

# Sydney Girls High School



## MATHEMATICS

### YEAR 9

## Yearly Examination 2006

Time Allowed: 75 minutes

Total Marks: 100

#### Instructions:

- There are 5 (FIVE) questions, each worth 20 marks.
- Attempt ALL questions.
- Start each question on a new page.
- Write your name and MATHS class clearly at the top of each page and clearly number each question.
- Show all necessary working. Marks may be deducted for badly arranged work or incomplete working.
- Board-approved calculators may be used in all parts of the test.
- Diagrams are NOT to scale.

#### Question 1: (20 marks)

- Write  $\sqrt{50}$  in simplest surd form. 1
- Expand  $(x-1)^2$ . 1
- Factorise  $ap+3a$ . 1
- Solve  $x+5 < 11$ . 1
- Make  $B$  the subject of the formula  $\frac{1}{2}AB = 5$ . 1
- Write 56 out of 64 as a percentage. 1
- If  $b = -3$  find the value of  $3b^2$ . 1
- Fully factorise  $x^2 - 2x - 3$ . 1
- Simplify  $6\sqrt{3} - (2\sqrt{3} + 5\sqrt{6})$ . 1
- What is the perimeter of the trapezium with sides 1.7 cm, 2.01 cm, 1.65 cm and 4.8 cm. 1
- Find the reciprocal of  $2\frac{1}{4}$ . 1
- Evaluate  $6\text{ km} + 40\text{ m} + 3\text{ cm}$ , expressing your answer in metres. 1
- What is the range of the scores 28, 32, 57, 91, 85. 1
- Jie is  $m$  years old. Her sister Kara is twice Jie's age. Write and simplify an algebraic expression that represents the total age of the two children. 1
- Find the area of a parallelogram which has base 7.5 cm and height 5.3 cm. 1
- If  $2^a = \frac{1}{4}$ , find the value of  $a$ . 1
- Solve  $\frac{1}{2}x^4 = 8$ . 1
- The following minimum temperatures ( $^{\circ}\text{C}$ ), were recorded on five consecutive days in Coldtown:  $-0.8, 1.7, -1.5, -0.8, 0.7$ . 1  
Write the five temperatures in ascending order.

s) Simplify  $\frac{x}{y} + \frac{1}{y}$ .

1

t) Write the value of  $(\sqrt{5})^4$ .

1

**Question 2:** (20 marks)

a) Write  $2\sqrt{3} - 5\sqrt{12}$  in simplest surd form.

2

b) Solve  $7x + 6 = 13 - 3x$ .

2

c) Lara bought five CDs for \$30 each and received a discount of 10% on the total price.

2

How much did Lara pay for the five CDs?

d) Write  $\sqrt{72} + \sqrt{27}$  in simplest surd form.

2

e) Solve  $\frac{5x-3}{4} = 8$ .

2

f) What is the value  $3600 \text{ mm}^2$  expressed in  $\text{cm}^2$ .

2

g) Expand and simplify  $2(x+4) - (x-4)$ . \$ 9

2

h) In 2005 Marie received \$13.00 per hour for part-time work. She worked an average of seven hours per week.

2

Based on a year of 52.18 weeks, how much did Marie earn in 2005?

i) Solve  $3(2x-1) \leq 3$ .

2

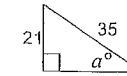
j) Write in ascending order.  $1\frac{1}{4}, \sqrt{2}, 1.3, \frac{7}{5}, \frac{3}{\sqrt{5}}$

2

**Question 3:** (20 marks)

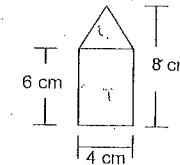
a) What is the value of  $a$  in this diagram.

Write your answer to the nearest degree.



2

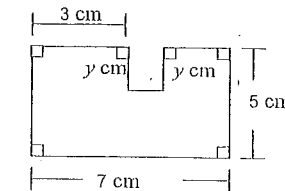
b) What is the area of the figure in this diagram?



2

c) The perimeter of this figure is 30.

What is the value of  $y$ ?



2

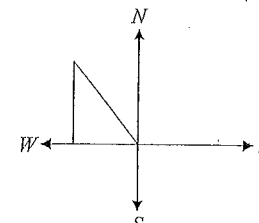
d) Factorise  $p^2 + qm + pq + pm$ .

2

e) Simplify  $\frac{5(2-a)}{2} \times \frac{6a}{a-2}$ .

2

f) Jean walked 5 km northwest from position  $X$  to position  $Y$ . She then walked due south until she was in a position  $Z$  due west of position  $X$ .



