



THE UNIVERSITY
OF QUEENSLAND
AUSTRALIA

Tute no. _____

VENUE: _____
 SEAT NUMBER: _____
 STUDENT NUMBER: _____
 STUDENT NAME: **SOLUTIONS**
Family Name

First Name

St Lucia Campus

Mid-Semester EXAMINATION

Semester One 2011

MATH1040/7040 BASIC MATHEMATICS

PERUSAL TIME 10 mins. During perusal, write on the blank paper provided
 WRITING TIME 1:30 Hours
 EXAMINER Michael Jennings

This examination paper has 13 pages (not including the title page) and is printed Single-Sided

THIS EXAMINATION PAPER MUST NOT BE REMOVED FROM THE EXAMINATION ROOM

Exam Type:	Closed Book - Specified materials permitted
Permitted Materials:	<p>Calculator - Yes - Casio FX82 series or UQ approved (labelled)</p> <p>Dictionary - Yes - Any unmarked paper dictionary is permitted</p> <p>Other - - No electronic aids are permitted (e.g. laptops, phones)</p>
Answer: (Where students should write answers)	<p>All Questions on Examination paper in spaces provided</p> <p>_____</p> <p>_____</p> <p>_____</p>
Other Instructions:	
Total Number of Questions: (for the whole examination)	49
Total Number of Marks	85 total marks

Examiner's use ONLY
 Question Mark

A	
1-30	
1-9	
B	
1	
2-3	
4	
5-6	
7	
8	
9	
10	

TOTAL

Students must comply with the General Award Rules 1A.5 and 1A.7 which outline the responsibilities of students during an examination.

Part A

For each of the following 30 questions, enter the correct value of x into the corresponding box. There is no need to show any working. Each correct answer is worth 1 mark; each incorrect answer is worth 0 marks. (Hint: in each case, x is an integer between -6 and 6 inclusive.)

1. $x = 2 + 3 \times -1$

-1

2. $x = (-1 - 1)^2$

4

3. $x = \frac{3 \times 4 + 6}{-3 + 2 \times 3}$

6

4. $x = 25^{\frac{1}{2}}$

5

5. $x = -|-2 - 3| - |2 - 3|$

-6

6. $x = |-2^0|$

1

7. The point $(2, x)$ lies on the line $y = 6$.

6

8. x is the gradient of a line perpendicular to $y = \frac{1}{4}x + 2$.

-4

9. x is the y -intercept on the graph $y = 3t$.

0

10. $\frac{1}{x+2} = \frac{2}{6}$

1

11. $-4 + x = 3x$

-2

12. $2(x + 4) = 14$

3

13. $x + 2 = 6 - x$

2

14. $6(x - 1) = 5(1 - x)$

1

continued...

$$15. x = \frac{-\sqrt{3}}{6} \times 2\sqrt{3}$$

-1

$$16. x\sqrt{2} = \sqrt{8}$$

2

$$17. (3\sqrt{4})^2 \div x = -12$$

-3

$$18. x \times x \div 2 = \frac{9}{2}$$

± 3

$$19. \sum_{i=-1}^3 i = x$$

5

$$20. \sum_{j=5}^6 2jx = -22$$

-1

$$21. \sum_{j=0}^2 3x = 9$$

1

22. The gradient of a horizontal line is x .

0

23. The highest power of any variable in a linear equation is x .

1

$$24. x^2 = 12 + x$$

4 or -3

$$25. 2^{\frac{3}{x}} = \frac{1}{\sqrt{2}}$$

-6

$$26. \frac{-3}{x} + \frac{-3}{x} = 1$$

-6

$$27. x^2 = 3^2 + 4^2$$

± 5

$$28. \sqrt{-x} = \sqrt{4}$$

-4

$$29. 4^x = 14 + x$$

2

$$30. 40^{\frac{1}{2}} = x\sqrt{10}$$

2

continued...

For each of the following nine multiple-choice questions, enter the letter corresponding to the correct answer in the corresponding box. There is no need to show any working. Each correct answer is worth 1 mark; each incorrect answer is worth 0 marks.

