

**AGA KHAN UNIVERSITY EXAMINATION BOARD**

**HIGHER SECONDARY SCHOOL CERTIFICATE**

**CLASS XI**

**MODEL EXAMINATION PAPER 2023 AND ONWARDS**

**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 <input type="radio"/> A <input type="radio"/> B <input checked="" type="radio"/> C <input type="radio"/> D	1 <input type="radio"/> A <input type="radio"/> B <input checked="" type="radio"/> C <input type="radio"/> D
	2 <input type="radio"/> A <input type="radio"/> B <input checked="" type="radio"/> C <input type="radio"/> D
	3 <input type="radio"/> A <input type="radio"/> B <input checked="" type="radio"/> C <input type="radio"/> D
	4 <input type="radio"/> A <input type="radio"/> B <input checked="" type="radio"/> C <input type="radio"/> D

**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.

**Aga Khan University Examination Board**  
**List of Formulae for Business Mathematics XI**

**Note:**

- The symbols have their usual meanings.
- The same formulae list will be provided in annual and re-sit examinations.

**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 a number is increased in a ratio of 5:3 and then the result is 15. The number is
  - A. 5
  - B. 8
  - C. 9
  - D. 15
2. If 16 workers can dig a trench in 9 hours, then the number of workers required to dig the same trench in 6 hours will be
  - A. 4
  - B. 11
  - C. 20
  - D. 24
3. In a sale, the marked price of goods is reduced by 25%. If the marked price of a diary in the sale was Rs 500, then its selling price will be Rs
  - A. 325
  - B. 375
  - C. 525
  - D. 575
4. A health supplement consists of vitamin A and C. In the health supplement of 250g, if vitamin A makes 70% of its weight, then the weight of vitamin C will be
  - A. 30 g.
  - B. 75 g.
  - C. 150 g.
  - D. 175 g.
5. The given table shows the relation between two quantities  $s$  and  $t$ .

$s$	2	4	12
$t$	60	$x$	10

From the values in the given table, the value of  $x$  will be

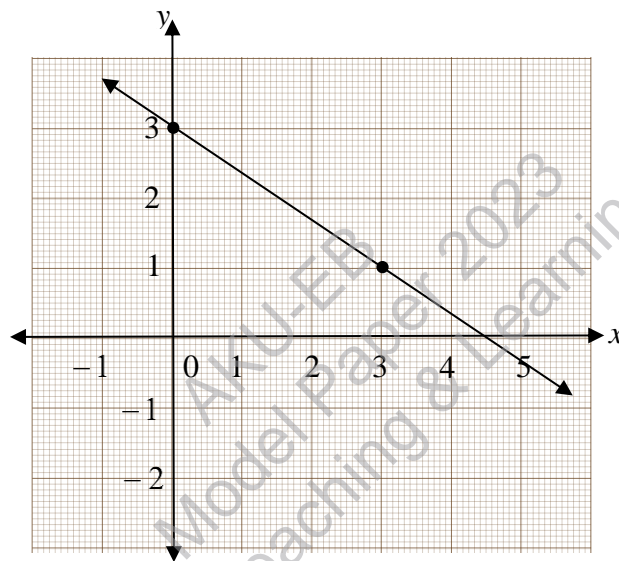
- A.  $\frac{1}{30}$
- B.  $\frac{5}{6}$
- C. 30
- D. 120

6. If the annual interest rate is 20 % and the interest is compounded semi-annually, then the interest rate per period will be
- A. 5%.
  - B. 10%.
  - C. 20%.
  - D. 40%.
7. The sum of annuity for Rs 10,000 at interest rate of 10% compounded annually, will be Rs
- A. 4,641
  - B. 6,105
  - C. 46,410
  - D. 61,051
8. Alam invested his savings of Rs 110,000 in two different banks. In ABC Bank, he invested Rs 50,000 at the rate of 6% per annum for three years. In PQR Bank, he invested Rs 60,000 at the rate of 5% per annum for three years.
- The total amount of interest earned by Alam after three years will be Rs
- A. 6,000
  - B. 6,050
  - C. 18,000
  - D. 18,150
9. Which of the following ordered pairs lies on y-axis?
- I. (0, 3) and (0, -3)
  - II. (3,0) and (-3,0)
  - III. (0,0)
- A. I only
  - B. II only
  - C. I and III
  - D. II and III
10. The equation  $3x + y = 6$  represents a straight line. The x-intercept of the line is
- A.  $\frac{1}{6}$
  - B.  $\frac{1}{2}$
  - C. 2
  - D. 6

11. Which of the following points does NOT lie on the line  $y - 4x = -1$  ?

- A.  $(-1, -3)$
- B.  $(0, -1)$
- C.  $(3, 11)$
- D.  $(1, 3)$

12. In the given graph, the  $x$ -intercept and the  $y$ -intercept respectively are



- A. 3 and  $\frac{9}{2}$
- B.  $\frac{9}{2}$  and 3
- C.  $(0, 3)$  and  $\left(\frac{9}{2}, 0\right)$
- D.  $\left(0, \frac{9}{2}\right)$  and  $(3, 0)$

