

THE UNIVERSITY OF QUEENSLAND

Mid Semester Examination, April 2011

**MATH1040/7040: BASIC MATHEMATICS**  
**ST LUCIA and EXTERNAL STUDENTS**

Time allowed: 90 minutes

In addition, there will be 10 minutes for perusal

Total marks on this paper: 85

Scientific calculators allowed

First name(s): \_\_\_\_\_

Family Name: \_\_\_\_\_

Student Number: \_\_\_\_\_

Signature: \_\_\_\_\_

Photo Identification checked by (office use only): \_\_\_\_\_

There are two parts to this paper. Part A is worth 39 marks, and Part B is worth 46 marks. Each question in Part A is worth 1 mark for a correct answer, and 0 marks for an incorrect answer. There are 10 questions in Part B; each question carries the stated number of marks, and part marks will be awarded for correct working.

There are some formulae on the last page of this paper.

Write your answers (including rough working in Part B), in the space provided. If you need extra room, use the back of other pages. You will be issued with a single sheet of blank paper. During perusal, you may write on the blank sheet, but not on this exam booklet. Do not write on the single sheet once perusal is over. Your single sheet will be collected with your exam script and will be destroyed (so material written on that sheet will not be assessed).

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

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

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

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

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

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

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

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

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

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

11.  $-4 + x = 3x$

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

13.  $x + 2 = 6 - x$

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

*continued...*

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

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

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

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

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

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

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

22. The gradient of a horizontal line is  $x$ .

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

24.  $x^2 = 12 + x$

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

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

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

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

29.  $4^x = 14 + x$

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

*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:

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:

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:

*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:

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:

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:

*continued...*

## 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)

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

(3 marks)

*continued...*

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

(3 marks)

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

(2 marks)

*continued...*



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)

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

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

*continued...*

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

$$3x^2 + 4x^3 + 5x^4 + \dots \quad (2 \text{ marks})$$

(b) Write in summation (sigma) notation:

$$3 + 3 + 3 + 3 \quad (2 \text{ marks})$$

6. Simplify  $k^2 (k^3 + k^{-2}) - \frac{k}{(k^{-3})^2}$ . (4 marks)

*continued...*

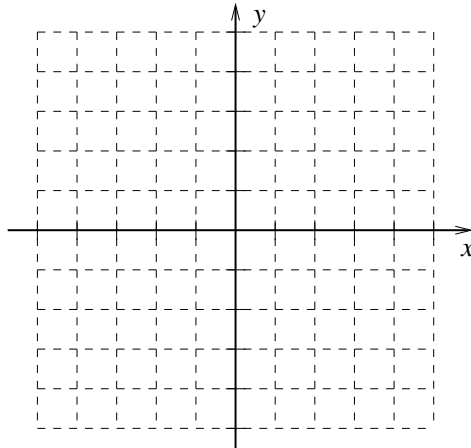
7. Let A be the point  $(0, 3)$  and B be the point  $\left(\frac{1}{3}, 5\right)$ .

(a) What is the equation of the line between A and B? (3 marks)

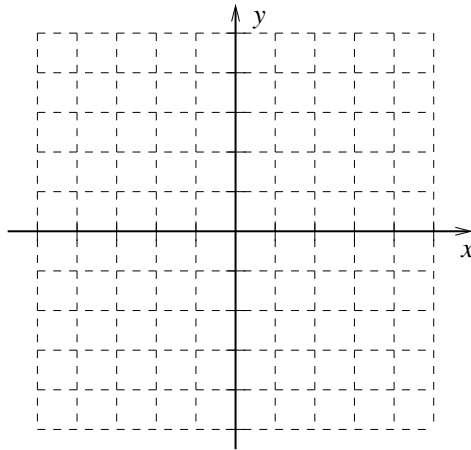
(b) What is the distance between A and B? Write your answer as a simplified surd. (2 marks)

*continued...*

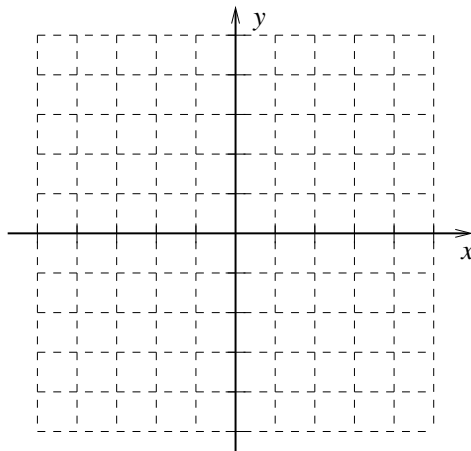
8. (a) Sketch the graph of  $y = 2x + 1$ . Make sure you include the  $x$ - and  $y$ - intercepts (where they exist). (2 marks)



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



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



*continued...*

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

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

*continued...*

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

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

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

**End of exam**

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