

AGA KHAN UNIVERSITY EXAMINATION BOARD

HIGHER SECONDARY SCHOOL CERTIFICATE

CLASS XI

ANNUAL EXAMINATIONS (THEORY) 2023

Business Mathematics Paper I

Time: 55 minutes Marks: 30

INSTRUCTIONS

1. Read each question carefully.
2. Answer the questions on the separate answer sheet provided. DO NOT write your answers on the question paper.
3. There are 100 answer numbers on the answer sheet. Use answer numbers 1 to 30 only.
4. In each question, there are four choices A, B, C, D. Choose ONE. On the answer grid, black out the circle for your choice with a pencil as shown below.

Correct Way		Incorrect Ways	
1		1	
		2	
		3	
		4	

Candidate's Signature

5. If you want to change your answer, ERASE the first answer completely with a rubber, before blacking out a new circle.
6. DO NOT write anything in the answer grid. The computer only records what is in the circles.
7. A formulae list is provided on page 2. You may refer to it during the paper, if you wish.
8. You may use a scientific calculator if you wish.

List of Formulae**Note:**

- The symbols have their usual meanings.

Interest and Annuities

$$I = \frac{PTR}{100}$$

$$A = P \times \left(1 + \frac{r}{n}\right)^{nt}$$

$$R = \left(1 + \frac{i}{n}\right)^n - 1$$

$$j = \left(1 + \frac{r}{m}\right)^m - 1$$

$$\text{Accumulating factor} = \left(\frac{(1+i)^n - 1}{i}\right)$$

$$\text{Annuity} = R \times \left(\frac{(1+i)^n - 1}{i}\right)$$

Linear Equations, Functions and their Graphs

The general form of linear equation is
 $ax + by + c = 0$

The intercepts form of the linear equation is $\frac{x}{a} + \frac{y}{b} = 1$
 $a \neq 0$ and $b \neq 0$

Quadratic Equations, Functions and their Graphs

$$\text{Quadratic Formula } x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

Derivative of Algebraic Functions

$$\frac{d}{dx}[c] = 0$$

$$\frac{d}{dx}[f(x)]^n = n[f(x)]^{n-1} \times f'(x)$$

$$\frac{d}{dx}[f(x)g(x)] = f(x)g'(x) + g(x)f'(x)$$

$$\frac{d}{dx}[f(x) \pm g(x)] = f'(x) \pm g'(x)$$

$$\frac{d}{dx}\left[\frac{f(x)}{g(x)}\right] = \frac{g(x)f'(x) - f(x)g'(x)}{[g(x)]^2}$$

Sequence and Series

$$a_n = a_1 + (n-1)d$$

$$S_n = \frac{a_1(1-r^n)}{1-r} \text{ if } |r| < 1$$

$$S_n = \frac{a_1(r^n - 1)}{r - 1} \text{ if } |r| > 1$$

$$S_n = \frac{n}{2}(2a_1 + (n-1)d)$$

$$a_n = a_1 r^{n-1}$$

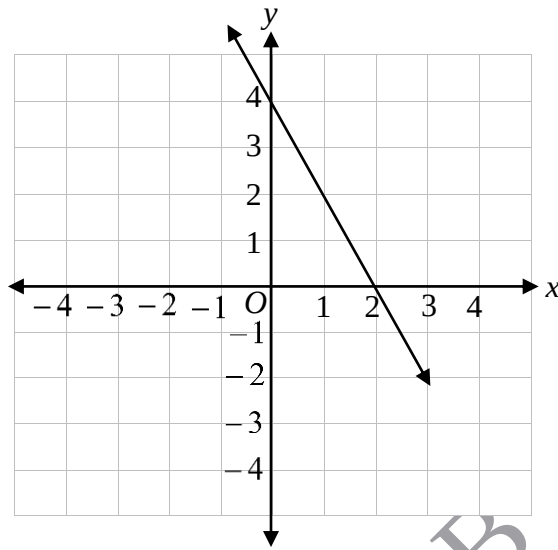
1. If 6000 candidates are appearing in a mathematics test and 55% of the candidates are male, then the ratio of female to male candidates is
 - A. 11:9
 - B. 9:11
 - C. 13:11
 - D. 11:13
2. 60 chocolates are divided in a ratio of 2:3 between two friends. The friend with greater share gets
 - A. 12 chocolates.
 - B. 24 chocolates.
 - C. 36 chocolates.
 - D. 48 chocolates.
3. If $\frac{r}{s} = \frac{210}{214}$, then the value of s and of r , respectively, will be
 - A. 107 and 105
 - B. 105 and 107
 - C. 17 and 15
 - D. 15 and 17
4. 2.3% expressed as a number is
 - A. 0.0023
 - B. 0.023
 - C. 2.3
 - D. 230
5. Classroom A can accommodate x number of students. Classroom B can accommodate 20 more students than classroom A.

