

$\frac{6}{25}$

YEAR 11 HALF YEARLY EXAM MATHEMATICS

NAME: Susan Nguyen

CLASS: Ms Nacler

EXAMINER: *J. Agami*

TIME ALLOWED: 1 ½ HOURS

INSTRUCTIONS:

- Show all necessary working
- Marks will be deducted for careless or badly arranged work

92%

QUESTION	MARKS
1	20/20
2	18½/20
3	15/16
4	13/14
5	13½/15
6	13½/15
7	12/15
TOTAL	76½/115

QUESTION 1: (20 marks – 1 mark each)

1. Round off 2869 to the nearest hundred.
2. Divide 28.2 grams of pepper into 9 equal portions, to 1 decimal place.
3. Write 21.003504 correct to seven significant figures.
4. Find the value of $|-2| - |-6|$
5. Simplify $\sqrt{18}$
6. 0.086×100
7. Anna spends $\frac{1}{3}$ of her day sleeping, $\frac{1}{4}$ of her day at school, $\frac{1}{6}$ at work, $\frac{1}{6}$ doing homework. What fraction of the day is left?
8. Increase \$1250 by 8%
9. Evaluate $\frac{8}{4.8 + 7.4 - 5.2}$ to 1 decimal place
10. Simplify: $(2^8)^3$
11. Simplify: $(2^3 + 3^8)^0$
12. Express with a positive index $\frac{1}{3^{-2}}$
13. Evaluate $4^{\frac{3}{2}}$
14. Simplify $5\sqrt{2} + 7\sqrt{2} - 3\sqrt{2}$
15. Factorise $3x^2(2y - 1) + 7x^2(2y - 1)$
16. Factorise $3x^3 + 6x^4 - 15x^5$
17. Write $(2x + 5)^{\frac{1}{2}}$ without a fractional index
18. Solve $y + 2 = -7$
19. Simplify $\frac{3^n}{3^{n-1}}$
20. Complete, to make this product a sum by difference:
 $(x + 5)(\underline{\hspace{2cm}})$

QUESTION 2: (20 marks – 1 mark each)

1. Write 0.0013502 to 4 significant figures.
2. Decrease 220 by 15%
3. Evaluate: $|-2| + 5 - |-14|$
4. Evaluate: $2.35 \times 10^{-3} + 9.328 \times 10^{-4}$
5. Evaluate: $2^{-3} + 2^{-2}$
6. Simplify: $2x^0 \times 5^0 x^2$
7. Simplify: $-6p + 4q - 7q + 3p + p$
8. Find: $3p^4 \times 2p^5$
9. $(4a^2)^3 =$
10. $-5(5e + 1)$
11. Is the expression $p^2 - 16p - 64$ a perfect square?
12. Find the exact value of $\frac{40}{1 - \frac{3}{7}}$
13. Write $\frac{2}{3}$ to 3 decimal places.
14. A school receives a 10% discount on a textbook order of \$6450. Find how much the school pays.
15. If $x^2 = 25$, find x .
16. Remove the parentheses $-7a(2a - 3b + 4c)$
17. Expand $(3x - 5)^2$
18. Find the value of y if $y = 2x + 9$ if $x = 7$.
19. If $y = \frac{2}{x}$, find y when $x = \frac{1}{4}$
20. Simplify $2\sqrt{2} \times 8\sqrt{3}$

QUESTION 3: (16 marks)

1. Write in index form:

(a) $\sqrt[5]{y^3}$ (1)

(b) $\frac{3}{x}$ (1)

2. During one day, 4% of the water in a wading pool is lost by evaporation. If this left 60 litres in the pool, how much water was in the pool at the beginning of the day? (2)

