FEDERAL REPUBLIC OF SOMALIA

GRADE 12 EXAMS, 2024

# MATHEMATICS


OFFICE OF EXAMINATIONS AND CERTIFICATION

SomExams

**Ministry of Education, Culture & Higher Education**

**National Examinations and Certifications Office**

**Form Four National Examinations.**

**June, 2024**

# SUBJECT: Math

**TIME: 2 HOURS**

**INSTRUCTIONS:** Answer all questions in the ANSWER BOOKLET

## SECTION I: MULTIPLE CHOICE QUESTIONS (20 × 2 = 40 MARKS)

1. Which of the following is a measure of dispersion?
   (a) Mean
   (b) Mode
   (c) Range
   (d) Median

2. The point A in fig. 1, represents
   (a) $3 + 2i$
   (b) $2 + 3i$
   (c) $3 + 3i$
   (d) $2 + 2i$

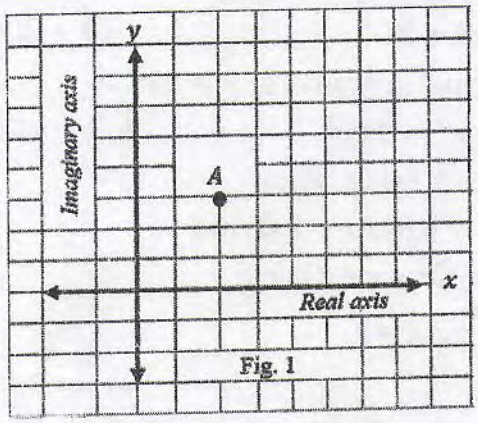

Fig. 1

3. $\sin x \cos y - \cos x \sin y =$
   (a) $\sin(x + y)$
   (b) $\cos(x - y)$
   (c) $\sin(x - y)$
   (d) $\cos(x + y)$

4. If $n\,! = 720$, then the value of $n$ is:
   a) 5 b) 6 c) 7 d)8

5. The derivative of $\pi x$ is
   a) $\pi x$ b) $-\pi$ c) $\pi$ d) $x$

6. The ages (in years) of 11 students in grade 3 are: 7,7,6,8,6,6,7,7,9,7 and 6. The middle value (median) is
   a) 6 b) 7 c) 8 d) 9

7. The intersection set A and B contains
   (a) {0,1,2}
   (b) {3,4}
   (c) {0,1,2,3,4}
   (d) {5,6,7}

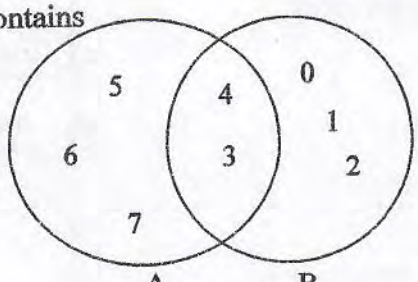

Fig. 2

8. $P(E) + P(not\ E) =$

a) 0 b) 1 c) 2 d) 3

9. $\frac{d}{dx}(\sin x - \cos x) =$

a) $\sin x - \cos x$ b) $\cos x - \sin x$ c) $\cos x + \sin x$ d) $-\cos x - \sin x$

10. Which of the following statements is NOT true?

a) For independent events, $P(A\ \ and\ \ B) = P(A) \times P(B)$

b) For dependent events, $P(A\ and\ B) = P(A) \times P\ (B\ \ following\ \ A)$

c) For mutually exclusive events $P(A\ or\ B) = P(A) \times P(B)$

d) For non-mutually exclusive events, $P(A\ or\ B) = P(A) + P(B) - P(A \cap B)$

11. The derivative of a function at a *stationary point* is:

a) $-1$ b) 0 c) 1 d) $-2$

12. The conjugate of $3 - 2i$ is

a) $3 - 2i$ b) $3 + 2i$ c) $-3 - 2i$ d) $-3 + 2i$

13. The *second* derivative of $y = 4x^3$ is

a) $y'' = 12x^2$ b) $y'' = 24x$ c) $y'' = 12x$ d) $y'' = 24$

14. $[r(\cos x + i \sin x)]^n =$

a) $r^n[\cos nx + i \sin nx]$ b) $r[\cos nx + i \sin nx]$

c) $r^n[\cos x + i \sin x]$ d) $\cos nx + i \sin nx$

15. $\int_0^{\pi} \sin\ x\ dx =$

a) 0 b) -2 c) 2 d) 1

16. The number of students in 5 different public schools in Mogadishu are; 450, 720, 525, 1000, and 1300 students. The average number of students in a school is:

