SYDNEY GRAMMAR SCHOOL

2014 Half-Yearly Examination

Yr 8

FORM II

MATHEMATICS

General Instructions

- Writing time — 1 hour 30 minutes
- Write using black or blue pen.
- Calculators are not to be used.

Total — 96 Marks

- All questions may be attempted.
- All necessary working should be shown.
- Start each question on a new page.

Collection

- Write your name, class and master on each page of your answers.
- Staple your answers in a single bundle.
- Write your name and master on this question paper and submit it with your answers.

2A: DWH	2B: KWM	2C: DS
2D: GMC	2E: LJF/MLS	2F: RCF
2G: SG	2H: PKH	2I: LYL

Checklist

- Writing paper required.

Examiner

KWM

QUESTION ONE   (12 marks)   Start a new page.

(a) Calculate:

   (i) $6 - 3 - 5$

   (ii) $-54 \div 6 \times (-3)$

   (iii) $(-4)^2 + 3 \times (-5)$

(b) Calculate:

   (i) $1{\cdot}634 \times 100$

   (ii) $0{\cdot}3 \times 0{\cdot}2 \times 0{\cdot}4$

   (iii) $(1{\cdot}3)^2$

   (iv) $3{\cdot}6 \div 0{\cdot}12$

(c) Express the following as percentages:

   (i) $0{\cdot}18$

   (ii) $\dfrac{4}{5}$

(d) Calculate:

   (i) $\dfrac{3}{5} \times \dfrac{20}{21}$

   (ii) $\dfrac{3}{8} \div \dfrac{3}{4}$

   (iii) $\dfrac{2}{3} + \dfrac{3}{5}$

QUESTION TWO   (12 marks)   Start a new page.

(a) Simplify:

(i) $2m - 3n - m$

(ii) $3q \times 2q^2$

(iii) $g^{12} \div g^4$

(iv) $(y^3)^2$

(b) Find the value of $8 - 3p^2$ when $p = -1$.

(c) Expand:

(i) $5(3w - 2)$

(ii) $-3a(2a - 1)$

(d) Factorise fully:

(i) $3m - 12$
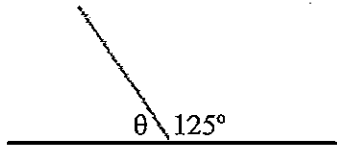
(ii) $15g^2h - 20gh^2$

(e) Express the following as single fractions in simplest form:
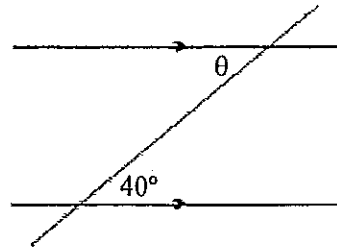
(i) $\dfrac{7m^3}{14m}$

(ii) $\dfrac{2a}{5} + \dfrac{a}{2}$

QUESTION THREE (12 marks) Start a new page.
Refer to the diagrams below, and in each case find θ. Give reasons for your answers.
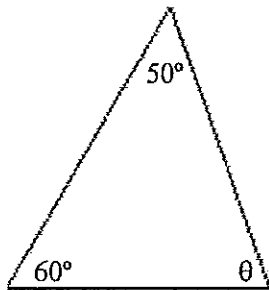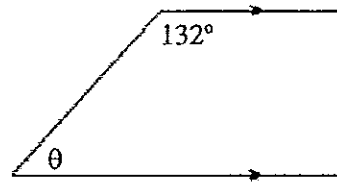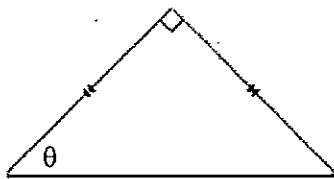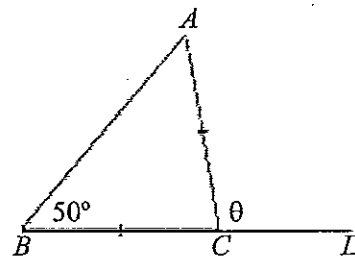
(a)

(d)

(b)

(e)

(c)

(f)

QUESTION FOUR   (12 marks)   Start a new page.

(a) Write 35% as a fraction in lowest terms.

(b) Find 65% of $240.

(c) Jane scores 32 in her Geography test out of a total of 80. Calculate her mark as a percentage.

