Sydney Girls High School

2011

MATHEMATICS

Half Yearly

Year 11

60 minutes + 3 minutes reading time

Topics: Basic Arithmetic and Algebra, Geometry.

Instructions:

- Attempt all 4 questions
- All necessary working should be shown in every question
- Marks may be deducted for careless or badly arranged work
- Write on one side of the paper only
- Start each question on a new page

Name:..... **Teacher:**.....

Marks

Question 1 (12 marks)

(a) Evaluate $\sqrt{\pi}$ correct to 2 significant figures. 2

(b) Expand and collect the like terms of $5-3(2x-4)$ 2

(c) Factorise $9x^2-16x$ 1

(d) Solve $5-2x=-7$ 2

(e) What is the angle sum of a dodecagon (12 sides)? 1

(f) Evaluate $|5|-|-3|$ 1

(g) Express 0.0051 in scientific notation. 1

(h) If $a=28.1$ and $b=4.3$ evaluate $\left(\frac{2a}{b^2-5}\right)^3$ correct to 1 decimal place 2

Question 2 (12 marks) **Marks**

(a) Simplify: (i) $5x^3 \times 6x$ 1

(ii) $\dfrac{(4a^2b^4)^3}{16a^4}$ 2

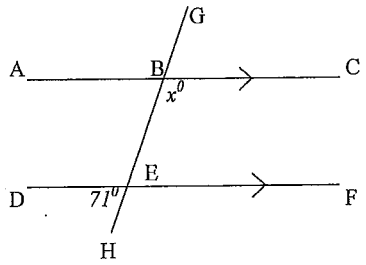
(b) Expand and simplify: (i) $(x-3)(x+4)$ 1

(ii) $(2a+3b)^2$ 1

(c) Factorise: (i) $4d^2-9$ 1

(ii) $5y^2+30y+40$ 2

(d) 2



Copy the above diagram.

Find the value of the pronumeral giving full reasons for your answer.

Express $\left(5+3\sqrt{2}\right)^2$ in the form $a+b\sqrt{2}$ 2

Question 3 (12 marks) **Marks**

(a) Solve: (i) $\dfrac{x-4}{3}=5$ 1

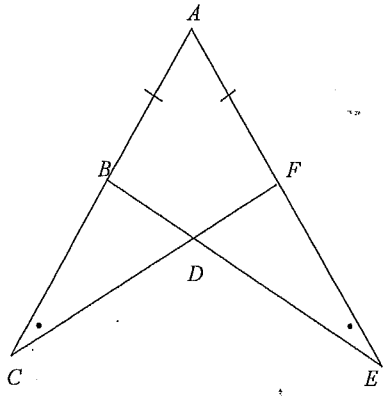
(ii) $|2x-1|=4$ 2

(iii) $2x^2-3x-3=0$ 1

(b) Express $0.2\dot{7}$ as a simple fraction. 2

(c) Factorise $x^2 - y^2 + 5x + 5y$ 2

(d) 4



Copy the above diagram.

Given that $AB = AF$ and $\angle C = \angle E$, show that $BC = EF$

Question 4 (12 marks) **Marks**

(a) After a 6% increase I have \$1431 1
What was the original amount?

(b) Rationalise the denominator of $\frac{5}{2-\sqrt{3}}$ 2

(c) Simplify $\frac{a^3-b^3}{a^3+a^2b+ab^2}\times\frac{a^2+ab}{a^2-b^2}$ 2

(d) Solve simultaneously 2

$y=x^2$
$y=3x+4$

(e) Find the exact value(s) of x if $\frac{1}{x-1}+\frac{1}{x+2}=3$ 3

(f) Solve $|x|+2x=2$ 2

End of Exam

Half yearly 11

Q1

a) $\sqrt{\pi} = 1.7724...$

$\doteq 1.8$

b) $5 - 3(2x - 4)$

$= 5 - 6x + 12$

$= 17 - 6x$

c) $9x^2 - 16x$

$= x(9x - 16)$

d) $5 - 2x = -7$

$-2x = -12$

$x = 6$

e) Angle Sum $= (12-2) \times 180^\circ$

$= 1800^\circ$

f) $|5| - |-3|$

$= 5 - 3$

$= 2$

g) $0.0051 = 5.1 \times 10^{-3}$

h) $\left(\frac{2 \times 28.1}{4 \cdot 3^2 - 5}\right)^3 \doteq 72.3$

Question 2 - 2 unit - (12 marks)

a) i) $30x^4$ (1)

ii) $\frac{(4a^2b^4)^3}{16a^4} = \frac{64a^6b^{12}}{16a^4}$

$= 4a^2b^{12}$ (2)

b) i) $(x-3)(x+4) = x^2 - 3x + 4x - 12$

$= x^2 + x - 12$ (1)

