**2019** SCHOOL.:_____ **CANDIDATE'S NAME**_____

# PROVIDENCE CLUSTER MOCK EXAMINATION

## 2019 MSCE MOCK EXAMINATION

# MATHEMATICS

**Subject Number: M131/II**

**Friday, 5th April**

**Time Allowed: 2 hours 30 mins**
**8:00 – 10:30am**

## PAPER II
**(100 Marks)**

**Instructions**

1. **This paper contains 18 pages. Please check.**
2. There are three sections in this paper; **A, B,** and **C.**
3. Answer six questions in all (two questions from each section). Each question carries 20 marks.
4. The total mark for the paper is **120**.
5. Write your answers in the spaces provided.
6. In the table provided on this page, **tick** against the number of the question you have answered**.**

| Question number | Tick if answered | Do not write in these columns | |
|---|---|---|---|
| 1 | | | |
| 2 | | | |
| 3 | | | |
| 4 | | | |
| 5 | | | |
| 6 | | | |
| 7 | | | |
| 8 | | | |
| 9 | | | |
| 10 | | | |
| 11 | | | |
| | | | |

## SECTIONA (55 marks)

There are **six** questions in this section. Answer **all** the questions in the spaces provided**.**

1. a. Factorise completely $1 - (1 + 2y + y^2)$

**(3marks)**

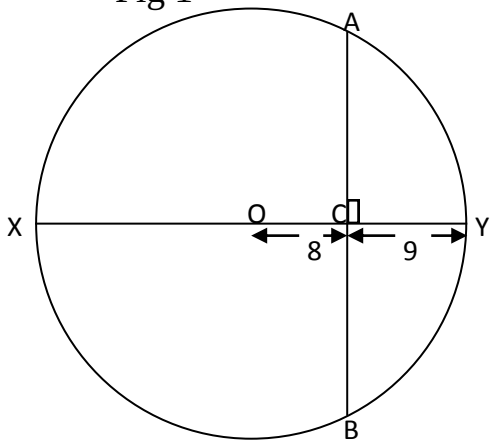
b. Without using a calculator or four-figure tables, simplify $\frac{8\sqrt{2}}{\sqrt{98} - 3\sqrt{2}}$,

giving your answer in its simplest term.

**(4marks)**

2. a. **Figure 1** shows a circle **AYBX** centre **O**. **XY** cuts **AB** at **C** such that angle **ACY** = $90^o$.

Fig 1




Continued/…

If **OC** = 8cm and **CY** = 9cm, calculate the length of **AB.**

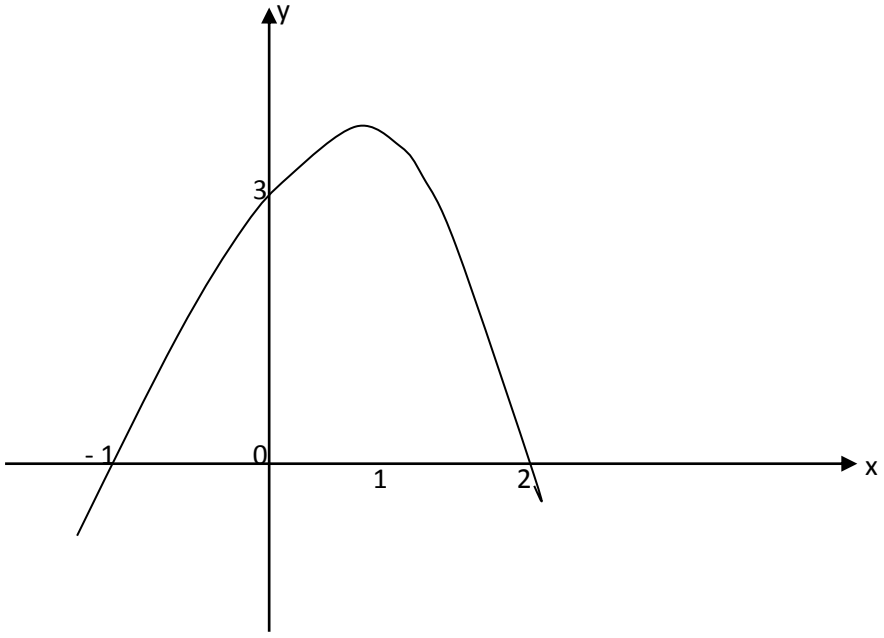
**(5marks)**

**2.** (Continued)

b. Make ***p*** the subject of the formula $Q = \frac{Tp^n + k}{k - p^n}$

**(4marks)**

3. a. **Figure 2** is a parabola in the form $y = ax^2 + bx + c$ where *a*, *b* and *c* are constants.



