

MOCK EXAMINATION 2012 /2013 ORDINARY LEVEL

SUBJECT TITLE	MATHEMATICS
SUBJECT CODE N°	570
PAPER NUMBER	2
Time Allowed	Two and a half hours

Answer SEVEN questions.

All questions carry equal marks.

All necessary working must be shown.

You are reminded of the necessity for good English and orderly presentation in your answers.

In calculations, you are advised to show all the steps in your working, giving your answer at each stage.

Electronic calculators may be used.

1. The functions f and g define on \mathfrak{R} the of real numbers as

$$f : x \mapsto 2(x-7).$$

$$g : x \mapsto \frac{1}{2}(x - 6)$$

(i) Find the value of

(a) $f(6)$

(b) $f^{-1}(5)$

(c) $f \circ g(8)$

(ii) Show that $f \circ g(x) + 13 = g \circ f(x)$

(iii) Find x , given that $g^{-1}(x) = f^{-1}(x)$

2. (i)

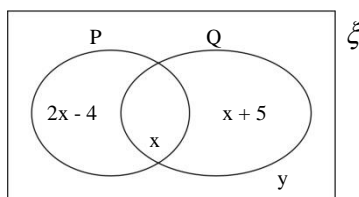


Figure1

Figure 1 represents the relationship among the sets P , Q and $(\xi) = 50$,

(a) find the value of x

(b) Find $n(p \cap Q')$

(c) Determine the relationship between x and y .

(ii) A binary operation $*$ is defined on the set \mathfrak{R} of real numbers as

$$a * b = a + b + ab, a, b \in \mathfrak{R}.$$

- (a) Evaluate $2 * 3$
- (b) Find $*(-2)$
- (c) Solve the equation $x * x = 48$
- (b) Determine the identity of the operation

3. (i)

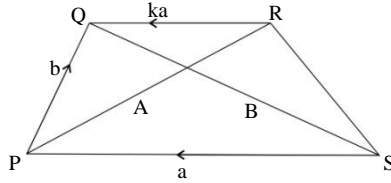


Figure 2

In figure 2, $(\overline{PQ} = \underline{b}, \overline{SP} = \underline{a}$ and $\overline{RQ} = k\underline{a}$, where k is a constant. A and B are the midpoints of PR and QS respectively. Express the following in terms of \underline{a} , \underline{b} and k :

- (a) \overline{PR}
- (b) \overline{SB}

(c) Show that $\overline{BA} = \left(\frac{1-k}{2} \right) \underline{a}$

(d) Find the value of k given that $|\overline{AB}| = 4$ when $|\underline{a}| = 16$

(ii) Given the position vectors of the points C and D are respectively $-3i + 4j$ and $-15i + pj$, where i and j are vectors along the positive x – and y – axes respectively, find

(a) $|\overline{OC}|$,

(b) The value of p when \overline{OD} is parallel to \overline{OA} . Hence deduce \overline{CD} in terms of i and j .

4. (i) In January, Mr and Mrs Eki have 500,000 francs with a bank at an interest rate of 4% per year, after their child has entered into form one. They withdraw 150,000 francs each September as the child is moving to the next class. Given that interest is calculated at the end of each calendar year, find how much is in three accounts.

- (a) After the year
- (b) When the child moves to Form Three, assuming the child repeats no class.

(ii) Pa Boris leaves for the church which is 9km away at 7.00a.m. On his bicycle, riding at 10km/h...

(a) Find when he is expected to reach the church.
Two kilometres from his destination he has a tyre puncture and has to push the bicycle the rest of the way. He arrives church sweating at 8:22a.m.

Find

- (b) For how long he rode the bicycle.
- (c) The duration of his trek
- (d) His trekking speed.

5. In a certain club competition, the points scored by representatives from some clubs in as follows:

Agriculture	(A)	= 24
Retail Trade	(R)	= 14
Catering and Industry	(I)	= 08
Clerical	(C)	= 10
Education	(E)	= 16

Represent information on

- (a) a bar chart, taking 2cm for bar width and 1 cm to represent 2 points using graph paper,
- (b) a pie chart with radius 5cm, showing all necessary working.

Calculate

- (c) The mean number of points per club (answer correct to 1 decimal place).
- (d) The probability, in its lowest terms, that two participants chosen at random without replacements are of the Education Club.

6. The quantities x and y are related by the equation $4y = 9 + 3x - 2x^2$.
 Taking 2cm for 1 unit on both axes, draw the graph of y for values of x from $x = 2$ to $x = 4$
 From your graph, find
- The value(s) of x for which $y = 2$
 - The greatest value of y
 - The gradient of the graph of this equation at the point where $x = 3$.
 - Using the same scales and axes, draw the line $y = x + 1$.
 - From your graphs estimate the roots of the equation $2x^2 + x - 5 = 0$

7. Using graph paper and with a scale of 1 cm for unit on both axes, where $-2 \leq x \leq 14$ and $-6 \leq y \leq 10$,
- Plot the points $A(0,1)$, $B(1,2)$, $C(3, 1)$, and $D(2,1)$. Name the type of quadrilateral ABCD.
 - Transform ABCD using the matrix $M = \begin{pmatrix} 2 & 0 \\ 0 & -2 \end{pmatrix}$. Plot the image $A'B'C'D'$. Describe completely the transformation M.
 - By construction, find the image $A''B''C''D''$ of $A'B'C'D'$ under the transformation M. Write your graph the coordinates of vertices.
 - Find the ratio of $\frac{\text{Area of } A'B'C'D'}{\text{Area of ABCD}}$

8. (i)

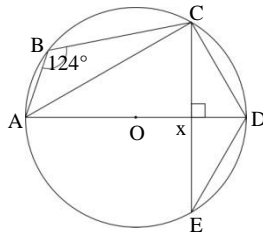


Figure 3

Figure 3 represents a circle with radius 7cm and centre O. Given that angle ABC is 124° and CE is perpendicular to AD, find, in degrees, the size of,

- angle ADC,
 - angle ADC,
 - angle CED; and
 - find the length of CE to 2 decimal places.
- (ii) From a point P that is 30m due west of a vertical pole RT, angle of elevation of the top, of the pole is 30°
- Find the height, RT, of the pole, to 2 decimal places.
 - Find the angle of elevation of the top of the pole from another point Q the is 40m due south of RT.
 - Determine the distance between P and Q.

9. (i) Given the function $f(x) = 2x^3 - 5x^2 - 4x + 7$, show that $(x - 1)$ is a factor of $f(x)$. Hence, or otherwise, find the roots of $f(x) = 0$, correct to 1 decimal place.

- (ii) Using the relations $p = m^2 - n^2 = 1$, show $p + 1/p = 2m$.

- (ii) The variables d , f and h are related by the formula
$$= \frac{2h}{1-f}$$

- Find
- the value of d when $h = 8$ and $f = \frac{3}{4}$
 - the of f when $d = 45$ and $h = 15$