

R&PUBLIC OF SOMALILAND

FORM FOUR EXAMS, 2017

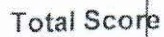
MATHEMATICS

PAPER TWO



NATIONAL EXAMINATION BOARD





School 2e-jun

Roll No

Somaliland National Examination Board

Form Four

MATHEMATICS

PAPER TWO

July 2017

TIME 2 HOURS

Plus 10 minutes for reading through the paper

INSTRUCTIONS TO CANDIDATES

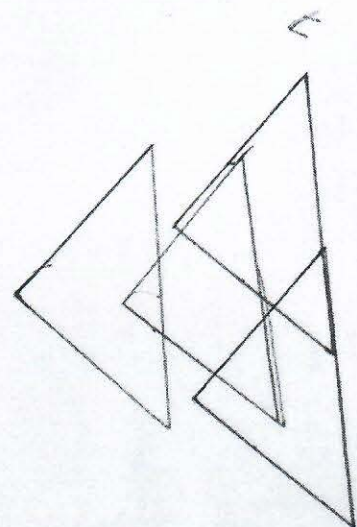
This paper consists of 9 printed pages.
Count them now. Inform the invigilator if there are any pages missing.

PART 1: 20 Multiple Choice Questions 40 Marks

PART 2: 6 Structured Questions 60 Marks

TOTAL 100 Marks

- Answer ALL questions in Part 1 and 2.
- Extra papers and Mobile Not Allowed.



PART ONE: 20 MULTIPLE CHOICE QUESTIONS

(40 marks).

Do ALL the questions. Circle the correct answer only.

1. Convert 270° to radian measure.

A. 2π

B. 3π

C. $\frac{3}{2}\pi$

D. 1.6π

2. Given $A = 60^\circ$, find $\sin 2A$:

A. $\frac{1}{2}$

B. $\frac{\sqrt{3}}{2}$

C. $\sqrt{3}$

D. $\frac{\sqrt{3}}{4}$

3. Using $\sin 30^\circ = \frac{1}{2}$; find $\tan 30^\circ$:

A. $\frac{1}{\sqrt{3}}$

B. $\sqrt{3}$

C. $\frac{1}{2}$

D. $\frac{\sqrt{3}}{4}$

4. Given $\sin(30^\circ + A) + \cos(60^\circ + A) = \frac{1}{2}$, calculate angle A.

A. 45°

B. 30°

C. 60°

D. 90°

5. Calculate the mean of the grouped data of scores of 30 teams

Scores (x)	1	2	5	7	8	9	10
Teams (f)	2	4	6	7	5	4	2

$f(x)$ 2 8 30 49 40 36 20
 A. 5.93 B. 5.56 C. 5.83 D. 5.43 E. 6.1

6. What is the mean deviation of 3, 4, 6, 7, 8.

A. 1.65

B. 1.56

C. 1.52

D. 1.68

7. Calculate the interquartile range of the data 9, 15, 32, 25, 30, 12, 20:

A. 15

B. 20

C. 18

D. 30

8. Find the mode of the data : 7, 4, 2, 3, 3, 2, 6, 5, 4, 2, 3, 4, 2, 5, 4, 6,

- A. 4 B. 2 C. 3 D. 2 & 4

9. A box contains 4 red, 3 blue and 3 white balls. A ball is drawn at random and replaced, then another ball is drawn. What is the probability that both are red?

