

Sydney Girls High School



Mathematics Year 9

Yearly Examination 2007

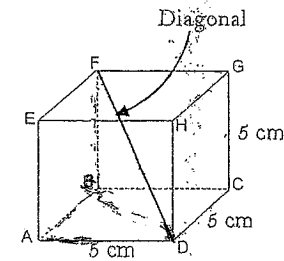
Time Allowed: 75 Minutes

Instructions:

- There are five questions of equal value (20 marks each)
- Attempt all questions.
- Show all necessary working. Marks may be deducted for badly arranged work or incomplete working
- Start each question on a new page.
- Write on one side of paper only.
- Diagrams are NOT to scale.
- Board- approved calculators may be used.

QUESTION 1:

1. Simplify $2\sqrt{32} - 5\sqrt{8}$ 2
2. Expand and simplify $(3\sqrt{2} - 2\sqrt{3})^2$ 2
3. Simplify by rationalising the denominator:
 - a. $\frac{\sqrt{3} + 1}{5\sqrt{3}}$ 2
 - b. $\frac{\sqrt{3} - \sqrt{2}}{\sqrt{3} + \sqrt{2}}$ 2
4. Find the length of the diagonal in the cube shown in the diagram. Express your answer as a surd in its simplest form. 3



5. For the following scores:

6 5 7 2 6 4 3 4

find:

- a. the range 1
- b. the mode 1
- c. the mean 1

QUESTION 2:

1. Solve the following equations:

a. $7 - 3p = 14 - p$ 2

b. $3(2p - 1) - 3(1 + 3p) = 3$ 2

c. $\frac{7a - 21}{2} - \frac{a + 1}{3} = 5$ 2

d. $\frac{3}{2x} = 1 - \frac{4}{x}$ 2

2. Selma is ten years older than Marge, but twenty five years ago, Selma was twice Marge's age. Find Marge's present age. 3

3. Solve the inequation and graph your solution on a number line: $\frac{4 - 5x}{2} < 1$ 3

4. Make c the subject of the formula $A = 2b \times \sqrt{\frac{c}{d}}$. 3

5. Solve the literal equation for x : $m = \frac{1 + bx}{1 + x}$ 3

START QUESTION 3 ON A NEW PAGE.

6. The ages of participants in an aerobics class at a gym are shown below in a stem and leaf plot:

Stem	Leaf
1	4 7 8 8 9
2	0 1 3 5 6 7 9
3	2 4 5 6 7 8
4	2 5
5	3

a. Find the range of ages in the class. 1

b. Find the median age. 1

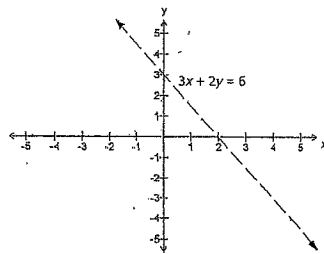
7. For the frequency distribution table below, draw a combined histogram and frequency polygon: 4

x	f
1	4
2	3
3	5
4	0
5	2
6	6

START QUESTION 2 ON A NEW PAGE.

QUESTION 3:

1. For the points $A(-1, 4)$ and $B(5, -4)$, find:
 - a. the distance between A and B ; 2
 - b. the midpoint of the interval joining A and B ; 2
 - c. the gradient of the line passing through A and B ; 2
 - d. the equation of the line AB in general form. 2
2. A vertical line passes through the point $(-5, 6)$. What is its equation? 1
3. Find the equation of the line parallel to $x + 5y - 1 = 0$ and passing through $(2, -5)$. Give your answer in general form. 3
4. Write down the inequation best represented by the graph below. 2



5. The coordinates of the midpoint M , of the interval AB are $(7, 2)$. If the coordinates of A are $(1, -4)$. Find the coordinates of B . 3
6. Two lines $x + 3y + 3 = 0$ and $y = mx + 2$ are perpendicular. Find the value of m . 3

START QUESTION 4 ON A NEW PAGE.

