



**Revision Examination Assessment Papers (REAP)
Semester 1 Examination 2012**

Question/Answer Booklet

(This paper is not to be released to take home before 25/6/2012)

**MATHEMATICS:
SPECIALIST 3A**

**Section One:
Calculator-free**

Name of Student: _____

Time allowed for this section

Reading time before commencing work: 5 minutes

Working time for this section: 50 minutes

Materials required/recommended for this section

To be provided by the supervisor

This Question/Answer Booklet

Formula Sheet

To be provided by the student

Standard items: pens, pencils, pencil sharpener, eraser, correction fluid/tape, ruler,
highlighters

Special items: nil

Important note to students

No other items may be used in this section of the examination. It is **your** responsibility to ensure that you do not have any unauthorised notes or other items in the examination room. If you have any unauthorised material with you, hand it to the supervisor **before** reading any further.

Structure of this paper

Section	Number of questions available	Number of questions to be answered	Working time (minutes)	Marks available	Percentage of exam
Section One Calculator-free	6	6	50	50	
Section Two Calculator-assumed	12	12	100	100	
			Total	150	100

Instructions to students

- 1 Write your answers in the spaces provided in this Question/Answer Booklet. Spare pages are included at the end of this booklet. They can be used for planning your responses and/or as additional space if required to continue an answer. If you need to use the space to continue an answer, indicate in the original answer space where the answer is continued. i.e. give the page number. Fill in the number of the question(s) that you are continuing to answer at the top of the page.
- 2 **Show all your working clearly.** Your working should be in sufficient detail to allow your answers to be checked readily and for marks to be awarded for reasoning. Incorrect answers given without supporting reasoning cannot be allocated any marks. For any question or part question worth more than two marks, valid working or justification is required to receive full marks. If you repeat an answer to any question, ensure that you cancel the answer you do not wish to have marked.
- 3 It is recommended that you **do not use pencil**, except in diagrams.

Section One: Calculator-free

(50 marks)

This section has **six (6)** questions. Answer all questions. Write your answers in the spaces provided.

Working time: 50 minutes

Question 1**(10 marks)**

Let P be point with polar coordinates $\left(4, \frac{2\pi}{3}\right)$ and O with co-ordinates (0,0)

(i) State the **Cartesian** co-ordinates of P. (3)

(ii) Q is a point which lies in the first quadrant such that it has Cartesian co-ordinates $(4, 4\sqrt{3})$. State the **polar** co-ordinates of Q. (2)

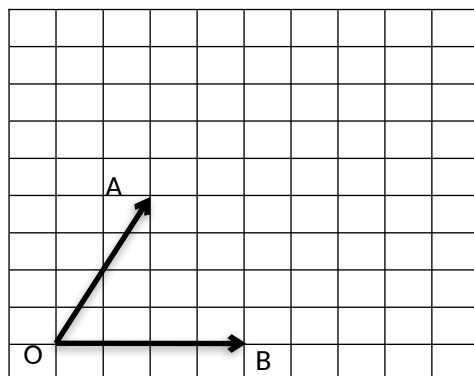
(iii) Hence, calculate the **exact** distance between P and Q. (3)

(iv) Hence, or otherwise state what type of triangle is $\triangle POQ$? Justify your answer. (2)

Question 2

(10 marks)

(a)



It is given that $OA = 4a$ and $OB = 4b$.

(i) If $BP = 2a - b$, mark the point P on the grid. (2)

(ii) Q is the point of intersection of OA and BP produced. Mark the point Q clearly on the grid. Hence state the value of n given that $OQ = nOA$. (2)

(iii) If $\vec{CA} = \frac{1}{2}\vec{OB}$, mark the point C on the grid. (1)

(iv) If $OA = 2i + 4j$, express BC in $i - j$ component. (1)

(b) Solve the equation.

(4)

$$2^{x+1} + 7 = \frac{2^2}{2^x}$$

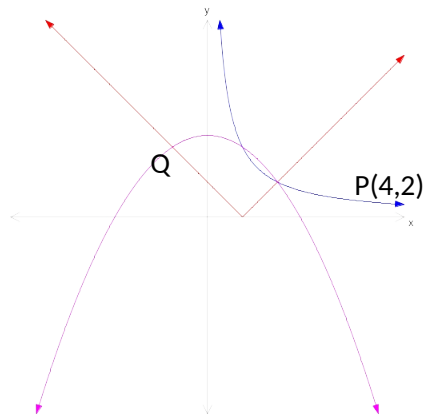
Question 3

(9 marks)

The graphs of $f(x)$, $g(x)$ and $h(x)$ are drawn below such that

- $f(x)$ is a reciprocal function, $x > 0$.
- $g(x)$ is a quadratic function such that $6y = -x^2 + 28$
- $h(x)$ is the absolute value function $h(x) = |x - m|$, where m is a constant

The point $P(4,2)$ is the point of intersection of the three graphs.



(a) Determine the equation of $f(x)$ (2)

(b) Show that the value of m is 2. (3)

(c) Calculate the co-ordinates of Q. (4)

Question 4**(6 marks)**

If $f(x) = (x - 1)^2 - 4$, $x \leq 1$ and $g(x) = \sqrt{x + 4}$, $x \geq -4$

(i) Find $f(-2)$. (1)

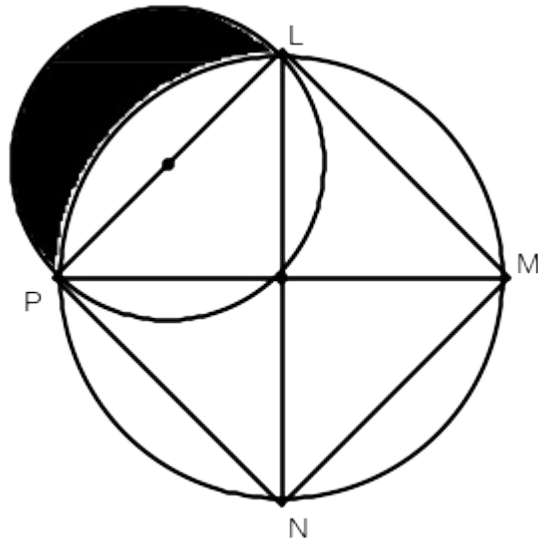
(ii) Determine and simplify $g[f(x)]$. (3)

(iii) State the natural domain and corresponding range of $g[f(x)]$. (2)

Question 5

(6 marks)

In the diagram below, LMNP is a square whose diagonals are each 2cm long. MP and LP are diameters of the bigger and smaller circles respectively. Find the perimeter of the shaded region, expressing your answer in surd form.



Question 6**(9 marks)**

(a) Show that.

(3)

$$1 + 4 \left(\frac{\log 3}{\log 4} \right) \left(\frac{\log \frac{1}{2}}{\log 9} \right) = 0$$

(b) Solve for x.

(3)

$$x \log 7 = \log \frac{5}{7} + x \log 5$$

(c) If $2^{5.322} = 40$ determine $\log_2 80$.

(3)

Show all calculations. (Hint: Let $x = \log_2 80$)