2

i) Copy the diagram and label with the information given.

ii) How far due south did Jean walk? Round your answer to one decimal place.

g) Use the incomplete timesheet for Alice Lee to calculate the two

missing values  $X$  and  $Y$ .

| Alice Lee   | Time Sheet Summary |                 |             | Rate  |
|-------------|--------------------|-----------------|-------------|-------|
|             | Number of hours at |                 |             | \$W   |
| Week ending | Normal rate        | Time and a half | Double time | Wage  |
| 6 Oct       | 7                  | 0               | 0           | \$70  |
| 13 Oct      | $X$                | 2               | 0           | \$130 |
| 20 Oct      | 10                 | $Y$             | 1           | \$165 |

- h) A distance  $K$  metres was divided in the ratio  $5 : B$ . The two distances obtained were to give a distance ratio of 150 m and 90 m.

Write down the values of  $K$  and  $B$ ?

- i) Expand and simplify.

i)  $(2x - 1)(1 + 5x)$

ii)  $(2x - 3y)^2 - (2x^2 - y^2)$

**Question 4: (20 marks)**

- a) Expand and simplify.

i)  $(\sqrt{2} - \sqrt{5}) \times (\sqrt{2} + \sqrt{5})$

ii)  $3\sqrt{2} - 2\sqrt{5} - 3(\sqrt{5} + 4\sqrt{2})$

- b) Simplify  $\frac{1}{\sqrt{2} - \sqrt{3}}$  by rationalising the denominator.

- c) A wetsuit had a selling price that was marked up by 80% from the cost price of \$260. During a sale the selling price of the wetsuit was reduced by 30%. What was the sale price of the wetsuit?

- d) Use the table of tax rates for 2005-06 to calculate the tax payable on a taxable income of \$90,000. Do not include the Medicare Levy.

| Tax rates for 2005-06 |   |
|-----------------------|---|
| Taxable income        | Tax rate  |
| \$0 - \$6,000         | NIL   |
| \$6,001 - \$21,600    | 17c for each dollar over \$6,000                |
| \$21,601 - \$63,000   | \$2,340 plus 30c for each dollar over \$21,600  |
| \$63,001 - \$95,000   | \$14,762 plus 42c for each dollar over \$63,000 |
| Over \$95,000         | \$28,200 plus 47c for each dollar over \$95,000 |

- e) Ms Jones sells floor tiles to builders. Each week she receives a base salary of \$1,000 and a commission of 1.5% on all sales finalised in that week. Last week Ms Jones sold floor tiles to five builders with sale prices finalised at \$10,000, \$25,000, \$16,500, \$7,000, and \$8,000.

What was Ms Jones total income last week?

- f) Construct a table to show the frequency and cumulative frequency for the following data set.

|   |   |   |   |   |
|---|---|---|---|---|
| 5 | 6 | 1 | 3 | 1 |
| 3 | 2 | 3 | 6 | 4 |
| 1 | 1 | 5 | 5 | 4 |

- g) The table shows the number of 2-litre milk cartons delivered to a cafe each day for eight days.

| M  | Tu | W  | Th | F  | Sa | Su | M  |
|----|----|----|----|----|----|----|----|
| 40 | 40 | 45 | 45 | 50 | 75 | 80 | 40 |

- i) Find the mean for these data?  
 ii) The cafe owner is considering not opening on Sundays. Which of the median, mode and range will decrease if the Sunday (Su) data is excluded from the data set?

**Question 5: (20 marks)**

a) Solve these two equations algebraically.

$$2a + b = 5$$

$$3a + 4b = 15$$

3

b) Use two equations to solve the following problem. A sports store has all golf balls on sale for \$X and all tennis balls on sale for \$Y. Jamie bought 3 golf balls and 7 tennis balls for a total of \$70. Helen bought 4 golf balls and 5 tennis balls for a total of \$63. How much did one golf ball cost?

4

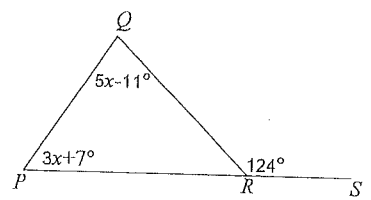
c) Find the value of x in the following equations.

i)  $\frac{2x}{3} - \frac{x}{5} = 1$

4

ii)  $\frac{x}{2+x} - \frac{5}{x-2} = 1$

d) Use the information in the diagram to find the size of  $\angle RPQ$ .

