Sydney Girls High School

MATHEMATICS

YEAR 9

2005 Yearly Examination

Time Allowed: 75 minutes

INSTRUCTIONS:

- There are FIVE (5) Sections: Sections 1-5.
  Each Section is of equal value (20 Marks each).
- Start each Section on a new page.
- Write your name and Maths class clearly at the top of each Section and clearly number each question.
- Write on one side of paper only.
- Attempt all questions.
- Show all necessary working. Marks may be deducted for badly arranged work or incomplete working.
- Diagrams are NOT to scale.
- Board-approved calculators may be used.
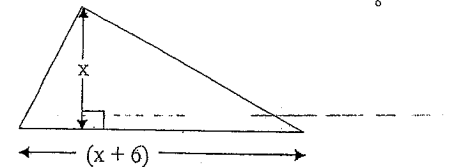
SECTION 1 (20 Marks)

MARKS

1. A 1kg packet of flour is divided in the ratio 3:5. How heavy is the smaller portion of flour in g? **2**

2. Complete the conversion:
   $330 \ m/s \ = \ .... \ km/h$ **3**

3. Find the equation of the line which has a gradient of $-\frac{1}{3}$ and a y-intercept of 2. **1**

4. Write an expression for the area of the following figure: **2**


$(x + 6)$

5. From a standard pack of 52 playing cards, what is the probability of drawing an Ace or a King? **1**

6. A sample test of 200 toys in a factory was done and 12 were found to be faulty. Based on this test, what is the probability of buying a toy, from that factory, which is not faulty? **1**

7. Write the basic numeral for $620,9 \times 10^{-5}$ **1**

8. Find the perimeter of the following shape to 2 decimal places: **2**

18cm

20cm
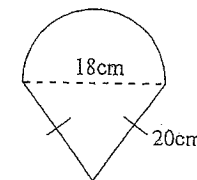
9. Find the midpoint of the interval joining the points $(0,-3)$ and $(-2,1)$. **2**

10. Factorise the following: **5**

   (a) $6n^3 + 21n^2 - 3n$

   (b) $3x^2 - 11x + 6$

SECTION 2 (20 Marks) Start a new page

MARKS

1. Solve the following equations:

   (a) $\dfrac{m}{7} + \dfrac{10m}{5} = 2$

   (b) $5(y + 4) - (y - 9) = 33$

   4
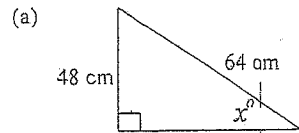
2. A clothing store buys a certain jacket for $39. If this cost price has a mark-up of 55%, find:
   (a) the marked (or selling) price of the jacket
   (b) the profit on each jacket.
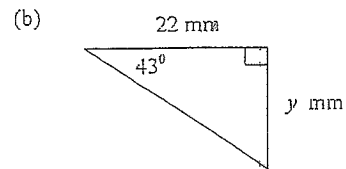
   2

3. Simplify the following:

   $\dfrac{4\sqrt{12}}{6\sqrt{2} \times \sqrt{3}}$

   2

4. Find the value of the pronumeral in each of the following figures:

   4

   (a)

   48 cm   64 cm x°

   Answer to the nearest degree.

   (b)

   22 mm   43° y mm

   Answer to 1 decimal place.

5. Solve the following problem using simultaneous equations.
   Anna bought a bag of 15 lollies worth $4.05. Inside there were 'Jaffas' which cost 25c each and 'Fantails' which cost 30c each. How many of each type of lolly did she buy?

   3

6. Solve the following inequation:

   $\dfrac{4 - x}{5} \leq 8$

   3

7. Show that the hypotenuse of a right-angled isosceles triangle, with side lengths of 1 unit, is $\sqrt{2}$.

   2

SECTION 3 (20 Marks) Start a new page

MARKS

1. Expand and simplify:
   (a) $(2x - 5)(x + 3)$

   (b) $(p - 7)^2$

   (c) $(m + 4)(m - 4)$

   4

2. Solve the following simultaneous equations algebraically:

   $3x + y = 13$

   $x + y = 5$

   3

3. Sophie has an annual salary of $49,000. She earned $325 in bank interest in the last financial year. Her valid tax deductions include: union membership fees of $125 per year, books to assist in her work which cost $230, and donations made to recognised charities to the value of $20.

