AGA KHAN UNIVERSITY EXAMINATION BOARD

SECONDARY SCHOOL CERTIFICATE

CLASS IX

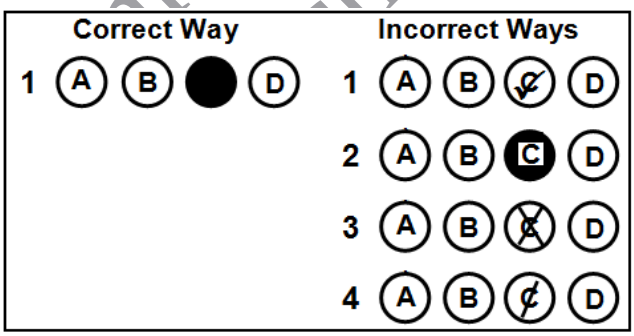
ANNUAL EXAMINATIONS (THEORY) 2023

General Mathematics Paper I

Time: 1 hour 20 minutes Marks: 45

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 45 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.



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 simple calculator if you wish.

List of Formulae

NOTE:

- The symbols have their usual meanings.

Business Mathematics

$$\text{Loss }\% = \left(\frac{\text{Loss}}{CP} \times 100\right) \qquad \text{Profit }\% = \left(\frac{\text{Profit}}{CP} \times 100\right) \qquad SP = CP \times \left(\frac{100 + \text{profit}\,\%}{100}\right)$$

$$SP = CP \times \left(\frac{100 - \text{loss}\%}{100}\right) \qquad \text{Discount }\% = \frac{\text{Discount}}{MP} \times 100$$

Sets and Functions

$$(A \cup B)^c = A^c \cap B^c \qquad (A \cap B)^c = A^c \cup B^c$$

Exponents and Logarithms

$$a^m \times a^n = a^{m+n} \qquad a^m \div a^n = a^{m-n} \qquad \frac{a^m}{b^m} = \left(\frac{a}{b}\right)^m$$

$$\left(a^m\right)^n = a^{mn} \qquad (a \times b)^m = a^m \times b^m \qquad a^{\frac{m}{n}} = \sqrt[n]{a^m}$$

$$\log_a (m)^n = n \log_a m \qquad \log_a (m \times n) = \log_a m + \log_a n \qquad \log_a \left(\frac{m}{n}\right) = \log_a m - \log_a n$$

$$\log_a n = \log_b n \times \log_a b \qquad \log_a b = n \Leftrightarrow a^n = b$$

Algebraic Formulae and Applications/ Factorisation

$$(a-b)^2 = a^2 - 2ab + b^2 \qquad (a+b)^2 = a^2 + 2ab + b^2$$

$$a^2 - b^2 = (a+b)(a-b) \qquad 2\left(a^2 + b^2\right) = (a+b)^2 + (a-b)^2$$

$$(a+b)^2 - (a-b)^2 = 4ab \qquad (a+b+c)^2 = a^2 + b^2 + c^2 + 2ab + 2bc + 2ca$$

Linear Graphs

$$1 \text{ mile} = \frac{8}{5}\text{km} \qquad 1 \text{ Hectare} = 2.471 \text{ Acres} \qquad {}^\circ F = \left(\frac{9}{5} \times {}^\circ\text{C}\right) + 32$$

Matrices and Determinants

$$A^{-1} = \frac{1}{|A|} AdjA$$

1. The fraction $\frac{1}{16}$ can be expressed in percentage form as

   A. 6.25%
   B. 0.000625%
   C. 0.16%
   D. 16%

2. 8% of 200 is equal to

   A. 4
   B. 8
   C. 16
   D. 25

3. Mr Jamal's monthly salary is Rs 87,300. The details of his expenditures for the month of September are given in the table. The remaining salary is his saving.