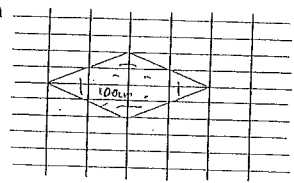


3

e) Solve  $\frac{1-2x}{5} \leq \frac{3(2-x)}{3}$

3

f) In the following grid each division on the vertical and on the horizontal axis represents 10 cm. What is the area of quadrilateral shown on the grid?



3

Question 1

① each

)  $5\sqrt{2}$

)  $x^2 - 2x + 1$

)  $a(p+q)$

)  $x < 6$

)  $\beta = \frac{10}{A}$

)  $\frac{56}{64} \times 120 = 87.5\%$

)  $2(-3)^2 = 27$

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

)  $4\sqrt{3} - 5\sqrt{6}$

)  $10.16 \text{ cm}$

)  $\frac{4}{9}$

)  $6040.03 \text{ m}$

)  $91 - 28 = 63$

)  $m + 2m = 3m$

)  $7.5 \times 5.3 = 87.75 \text{ cm}^2$

)  $a = -2$

)  $x = 2$

)  $-1.5, -0.8, -0.3, 0.7, 1.7$

)  $\frac{x}{y} \times \frac{y}{x} = x$

)  $25$

Question 2

a)  $2\sqrt{3} - 5\sqrt{4 \times 3} = 2\sqrt{3} - 10\sqrt{3} \quad (1)$   
 $= -8\sqrt{3} \quad (1)$

b)  $7x + 3x = 13 - 6 \quad (1)$   
 $x = \frac{7}{10} \quad (1)$

c)  $5 \times 30 - 0.1 \times 5 \times 30 \quad (1)$   
 $= \$135 \quad (1)$

d)  $\sqrt{72} + \sqrt{27} = 6\sqrt{2} + 3\sqrt{3} \quad (1) \quad (1)$

e)  $5x - 3 = 32 \quad (1)$   
 $x = 7 \quad (1)$

f)  $(60 \text{ mm})^2 \quad (1)$   
 $= (6 \text{ cm})^2 = 36 \text{ cm}^2 \quad (1)$

g)  $2x + 8 - x + 4 \quad (1)$   
 $= x + 12 \quad (1)$

h)  $13 \times 7 \times 52.18 \quad (1)$   
 $= \$4,748.38 \quad (1)$

i)  $62 - 3 \leq 3 \quad (1)$   
 $x \leq 1 \quad (1)$

j)  $1\frac{1}{2}, \sqrt{2}, 1.3, \frac{7}{5}, \frac{3}{\sqrt{5}}$   
 $1.25, 1.41, 1.3, 1.40, 1.34 \quad (1)$

and  
 $1.25, 1.3, 1.34, 1.40, 1.41$  in correct order

so  
 $1\frac{1}{2}, 1.3, \frac{3}{\sqrt{5}}, \frac{7}{5}, \sqrt{2} \quad (1)$

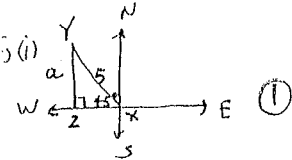
a)  $\sin A = \frac{21}{35}$   
 $A = \sin^{-1} \frac{3}{5}$   
 $= 36.8698...$   
 $= 37^\circ$  (2)

b)  $A = 4 \times 6 + \frac{1}{2} \times 4 \times (8-6)$   
 $= 24 + 4$  (2)  
 $= 28 \text{ cm}^2$

c)  $P = 7+7+5+5+y+y=30$   
 $2y = 6$  (2)  
 $y = 3 \text{ cm}$

d)  $p^2 + qm + pm + pm$   
 $= p^2 + pm + pm + qm$   
 $= p(p+q) + m(p+q)$   
 $= (p+m)(p+q)$  (2)

$\frac{5(2-a)}{2} \times \frac{64}{a-2}$   
 $= \frac{-5(a-2)}{2} \times \frac{2 \times 32}{a-2}$   
 $= -15a$  (2)



ii)  $\sin 55^\circ = \frac{a}{5}$   
 $a = 5 \sin 55^\circ$   
 $= 3.5 \text{ km}$  (1)

X, Y is isosceles and  $a^2 + a^2 = 25$   
 $a = 3.5 \text{ km}$

Normal rate  $\$70 \div 7 = \$10$  (1)  
 $10x + 2x \times 5 + 0 \times 20 = 130$   
 $x = 10$  (1)