QUESTION 4:

1. Homer is a nuclear power plant technician and is paid \$500 for a 40-hour week. In one week, he works 12 hours overtime of which 8 hours is at time-and-a-half and the remainder is at double time. What are his earnings for that week? 3
2. Patti works at the RTA on an annual salary of \$39 104. If she receives $17\frac{1}{2}\%$ holiday loading on the four weeks holiday pay period, calculate her holiday pay for the four weeks (use 52 weeks per year). 3
3. Moe's gross income is \$64 530. His tax deductions amount to \$1360. Using the tax table below:

<i>Taxable income</i>	<i>Tax on this income</i>
\$0 - \$6000	Nil
\$6001 - \$25000	15c for each \$1 over \$6000
\$25001 - \$75000	\$2850 + 30c for each \$1 over \$25000
\$75001 - \$150000	\$17850 + 40c for each \$1 over \$75000
\$150001 and over	\$47850 + 45c for each \$1 over \$150000

- a. calculate the amount of tax due; 3
 - b. his Medicare levy if it is 1.5% of his taxable income. 2
4. Krusty is offering multiple discounts of 15% and 12% on the cost of a wall clock. If the clock was originally priced at \$98, find the final discounted price. 3

5. Lisa bought a saxophone on terms of \$150 deposit and 24 monthly payments of \$30. The cash price of the saxophone was \$700. How much interest did she pay on the money borrowed? 3
6. Bart bought a magic kit for \$90. If the price included 10% GST, how much would the kit cost *before* GST was added? 3

START QUESTION 5 ON A NEW PAGE.

QUESTION 5:

1. Expand and simplify: $(6 + m)(2 - m)$ 2
2. Expand and simplify: $(2a + 3)^2 - (a + 1)(a - 1)$ 3
3. Factorise fully:
- a. $100a^2 - 25b^2$ 2
- b. $4x^2 - x - 18$ 2
4. Simplify:
- a. $\frac{a^2 + 5a + 6}{a^2 - 9} \times \frac{a^2 - 1}{a^2 + 3a + 2}$ 4
- b. $\frac{x}{x^2 + 7x + 12} - \frac{x + 2}{x^2 + 2x - 3}$ 3
5. Solve for x and y : 4
- $$3x - 8y = 2$$
- $$2x + 5y = 22$$

END OF TEST ☺

YEAR 9 YEARLY EXAMINATION 2007 - SOLUTIONS

Question 1: (20 marks)

1) $2\sqrt{32} - 5\sqrt{8} = 2 \times 4\sqrt{2} - 5 \times 2\sqrt{2}$
 $= 8\sqrt{2} - 10\sqrt{2}$
 $= -2\sqrt{2}$ (2)

2) $(3\sqrt{2} - 2\sqrt{3})^2 = 18 - 12\sqrt{6} + 12$
 $= 30 - 12\sqrt{6}$ (2)

3a) $\frac{\sqrt{3}+1}{5\sqrt{3}} = \frac{\sqrt{3}+1}{5\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}}$
 $= \frac{3+\sqrt{3}}{15}$ (2)

b) $\frac{\sqrt{3}-\sqrt{2}}{\sqrt{3}+\sqrt{2}} = \frac{\sqrt{3}-\sqrt{2}}{\sqrt{3}+\sqrt{2}} \times \frac{\sqrt{3}-\sqrt{2}}{\sqrt{3}-\sqrt{2}}$
 $= \frac{(\sqrt{3}-\sqrt{2})^2}{(\sqrt{3}+\sqrt{2})(\sqrt{3}-\sqrt{2})}$
 $= \frac{3-2\sqrt{6}+2}{3-2}$
 $= 5-2\sqrt{6}$ (2)

4) $BD^2 = 5^2 + 5^2$
 $= 50$

$FD^2 = FB^2 + BD^2$
 $= 25 + 50$
 $= 75$
 $FD = 5\sqrt{3} \text{ cm}$

∴ diagonal of cube is $5\sqrt{3} \text{ cm}$.

