



2 Unit Mathematics Assessment 27/2/1998

Year 11

Question 1.

- 2 a) Evaluate $\frac{4 + \sqrt{40}}{4}$ correct to 2 decimal places.
- 2 b) A person's heart beats approximately 72 times per minute. Assuming there are 365 days in every year, find how many times a heart would beat in 70 years. Give your answer in scientific notation correct to three significant figures.
- c) The radius, r , of a conical flask of height h and volume V is given by $r = \sqrt[3]{\frac{3V}{\pi h}}$. A manufacturer is required to produce two conical flasks each having a volume of $1\,000\text{ cm}^3$. Calculate, in centimetres, and correct to one decimal place
- 1 (i) the radius of the conical flask of height 50 cm.
- 2 (ii) the radius of the conical flask with height and radius of equal magnitude.
- 2 d) Graph on the number line the solution set of $-12 \leq \frac{2x}{3} < 4$.
- 1 e) "At Gosford High there are four houses, so that the probability that O.S.U. will win the next swimming carnival is $\frac{1}{4}$ ". Is this statement true or false? Explain in no more than one sentence.
- 2 f) Express with a rational denominator $\frac{6}{7 - 2\sqrt{5}}$.

Question 2.

- 2 a) Solve for x : $|1 - 2x| = 5$
- 2 b) Find the exact values of x if $(x - 1)^2 = 7$
- 2 c) At Octopus Communications' annual sale, all mobile phones were discounted by 40%. Arun paid \$156 for a mobile phone at the sale. What was the original price of the phone?
- 2 d) If $x\sqrt{3} + 4\sqrt{y} = \sqrt{75} + \sqrt{80} + \sqrt{12}$ find the value of x and y .
- 2 e) Show that the recurring decimal 0.47 is rational.

2 f) Solve for x : $|3x - 2| \leq 4$

Question 3.

- 2 a) Factor fully: $x^3y - xy^3$
- 2 b) Simplify: $\frac{1}{x} - \frac{1-x}{2x}$
- 1 c) Solve: (i) $4 - x = 5$
- 2 (ii) $2x^2 - 7x - 4 = 0$
- 2 (iii) $2 - (1 - x) \leq 3 + 2x$
- 2 (iv) $x^2 = 9x$
- 1 d) Find the value of x if 2^x is half of 2^{400}

Question 4.

- 2 a) Solve $|5 - 2x| \geq 3$
- 2 b) Solve $\frac{3x - 2}{4} - \frac{2x + 1}{8} = 5$
- 2 c) Factorise fully $a^2 - b^2 - 3a + 3b$
- 2 d) Factorise $8x^3 - 1\,000$
- 2 e) If $x + \frac{1}{x} = k$ what is the value of $x^2 + \frac{1}{x^2}$
- 2 f) Solve the simultaneous equations $3x - 2y = 8$ and $5x - 6y = 16$

Question 5.

- 2 a) Solve for x : $|x + 7| = 3x - 1$
- 2 b) Find in terms of a $(x - 1)(x^2 + x + 1)$ when $x = \sqrt[3]{a + 1}$
- 2 (c) Solve the simultaneous equations $xy = 8$ and $x + y = 6$
- 2 (d) Simplify (i) $\frac{a - b}{b - a}$ (ii) $\frac{x - 3}{x^2 - 9}$
- 2 (e) Simplify $\frac{x + 1}{1 - x} + \frac{x - 1}{1 + x}$
- 2 (f) Find the value of x and y if $x + 2y + 2\sqrt{5} = 11 + \sqrt{x - y}$

3 Unit Only

- a) Solve $\frac{3}{x - 5} \leq 1$
- b) Write down a quadratic, in x , such that the quadratic is greater than or equal to zero if $x \leq -2$ or $x \geq 3$ and less than zero for any other values of x .

Q1) a) $\frac{4+\sqrt{40}}{4}$
 $= 2.58$

b) 2.65×10^9

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

(i) $r = \sqrt{\frac{3 \times 1000}{\pi \times 50}}$
 $= 4.4 \text{ cm}$

(ii) $r = \sqrt{\frac{3000}{\pi}}$

$r^2 = \frac{3000}{\pi}$

$r^3 = \frac{300}{\pi}$

$r = 9.8 \text{ cm}$

d) $-12 \leq \frac{2x}{3} \leq 4$
 $-36 \leq 2x \leq 12$
 $-18 \leq x \leq 6$



e) False: swimmers not all of the same ability.