13. The solution set of a quadratic equation  $x^2 + 2x = 0$  will be

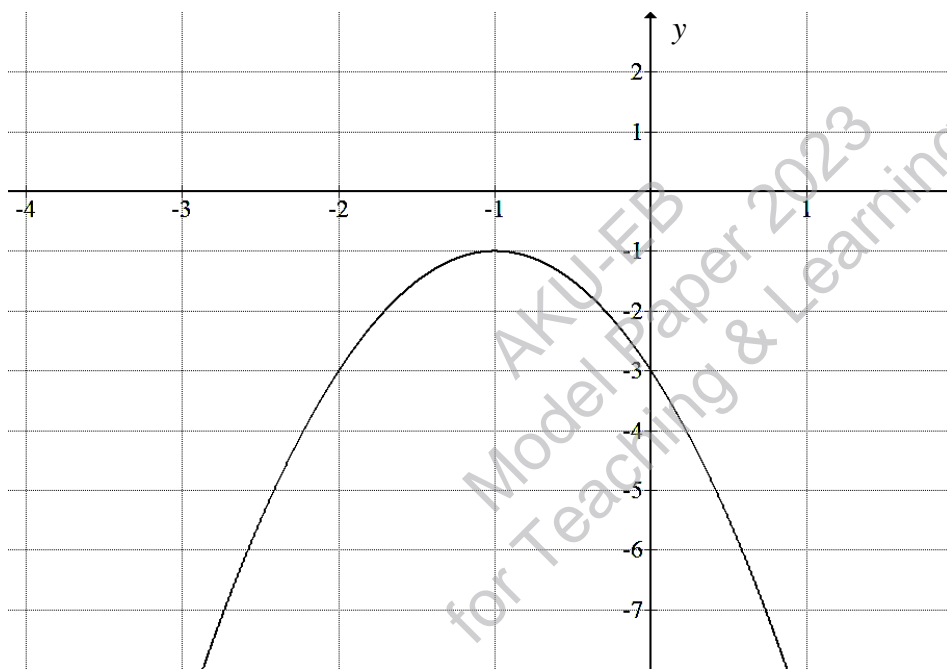
- A.  $\{0, 2\}$ .
- B.  $\left\{0, \frac{1}{2}\right\}$ .
- C.  $\{0, -2\}$ .
- D.  $\left\{0, -\frac{1}{2}\right\}$ .

14. The vertex of the parabola  $y = x^2 - 2$  is

- A.  $(2, 0)$ .
- B.  $(0, 2)$ .
- C.  $(-2, 0)$ .
- D.  $(0, -2)$ .

**Use the given graph to answer Q.15. and Q.16.**

Consider the given quadratic function.



15. The range of the quadratic function is all the

- A. real numbers
- B. real numbers less than  $-1$
- C. real numbers greater than  $-1$
- D. real numbers greater than  $-1$  and less than  $-3$

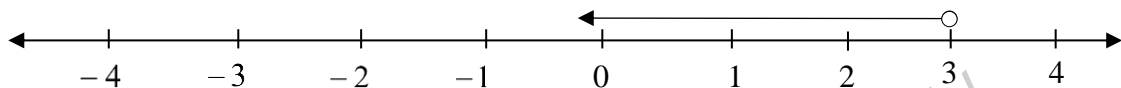
16. The y-intercept of the quadratic function is

- A.  $-2$
- B.  $-3$
- C.  $-4$
- D.  $-16$

17. The solution set of the simultaneous equations  $x = y$  and  $x = -y$ , is

- A.  $\{(1,1)\}$ .
- B.  $\{(0,0)\}$ .
- C.  $\{(1,-1)\}$ .
- D.  $\{(-1,1)\}$ .

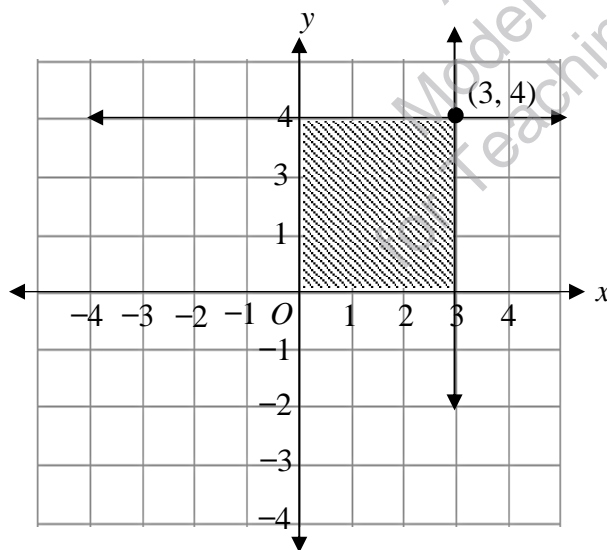
18. The given number line shows solution region of a linear inequality.