(d) Jimmy earns $40 every week delivering advertising flyers on his bicycle. His boss decides to increase his salary by 5%. Calculate his new salary.

(e) Bob the builder spends 18% of his weekly income on timber. If he spends $288 each week on timber, calculate his weekly income.

(f) A motor bike originally priced at $8000 is discounted by $640. Find:

(i) the price paid,

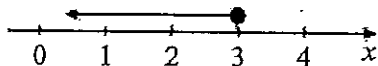(ii) the discount as a percentage of the original price.

QUESTION FIVE   (12 marks)   Start a new page.

(a) Simplify:

(i) $(3pq)^2 \times 5q$

(ii) $\dfrac{12p}{5q} \div \dfrac{18p^2}{25q^2}$

(b) Write an inequation to describe the set graphed on the number line below.

(c) Given the formula $V = 3u^2 - w$, find the value of V when $u = 2$ and $w = -5$.

(d) Solve:

(i) $3m + 5 = 4m - 3$

(ii) $2(3h - 1) = -14$

(iii) $\dfrac{3a}{4} - 7 = -1$

QUESTION SIX (12 marks) Start a new page.

(a) Given $a = -1\frac{1}{4}$ and $b = 1\frac{3}{5}$, find:
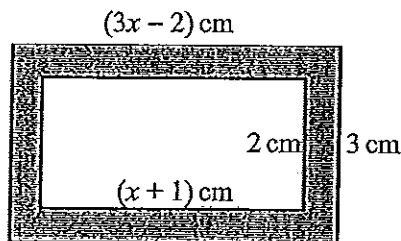
  (i) $a \div b$

  (ii) $a + a \times b$

(b) Calculate: $\dfrac{0 \cdot 008 \times 1 \cdot 08 \times 0 \cdot 2}{0 \cdot 05 \times 1 \cdot 2 \times 0 \cdot 072}$

(c) Express $\dfrac{\frac{3}{4} + \frac{2}{3}}{\frac{7}{6} - \frac{1}{4}}$ as an improper fraction in its lowest terms.

(d) In a raffle there were two prizes. After the raffle was drawn, it was found that $0 \cdot 02\%$ of tickets had won a prize. How many tickets were sold?

(e)

The diagram above shows a piece of rectangular cardboard of length $(3x - 2)$ cm and width 3 cm. A smaller rectangular piece of width 2 cm and length $(x + 1)$ cm is cut from the cardboard leaving an area half the original area.

  (i) Using the given information, form an equation in x.

  (ii) Hence find the area of the original rectangle.

Exam continues next page ...

QUESTION SEVEN   (12 marks)   Start a new page.

(a) Express $1 + \dfrac{2m}{3} - \dfrac{2m}{5} + \dfrac{3m}{10}$ as a single fraction in its lowest terms.

(b) A man pays \$81 for a shirt which includes a sales tax of $12\frac{1}{2}\%$. What was the price of the shirt before the sales tax was added on?

(c) Solve $3(2p - 1) - 2(p - 4) = -15$.

(d)
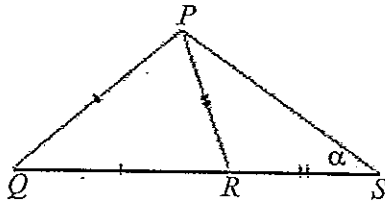
In the diagram above $\angle PSR = \alpha$, $RS = RP$ and $QP = QR$. Find an expression for $\angle PQR$ in terms of α, giving reasons.

(e) My grandfather is presently five times my age. In ten years time he will be three times my age.

   (i) Suppose that my age now is n. Write two different expressions in terms of n for my grandfather's age in ten years time.

   (ii) Find my age now.

**QUESTION EIGHT** (12 marks) Start a new page.

(a) Simplify:

    (i) $4^n + 4^n + 4^n + 4^n$

   (ii) $\left(0.4 + \dfrac{1}{0.4}\right)^2$

(b) Jerry has a piggy bank that contains fifty coins consisting of only five cent and ten cent coins. 94% of the coins are five cent coins. Jerry takes some of the five cent coins from the piggy bank, and now only 90% of the coins in the piggy bank are five cent coins. How much money did Jerry remove from the piggy bank?