1. Two numbers that lie in the interval $(-3, 2]$ are:

- (A) -3 and 2
- (B) 0 and 2.1
- (C) -2.6 and 3
- (D) -2 and 2
- (E) 0.5 and 10
- (F) 0.9 and 3.1

Answer to Question 1:

2. $\frac{a}{b} + \frac{b}{a}$ equals:

- (A) $b^2 + a^2$
- (B) 1
- (C) $\frac{ab}{ba}$
- (D) $a + b$
- (E) $\frac{b^2 + a^2}{ab}$
- (F) 0

Answer to Question 2:

3. $(a - b)^2$ expands and simplifies to:

- (A) $2a - 2b$
- (B) $a^2 - b^2$
- (C) $a^2 - ab - b^2$
- (D) $a^2 - 2ab - b^2$
- (E) $a^2 - 2ab + b^2$
- (F) $a^2 + b^2$

Answer to Question 3:

continued...

4. The line $y = 6x - 5$ will cut the y -axis at the same point as the line

(A) $y = 6x + 5$

(B) $y = 5x - 6$

(C) $y = 3x - 5$

(D) $y = \frac{1}{6}x + 5$

(E) $y = 5$

(F) $x = -5$

Answer to Question 4:

C

5. $3a^3b^2c \times 3a^2b$ simplifies to:

(A) $9a^6b^3c$

(B) $9a^6b^2$

(C) $6a^5b^2c$

(D) $6a^5b^3c$

(E) $9a^5b^3c$

(F) $6a^6b^3c^2$

Answer to Question 5:

E

6. $2e^4f + 2e^4f$ simplifies to:

(A) $4e^8f^2$

(B) $2e^8f$

(C) $2e^4f^2$

(D) $4e^4f^2$

(E) $4e^4f$

(F) $2ef$

Answer to Question 6:

E

continued...

7. What is the value of the gradient of a vertical line?

- (A) 0
- (B) 1
- (C) -1
- (D) It depends.
- (E) Not defined.
- (F) 100

Answer to Question 7:

E

8. For all $a, b \geq 0$, $\sqrt{a} - \sqrt{b} =$

- (A) $\sqrt{a - b}$
- (B) $\sqrt{a} + \sqrt{-b}$
- (C) $\sqrt{a} - \sqrt{b}$
- (D) 0
- (E) $\sqrt{b} - \sqrt{a}$
- (F) $\sqrt{\frac{a}{b}}$

Answer to Question 8:

C

9. For all a, m, n , $(a^m)^n =$

- (A) a^{mn}
- (B) $a^m a^n$
- (C) a^{m+n}
- (D) a^{m-n}
- (E) $(m^a)^n$
- (F) $(n^a)^m$

Answer to Question 9:

A

continued...

~~9~~

Part B

Each of the following questions carries the stated number of marks. Write your answers in the space provided. Part marks will be awarded for correct working.

1. (a) Simplify $\frac{1}{2} - \frac{1}{3} \times \left(\frac{-3}{2}\right)^3 \div 3^2$. Show all working.

(3 marks)

$$\begin{aligned} & \frac{1}{2} - \frac{1}{3} \times \frac{-27}{8} \div 9 \\ = & \frac{1}{2} - \frac{-27}{24} \times \frac{1}{9} \\ = & \frac{1}{2} + \frac{9}{8} \times \frac{1}{9} \\ = & \frac{1}{2} + \frac{1}{8} = \frac{4}{8} + \frac{1}{8} = \frac{5}{8} \end{aligned}$$

- (b) Simplify $-\sqrt{24} + 3\sqrt{54} - 2\sqrt{96}$. Leave your answer as a simplified surd. Show all working.

(3 marks)

$$\begin{aligned} & -\sqrt{4}\sqrt{6} + 3\sqrt{9}\sqrt{6} - 2\sqrt{16}\sqrt{6} \\ = & -2\sqrt{6} + 9\sqrt{6} - 8\sqrt{6} \\ = & -\sqrt{6} \end{aligned}$$

continued...

2. Solve for x : $\frac{2}{2-3x} + \frac{3}{5x+1} = 0$

(3 marks)

$$\frac{2(5x+1) + 3(2-3x)}{(2-3x)(5x+1)} = 0$$

$$10x + 2 + 6 - 9x = 0$$

$$x + 8 = 0$$

$$x = -8$$

3. Solve $|-5x + 2| + 3 = 5$

(2 marks)

$$|-5x + 2| = 2$$

$$-5x + 2 = 2$$

$$-5x = 0$$

$$x = 0$$

$$-5x + 2 = -2$$

$$-5x = -4$$

$$x = \frac{4}{5}$$

continued...