(f) $\frac{6}{7-2\sqrt{5}}$
 $= \frac{6}{7-2\sqrt{5}} \times \frac{7+2\sqrt{5}}{7+2\sqrt{5}}$
 $= \frac{42+12\sqrt{5}}{49-20}$
 $= \frac{42+12\sqrt{5}}{29}$

Ques 2

a) $|1-2x| = 5$

$1-2x = 5$ or $1-2x = -5$
 $-2x = 4$ $-2x = -6$
 $x = -2$ $x = 3$

b) $(x-1)^2 = 7$

$x-1 = \sqrt{7}$ or $x-1 = -\sqrt{7}$
 $x = 1+\sqrt{7}$ or $x = 1-\sqrt{7}$

c) $60\% = \$156$

$10\% = 2.6$

$100\% = \$260$

\therefore original price = \$260

d) $x\sqrt{3} + 4\sqrt{y} = \sqrt{95} + \sqrt{40} + \sqrt{16}$
 $= \sqrt{25} \cdot \sqrt{3} + \sqrt{16} \cdot \sqrt{5} + \sqrt{4} \cdot \sqrt{3}$
 $= 5\sqrt{3} + 4\sqrt{5} + 2\sqrt{3}$
 $= 7\sqrt{3} + 4\sqrt{5}$
 $\therefore x = 7, y = 5$

e) let $x = 0.47474747 \dots$ (1)
 $\therefore 100x = 47.474747 \dots$ (2)

(2) - (1) $99x = 47$
 $x = \frac{47}{99}$

\therefore rational

(f) $|3x-2| \leq 4$

$-4 \leq 3x-2 \leq 4$
 $-2 \leq 3x \leq 6$
 $-\frac{2}{3} \leq x \leq 2$

Question 3

a) $x^3y - xy^3$
 $= xy(x^2 - y^2)$
 $= xy(x+y)(x-y)$

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

c) (i) $4-x = 5$
 $-x = 1$
 $x = -1$

(ii) $2x^2 - 7x - 4 = 0$
 $(2x+1)(x-4) = 0$
 $x = -\frac{1}{2}, 4$

(iii) $2 - (1-x) \leq 3+2x$
 $2-1+x \leq 3+2x$
 $1+x \leq 3+2x$
 $-2 \leq x$

(iv) $x^2 = 9x$
 $x^2 - 9x = 0$
 $x(x-9) = 0$
 $x = 0, 9$

(d) $2^x = 2^{400} \div 2$
 $2^x = 2^{399}$
 $\therefore x = 399$

Ques 4

a) $|5-2x| \geq 3$

$5-2x \leq -3$ or $3 \leq 5-2x$
 $-2x \leq -8$ or $-2 \leq -2x$
 $x \geq 4$ $x \leq 1$

b) $\frac{3x-2}{4} - \frac{2x+1}{8} = 5$
 $2(3x-2) - (2x+1) = 40$
 $6x-4-2x-1 = 40$
 $4x-5 = 40$
 $4x = 45$
 $x = 11\frac{1}{4}$

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

d) $8x^3 - 1000$
 $= 8(x^3 - 125)$
 $= 8(x-5)(x^2+5x+25)$

(e) $(x+\frac{1}{x})^2 = x^2 + 2 + \frac{1}{x^2}$
 $\therefore x^2 + \frac{1}{x^2} = (x+\frac{1}{x})^2 - 2$
 $= k^2 - 2$

(f) $3x-2y = 8 \dots (1)$
 $5x-6y = 16 \dots (2)$

(1) $\times 3$ $9x-6y = 24 \dots (3)$

(3) - (2) $4x = 8$
 $x = 2$

Subst $x=2$ into (1)
 $6-2y = 8$
 $y = -1$

$\therefore x = 2, y = -1$

Ques 5

a) $|x+7| = 3x-1$

$x+7 = 3x-1$ or $x+7 = -(3x-1)$

$8 = 2x$ $4x = -6$
 $4 = x$ $x = -1\frac{1}{2}$

Get solutions:

$x = 4$ $x = -1\frac{1}{2}$
 $|4+7| = 12-1$ $|5\frac{1}{2}| = -4.5-1$
 True False

$\therefore x = 4$

(b) $(x-1)(x^2+x+1)$
 $= x^3 - 1$
 $= (3\sqrt{9+1})^3 - 1$
 $= 9+1 - 1$
 $= 9$

(c) $xy = 8 \dots (1)$
 $2x+y = 6 \dots (2)$

from (2) $y = 6-2x$
 Subst into (1)

$x(6-2x) = 8$

$6x - 2x^2 = 8$

$x^2 - 3x + 4 = 0$

$(x-4)(x-2) = 0$

$x = 2$, or 4

Subst into (2)

$y = 4$ or 2

$\therefore x = 2$ or $x = 4$
 $y = 4$ or $y = 2$

d) (i) $\frac{a-b}{b-a}$
 $= -1$

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

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

$= \frac{1}{x+3}$

e) $\frac{x+1}{1-x} + \frac{x-1}{1+x}$

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

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

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

(f) $x+2y+2\sqrt{5} = 11 + \sqrt{x-y}$
 $x+2y+\sqrt{20} = 11 + \sqrt{x-y}$

$\therefore x+2y = 11 \dots (1)$

$x-y = 20 \dots (2)$

(1) - (2) $3y = -9$

$y = -3$

Subst. $y = -3$ into (2)

$x+3 = 20$

$\therefore x = 17$

$\therefore x = 17, y = -3$

3 UNIT

a) $\frac{3}{x-5} \leq 1$

Critical pts: $x = 5$

and $\frac{3}{x-5} = 1$

$3 = x-5$

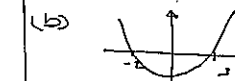
$8 = x$

test $x = 0$

$\frac{3}{-5} \leq 1$

true

$\therefore x < 5$ or $8 \leq x$



$y = (x+2)(x-2)$

$y = x^2 - x - 6$