(c)   (i) Consider the sequence of match-stick diagrams below.
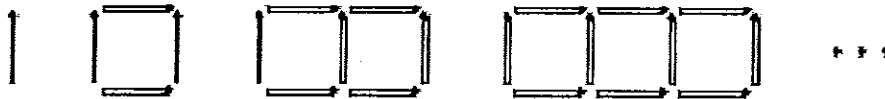
    How many matches are required to build the tenth diagram in the sequence?

  (ii) Now consider a second sequence of diagrams.
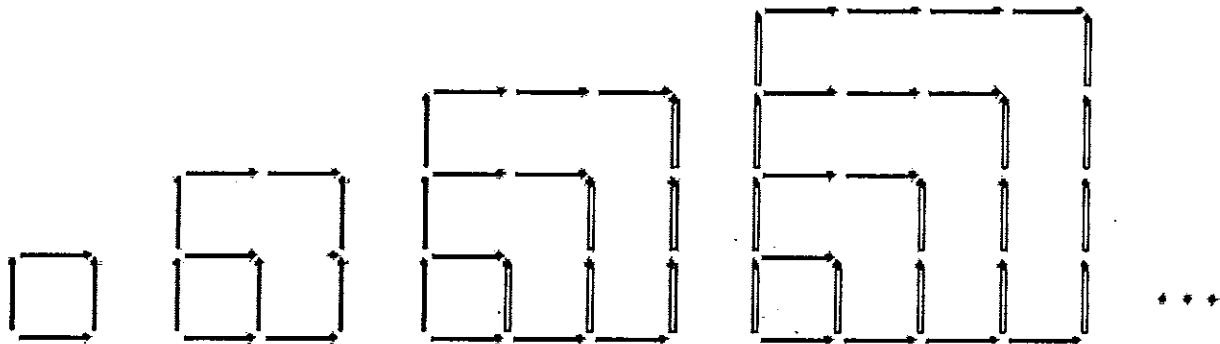
    How many matches are required to build the 100th diagram in the sequence?

(d) Two water tanks of different capacities have their taps turned on simultaneously and begin to empty. The smaller tank takes 6 hours to empty and the larger tank 10 hours. After 4 hours, the amount of water drained from the smaller tank equals the amount remaining in the larger tank. How many smaller tanks of water would be required to fill 9 of the larger type of tank when empty?

END OF EXAMINATION

SYDNEY GRAMMAR SCHOOL

NAME: ....

CLASS: ....MASTER: ....

Question One

A ◯   B ◯   C ◯   D ◯

2014
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FORM II
MATHEMATICS

- Record your multiple choice answers
  by filling in the circle corresponding
  to your choice for each question.

- Fill in the circle completely.

- Each question has only one correct
  answer.

QUESTION 1

(a)

(i) $6 - 3 - 5 = -2$ ✓

(ii) $-54 \div 6 \times (-3) = 27$ ✓

(iii) $(-4)^2 + 3 \times (-5) = 1$ ✓

(b) (i) $1.634 \times 1000 = 163.4$ ✓

(ii) $0.3 \times 0.2 \times 0.4 = 0.024$ ✓

(iii) $(1.3)^2 = 1.69$ ✓

(iv) $\dfrac{3.6}{0.12} = \dfrac{360}{12} = 30$ ✓

(c) (i) $0.18 = 18\%$ ✓

(ii) $\dfrac{4}{5} \times 100 = 80\%$ ✓

(d) (i) $\dfrac{3}{5} \times \dfrac{20}{21} = \dfrac{4}{7}$ ✓

(ii) $\dfrac{3}{8} \div \dfrac{3}{4} = \dfrac{3}{8} \times \dfrac{4}{3}$

$= \dfrac{1}{2}$ ✓

(iii) $\dfrac{2}{3} + \dfrac{3}{5} = \dfrac{10 + 9}{15}$

$= \dfrac{19}{15}$ ✓

$= 1\dfrac{4}{15}$

(12)

QUESTION 2

(a)