   5

   (a) Calculate Sophie's taxable income.

   (b) Using the table below, calculate the amount of tax Sophie is required to pay for the year.

Tax rates 2004-05	
Taxable income	Tax payable on Taxable income
$0 – $6,000	Nil
$6,001 – $21,600	17c for each $1 over $6,000
$21,601 – $58,000	$2,652 plus 30c for each $1 over $21,600
$58,001 – $70,000	$13,572 plus 42c for each $1 over $58,000
Over $70,000	$18,612 plus 47c for each $1 over $70,000

   (c) Sophie has paid $11,336 in tax through P.A.Y.E. Find her tax refund or balance payable.

4. Simplify the following:

   (a) $\sqrt{30} \times \sqrt{54}$

   (b) $5\sqrt{5} + 7\sqrt{11} - \sqrt{5} + \sqrt{11}$

   (c) $(\sqrt{7} + 6)(\sqrt{7} - 6)$

   5

5. Find the radius of a cone if its height is 5cm and its volume is 124cm^3. The volume, V, is given by the formula $V = \dfrac{1}{3}\pi r^2 h$, where r is the radius. Give your answer correct to 2 significant figures.

   3

SECTION 4 (20 Marks) Start a new page

1. Melanie works in a shop earning $15.50 per hour. Her normal fortnight is 68 hours, but in the last fortnight she worked 12 hours overtime as well, for which she is paid time and a half. From her fortnightly pay, $320 tax was taken. Each fortnight she pays $9.50 in union fees, invests $95 in superannuation and pays $18.50 to a health fund through her employer. Calculate Melanie's net weekly pay.   **3**

2. Solve each equation for the letter shown in brackets: **4**

   (a) $c - 2b = ax + b$ $[x]$

   (b) $S = 2\pi r(r + h)$ $[h]$

3. Simplify the following: **5**

   (a) $\dfrac{3y^2 - 3}{3y - 3}$

   (b) $\dfrac{3}{y^2 + 7y + 12} - \dfrac{5}{y^2 + 5y + 4}$

4. Selena wants to purchase a new laptop for $1500. She decides to purchase it on terms. She pays 10% deposit and monthly instalments of $75 for 2 years.   **4**

   (a) How much does Selena pay for the laptop?

   (b) What amount of interest was charged?

   (c) Express the interest charged as a percentage of the cost price.

5. Solve the following simultaneous equations graphically: **4**

   $$y = 2x + 4$$
   $$2x + y = 8$$

SECTION 5 (20 Marks) Start a new page

1. Fiona surveyed 36 households in her suburb to find out how many pets the average family owns in her suburb. Her results are as follows:

1	0	1	1	1	2	3	1	1	2	1	3
4	0	2	1	3	5	0	6	0	1	1	1
2	4	0	2	3	4	7	2	1	0	2	3

   (a) Organise this data into a frequency distribution table including columns for score, tally, frequency, c.f., and fx.   **5**

   (b) Use the table in (a) to draw a combined frequency histogram and polygon.   **4**

   (c) Using the data provided calculate: **5**

   (i) the range

   (ii) the mean

   (iii) the median

   (iv) the mode

   (v) the relative frequency of households which have no pets.