If the ratio of number of students who can be accommodated in the classrooms A and B is 3:4, then the number of students that can be accommodated in classroom A must be

 - A. 15
 - B. 40
 - C. 60
 - D. 70
6. Ahmed invested Rs 4,000 for 2 years and earned a simple interest of Rs 200. The rate of interest per year is
 - A. 2.5%
 - B. 5%
 - C. 7.5%
 - D. 10%

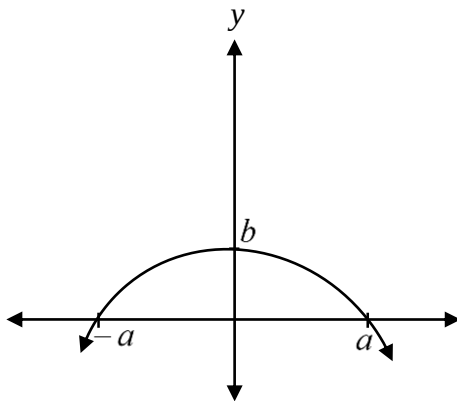
7. If an amount is invested for 10 years and interest is compounded quarterly, then the number of compounding periods will be
- A. 4
 - B. 10
 - C. 14
 - D. 40
8. Kamil took a loan of Rs 800,000 from a bank at 5% interest rate compounded annually for a period of 3 years.
- The amount of interest to be paid on the principal amount at end 3 years will be
- A. Rs 120,000
 - B. Rs 126,100
 - C. Rs 840,000
 - D. Rs 926,100
9. The x -intercept of the line $ax + by = 1$ is
- A. a .
 - B. b .
 - C. $\frac{1}{a}$.
 - D. $\frac{1}{b}$.
10. The equation of the line parallel to the line $2x - y + 1 = 0$ and passing through $(1, 0)$ is
- A. $2x - y + 2 = 0$
 - B. $2x - y - 2 = 0$
 - C. $x + 2y - 2 = 0$
 - D. $x + 2y + 2 = 0$