(i) $2m - 3n - m = m - 3n$ ✓

(ii) $3q \times 2q^2 = 6q^3$ ✓

(iii) $g^{12} \div g^4 = g^8$ ✓

(iv) $(y^3)^2 = y^6$ ✓

(b) $8 - 3p^2 = 8 - 3(-1)^2$

$= 8 - 3$

$= 5$ ✓

(c) (i) $5(3v - 2) = 15v - 10$ ✓

(ii) $-3a(2a - 1) = -6a^2 + 3a$ ✓

(d) (i) $3m - 12 = 3(m - 4)$ ✓

(ii) $15g^2h - 20gh^2 = 5gh(3g - 4h)$ ✓

(e) (i) $\dfrac{7m^3}{14m} = \dfrac{m^2}{2}$ ✓

(ii) $\dfrac{2a}{5} + \dfrac{a}{2} = \dfrac{4a + 5a}{10}$ ✓

$= \dfrac{9a}{10}$ ✓

(12)

TOTAL (96)

1

QUESTION 3

(a) $\theta = 55°$ ✓
(straight angle) ✓

(b) $\theta = 70°$ ✓
(angle sum of a triangle) ✓

(c) $\theta = 45°$ ✓
(base angles of a right-angled isosceles triangle) ✓

(d) $\theta = 40°$ ✓
(alternate angles of parallel lines.) ✓

(e) $\theta = 48°$ ✓
(co-interior angles of ✓ parallel lines are supplementary)

(f) $\angle BAC = 50°$
(base angles isosceles $\triangle CAB$)

$\theta = 100°$ ✓
(external angle of triangle theorem.) ✓

(12)

QUESTION 4

(a) $35\% = \dfrac{35}{100}$

$= \dfrac{7}{20}$ ✓

(b) 65% of $\$240$
$\dfrac{65 \times 240}{100} = \$156$ ✓
✓

(c) $\dfrac{32 \times 100}{80} = 40$ ✓
Jane scores 40%. ✓

(d) 105% of 840
$\dfrac{105 \times 40}{105} = 42$ ✓
Jimmy's new salary is $\$42$ ✓

(e) $18\% = 288$
$1\% = \dfrac{288}{18}$ ✓
$1\% = \dfrac{32}{2}$
$1\% = 16$
$100\% = 1600$
Bob's weekly earnings are $\$1600$. ✓

(f) (i) Price paid $= 8000 - 640$
$= \$7360$ ✓

(ii) $\dfrac{640}{8000} \times 100 = 8$ ✓
The discount is 8% ✓

(12)

QUESTION 5

(a)

(i) $(3pq)^2 \times 5q$

$= 9p^2q^2 \times 5q$ ✓

$= 45p^2q^3$ ✓

(ii) $\dfrac{12p}{5q} \times \dfrac{25q^2}{18p^2}$

$= \dfrac{10q}{3p}$ ✓ ✓

(b)

$x \leq 3$ ✓

(c) $V = 3u^2 - w$

$V = 3 \times 2^2 - -5$

$V = 12 + 5$

$V = 17$ ✓

(d)

(i) $3m + 5 = 4m - 3$

$3m = 4m - 8$ ✓

$-m = -8$

$m = 8$ ✓

(ii) $2(3h - 1) = -14$

$6h - 2 = -14$ ✓

$6h = -12$

$h = -2$ ✓

(iii) $\dfrac{3a}{4} - 7 = -1$

$3a - 28 = -4$ ✓

$3a = 24$

$a = 8$ ✓

⟨12⟩

QUESTION 6

(a)

(i) $-1\frac{1}{4} \div 1\frac{3}{5}$

$= -\frac{5}{4} \div \frac{8}{5}$

$= -\frac{5}{4} \times \frac{5}{8}$

$= -\frac{25}{32}$ ✓

(ii) $-1\frac{1}{4} + -\frac{5}{4} \times \frac{8}{5}$

$= -\frac{5}{4} - 2$ ✓

$= \frac{-5-8}{4}$

$= -\frac{13}{4}$

$= -3\frac{1}{4}$ ✓

(b) $\frac{0.008 \times 1.08 \times 0.2}{0.05 \times 1.2 \times 0.072}$

$= \frac{8 \times 108 \times 2}{5 \times 12 \times 72}$ ✓

$= \frac{2}{5}$ ✓

(c) $\frac{\frac{3}{4} + \frac{2}{3}}{\frac{1}{6} - \frac{1}{4}} = \frac{9+8}{14-3}$ ✓

$= \frac{17}{11}$ ✓

(d) $0.02\% = 2$

$0.01\% = 1$

$1\% = 100$ ✓

$100\% = 10000$

10,000 tickets were sold. ✓

(e)