**3. (Continued)**

b. (i) Find the equation of the parabola in the form $y = ax^2 + bx + c$.

(**5marks)**

(ii) Find the equation of the line of symmetry.

(**1mark)**

Continued/…

**3. (Continued)**

c. Factorise the expression $b^2 - 5b$, and hence express the following as a single fraction in its simplest form $\frac{4}{b-5} + \frac{15}{b^2-5b} - \frac{3}{b}$.

(**3marks)**

d. Given that $f(p) = \frac{p^2-1}{p+1}$ and $g(p) = \frac{(p^2-1)(2p-4)}{p^2-1}$. If *f(p) = g(p)*, find the value of *p.*

(**3marks)**

4. a. Solve the simultaneous equations:

$x + y = 1$

$x^2 - 2xy + y^2 = 4$

**(6marks)**

b. The expression $2x^3 + ax^2 + bx - 6$ is exactly divisible by $x - 1$ and leaves a remainder of 9 when divided by $x + 2$. Find the values of *a* and *b*.

(**5marks)**

Continued/…

5. a. **Figure 3** is a sketch of a parallelogram with vertices **K**(-2,-4), **L**(-5,-2), **M**(2,1) and **N**(-5,-2).

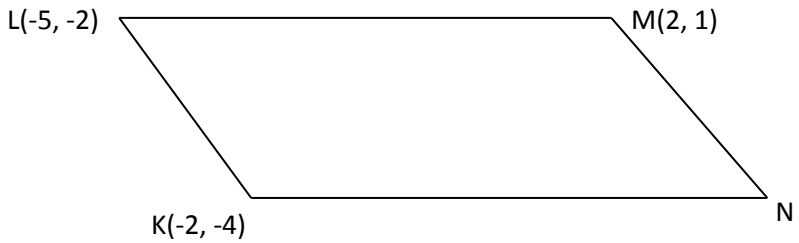



**Fig 3**

Use the vector method to find the coordinates of N.

(**4marks)**

b. A point **K**(m, 5) has been translated to point **K´(**2m, m). Find the coordinates of the translation vector **T** if m = -5.

(**3marks)**

6. a. Given that**μ** = {1,3,4,5,7,9,10,12,16,17,19,23,25,32,34,36,45,47}, set **A** and **B** are subsets of **μ** such that **A = {**c: $3 \leq c \leq 32$**}** and **B = {**d:d is a prime number**}.**
Find $\mathbf{A' \cap B'}$**.**

**(4marks)**

**6.** (Continued)

b. Draw a circle centre **O** with radius 2.5cm. Construct another circle radius 3.5cmpassing through point **O**. Label its centre **C**. Label one of the intersection points of the two circles **B**. Construct a tangent to the circle centre **O** at point **B** and produce it to meet the circle centre C at M. Measure and state the value of angle **BMC**.

**(5marks)**

Continued/…

## SECTION B (45 marks)

There are **five** questions in this section**.** Answer any **three** questions in the spaces provided**.**

7. a. Given that the graphs of $-(3a-1)x = 8-y$ and $3y = x-12$ are parallel. Find the value of *a*.

**(5marks)**

b. James is seen running at ***t*** **=** 0 seconds at a speed of 9 *m/s*. She then underwent a deceleration of 1.5 *m/s* for 2 seconds because of a slippery path. She maintains this new speed for the next 8 seconds after which she accelerates for 3 seconds to a speed of 10 *m/s.*

(i) Use a scale of 1 cm to represent 1 unit on both axes to draw the speed-time graph of James' motion on the graph paper provided. **(6marks)**

**7. b. (Continued)**

(ii) Calculate the acceleration James underwent in the last 3 seconds.

(**4marks)**

8. a. Angella wants to buy $x$ metres of low quality cloth at K300 per metre and $y$ metres of high quality cloth at K600 per metre. She decided to:

- buy at most a total of 1500 metres of cloth
- spend at least a total sum of K120 000

(i) Write down two inequalities in $x$ and $y$ in addition to $x \geq 0$ and $y \geq 0$.

(ii) Using a scale of 2 cm to represent 300 units on both axes, draw on the graph paper provided, the region which represents the four inequalities.

(iii) Angella will make a profit of K10 per metre on cheaper cloth and K30 per metre on expensive cloth. How many metres of cloth of each type must she buy to get the maximum profit?