2. Simplify with a rational denominator: **3**

   $$\frac{3}{4\sqrt{6}} + \frac{7}{2\sqrt{3}}$$

3. A photograph is hung symmetrically on a wall with string attached to each end of the upper corners of the picture frame, as shown in the diagram below. The total length of string is 30cm and the length of the picture frame is 18cm. Find the angle, to the nearest minute, between the string and the picture frame.   **3**

End of test
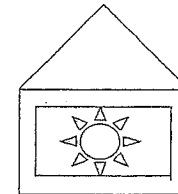
2005 Year 9 Yearly Exam

Section 1

- Smaller portion $= \frac{3}{8} \times 1000g$

$= 375g$ ②

∴ $330 m/s = 0.33 km/s$

$= 0.33 \times 3600 \, km / 3600 \, s$

$= 1,188 \, km/h$ ③

- $y = mx + b$

$y = -\frac{x}{3} + 2$ ①

- $A = \frac{1}{2} bh$

$= \frac{1}{2} \times (x+6) \times x$

$= \frac{x}{2}(x+6)$

$= \frac{x^2}{2} + 3x$ ②

- $P(\text{Ace or king}) = \frac{8}{52}$

$= \frac{2}{13}$ ①

- $P(\text{not faulty}) = \frac{188}{200}$

$= \frac{47}{50}$

$= 0.94$ ①

- 0.006209 ①

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8. $P = \frac{2\pi r}{2} + 2 \times 20$

$= 9\pi + 40$

$\doteqdot 68.27 \, cm \; (2 \, d.p.)$ ②

9. $M = \left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right)$

$= \left(\frac{0 + -2}{2}, \frac{-3 + 1}{2} \right)$

$= (-1, -1)$ ②

10. (a) $3n(2n^2 + 7n - 1)$

(b) $\frac{(3x-2)(3x-9)}{3}$

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

$= (3x-2)(x-3)$ ⑤

Section 2

1. (a) $\frac{5m + 70m}{35} = 2$

$75m = 70$

$m = \frac{70}{75}$

$m = \frac{14}{15}$

(b) $5y + 20 - y + 9 = 33$

$4y + 29 = 33$

$4y = 4$

$y = 1$ ④

2. (a) Selling Price $= \$39 \times 1.55$

$\doteqdot \$60.45$

(b) Profit $= \frac{\text{Selling}}{\text{price}} - \frac{\text{Cost}}{\text{price}}$

$= \$60.45 - \$39$

$= \$21.45$ ②

3. $\frac{4 \times \sqrt{2 \times 2 \times 3}}{6 \times \sqrt{2} \times \sqrt{3}}$

$= \frac{2\sqrt{2}}{3}$ ②

4. (a) $\sin x° = \frac{48}{64}$

$x° \doteqdot 49° \; (\text{nearest degree})$

(b) $\tan 43° = \frac{y}{22}$

$y = 22 \times \tan 43°$

$y \doteqdot 20.5 \; (1 \, dec. \, pl.)$

5. Let no. of Jaffas $= J$

" " " Fantails $= F$

$J + F = 15$ — ①

$25J + 30F = 405$ — ②

$J = 15 - F$

$25(15 - F) + 30F = 405$

$375 - 25F + 30F = 405$
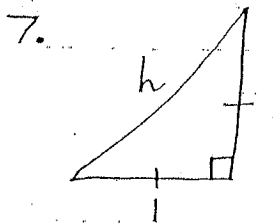
$5F = 30$

$F = 6$

$J = 9$

∴ 6 Fantails and 9 Jaffas ③

6. $\frac{4 - x}{5} \leq 8$

$4 - x \leq 40$

$-36 \leq x$

$x \geq -36$ ③

7.

$h^2 = 1^2 + 1^2$

$= 2$

∴ $h = \sqrt{2}$ ②

Section 3

(a) $2x^2 + 6x - 5x - 15$
$= 2x^2 + x - 15$ ½

(b) $p^2 - 14p + 49$ 1

(c) $m^2 - 16$ 1   ④

$\therefore\ 3x + y = 13$ —
$\underline{\quad x + y = 5}$
$\quad 2x = 8$
$\quad\quad x = 4$

$x + y = 5$
$4 + y = 5$
$\quad y = 1$

$\therefore\ x = 4,\ y = 1\ (4,1)$ ③

(a) Taxable income
$=$ Amount earned $-$ Tax Deductions
$= \$49,325 - (\$125 + \$230 + \$20)$
$= \$48,950$ 1½