$10 \times 10 + 15 \times Y + 1 \times 20 = 165$   
 $Y = 3$  (1)

h)  $\frac{150}{90} = \frac{5}{9}$  8 wires  $\theta = 3$  (1)  
 $k = 150 + 90 = 240 \text{ m}$  (1)

i) i)  $2z + 10x^2 - 1 - 5xz$   
 $= 10x^2 - 3xz - 1$  (1)

ii)  $4x^2 - 12xy + 9y^2 - 2x^2 + y^2$   
 $= 2x^2 - 12xy + 10y^2$  (2)

Question 4

a) i)  $(\sqrt{2})^2 - (\sqrt{5})^2$  (1)  
 $= -3$  (1)

ii)  $3\sqrt{2} - 2\sqrt{5} - 3\sqrt{5} - 12\sqrt{2}$  (1)  
 $= -9\sqrt{2} - 5\sqrt{5}$  (1)

b)  $\frac{1}{\sqrt{2}-\sqrt{3}} \times \frac{\sqrt{2}+\sqrt{3}}{\sqrt{2}+\sqrt{3}}$  (1)  
 $= \frac{\sqrt{2}+\sqrt{3}}{2-3} = -\sqrt{2}-\sqrt{3}$  (1)  
 or  $-(\sqrt{2}+\sqrt{3})$

c)  $260 + 0.8 \times 260 = \$468$  (1)  
 $468 - 0.3 \times 468 = \$327.60$  (1) carry error

d)  $\$14,762 + 0.42 \times 27,000$  (1)  
 $= \$26,102$  (1)

e)  $\$1,000 + 0.015(10,000 + 29,000 + 16,500 + 7,000 + 8,000)$  (1)  
 $= \$19,977.50$  (1)

f)

| S | f | c.f |
|---|---|-----|
| 1 | 4 | 4   |
| 2 | 1 | 5   |
| 3 | 3 | 8   |
| 4 | 2 | 10  |
| 5 | 3 | 13  |
| 6 | 2 | 15  |

(1) for construction of correct table  
 (1) for f  
 (1) for c.f

g) i)  $\frac{10+10+15+15+15+15+17.5+80}{8} = \frac{115}{8} = 14.375$  (1)

ii)  $\frac{40}{40}$   $\frac{45}{45}$  so 75 80 median - no change (1)  
 mode - no change (1)  
 range reduced (1)  
 (from 80-40=40 to 75-40=35)

Question 5

a)  $2a + b = 5$  (1)  
 $3a + 4b = 15$  (2)  
 $(1) \times 4 - 8a + 4b = -20$  (3) (1)

add (2) and (3)  
 $-5a = -5$  ✓  
 $a = 1$  (1) ✓  
 $b = 3$  (1) ✓

b) i)  $30x + 7y = 70$  (1) ✓  
 ii)  $4x + 5y = 63$  (1) ✓

5x)  $-15x - 35y = -350$  (1) ✓  
 ii)  $28x + 35y = 441$  (2) ✓  
 $13x = 91$   
 $x = 7$  (1) ✓

c) i)  $\frac{2x}{3} - \frac{x}{5} = 1$   
 $\frac{5}{5} \times \frac{2x}{3} - \frac{3}{3} \times \frac{x}{5} = \frac{15}{15}$  (1)  
 $10x - 3x = 15$   
 $7x = 15$  or  $2 \frac{1}{7}$  (1) ✓

ii)  $\frac{x}{2+x} - \frac{5}{x-2} = 1$   
 $\frac{x(x-2) - 5(x+2)}{(x+2)(x-2)} = 1$  (1)

$x^2 - 2x - 5x - 10 = x^2 - 4$   
 $-7x = 6$   
 $x = -\frac{6}{7}$  (1) ✓

$5x - 11 + 3x + 7 = 124$  (1) ✓  
 $8x = 128$   
 $x = 16$  (1) ✓  
 $\angle RPA = 3x + 7 = 55^\circ$  (1) ✓

Question 5

e)  $\frac{1-2x}{5} \leq \frac{3(2-x)}{3}$   
 $3(1-2x) \leq 15(2-x)$  (1) ✓  
 $3-6x \leq 30-15x$   
 $-27 \leq -9x$   
 $\frac{-27}{-9} \geq \frac{-9x}{-9}$  (1) ✓  
 $3 \geq x$  (1) ✓

f) square with diagonal 40 cm (1)  
  
 $a^2 + a^2 = 40^2 \rightarrow a^2 = \frac{40^2}{2}$  (1)  
 Area =  $a^2$   
 so Area =  $\frac{40^2}{2} = 800 \text{ cm}^2$  (1)

1 or 3