**8.** (Continued)

**(10marks)**

Continued/…

**8. (Continued)**

b. iven **table 1** are marks of two students X and Y.

| | | | | | |
|---|---|---|---|---|---|
| Student **X** | 81 | 63 | 72 | 75 | 59 |
| Student **Y** | 55 | 71 | ***m*** | 90 | 67 |

**Table 1**

Given that their mean marks are equal, calculate the missing mark ***m*** of the student **Y.**

**(5marks)**

9. a. Solve the equation $2(3^{2x}) - 8(3^{x}) + 6 = 0$

(**6marks)**

**9. (Continued)**

b. In **figure 4, ABDC** and **CDHK** are horizontal and vertical rectangles respectively. Angle CAK = $34^0$ and angle CBK = $48^0$.

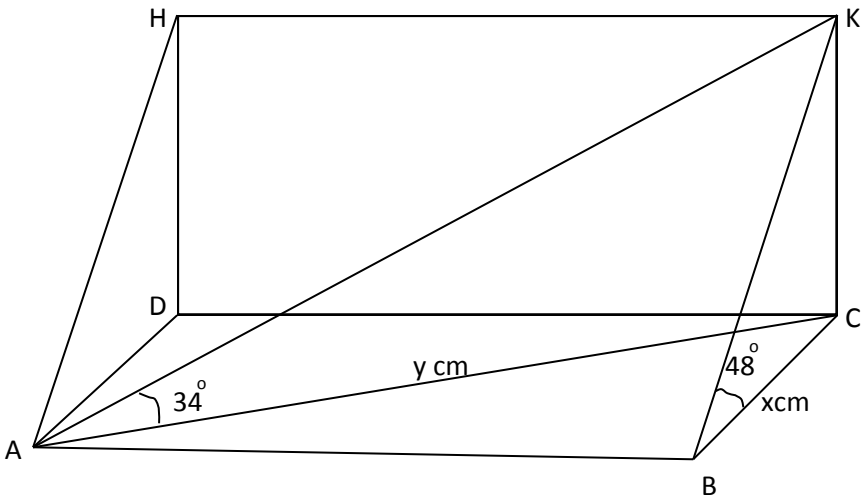



**Fig 4**

If **BC** = $x$ cm and **AC** = $y$ cm, express **CK** in terms of:

(i) $x$

(ii) *y*

(iii) calculate the value of angle **CAB**

(**9marks)**

10. a. A bag contains 4 black, 3 red and 5 white marbles. Two marbles are drawn from the bag without replacement.

(i) Draw a tree diagram to show the probabilities.

(ii) Find the probability that they are both of the same colour.

(ii) they are of different colour.

(**9marks)**

Continued/…

**10. (Continued)**

**b.** In **figure 5,** triangles **DEF** and **DRS** are similar, **RS** = 2cm, **EF** = 3cm and area of the triangle **DEF** = 10 $cm^2$.

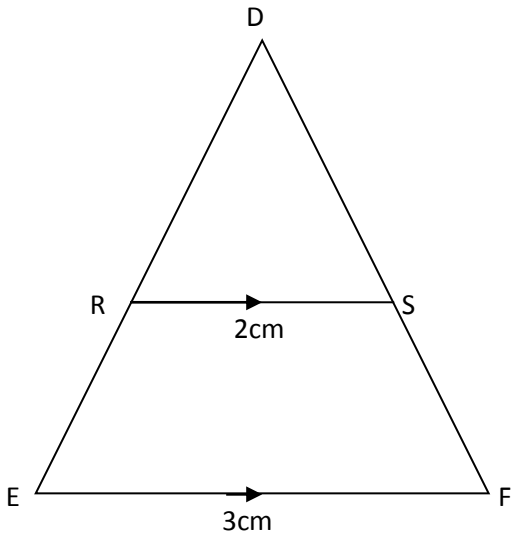



**Fig 5**

If area of triangle **DRS** = *y* $cm^2$, calculate the value of *y*.

**(6 marks)**

11. a. **Table 2** shows some of the values for equation $y = x^3 - 2x^2 - 5x + 6$.

(i) Complete the table.

| $x$ | -3 | -2 | -1 | 0 | 1 | 2 | 3 | 4 |
|---|---|---|---|---|---|---|---|---|
| $y$ | -24 | 0 | 8 | | 0 | | 0 | 18 |

(**2marks)**

(ii) Using a scale of 2cm to represent 1 unit on the $x$- axis and 2 cm to represent 5 units on the y-axis, draw the graph of $y = x^3 - 2x^2 - 5x + 6$.

(**8marks)**

b. The sum of *n* terms of an Arithmetic progression is $\frac{7n-3n^2}{2}$. Find the common difference.

**END OF QUESTION PAPER**

**NB: This paper contains 18 printed pages.**