11. The gradient of the line shown in the given graph is

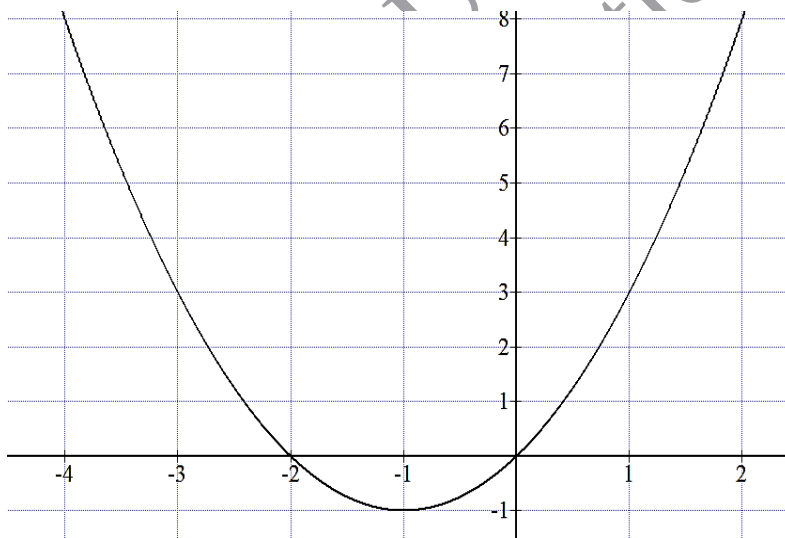


- A. positive.
B. negative.
C. zero.
D. undefined.
12. The y-intercept of the line $2x - 3y - 6 = 0$ is
- A. -2
B. -3
C. 2
D. 3
13. The solution set of the quadratic equation $x^2 - 5x + 6 = 0$ is
- A. $\{-3, -2\}$.
B. $\{-3, 2\}$.
C. $\{-2, 3\}$.
D. $\{2, 3\}$.

14. The sum of x – intercepts in the given curve is



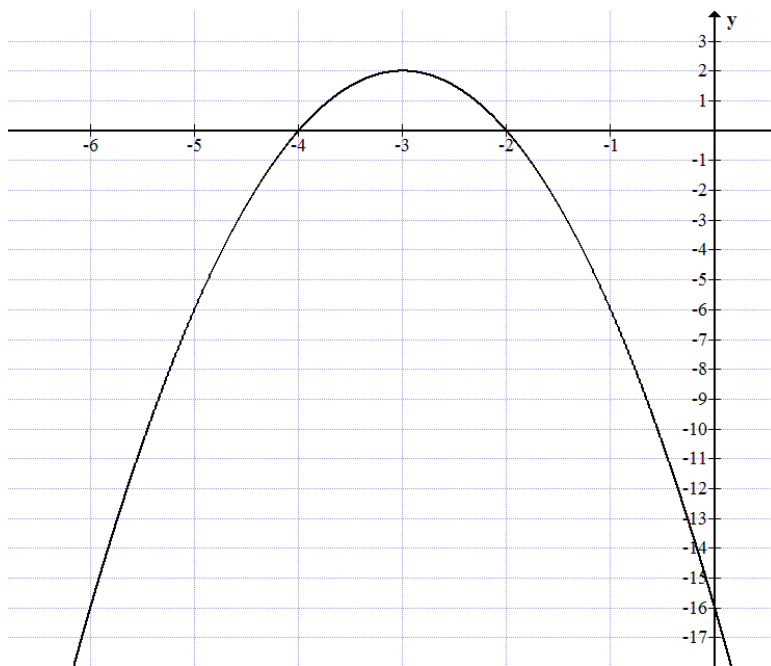
- A. 0
 B. 1
 C. b
 D. $2a$
15. The given graph represents a quadratic function.



The domain of the given quadratic function consists of

- A. real numbers greater than -2
 B. real numbers greater than 0 and less than -2
 C. set of real numbers greater than -1
 D. all real numbers

16. The given graph represents a quadratic function.



The maximum value of the quadratic function is

- A. -4
 B. -2
 C. 2
 D. 4
17. Consider the simultaneous equations $3x^2 + 3 = 3$ and $3y - 3x = 3$. On solving these equations, the value of y will be
- A. -1
 B. 0
 C. 1
 D. 3
18. If the sum of roots of the quadratic equation $5 + (2x - 3)x = 5$ is m , then the value of m will be
- A. 0
 B. $\frac{2}{3}$
 C. $\frac{3}{2}$
 D. 6

19. If $x = by$ and $a = b - 2$, then the value of $\frac{x}{y}$, in terms of a , is equal to

(Note: a and b are constants.)

- A. $\frac{a}{2}$
- B. $2a$
- C. $a - 2$
- D. $a + 2$

20. The matrix $\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & -1 \end{bmatrix}$ is a/an

- A. null matrix.
- B. scalar matrix.
- C. identity matrix.
- D. diagonal matrix.

21. The sum of the matrices $\begin{bmatrix} 2 & 3 \\ 2 & 3 \\ 2 & 3 \end{bmatrix}$ and $\begin{bmatrix} 3 \\ 3 \\ 3 \end{bmatrix}$

- A. is $\begin{bmatrix} 5 & 3 \\ 5 & 3 \\ 5 & 3 \end{bmatrix}$.
- B. is $\begin{bmatrix} 2 & 6 \\ 2 & 6 \\ 2 & 6 \end{bmatrix}$.
- C. is $\begin{bmatrix} 5 & 6 \\ 5 & 6 \\ 5 & 6 \end{bmatrix}$.
- D. cannot be found.