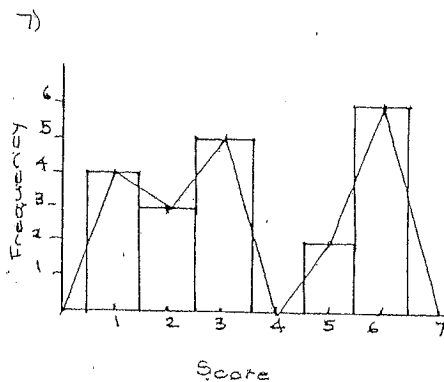
5a) Range = $7-2$
 $= 5$ (1)

b) Mode = 4 and 6 (1)

c) $\bar{x} = \frac{37}{8}$
 $= 4.625$ (1)

6a) Range = $53-14$
 $= 39$ (1)

b) Median = 27 (1)



(4)

Question 2: (20 marks)

1a) $7-3p = 14-p$
 $2p = -7$
 $p = -\frac{7}{2}$ (2)

b) $3(2p-1) - 3(1+3p) = 3$
 $6p-3-3-9p = 3$
 $-3p-6 = 3$
 $3p = -9$
 $p = -3$ (2)

c) $\frac{7a-21}{2} - \frac{a+1}{3} = 5$

$\frac{3(7a-21) - 2(a+1)}{6} = 5$

$21a-63-2a-2 = 30$

$19a-65 = 30$

$19a = 95$

$a = 5$ (2)

d) $\frac{3}{2x} = 1 - \frac{4}{x}$

$3 = 2x - 8$

$2x = 11$

$x = \frac{11}{2}$ (2)

2) Let Marge's age = x

∴ Selma's age = $x+10$

$(x+10) - 25 = 2(x-25)$

$x-15 = 2x-50$

$x = 35$

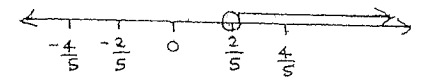
∴ Marge's present age = 35 (3)

3) $\frac{4-5x}{2} < 1$

$4-5x < 2$

$-5x < -2$

$x > \frac{2}{5}$ (3)



4) $A = 2b \times \sqrt{\frac{c}{d}}$

$\frac{A}{2b} = \sqrt{\frac{c}{d}}$

$\frac{A^2}{4b^2} = \frac{c}{d}$

$c = \frac{A^2 d}{4b^2}$ (3)

5) $m = \frac{1+bx}{1+x}$

$m(1+x) = 1+bx$

$m+mx = 1+bx$

$bx-mx = m-1$

$x(b-m) = m-1$

$x = \frac{m-1}{b-m}$ (3)

Question 3: (20 marks)

$$1a) d_{AB} = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

$$= \sqrt{(5+1)^2 + (-4-4)^2}$$

$$= \sqrt{6^2 + (-8)^2}$$

$$= \sqrt{36 + 64}$$

$$= \sqrt{100}$$

$$= 10 \quad (2)$$

$$b) M_{AB} = \left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right)$$

$$= \left(\frac{-1+5}{2}, \frac{4-4}{2} \right)$$

$$= (2, 0) \quad (2)$$

$$c) m_{AB} = \frac{y_2 - y_1}{x_2 - x_1}$$

$$= \frac{-4 - 4}{5 + 1}$$

$$= \frac{-8}{6}$$

$$= -\frac{4}{3} \quad (2)$$

$$d) y - y_1 = m(x - x_1)$$

$$y - 4 = -\frac{4}{3}(x + 1)$$

$$3y - 12 = -4x - 4$$

$$4x + 3y - 8 = 0 \quad (2)$$

$$2) x = -5 \quad (1)$$

$$3) x + 5y - 1 = 0$$

$$5y = -x + 1$$

$$y = -\frac{1}{5}x + \frac{1}{5}$$

$$m_1 = -\frac{1}{5}$$

Parallel lines $m_1 = m_2$

$$\therefore m_2 = -\frac{1}{5}$$

$$y - y_1 = m(x - x_1)$$

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

$$5y + 25 = -x + 2 \quad (3)$$

$$x + 5y + 23 = 0$$

$$4) 3x + 2y < 6 \quad (2)$$

$$5) M = \left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right)$$

$$(7, 2) = \left(\frac{1 + x_2}{2}, \frac{-4 + y_2}{2} \right)$$

$$\frac{1 + x_2}{2} = 7 \quad \frac{-4 + y_2}{2} = 2$$

$$1 + x_2 = 14 \quad -4 + y_2 = 4$$

$$x_2 = 13 \quad y_2 = 8$$

$$\therefore B(13, 8) \quad (3)$$

$$6) x + 3y + 3 = 0 \quad y = -\frac{1}{3}x - 1$$

$$3y = -x - 3 \quad m_2 = m$$

$$y = -\frac{1}{3}x - 1$$

$$m_1 = -\frac{1}{3} \quad (3)$$

Perpendicular lines: $m_2 = -\frac{1}{m_1}$

Question 4: (20 marks)