5

4. (a) Find all x for which $-5x + 2 \geq -(-x + 4)$, writing your answer in inequality form. (An example of inequality form is $x > \dots$). (3 marks)

$$-5x + 2 \geq x - 4$$

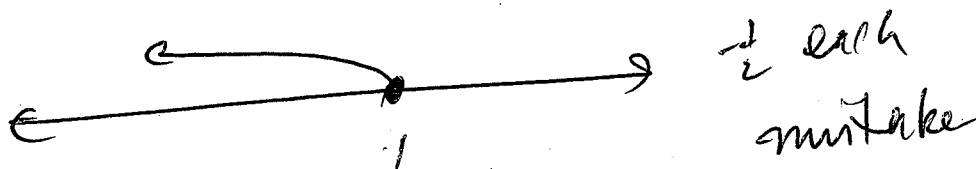
$$-6x \geq -6$$

$$x \leq 1$$

- (b) Write your answer to part (a) in interval format. (1 mark)

answers should match part a) $(-\infty, 1]$ $\frac{1}{2}$ for each mistake

- (c) Mark your answer to part (a) on the real line. (1 mark)



continued...

5. (a) Write in summation (sigma) notation:

$$3x^2 + 4x^3 + 5x^4 + \dots$$

(2 marks)

any correct answer is fine

$$\sum_{i=2}^{\infty} (i+1)x^i$$

$$\sum_{i=2}^{\infty} (i+1)x^i$$

(b) Write in summation (sigma) notation:

$$3 + 3 + 3 + 3$$

(2 marks)

$$\sum_{i=1}^3 3$$

$$\sum_{i=1}^3 12$$

any correct answer is fine

6. Simplify $k^2(k^3 + k^{-2}) - \frac{k}{(k^{-3})^2}$

(4 marks)

$$k^5 + k^0 - \frac{k}{k^{-6}}$$

$$= k^5 + 1 - k^7$$

continued...

7. Let A be the point (0, 3) and B be the point $(\frac{1}{3}, 5)$.

(a) What is the equation of the line between A and B?

(3 marks)

$$m = \frac{5-3}{\frac{1}{3}-0} = \frac{2}{\frac{1}{3}} = 6 \quad \text{✓}$$

$$y = 6x + c \quad \text{✓}$$

$$3 = 6 \times 0 + c$$

$$c = 3 \quad \text{✓}$$

$$\therefore y = 6x + 3 \quad \text{✓}$$

(b) What is the distance between A and B? Write your answer as a simplified surd.

(2 marks)

$$d = \sqrt{\left(\frac{1}{3}-0\right)^2 + (5-3)^2} \quad \text{✓}$$

$$= \sqrt{\frac{1}{9} + 4} \quad \text{✓}$$

$$= \sqrt{4\frac{1}{9}} \quad \text{✓}$$

$$= \sqrt{\frac{37}{9}}$$

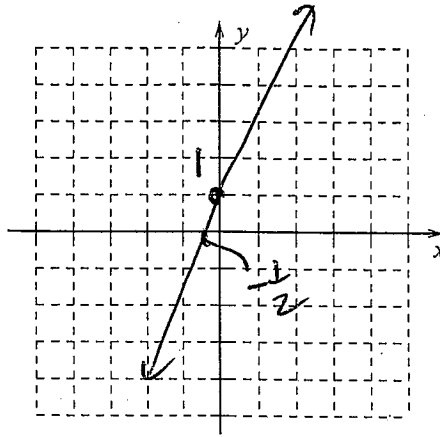
$$= \frac{\sqrt{37}}{3} \quad \text{✓}$$

continued...

5

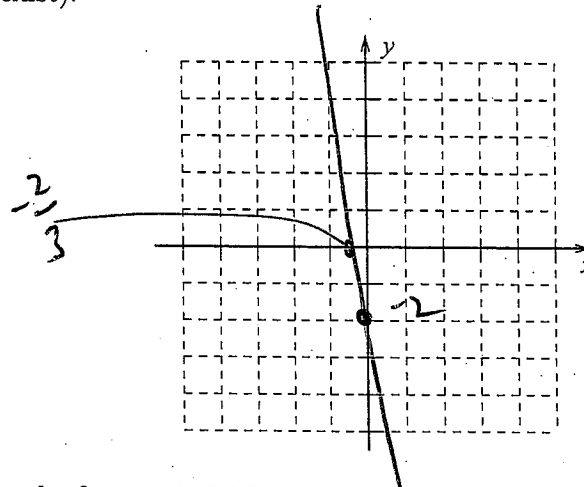
8. (a) Sketch the graph of $y = 2x + 1$. Make sure you include the x - and y - intercepts (where they exist). (2 marks)