3. Find E if $E = \frac{mv^2}{2}$ and $m = 10.2$, $v = 5.8$ (correct to 2 decimal places) (2)

4. Evaluate $5^{0.3}$, correct to 2 decimal places. (2)

5. Factorise completely: $k^3 - 4k$ (2)

6. Solve $6 - 2x > 0$ (2)

7. Solve $\frac{1}{x} - \frac{1}{2} = \frac{1}{3} - \frac{1}{x}$ (2)

8. Subtract $(1 - x)$ from $(1 + x)$ (2)

QUESTION 4: (14 marks)

1. Find correct to 3 significant figures: $\frac{9.7 \times 4.16}{\sqrt{4.7 - 2.9}}$ (2)

2. Simplify: $8 \times \frac{\left(\frac{-2}{3}\right)^3}{-1}$ (2)

3. Simplify: $\frac{8^{-2}}{9^{-3}}$ without using a calculator (leave answer as a fraction). (2)

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

5. Simplify:
(a) $\sqrt{75} - \sqrt{48}$ (2)

(b) $\sqrt{x^3} + \sqrt{x} - \sqrt{4x}$ (2)

(c) $3\sqrt{3}(\sqrt{8} + 2\sqrt{2})$ (2)

QUESTION 5: (15 marks)

1. Rationalise the denominators and simplify:

(a) $\frac{2\sqrt{5}}{3\sqrt{10}}$ (2)

(b) $\frac{3+2\sqrt{5}}{2\sqrt{5}-1}$ (3)

2. Factorise fully:

(a) $m^2 + 2m - 8$ (1)

(b) $a^3 - b^3$ (1)

(c) $2x^2 - 7x - 15$ (1)

(d) $m - 2 + 4y - 2my$ (2)

3. Expand and simplify: $2b(b-4) - b(2b-5)$ (2)

4. Solve: $\frac{9}{2x} = 4 - \frac{3}{x}$ (2)

QUESTION 6: (15 marks)

1. Show that $\frac{1}{8-\sqrt{2}} + \frac{1}{8+\sqrt{2}}$ is a rational number (2)

2. Find $\frac{x+2}{x^2-x} - \frac{x-3}{x^2+x}$ (3)

3. Simplify: $\frac{x^2-x-6}{2x^3+16} \times \frac{2x}{x^2-3x}$ (3)

4. Find integers 'a' and 'b' such that $\frac{\sqrt{5}}{2+\sqrt{5}} = a + b\sqrt{5}$ (3)

5. Solve for x: $\sqrt{3x-2} = 7$ (2)

6. Solve $\left| \frac{x}{3} \right| > 5$, and graph the solution on a number line. (2)

QUESTION 7: (15 marks)

1. Solve $16x = x^2$ (2)
2. Solve, using the quadratic formula: $3x^2 - x - 1 = 0$
(Leave your answer in surd form). (2)
3. Solve $|2x + 5| = 3x + 9$ (4)
4. Solve and graph on the number line: $2(3x - 6) < \frac{5x + 3}{2}$ (3)
5. Solve $3^{2x} = 27$ (2)
6. Express $0.\dot{2}7$ as a fraction in its simplest terms. (2)

Question 1: (mark each)

- 1) 2900
- 2) 3.1g
- 3) 21.00350
- 4) -4
- 5) $3\sqrt{2}$
- 6) 8.6
- 7) $\frac{1}{2}$
- 8) \$1350
- 9) .1
- 10) 2^{24}
- 11) 1
- 12) 3^2
- 13) 8
- 14) $9\sqrt{2}$

- 9) $64a^6$
- 10) $-25e-5$
- 11) No.
- 12) 70
- 13) 0.667
- 14) \$5305
- 15) $x = \pm 5$
- 16) $-14a^2 + 2lab - 2bac$
- 17) $9x^2 - 30x + 25$
- 18) $y = 23$
- 19) $y = 8$
- 20) $16\sqrt{6}$

$\therefore x < 3$ (2)

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

$\frac{2}{x} = \frac{5}{6}$

$5x = 12$

$\therefore x = 2\frac{2}{5}$ (2)

8) $(1+x) - (1-x)$

$= 1+x - 1+x$

$= 2x$ (2)

- 15) $(2y-1)(3x^2+7x)$
- 16) $3x^3(1+2x-5x^2)$
- 17) $\sqrt{2x+5}$
- 18) $y = -9$
- 19) $\frac{1}{3}$
- 20) $(2x-5)$

Question 3.

