Name _____ACC. N0._____

ZOMBA CATHOLIC SECONDARY SCHOOL

2017- 2018 M.S.C.E. MOCK EXAMINATION

MATHEMATICS

PAPER II **(100 MARKS)**

DATE: **TIME: 2½HUORS**

SECTION A (55 MARKS)

Answer all the questions

1. a. Given that $x : y = 9 : 4$, evaluate $\frac{8x-3y}{x-\frac{3}{4y}}$ **(4marks)**

b. If $f(x) = x^3 + 1$ and $g(x) = (x-1)^{\frac{1}{2}}$, find g(5) and hence evaluate fg(5). **(6marks)**

Name _____ACC. N0._____

2. a. In **figure 1**, **PQ** and **RQ** are tangents at **P** and **R** respectively to the circle **PMR.**

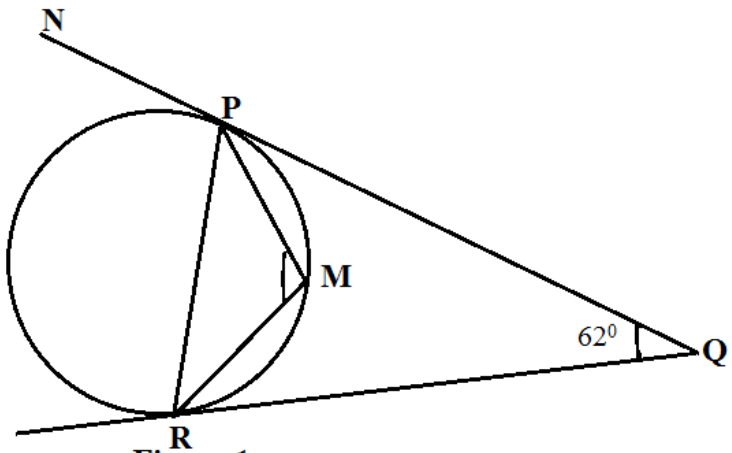

Figure 1

If angle **PQR** = 62^0, find the value of angle **PMR** **(6marks)**

b. Given that $x = a^2b$ and that y = $a^3\sqrt{b}$, express b in terms of x and y. **(6marks)**

Name _____ACC. N0._____

3. a. Without using a calculator, evaluate $\sqrt{\frac{2}{3}}\left(\sqrt{0.54}+\sqrt{6}\right)$ **(4marks)**

b. **Figure 2** shows a bucket which is in a shape of a frustum, has a diameter of 21cm at the bottom and 28cm at the top and its height is 40cm.

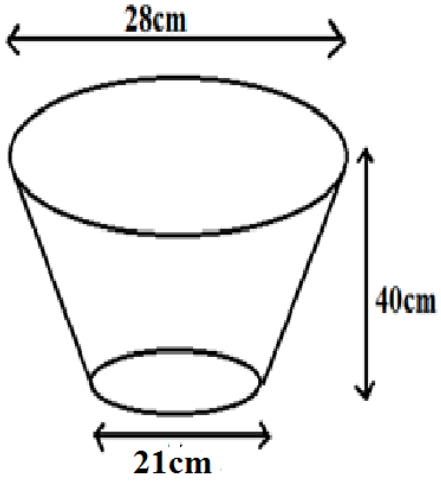

Figure 2

Find the capacity of the bucket. **(6marks)**

Name _____ACC. N0._____

4. If $\mathbf{P} = \begin{pmatrix} 4 & 0 \\ 0 & 4 \end{pmatrix}$, $\mathbf{Q} = \begin{pmatrix} 0 & -1 \\ 2 & 1 \end{pmatrix}$ and $\mathbf{R} = \begin{pmatrix} 1 & 3 \\ 2 & 4 \end{pmatrix}$, show that

$(\mathbf{3P} + \mathbf{5Q})\mathbf{R} = 3\mathbf{PR} + 5\mathbf{QR}$ **(7marks)**

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5 Solve the simultaneous equation;

$y = 2x^2 - 13x + 15$ and
$y = -x + 2$ **(8marks)**

Name _____ACC. N0._____

6. a. 50 households at Chingalangande were asked the TV station they like watching among TVM, Zodiak or Times TV. 3households like watching none of them, 25 like TVM, 25 like Zodiak and 11 like Times TV. 2 like Zodiak and TVM only. 2 like Zodiak and Times TV only. No household like watching TVM and Times TV only. How many households like watching all the three TV stations? **(4marks)**

b. Solve the equation

$\log_2 (3x - 2) - \log_2 (x + 10) + 1 = 0$ **(4marks)**

Name _____ACC. N0._____

Section B (45 marks)

*Answer any **three** questions from this section*

7. **a.** A surveyer counted the number of eggs in seagulls' nest in June. The results are shown in **table 1** below.