- A. $\frac{4}{25}$ B. $\frac{3}{25}$ C. $\frac{1}{12}$ D. $\frac{2}{5}$

10. The 5th term of the binomial $(x + y)^5$ is:

- A. ab^4 B. $5ab^4$ C. $10ab^4$ D. $4a^2b^4$

11. The simplified value of $\frac{(n+2)!}{n!}$

- A. $n^2 + 3n + 2$ B. $2!$
C. $1 + \frac{2!}{n!}$ D. $n + 2$

12. A die is tossed twice. The probability of getting two sixes will be :

- A. $\frac{1}{12}$ B. $\frac{1}{6}$
C. $\frac{1}{3}$ D. $\frac{1}{36}$

13. $(3 + 4i) + (2 - 2i)$

- A. $5 + 2i$ B. $6 - 8i$ C. $5 - 6i$ D. $5 + 6i$

$$\frac{1}{6} \times \frac{1}{6} = \frac{1}{36}$$

14. $(2 - 2i)$, written in polar form, is

A. $2\sqrt{2}(\cos 45^\circ + i \sin 45^\circ)$

B. $2\sqrt{2}(\cos 135^\circ + i \sin 135^\circ)$

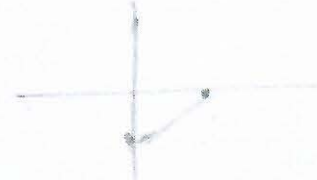
C. $2(\cos 45^\circ + i \sin 45^\circ)$

D. $\sqrt{2}(\cos 135^\circ + i \sin 135^\circ)$

$r = \sqrt{2^2 + 2^2} = 2\sqrt{2}$

$\theta = \tan^{-1}(-1) = -45^\circ$

$2\sqrt{2}(\cos 45^\circ + i \sin 45^\circ)$



15. $3x + 2yi = 12 + 8i$. The value of x and y are respectively:

A. (4, 9)

B. (6, 6)

C. (4, 4)

D. (9, 4)

16. The solution of the quadratic equation: $x^2 - 2x + 2$ is

A. 1

B. i

C. $1 + i$

D. $1 \pm i$

17. $\lim_{x \rightarrow 2} \frac{x^2 - 4}{x - 2}$ will be

$\frac{(x+2)(x-2)}{(x-2)}$

$\lim_{x \rightarrow 2} x + 2 = 2 + 2 = 4$

A. 0

B. ∞

C. 4

D. 2

18. $f(x) = x^3 + 4x^2 + 2x + 3$, then $\frac{df(x)}{dx}$ will be:

$3x^2 + 8x + 2$

A. $3x^2 + 8x + 3$

B. $3x^2 + 8x + 2$

C. $x^3 + 8x + 2$

D. $3x^2 + 4x + 3$

19. The curve whose gradient, $\frac{dy}{dx} = 3x^2 + 2x + 2$ at the point $(1, 2)$ is:

A. $y = 3x^2 + 2x$

B. $y = x^3 + x^2 + 2x - 2$

C. $y = 3x^3 + 2x^2 + 2$

D. $y = 6x + 2$

$m = 7$ $P(1, 2)$
 $y - y_1 = m(x - x_1)$
 $y - 2 = 7(x - 1)$
 $y - 2 = 7x - 7$
 $y = 7x - 7 + 2$
 $y = 7x - 5$

20. $\int_0^{\pi/2} \sin 2x \, dx$ is

A. 1

B. -1

C. 2

D. -2

PART 2: STRUCTURED QUESTIONS ANSWER ALL QUESTIONS.

(60 Marks)

(3 marks)

Q1 a) Evaluate $\cos 15^\circ$ without using a calculator

$\theta = 30^\circ$
 $\cos \frac{\theta}{2} = \cos 15^\circ$
 $\cos 15^\circ = \sqrt{\frac{1 + \cos 30^\circ}{2}}$
 $\cos 15^\circ = \sqrt{\frac{1 + \frac{\sqrt{3}}{2}}{2}} = \sqrt{\frac{\frac{2}{2} + \frac{\sqrt{3}}{2}}{2}} = \sqrt{\frac{\frac{2 + \sqrt{3}}{2}}{2}} = \sqrt{\frac{2 + \sqrt{3}}{4}} = \frac{\sqrt{2 + \sqrt{3}}}{2}$

b) If $\sin A = \frac{12}{13}$ and $\cos B = \frac{4}{5}$ find the value of $\sin (A - B)$.

