 6\sqrt{18}$ (2)

(f) Find x and y if $(2\sqrt{3} - 3\sqrt{2})^2 = x + y\sqrt{6}$ (2)

(g) Express $\dfrac{\sqrt{3}+2}{3\sqrt{3}-2}$ with a rational denominator (2)

(h) Triangle ABC is right angled at C, $a = \sqrt{5} - 2$, $b = \sqrt{5} + 2$.
Find c in simplest surd form. (3)

Question 3 (15 Marks)

(a) Find all possible values of k if $16x^2 + kx + 25$ is a perfect square (2)

(b) Factorise each of the following

(i) $18y^2 - 50$ (2)

(ii) $3x^2 - 3xy + 5y - 5x$ (1)

(iii) $x^3 - 27$ (1)

(iv) $9k^2 - 42k + 49$ (1)

(v) $10x^2 + x - 21$ (1)

(vi) $y^4 - y^2 - 12$ (2)

(c) Expand and simplify

(i) $(2x+3y)(2x-3y)$ (1)

(ii) $(e^x - 2)^2$ (1)

(iii) $(3x-1)^2 - 2(3x+1)(3x-1)$ (3)

Question 4 (20 Marks)

(a) Subtract $4x-5y+7$ from $3x-2y$ (1)

(b) Find y when $x=-3$ given $y=1-5x-2x^3$ (1)

(c) Given $d=\left|\dfrac{ax_1+by_1+c}{\sqrt{a^2+b^2}}\right|$ find the exact value of d (in simplest form) given

$a=3$, $b=-2$, $c=-4$, $x_1=6$, $y_1=20$ (3)

(d) Simplify $(16x^{-2})^{-\frac{3}{2}}$ express your answer without fractional or negative indices (2)

(e) Solve $27^x=\dfrac{1}{9}$ (1)

(f) Simplify $\dfrac{4^{-1}x^{\frac{5}{2}}}{2^{-3}x^{-\frac{1}{2}}}$ (1)

(g) Simplify $\dfrac{x^{-1}+y^{-1}}{x+y}$ (2)

(h) Simplify

(i) $\dfrac{2a-3}{6}-\dfrac{3a+1}{9}$ (2)

(ii) $\dfrac{a^2m-4m^3}{6a^2m}\div\dfrac{a^2+am-6m^2}{3a^2+9am}$ (3)

(iii) $\dfrac{2}{x^2-1}-\dfrac{1}{x^2-x}+\dfrac{x-1}{x^2+x}$ (4)

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1) a) 57%
b) 6.7×10^9
c) 23
d) $5/13$
e) i) $-12, 3/7, 2.\dot{5}, 0, 12.5, 33\frac{1}{3}\%, |14|, 7^{-3}$
ii) $\sqrt{-6}, \sqrt{8}, \pi$
f) let $x = 0.51818....$
$100x = 51.81818....$
$99x = 51.3$
$x = \frac{513}{990}$
$= 57/110$
g) -0.11
h) 85% of marked price = 153
marked price = \$180
i) i) 0.003
ii) 109000 000
j) -11
k) $10 \div (1.02 \times 10^{-4}) = 98039$
l) 1.25×10^{-4}

2) a) 7 and 8
b) $n = 128$
c) $\frac{\sqrt{98}}{7} = \frac{7\sqrt{2}}{7}$
$= \sqrt{2}$
d) $16\sqrt{2} \times 25\sqrt{3} = 400\sqrt{6}$
e) $10\sqrt{2} - 18\sqrt{2} = -8\sqrt{2}$
f) $12 - 12\sqrt{6} + 18 = 30 - 12\sqrt{6}$
$x = 30$ and $y = -12$
g) $\frac{\sqrt{3}+2}{3\sqrt{3}-2} \times \frac{3\sqrt{3}+2}{3\sqrt{3}+2} = \frac{9+8\sqrt{3}+4}{27-4}$
$= \frac{13+8\sqrt{3}}{23}$
h) $c^2 = (\sqrt{5}-2)^2 + (\sqrt{5}+2)^2$
$= 9 - 4\sqrt{5} + 9 + 4\sqrt{5}$
$= 18$
$c = 3\sqrt{2}$

3) a) $(4x \pm 5)^2$
$k = \pm 20$
b) i) $2(9y^2 - 25)$
$= 2(3y-5)(3y+5)$
ii) $3x(x-y) - 5(x-y)$
$= (x-y)(3x-5)$
iii) $(x-3)(x^2+3x+9)$
iv) $(3k-7)^2$
v) $(5x-7)(2x+3)$
vi) $(y^2-4)(y^2+3)$
$= (y+2)(y-2)(y^2+3)$
c) i) $4x^2 - 9$
ii) $e^{2x} - 4e^x + 4$
iii) $9x^2 - 6x + 1 - 2(9x^2 - 1)$
$= 9x^2 - 6x + 1 - 18x^2 + 2$
$= 3 - 6x - 9x^2$

4) a) $3x - 2y - (4x - 5y + 7)$
$= 3x - 2y - 4x + 5y - 7$
$= 3y - x - 7$
b) $y = 1 + 15 - 18$
$= -2$
c) $d = \left| \frac{18 + -40 - 4}{\sqrt{3^2 + (-2)^2}} \right|$
$= \frac{26}{\sqrt{13}}$
$= 2\sqrt{13}$
d) $(16x^{-2})^{-3/2} = \left(\sqrt{\frac{16}{x^2}}\right)^3$
$= \frac{64}{x^3}$
e) $3^{3x} = 3^{-2}$
$x = -2/3$
f) $\frac{x^{3/2}}{4} \div \frac{1}{8x^{1/2}} = 2x^3$
g) $\frac{1}{x} + \frac{1}{y} \div (x+y)$
$= \frac{x+y}{xy} \times \frac{1}{x+y}$
$= 1/xy$

h) i) $\frac{2a-3}{6} - \frac{3a+1}{9}$

$= \frac{6a-9-2(3a+1)}{18}$

$= \frac{6a-9-6a-2}{18}$

$= \frac{-11}{18}$

ii) $\frac{a(a^2-4m^2)}{6a^2m} \times \frac{3a(a+m)}{(a-2m)(a+3m)}$

$= \frac{(a+2m)(a-2m)(a+m)}{2a(a-2m)(a+3m)}$

$= \frac{(a+2m)(a+m)}{2a(a+3m)}$

iii) $\frac{2}{(x+1)(x-1)} - \frac{1}{x(x-1)} + \frac{x-1}{x(x+1)}$

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

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

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

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