Table 1

Number of eggs x	**Frequency** y
0	17
1	12
2	23
3	37
4	18
Total:	**107**

Find the median egg. **(4marks)**

b. **Table 2** shows some values of x and y for the equation $y = x^3 - 3x^2 + 2$.

x	-2	-1	0	1	2	3	4
y	-18		2		-2		18

(i) Complete the table values.

(ii) Taking 2cm to represent one unit on the horizontal axis and 1cm to represent two units on the vertical axis draw the graph of $y = x^3 - 3x^2 + 2$ for values of x from -2 to 4.

(iii) Use your graph to solve the following equations $x^3 - 3x^2 + 2 = 0$

(iv) Use your graph to solve the simultaneous equations

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

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

(v) For what values of x is $x^3 - 3x^2 + 2 \geq 0$? **(11marks)**

Name _____ACC. N0._____

8. a. A small ball is dropped from a height of 10m onto a horizontal floor. Each time the ball strikes the floor, it rebounds to $\frac{3}{5}$ of the height it has fallen. What is the total distance it has travelled when the ball strikes the floor for the third time? **(6marks)**

b. **Figure 3** position vectors **OP**, **OQ**, **OX** and **P**(7, -3), **Q**(-5, 5).

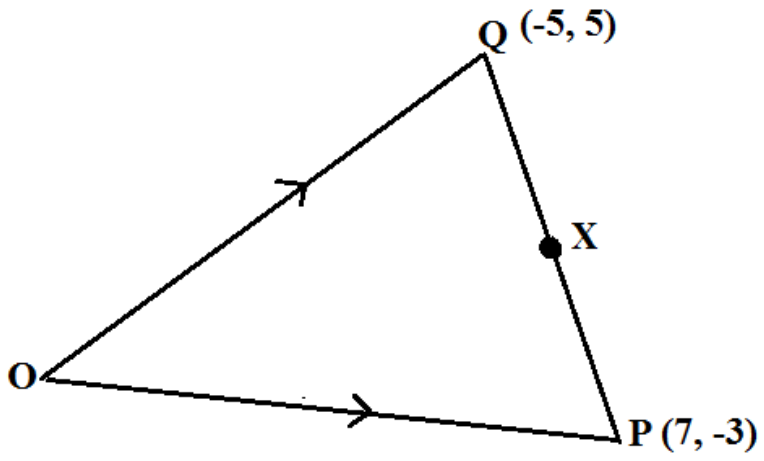

Figure 3

If **X** is the midpoint of **PQ**, find the coordinates of **X.** **(9marks)**

9. **a.** The total cost of making a solid metal sphere is partly constant and partly varies as the cube of its radius. When the radius of sphere is 8cm, its total cost is K1920 and when the radius is 12cm, the cost is K4960. Find the total cost of making a sphere whose radius is 10cm. **(8marks)**

b. Two similar buckets contain 960kg and 405kg of margarine respectively. If the area of the base of the larger bucket is $12000cm^2$,

(i) Find the area of the base of the smaller bucket.

(ii) What is the cost of painting the bucket if the painting costs k5, 000 for every $1m^2$? **(7marks)**

Name _____ACC. N0._____

10. a. A farmer has K6000 to rear goats and sheep. Goats cost k600 each and sheep cost K300 each. He wants to spend at least K1200 more on goats than on sheep. He would like to rear at least 4 goats and 2 sheep.

(i) If x represents the number of goats and y to represent the number of sheep, write down four inequalities in x and y.

(ii) Using the scale of 2cm to represent 2 units on both axes, draw the graph to show the region which represents the four inequalities.

(iii) Using your graph, find the maximum number of goats and sheep he can buy. **(11 marks)**

b. The straight line with gradient 3 passes through the point **A (3, -4).** Find the equation of the line. **(4marks)**

Name _____ACC. N0._____

11. a. Given that $\tan x = \frac{5}{12}$, evaluate $\frac{\cos x - \sin x}{\cos x + \sin x}$ **(7marks)**

b. The polynomial $\boldsymbol{a}x^3 - 8x^2 + \boldsymbol{b}x + 6$ has a factor of $x + 2$, and when it is divided by $x + 1$ there is a remainder of 10. Find the value of the constants $\boldsymbol{a}$ and $\boldsymbol{b}$ **(8marks)**

Name _____ACC. N0._____

12. a. A bag contains four yellow balls and five green balls. Two balls are drawn, one after another, without replacement. Draw a tree diagram to show the possible outcomes.

Hence find the probability that:

(i) Two yellow balls are obtained

(ii) The second ball is yellow given that the first is green.

(iii) A yellow ball and a green ball are obtained.

(iv) Both balls are the same colour. **(9marks)**

b. A land surveyor sighted a tree **A**, 5.5 km away on a bearing of **350^0** (**$N10^0W$**) from **O**. another tree **B,** 3 km on a bearing of **070^0** (**$N70^0E$**) was sighted from the same position **O**.

Calculate:

(i) The distance of **A** from **B** (correct to two decimal places)

(ii) The bearing of **B** from **A**. **(6marks)**

END OF QUESTION PAPER