(4 Marks)

$\sin A = \frac{12}{13}$ Then $\cos A = \frac{5}{13}$
 $\sin (A - B) = \sin A \cos B - \cos A \sin B$
 $\sin (A - B) = \frac{12}{13} \times \frac{4}{5} - \frac{5}{13} \times \frac{3}{5} = \frac{48}{65} - \frac{15}{65} = \frac{33}{65}$

c) Prove that $\sec^2 x = 1 + \tan^2 x$

(3 marks)

$\sec^2 x = \frac{1}{\cos^2 x}$
 $\tan^2 x = \frac{\sin^2 x}{\cos^2 x}$
 $1 + \tan^2 x = 1 + \frac{\sin^2 x}{\cos^2 x} = \frac{\cos^2 x + \sin^2 x}{\cos^2 x} = \frac{1}{\cos^2 x} = \sec^2 x$

Q2. Differentiate the following algebraic function with respect to x :

(3 Marks)

a) $Y = (2x^2 - 3)^6$
 $\frac{dY}{dx} = 6(2x^2 - 3)^5 \cdot 4x$
 $= 24x(2x^2 - 3)^5$

0.630

$$\frac{V(u) - u(V')}{V^2}$$

$$u(V) = V(u)$$

b) $F(x) = \frac{x^2 - 2}{x + 3}$

$$\frac{dy}{dx} = \frac{(x+3)(2x) - (x^2-2)(1)}{(x+3)^2}$$

(3 Marks)

$$= \frac{2x^2 + 6x - x^2 + 2}{(x+3)^2}$$

$$= \frac{x^2 + 6x + 2}{(x+3)^2}$$

c) $Y = \sin^3(4x^2)$

$$\begin{aligned} \frac{dy}{dx} &= 3(\sin 4x^2)^2 \cdot (\cos 4x^2) \cdot (8x) \\ &= 3(\sin 4x^2)^2 \cdot 8x \cos 4x^2 \\ &= 24x \cos 4x^2 (\sin 4x^2)^2 \end{aligned}$$

Q3.a) Find the area between the curve $y = -x^2$ and the line $y = 2x - 3$

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b) Work out the minimum and maximum values of x in $y = 2x^3 + \frac{7x^2}{2} - 10x$

Q4. By using the data: 8, 11, 13, 15, 18, 26, 29, 31, 33, 36 (2 Marks)
Calculate a) interquartile range

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b) The variance (5 Marks)

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c) The standard deviation (3 Marks)

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Q5. From a class of 15 students that contains 5 brothers, a team of 8 is randomly selected. Determine the probability that the team contains: (4 Marks)

a) All the brothers

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b) At least 4 of the brothers

(6 Marks)

Q6. a) write $z = (2 + 2\sqrt{3}i)$ in polar form

(4 Marks)

$$\begin{aligned}
 r &= \sqrt{2^2 + 12} \\
 &= \sqrt{16} = 4 \\
 \theta &= \frac{2\sqrt{3}}{2} \\
 &= \sqrt{3} \\
 \theta &= 60^\circ
 \end{aligned}$$

$$\begin{aligned}
 z &= r(\cos \theta + i \sin \theta) \quad \text{Let } k=0 \\
 &= 4(\cos 60^\circ + i \sin 60^\circ) \\
 &= 4\left(\cos 60^\circ + i \sin 60^\circ\right) \\
 &= 4\left(\frac{1}{2} + \frac{\sqrt{3}}{2}i\right) \\
 &= 2 + 2\sqrt{3}i
 \end{aligned}$$

b) Calculate the cubic root of $z = -1 + i$

(3 Marks)

$$\begin{aligned}
 \text{Let } k &= 0 \\
 z &= 1^{1/3}(\cos)
 \end{aligned}$$

c) Find the modulus of $Z = 6 + 8i$

(2 Marks)

$$\begin{aligned}
 m &= \sqrt{6^2 + 8^2} \\
 &= \sqrt{36 + 64} \\
 &= \sqrt{100} \\
 &= \pm 10
 \end{aligned}$$

END