1) a) $y^{3/5}$ (1)

b) $3x^{-1}$ (1)

2) $96\% = 60L$

$100\% = \frac{60}{96} \times 100$

$= 62.5$

\therefore there was 62.5L in the pool at start of day. (2)

3) $E = \frac{10 \cdot 2 \times 5 \cdot 8^2}{2}$

$\div 171.56$ (2)

4) 1.62 (2)

5) $k^3 - 4k = k(k^2 - 4)$

$= k(k-2)(k+2)$ (2)

6) $6 - 2x > 0$

$6 > 2x$

Question 4

1) $30 \cdot 1 = \frac{64}{27} = -2 \frac{10}{27}$ (2)

2) $2 \cdot \sqrt[3]{70} = \frac{64}{27}$ (2)

3) $\frac{8^{-2/3}}{9^{2/5}} = \frac{(2^3)^{-2/3}}{(3^2)^{2/5}} = \frac{2^{-2}}{3^5} = \frac{1}{2^2 \times 3^5}$

$= \frac{1}{972}$ (2)

4) $(x-3)(x^2+5x-1)$

$= x(x^2+5x-1) - 3(x^2+5x-1)$

$= x^3 + 5x^2 - x - 3x^2 - 15x + 3$ (2)

$= x^3 + 2x^2 - 16x + 3$ (2)

5) a) $\sqrt{75} - \sqrt{48} = 5\sqrt{3} - 4\sqrt{3} = \sqrt{3}$ (2)

b) $\sqrt{2x^3} + \sqrt{x} - \sqrt{4x} = x\sqrt{x} + \sqrt{x} - 2\sqrt{x}$

$= \sqrt{x}(x-1)$ (2)

c) $3\sqrt{3}(\sqrt{8} + 2\sqrt{2}) = 3\sqrt{24} + 6\sqrt{6}$

$= 6\sqrt{6} + 6\sqrt{6}$

$= 12\sqrt{6}$ (2)

Question 2:

- 1) 0.001350
- 2) 187
- 3) -7 3.3×10^{-3}
- 4) 0.0022828
- 5) $\frac{3}{8}$
- 6) $2x^2$
- 7) $-2p - 3q$
- 8) $6p^9$

Question 5

1) a) $\frac{2\sqrt{5}}{3\sqrt{6}} \times \frac{\sqrt{6}}{\sqrt{6}} = \frac{10\sqrt{2}}{30} = \frac{\sqrt{2}}{3}$ (2)

Question 5

$$1) \frac{3+2\sqrt{5}}{2\sqrt{5}-1} \times \frac{2\sqrt{5}+1}{2\sqrt{5}+1}$$

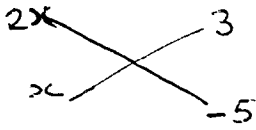
$$= \frac{6\sqrt{5}+3+20+2\sqrt{5}}{20-1}$$

$$= \frac{4\sqrt{5}+1}{19} \times \frac{8\sqrt{5}+23}{19} \quad (3)$$

2) a) $m^2+2m-8 = (m+4)(m-2)$ (1)

b) $a^3-b^3 = (a-b)(a^2+ab+b^2)$ (1)

c) $2x^2-7x+5 = (2x+3)(x-5)$ (2)



d) $m-2+4y-2my = (m-2)+2y(2-m)$
 $= (m-2)(1-2y)$ (2)

3) $2b(b-4)-b(2b-5)$
 $= 2b^2-8b-2b^2+5b$
 $= -3b$ (2)