$\frac{1}{2}$ mk x-int
 " y-int
 1 mk line
 (rising)



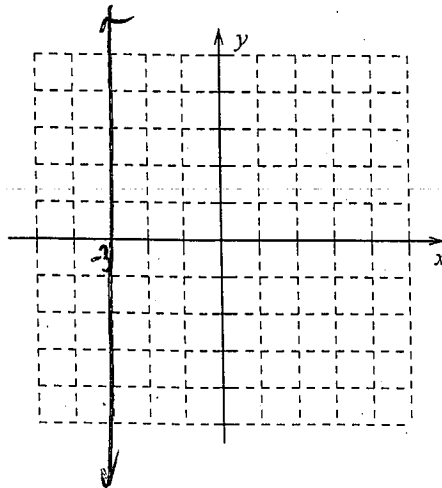
- (b) Sketch the graph of $y = -3x - 2$. Make sure you include the x - and y - intercepts (where they exist). (2 marks)

$\frac{1}{2}$ mk x-int
 " y-int
 1 mk line
 (falling)



- (c) Sketch the graph of $x = -3$. Make sure you include the x - and y - intercepts (where they exist). (2 marks)

1 mk x-int
 1 mk line



continued...

9. (a) What is the equation of the line parallel to $y = 4x - 3$ and passing through the point $(-2, -7)$? (3 marks)

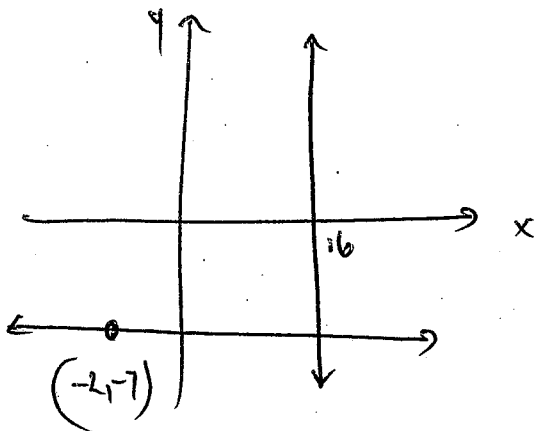
Parallel line is $y = 4x + c$ ✓

$$-7 = 4x - 2 + c$$

$$c = 1$$
 ✓

$$\therefore y = 4x + 1$$
 ✓

- (b) What is the equation of the line perpendicular to $x = 16$ and passing through the point $(-2, -7)$? (2 marks)



Perpendicular line

is $y = c$, ✓

so $y = -7$. ✓

continued...

10. (a) Solve the following system of two simultaneous equations.

$$\begin{aligned} x - 4y &= -4 & \text{--- (1)} \\ -3x + 12y &= 4 & \text{--- (2)} \end{aligned}$$

(3 marks)

$$\begin{aligned} \textcircled{1} \times 3 & \quad 3x - 12y = -12 & \text{--- (3)} \\ + & \quad -3x + 12y = 4 & \text{--- (2)} \\ \hline & \quad 0 = -8 & \text{--- (4)} \end{aligned}$$

Not true, \therefore no solution \checkmark

the lines are parallel. \checkmark

(b) Determine the solution to the pair of equations $0 = 5x - y - 4$ and $x + 2y = 14$.

(3 marks)

$$\begin{aligned} 5x - y &= 4 & \text{--- (1)} \\ x + 2y &= 14 & \text{--- (2)} \end{aligned}$$

$$\begin{aligned} \textcircled{1} \times 2 & \quad 10x - 2y = 8 & \text{--- (3)} \\ + & \quad x + 2y = 14 & \text{--- (2)} \\ \hline & \quad 11x = 22 & \text{--- (4)} \end{aligned}$$

$$11x = 22$$

$$x = 2 \quad \checkmark$$

Sub $x=2$ into $\textcircled{2}$ $2 + 2y = 14 \Rightarrow 2y = 12, y = 6 \quad \checkmark$

End of exam

~~Some formulae: Distance between two points. $d = \sqrt{(x_1 - x_2)^2 + (y_1 - y_2)^2}$.~~

ANS : $(2, 6)$