(b) Tax Payable
$= \$2652 + 0.3(\$48,950 - \$21,600)$
$= \$10,857$ ½

(c) Tax Refund
$= \$11,336 - \$10,857$
$= \$479$ 1½   ⑤

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4. (a) $\sqrt{30} \times \sqrt{54}$
$= \sqrt{5} \times \sqrt{6} \times \sqrt{9} \times \sqrt{6}$
$= \sqrt{5} \times 6 \times 3$
$= 18\sqrt{5}$ 2

(b) $4\sqrt{5} + 8\sqrt{11}$ 1

(c) $(\sqrt{7})^2 - 6^2$
$= 7 - 36$
$= -29$ ½   ⑤

5. $V = \frac{1}{3}\pi r^2 h$

$\frac{3V}{\pi h} = r^2$

$r = \sqrt{\frac{3V}{\pi h}}$

$= \sqrt{\frac{3 \times 124}{\pi \times 5}}$

$r \doteq 4.9\ cm\ (2\ sig.\ figs)$ ③

$(-\frac{1}{2}\ \text{...})$

Section 4

1. Net Pay = $(68 \times \$15.50 + 12 \times 1.5 \times \$15.50)$
(fortnight) $- (\$320 + \$9.50 + \$95 + \$18.50)$
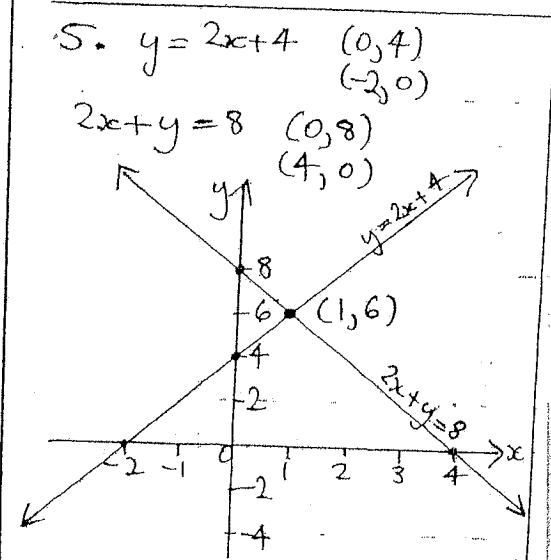$= \$1333 - \$443$
$= \$890$

Net weekly pay $= \$445$ ③

2. (a) $c - 26 = ax + b$
$c - 36 = ax$
$x = \dfrac{c - 36}{a}$

(b) $S = 2\pi r(r + h)$
$r + h = \dfrac{S}{2\pi r}$
$h = \dfrac{S}{2\pi r} - r$ ④

3. (a) $\dfrac{3(y^2 - 1)}{3(y - 1)} = \dfrac{(y-1)(y+1)}{(y-1)} = y + 1$

(b) $\dfrac{3}{(y+3)(y+4)} - \dfrac{5}{(y+4)(y+1)} = \dfrac{3(y+1) - 5(y+3)}{(y+3)(y+4)(y+1)}$

$= \dfrac{3y + 3 - 5y - 15}{(y+3)(y+4)(y+1)}$

$= \dfrac{-2y - 12}{(y+3)(y+4)(y+1)}$

$= \dfrac{-2(y+6)}{(y+3)(y+4)(y+1)}$ ⑤

5. $y = 2x + 4$ $(0,4)$
           $(-2,0)$

$2x + y = 8$ $(0,8)$
           $(4,0)$

$(1,6)$

Solution $= (1,6)$

4. (a) Laptop price $= 0.1 \times \$1500 + 24 \times \$75$
$= \$1950$

(b) Interest $= \$1950 - \$1500$
$= \$450$

(c) % interest on cost price $= \dfrac{450}{1500} \times 100\%$

Section 5

1.(a)

Score (x)	Tally	Frequency (f)	Cumulative Frequency (c.f.)	fx
0	‖‖ l	6	6	0
1	‖‖ ‖‖ ll	12	18	12
2	‖‖ ll	7	25	14
3	‖‖	5	30	15
4	lll	3	33	12
5	l	1	34	5
6	l	1	35	6
7	l	1	36	7
		$\Sigma f = 36$		$\Sigma fx = 71$