4) $\frac{9}{2x} = 4 - \frac{3}{x}$
 $9 = 8x - 6$
 $8x = 15$
 $x = 1\frac{7}{8}$ (2)

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

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

3) $\frac{x^2-x-6}{2x^3+16} \times \frac{2x}{x^2-3x}$

$$= \frac{(x-3)(x+2)}{2(x^3+8)} \times \frac{2x}{x(x-3)}$$

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

$$= \frac{1}{x^2-2x+4} \quad (5)$$

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

$$= \frac{2\sqrt{5}-5}{4-5}$$

$$= 5-2\sqrt{5}$$

If $\frac{\sqrt{5}}{2+\sqrt{5}} = a+b\sqrt{5}$, then $a=5$ (3)
 $b=-2$

5) $\sqrt{3x-2} = 7$

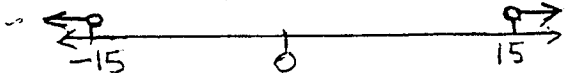
$$3x-2 = 49$$

$$3x = 51$$

$$\therefore x = 17$$

6) $\frac{x}{3} > 5$ or $\frac{x}{3} < -5$ (2)

$x > 15$ or $x < -15$



Question 7:

1) $16x = x^2$

$$x^2-16x = 0$$

$$x(x-16) = 0$$

$$x = 0 \text{ or } x = 16$$

Question 6:

1) $\frac{1}{8-\sqrt{2}} + \frac{1}{8+\sqrt{2}} = \frac{8+\sqrt{2}+8-\sqrt{2}}{8^2-2}$

$$= \frac{16}{62}$$

$$= \frac{8}{31} \quad (2)$$

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

$$2) x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$3x^2 - x - 1 = 0$$

$$\begin{cases} a=3 \\ b=-1 \\ c=-1 \end{cases}$$

$$x = \frac{1 \pm \sqrt{(-1)^2 - 4(3)(-1)}}{2(3)}$$

$$x = \frac{-1 \pm \sqrt{1+12}}{6}$$

(2)

$$\therefore x = \frac{-1 \pm \sqrt{13}}{6}$$

$$3) |2x+5| = 3x+9$$

$$2x+5 = 3x+9 \quad \text{or} \quad -2x-5 = 3x+9$$

$$-4 = x$$

$$-14 = 5x$$

$$\therefore x = -\frac{14}{5}$$

Check $x = -4$

$$|-8+5| = 7+9$$

$$3 = -3$$

False

$\therefore x = -4$ is not a solution

Check $x = -\frac{14}{5}$

$$\left| \frac{-28}{5} + 5 \right| = \frac{-42}{5} + 9$$

$$\left| \frac{-3}{5} \right| = \frac{3}{5}$$

$$\frac{3}{5} = \frac{3}{5}$$

True

$\therefore x = -\frac{14}{5}$ is a solution

(4)

$$4) 2(3x-6) < \frac{5x+3}{2}$$

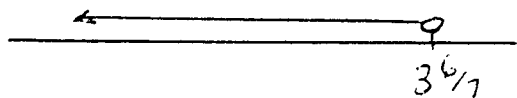
$$4(3x-6) < 5x+3$$

$$12x-24 < 5x+3$$

$$7x < 27$$

$$x < 3\frac{6}{7}$$

(3)



$$5) 3^{2x} = 27$$

$$3^{2x} = 3^3$$

Equating indices

$$2x = 3$$

$$\therefore x = 1\frac{1}{2}$$

(2)

$$6) \text{ Let } x = 0.2777\dots$$

$$\text{then } 10x = 2.7777\dots \quad \text{--- (1)}$$

$$\text{and } 100x = 27.7777\dots \quad \text{--- (2)}$$

$$\text{(2) - (1): } 90x = 25$$

$$x = \frac{25}{90}$$

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

(2)