The given number line represents the inequality

- A.  $x < 3$
- B.  $x > 3$
- C.  $x \leq 3$
- D.  $x \geq 3$

19. The given figure shows the solution region of inequalities.



Two of the inequalities satisfying the solution region are

- A.  $x \leq 4$  and  $y \leq 3$
- B.  $x \leq 3$  and  $y \leq 4$
- C.  $x \geq 4$  and  $y \geq 3$
- D.  $x \geq 3$  and  $y \geq 4$

20. If  $L - M = \begin{bmatrix} -2 & 0 & 1 \end{bmatrix}$ , then the order of matrix  $L$

- A. will be  $1 \times 1$
- B. will be  $1 \times 3$
- C. will be  $3 \times 1$
- D. cannot be determined

21. For the matrices  $X = \begin{bmatrix} a & b \end{bmatrix}$  and  $Y = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$ , the matrix multiplication  $X \times Y$  equals to

- A.  $\begin{bmatrix} a \\ b \end{bmatrix}$ .
- B.  $\begin{bmatrix} a & b \end{bmatrix}$ .
- C.  $\begin{bmatrix} a+b \end{bmatrix}$ .
- D.  $\begin{bmatrix} a & 0 \\ 0 & b \end{bmatrix}$ .

22. In the matrix equation  $\begin{bmatrix} 2 & 3 & 1 \\ 2 & 3 & 1 \\ 2 & 3 & 1 \end{bmatrix} - X = \begin{bmatrix} 1 & 0 & 2 \\ 1 & 0 & 2 \\ 1 & 0 & 2 \end{bmatrix}$ , the value of matrix  $X$  is

- A.  $\begin{bmatrix} 3 & 3 & 3 \\ 3 & 3 & 3 \\ 3 & 3 & 3 \end{bmatrix}$ .
- B.  $\begin{bmatrix} 1 & 3 & -1 \\ 1 & 3 & -1 \\ 1 & 3 & -1 \end{bmatrix}$ .
- C.  $\begin{bmatrix} -1 & -3 & 1 \\ -1 & -3 & 1 \\ -1 & -3 & 1 \end{bmatrix}$ .
- D.  $\begin{bmatrix} -3 & -3 & -3 \\ -3 & -3 & -3 \\ -3 & -3 & -3 \end{bmatrix}$ .



23. On solving the simultaneous linear equations  $5y - 2x = 11$  and  $x - 3y = 5$  using Cramer's rule, the value of  $y$  will be

A.  $\begin{vmatrix} -2 & 5 \\ 1 & -3 \end{vmatrix}$ .

B.  $\begin{vmatrix} 5 & 5 \\ 11 & -3 \end{vmatrix}$ .

C.  $\begin{vmatrix} -2 & 11 \\ 1 & 5 \end{vmatrix}$ .

D.  $\begin{vmatrix} 5 & 5 \\ 11 & 11 \end{vmatrix}$ .

24. The determinant of the matrix  $\begin{bmatrix} a+b & a+b \\ a & b \end{bmatrix}$  is

A.  $a^2 + b^2$

B.  $a^2 + b^2$

C.  $b^2 - a^2$

D.  $-b^2 - a^2$

25.  $\frac{d}{dx} \sqrt{\frac{ax-b}{a}}$  is equal to

A.  $\frac{1}{2} \left( \frac{ax-b}{a} \right)^{\frac{1}{2}}$

B.  $\frac{1}{2a} \left( \frac{ax-b}{a} \right)^{\frac{1}{2}}$

C.  $\frac{1}{2} \left( \frac{ax-b}{a} \right)^{-\frac{1}{2}}$

D.  $\frac{1}{2a} \left( \frac{ax-b}{a} \right)^{-\frac{1}{2}}$

26. The first derivative of the function  $y = 1 - x^{-n}$  is

A.  $nx^{-n-1}$

B.  $-nx^{-n-1}$

C.  $n(1-x)^{-n-1}$

D.  $-n(1-x)^{-n-1}$

27. If  $f(x) = \sqrt[3]{x}$ , then  $f'(x)$  will be

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 equation for the gradient (slope) of the tangent to the curve  $y = (ax + bx)^{-2}$  will be

A.  $-2(ax + bx)^{-3}$

B.  $-2(ax + bx)^{-1}$

C.  $-2(ax + bx)^{-3}(a + b)$

D.  $-2(ax + bx)^{-1}(a + b)$

29. If  $2^{6-n}$  is the  $n^{\text{th}}$  term of a geometric sequence, then the common ratio will be

A.  $-2$

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

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

D.  $2$

30. If the 23<sup>rd</sup> term of an arithmetic progression is 46 and the common difference is 2, then the 1<sup>st</sup> term will be

A.  $-2$

B.  $0$

C.  $1$

D.  $2$

Please use this page for rough work

AKU-EB  
Model Paper 2023  
for Teaching & Learning Only

Please use this page for rough work

AKU-EB  
Model Paper 2023  
for Teaching & Learning Only