(i) Area of cut out $= 2(x+1)$

Area of original $= 3(3x-2)$

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

or ✓

$4(x+1) = 3(3x-2)$

(ii) $4(x+1) = 3(3x-2)$

$4x+4 = 9x-6$

$4 = 5x-6$

$10 = 5x$

$x = 2$ ✓

substitute into:

$A = 3(3x-2)$

$= 3 \times 4$

$A = 12 \, cm^2$ ✓ ⑫

QUESTION 7

(a)

$$1 + \frac{2m}{3} - \frac{2m}{5} + \frac{3m}{10}$$

$$= \frac{30 + 20m - 12m + 9m}{30} \checkmark$$

$$= \frac{17m + 30}{30} \checkmark$$

(b)

$$112\tfrac{1}{2}\% = \$81$$

$$225\% = \$162 \checkmark$$

$$25\% = \$18$$

$$100\% = \$72$$

The cost of the shirt before the sales tax was $72. $\checkmark$

(c)

$$3(2p-1) - 2(p-4) = -15$$

$$6p - 3 - 2p + 8 = -15 \checkmark$$

$$4p + 5 = -15$$

$$4p = -20$$

$$p = -5 \checkmark$$

(d)

$$\angle RPS = \alpha$$

(base angles, isosceles $\triangle PRS$) $\checkmark$

$$\angle PRQ = 2\alpha$$

(external angle of triangle theorem.) $\checkmark$

$$\angle QPR = 2\alpha$$

(base angles, isosceles $\triangle QPR$)

$$\angle PQR = 180° - 4\alpha$$

(angle sum of $\triangle PQR$) $\checkmark$

(e)

(i) my age $= n$

Grandfather's $= 5n$

10 years time:

my age $= n + 10$

Grandfather = $5n + 10$ $\checkmark$ and

Grandfather's $= 3(n+10)$ $\checkmark$

(ii)

$$5n + 10 = 3(n+10)$$

$$5n + 10 = 3n + 30$$

$$2n + 10 = 30$$

$$2n = 20$$

$$n = 10$$

I am 10 years old. $\checkmark$

$\boxed{12}$

QUESTION 8

(a)

(1) $4^n + 4^n + 4^n + 4^n$

$= 4 \times 4^n$

$= 4^{n+1}$ ✓

(ii) $\left(0.4 + \dfrac{1}{0.4}\right)^2$

$= \left(0.4 + \dfrac{10}{4}\right)^2$

$= (0.4 + 2.5)^2$

$= (2.9)^2$

$= 8.41$ ✓

(b) Jerry takes x, 5^c coins – leaving $50-x$ coins.

94% of $50 = 47$

originally the piggy bank has 47 5^c coins.

$\dfrac{47-x}{50-x} = \dfrac{9}{10}$ ✓ (90%)

$10(47-x) = 9(50-x)$

$470 - 10x = 450 - 9x$

$\quad\quad 470 = 450 + x$ ✓

$\quad\quad 20 = x$

Jerry takes 20, 5^c coins or $\boxed{\$1.00}$ from the piggy bank. ✓

(c)

(1) $1, 4, 7, 10, \ldots$

$t_n = 3n - 2$

$t_{10} = 30 - 2$

28 matches needed for the tenth diagram. ✓

(ii) $4, 10, 18, 28, \ldots$

$t_n = n^2 + 3n$ ✓

$t_{100} = 10000 + 300$

$10,300$ matches are required for the 100th diagram. ✓

(d)

Smallest tank empties at $\dfrac{l}{6}$ litres/hr. Tank l litres.

Largest tank empties at $\dfrac{L}{10}$ litres/hr, capacity L litres. ✓

after 4 hours:

$4 \times \dfrac{l}{6} = L - 4\dfrac{L}{10}$ ✓

$\dfrac{2l}{3} = \dfrac{6L}{10}$

$\dfrac{2l}{3} = \dfrac{3L}{5}$

$\dfrac{l}{L} = \dfrac{3}{5} \times \dfrac{3}{2}$

$\dfrac{l}{L} = \dfrac{9}{10}$

10 smaller tanks would be required to fill 9 ✓ of the larger tanks.

note: ⑫

equations are not necessary for (b) or (d) – but a good explanation or working – is. (K.W.M)