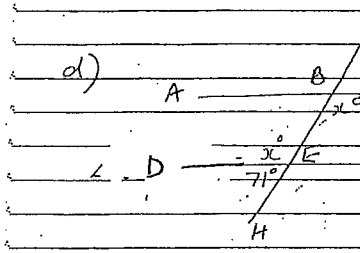
ii) $(2a+3b)^2 = 4a^2 + 12ab + 9b^2$ (1)

c) i) $4d^2 - 9 = (2d-3)(2d+3)$ (1)

ii) $5y^2 + 30y + 40 = 5(y^2 + 6y + 8)$

$= 5(y+4)(y+2)$ (2)

d)



$\angle CBH = \angle DEB = x$

(alternate $\angle$'s on parallel lines)

$x + 71^\circ = 180^\circ$

$x = 109^\circ$ (straight $\angle$) (2)

e) $(5 + 3\sqrt{2})^2 = 25 + 30\sqrt{2} + 18$

$= 43 + 30\sqrt{2}$

$\therefore a = 43$ and

$b = 30$ (2)

Q3 2U 2011 HY

a) i) $x - 4 = 15$

$x = 19$ ✓

ii) $2x - 1 = 4$

or

$2x - 1 = -4$

$2x = 5 \rightarrow x = \frac{5}{2}$ ✓

$2x = -3 \rightarrow x = -\frac{3}{2}$ ✓

iii) $x = \frac{3 \pm \sqrt{9+24}}{4}$

$= \frac{3 \pm \sqrt{33}}{4}$ ✓

b) $x = 0.2777\ldots$

$10x = 2.777\ldots$

$100x = 27.7777\ldots$

$90x = 25$

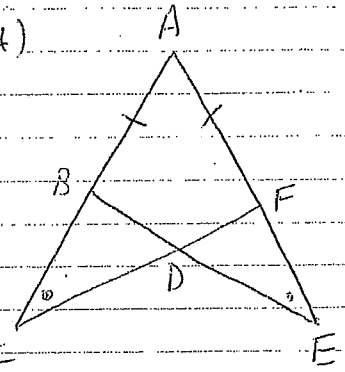
$x = \frac{25}{90}$ ✓✓

$x = \frac{5}{18}$

c) $(x-y)(x+y) + 5(x+y)$

$(x+y)(x-y+5)$ ✓✓

d)



In Δ's ABE & AFC

AB = AF (Given) ✓

$\angle ACF = \angle AEB$ (Given)

$\angle A$ is common ✓

$\Delta ABE \equiv \Delta AFC$ (AAS)

$\therefore AC = AE$ (corresp. sides of $\equiv \Delta$'s)

AB = AF

~~AB~~ + BC = ~~AF~~ + FE ✓

$\therefore BC = FE$ ✓

Question 4

12 marks

(a) $106\% = \$1431 \quad \Rightarrow \quad 100\% = \$1350$ — 1 mark

(b) 2 marks

$$\frac{5}{2-\sqrt{3}} = \frac{5}{2-\sqrt{3}} \times \frac{2+\sqrt{3}}{2+\sqrt{3}}$$

$$= 10 + 5\sqrt{3}$$

(c) 2 marks

$$\frac{a^3-b^3}{a^3+a^2b+ab^2} \times \frac{a^2+ab}{a^2-b^2} = \frac{(a-b)(a^2+ab+b^2)}{a(a^2+ab+b^2)} \times \frac{a(a+b)}{(a+b)(a-b)}$$

$$= 1$$

(d) 2 marks

$$\left.\begin{aligned} y &= x^2 \\ y &= 3x+4 \end{aligned}\right\}$$

$x^2 = 3x + 4 \quad \Rightarrow \quad x^2 - 3x - 4 = 0$

$(x-4)(x+1) = 0$

$\therefore x = 4, y = 16$ or $x = -1, y = 1$

(e) 3 marks

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

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

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

$3x^2 + x - 7 = 0$

$x = \frac{-1 \pm \sqrt{1+12\times 7}}{2\times 3}$

$\therefore x = \frac{-1 \pm \sqrt{85}}{6}$

(f) 2 marks

$|x| + 2x = 2$

$|x| = 2 - 2x$

$x = 2 - 2x$ or $x = -2 + 2x$

$3x = 2$ or $-x = -2$

$\therefore x = \frac{2}{3}$ or $x = 2$

Check solutions

$x = \frac{2}{3} \Rightarrow LHS = \left|\frac{2}{3}\right| + 2\times\frac{2}{3} = 2 = RHS$

$\therefore x = \frac{2}{3}$ is a solution

$x = 2 \Rightarrow LHS = |2| + 2\times 2 = 6 \neq RHS$

$\therefore x = 2$ is a solution

$\therefore x = \frac{2}{3}$ is the only solution

Note :

- Both answers must be found and shown for the 1st mark. Finding $x = \frac{2}{3}$ only is insufficient to be awarded the first mark.
- The solutions found must be checked/tested and a concluding statement shown for the 2nd mark.