$$1) \text{ Hourly rate} = \frac{\$500}{40}$$

$$= \$12.50$$

$$\text{Time-and-a-half} = \$12.50 \times 1.5 \times 8$$

$$= \$150$$

$$\text{Double-time} = \$12.50 \times 2 \times 4$$

$$= \$100$$

$$\therefore \text{Weekly wage} = \$500 + \$150 + \$100$$

$$= \$750 \quad (3)$$

$$2) \text{ Weekly pay} = \frac{\$29104}{52}$$

$$= \$752$$

$$\text{Holiday pay} = 117.5\% \times (\$752 \times 4)$$

$$= \$3534.40 \quad (3)$$

$$3) \text{ Taxable Income} = \$64530 - \$1360$$

$$= \$63170$$

$$a) \text{ Tax payable}$$

$$= \$2850 + 0.3 \times (63170 - 25000)$$

$$= \$2850 + \$11451$$

$$= \$14301 \quad (3)$$

$$b) \text{ Medicare levy} = 1.5\% \times \$63170$$

$$= \$947.55 \quad (2)$$

$$4) \text{ Final cost}$$

$$= 0.88 \times 0.85 \times \$98$$

$$= \$73.30 \text{ (nearest cent)}$$

$$5) \text{ Money borrowed} = \$700 - \$150$$

$$= \$550$$

$$\text{Amount repaid} = 24 \times \$30$$

$$= \$720$$

$$\text{Interest paid} = \$720 - \$550$$

$$= \$170$$

$$6) \text{ Let original cost} = x$$

$$110\% \times x = 90$$

$$x = \$81.81$$

(nearest cent)

Question 5: (20 marks)

$$1) (6+m)(2-m) = 12 - 6m + 2m - m^2 \\ = 12 - 4m - m^2 \quad (2)$$

$$2) (2a+3)^2 - (a+1)(a-1)$$

$$= 4a^2 + 12a + 9 - (a^2 - 1)$$

$$= 3a^2 + 12a + 10 \quad (3)$$

$$3 a) 100a^2 - 25b^2 = 25(4a^2 - b^2)$$

$$= 25(2a-b)(2a+b) \quad (2)$$

$$b) 4x^2 - x - 18$$

$$= 4x^2 + 8x - 9x - 18$$

$$= 4x(x+2) - 9(x+2)$$

$$= (x+2)(4x-9) \quad (2)$$

$$4 a) \frac{a^2 + 5a + 6}{a^2 - 9} \times \frac{a^2 - 1}{a^2 + 3a + 2}$$

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

$$= \frac{a-1}{a-3} \quad (4)$$

$$b) \frac{x}{x^2 + 7x + 12} - \frac{x+2}{x^2 + 2x - 3}$$

$$= \frac{x}{(x+4)(x+3)} - \frac{x+2}{(x+3)(x-1)}$$

$$= \frac{x(x-1) - (x+2)(x+4)}{(x+4)(x+3)(x-1)}$$

$$= \frac{x^2 - x - (x^2 + 6x + 8)}{(x+4)(x+3)(x-1)}$$

$$= \frac{-7x - 8}{(x+4)(x+3)(x-1)} \quad (3)$$

$$5) 3x - 8y = 2 \quad (1)$$

$$2x + 5y = 22 \quad (2)$$

$$(1) \times 2 \quad 6x - 16y = 4 \quad (3)$$

$$(2) \times 3 \quad 6x + 15y = 66 \quad (4)$$

$$(3) - (4) \quad 31y = 62 \\ y = 2$$

Sub $y=2$ into (1)

$$3x - 8 \times 2 = 2$$

$$3x - 16 = 2$$

$$3x = 18$$

$$x = 6$$

$$\therefore x = 6, y = 2 \quad (4)$$