a) 525 b) 720 c) 799 d) 1000

17. If $y = \sqrt{16}$ then $\frac{dy}{dx} =$

a) 4 b) $\frac{1}{2\sqrt{16}}$ c) 0 d) $-\frac{1}{2\sqrt{16}}$

18. $\sin 3x =$

a) $3 \sin x - 4 \sin^3 x$ c) $4 \sin^3 x - 3 \sin x$

b) $3 \sin x - 3 \sin^3 x$ d) $4 \sin^3 x + 3 \sin x$

19. $i^{155}$ is equal to

a) 1 b) $-i$ c) $-1$ d) $i$

20. Which of the following limits *does not exist*?

a) $\lim_{x \to \infty} 1/x^2$ c) $\lim_{x \to \infty} \sqrt{x^2 + 2} - x$

b) $\lim_{x \to \infty} e^{-x}$ d) $\lim_{x \to -\infty} \sqrt{x^2 + 2} - x$

**SECTION II: MATCH COLUMN A WITH COLUMN B** **(10 × 2 = 20 MARKS)**

| NO | COLUMN A | ANSWER | COLUMN B |
|---|---|---|---|
| 1. | If the mean of the numbers 1,2,3, $x$, 4,5 is 5 find the value of $x$. | | $\frac{1}{2}$ |
| 2. | $\left[\frac{2+2i}{2-2i}\right]^2 =$ | | $5(3x^2+2)(x^3+2x)^4$ |
| 3. | $\tan\theta \times cos\theta \times cosec\theta$ | | $\tan(x+\frac{\pi}{4})+c$ |
| 4. | If $2+xi = z-2i$, then $x =$ | | 15 |
| 5. | $\int sec^2(x+\frac{\pi}{4})\,dx$ | | 1 |
| 6. | $if\ y=(x^3+2x)^5$ then $\frac{dy}{dx} =$ | | $-1$ |
| 7. | If ${}^nP_2 = 20$, then the value of $n$ is | | $-2$ |
| 8. | $\lim_{x\to\infty} \frac{x^2+2x}{1+2x^2}$ | | 12 |
| 9. | How many different odd numbers can be formed using 2,3,4, and 9. Assume repetition is not allowed. | | $\frac{\sqrt{6}-\sqrt{2}}{4}$ |
| 10. | Sin 15° | | 5 |

**SECTION III: STRUCTURE QUESTIONS** **(40 MARKS)**

**CALCULUS**

1. Show that the function

$$f(x) = \begin{cases} 2x-2 & if\ x<1 \\ x^2-1 & if\ x\geq 1 \end{cases}$$

is **not** continuous at $x = 0$. [4marks]

2. Evaluate the following limits

$$\lim_{x\to 3} \frac{\sqrt{x}-\sqrt{3}}{x(x-3)}$$ [4 marks]

3. Differentiate the following

$$y = (x^3+1)(x^2+3)^8$$ [3 marks]

4. Find the first and second derivatives of the following function.

$$y = \sin 4x - \cos 2x + x^3 - 1/x$$ [3marks]

5. Integrate the following with respect to $x$

$$\int_0^{\pi/2} (sinx - \cos 2x)\, dx$$ [4 marks]

6. Find the area under the curve $y = x^2 + 2$, between $x = 1$ and $x = 3$ and above the $x - axis$. [4marks]

**COMPLEX NUMBERS**

1. Solve the equation $x^2 - 4x + 5 = 0$ [3marks]

2. Use The De Moiré's Theorem to find the value of $[\,2(\cos 20^\circ + i \sin 20^\circ)\,]^3$ [3marks]

3. Let $Z_1 = 5(\cos 25° + i \sin 25°)$ and $Z_2 = 4(\cos 20° + i \sin 20°)$, find $Z_1 \cdot Z_2$ [3marks]

**STATISTICS AND PROBABILITY**

1. Given the raw data

8, 12, 16, 24, 36, 48

Find

(a) Standard deviation [2 marks]

(b) Variance [1 mark]

2. A die with 12 faces numbered 1 to 12 is rolled once. What is the probability of obtaining 2 or 5? [2 Marks]

3. If $P(A') = 0.6$, $P(B') = 0.28$, and $P(A \cup B) = 0.71$

Find

(a) $P(A|B)$ [2marks]

(b) $P(B|A)$ [2marks]