⑤

(b)

No. of Pets Owned in a Family

Score (No. of pets)

④
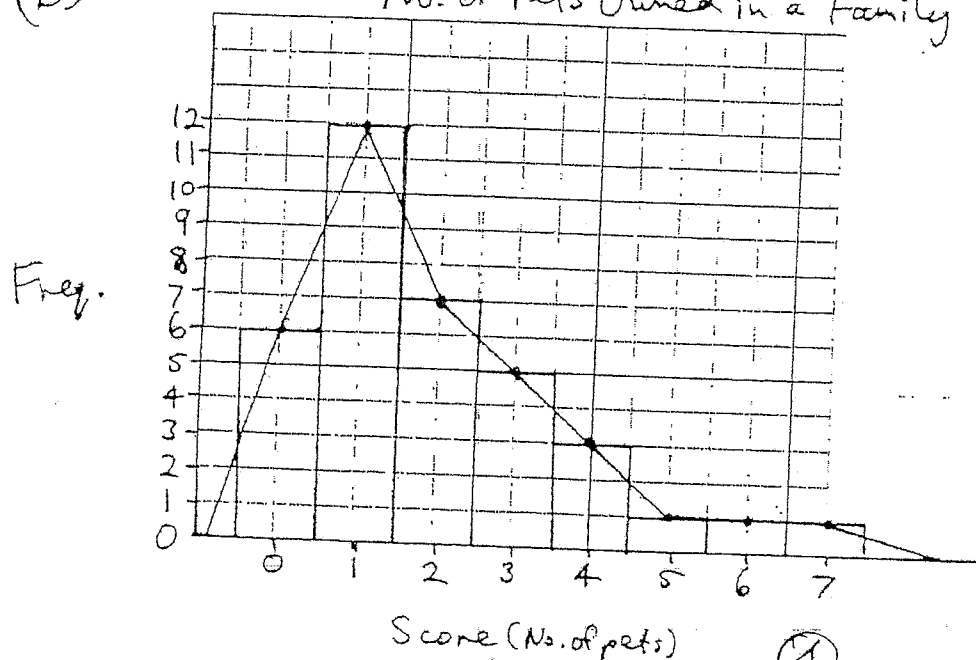
(c)(i) Range $= 7 - 0$
$$= 7$$

(ii) Mean $= \dfrac{\Sigma fx}{\Sigma f}$
$$= \dfrac{71}{36}$$
$$\doteq 1.97$$

(iii) Median
$$= \text{Av. of } 18^{th} + 19^{th} \text{ Scores}$$
$$= \dfrac{1+2}{2}$$
$$= 1.5$$

(iv) Mode $= \underline{1}$

(v) Rel. freq. $= \dfrac{6}{36}$
(0 pets)
$$= \dfrac{1}{6}$$ ⑤

2.

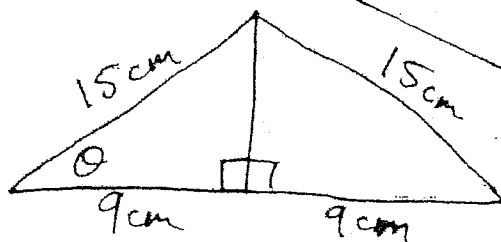$$\dfrac{3 + 7(2\sqrt{2})}{4\sqrt{6}}$$

$$= \dfrac{3 + 14\sqrt{2}}{4\sqrt{6}} \times \dfrac{\sqrt{6}}{\sqrt{6}}$$

$$= \dfrac{3\sqrt{6} + 14\sqrt{12}}{24}$$

$$= \dfrac{3\sqrt{6} + 28\sqrt{3}}{24}$$

③

3.

$$\cos \theta = \dfrac{9}{15}$$

$$\theta \doteq 53°8' \text{ (to nearest min.)}$$

③