22. It is given that $X = \begin{bmatrix} 1 & 0 \end{bmatrix}$ and $Y = \begin{bmatrix} 2 \\ 3 \\ 4 \end{bmatrix}$ are two matrices.

The matrix multiplication $Y \times X$ is equal to

- A. $\begin{bmatrix} 9 \\ 0 \end{bmatrix}$.
- B. $\begin{bmatrix} 9 & 0 \end{bmatrix}$.
- C. $\begin{bmatrix} 2 & 0 \\ 3 & 0 \\ 4 & 0 \end{bmatrix}$.
- D. $\begin{bmatrix} 2 & 3 & 4 \\ 0 & 0 & 0 \end{bmatrix}$.
23. If $E = \begin{bmatrix} 1 \\ 3 \end{bmatrix}$ and $D = \begin{bmatrix} 1 & 3 \end{bmatrix}$, then the order of the matrix $(ED)^t$ is
- A. 1×2
- B. 2×1
- C. 2×2
- D. 1×1
24. If $X + \begin{bmatrix} 4 & 8 \\ 1 & -2 \end{bmatrix} \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} = \begin{bmatrix} 6 & 7 \\ 1 & 2 \end{bmatrix}$, then the unknown matrix X is
- A. $\begin{bmatrix} 2 & 7 \\ 1 & 0 \end{bmatrix}$.
- B. $\begin{bmatrix} 2 & -1 \\ 0 & 0 \end{bmatrix}$.
- C. $\begin{bmatrix} 2 & -1 \\ 0 & 4 \end{bmatrix}$.
- D. $\begin{bmatrix} 2 & 7 \\ 1 & 4 \end{bmatrix}$.

25. A function is defined by $f(x) = (3x) \times x^{\frac{3}{2}}$. $f'(x)$ will be

A. $\frac{15}{2} \left(x^{\frac{3}{2}} \right)$.

B. $\frac{9}{2} \left(x^{\frac{3}{2}} \right)$.

C. $\frac{9}{2} \left(x^{\frac{1}{2}} \right)$.

D. $\frac{15}{2} \left(x^{\frac{1}{2}} \right)$.

26. A curve is represented by $y = \sqrt{2x}$. The gradient of the tangent to this curve at $x = a$ will be

A. $-\sqrt{2a}$.

B. $-\frac{1}{\sqrt{2a}}$.

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

D. $\sqrt{2a}$.

27. If $y = \sqrt[3]{x}$, then $\frac{dy}{dx}$ will be equal to

A. $\frac{1}{3} \left(x^{-\frac{1}{2}} \right)$.

B. $\frac{1}{3} \left(x^{-\frac{2}{3}} \right)$.

C. $\frac{1}{6} \left(x^{-\frac{1}{2}} \right)$.

D. $\frac{1}{6} \left(x^{-\frac{2}{3}} \right)$.

28. The derivative of the function $y = \sqrt{\frac{x+3}{4}}$ with respect to x will be

A. $\frac{1}{2} \left(\frac{x+3}{4} \right)^{\frac{1}{2}}.$

B. $\frac{1}{8} \left(\frac{x+3}{4} \right)^{\frac{1}{2}}.$

C. $\frac{1}{2} \left(\frac{x+3}{4} \right)^{-\frac{1}{2}}.$

D. $\frac{1}{8} \left(\frac{x+3}{4} \right)^{-\frac{1}{2}}.$

29. In the sequence 57, 51, 45, 39, 33, x , y , ..., the value of y is

A. 15

B. 21

C. 25

D. 27

30. Which of the following sequences is a geometric sequence?

A. 2, 4, 8, 12, 16, ...

B. 3, 9, 18, 36, 108, ...

C. 32, 16, 8, 4, 2, ...

D. 80, 64, 48, 32, 16, ...

Please use this page for rough work

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