School Fees of his Children	Monthly Grocery	Utility Bills	House Rent	Conveyance	Misc. Expenses
16,800	15,000	9,500	18,000	10%	15,000

   The amount he spends on the conveyance is

   A. Rs 5,000
   B. Rs 8,730
   C. Rs 10,000
   D. Rs 10,730

4. The price of a storybook is Rs 500. If the price of the book increases in the ratio of 6:5, and then decreases in the ratio of 3:4, then the final price of the book will be

   A. Rs 50
   B. Rs 150
   C. Rs 450
   D. Rs 600

5. The ratio of the ages of Nazia and Shazia is 2:3. If Nazia is 10 years old, then Shazia's age is

   A. 12 years.
   B. 13 years.
   C. 15 years.
   D. 18 years.

6. The amount of *zakat* Farhan paid on his annual savings is Rs 5,000. If the rate of zakat is 2.5% per annum, then his annual savings were

   A. Rs 50,000
   B. Rs 100,000
   C. Rs 125,000
   D. Rs 200,000

7. Meer earns Rs 225,000 from his rice field and Rs 300,000 from his cotton field in a certain year. The amount of Ushr he has to pay this year is

   (**Note:** Rate of Ushr is 10% of the earning.)

   A. Rs 5,250
   B. Rs 22,500
   C. Rs 30,000
   D. Rs 52,500

8. A man owns a land worth Rs 600,000. If he has only a son and a daughter among his legal heirs, the inheritance of son is

   (**Note**: The share of son is two times that of daughter.)

   A. Rs 200,000
   B. Rs 300,000
   C. Rs 400,000
   D. Rs 500,000

9. Samra bought 25 storybooks. The cost price of each storybook was Rs 200. If she sold each storybook at a price of Rs 300, then her profit percentage is

   A. 33%
   B. 50%
   C. 100%
   D. 150%

10. Sana bought books of Rs 15,000. She got a discount of 10% on Rs 15,000. She was awarded a further discount of 10% on the total discounted price for being the 100^{th} customer of the day. Her total saving was

    A. Rs 1,500
    B. Rs 1,650
    C. Rs 2,850
    D. Rs 3,000

11. Three business partners invested in a ratio 4:3:5. After one year, they earned a profit of Rs 840,000. The share of profit of the partner with the least amount of investment will be

    A. Rs 70,000
    B. Rs 210,000
    C. Rs 280,000
    D. Rs 350,000

12. Sajid bought two trousers and two shirts. The tag price of each trouser and shirt is Rs 1,000 and Rs 500 respectively.

    If the discount offered on the tag price of the trouser and the shirt are 5% and 10% respectively, then the total discount Sajid gets on two trousers and two shirts, in rupees, will be

    A. Rs 100
    B. Rs 200
    C. Rs 300
    D. Rs 350

13. The marked price of a suit was Rs 4,500. In the summer sale, the discounted price was Rs 3,000.

    Based on the given information, the discount percentage offered on the suit was

    A. 20%
    B. 33.33%
    C. 50%
    D. 66.67%

14. If $R = \{0, 5\}$ and $T = \{1, 2, 3\}$, then which of the following represents a function from R to T?

    A. $\{(0, 1), (5, 3)\}$
    B. $\{(1, 0), (5, 2)\}$
    C. $\{(0, 1), (5, 2), (5, 3)\}$
    D. $\{(1, 0), (2, 5), (3, 5)\}$

15. If $A = \{a, b, c, d, e\}$ and $B = \{d, e, f\}$, then $A \cap B$ is equal to

    A. $\{d, e\}$.
    B. $\{d, e, f\}$.
    C. $\{a, b, c, f\}$.
    D. $\{a, b, c, d, e, f\}$.

16. If N is the set of natural numbers and W is the set of whole numbers, then $N - W$ is equal to

    A. ϕ.
    B. $\{0\}$.
    C. $\{1, 2, 3, \ldots\}$.
    D. $\{0, 1, 2, 3, \ldots\}$.

17. If E is a non-empty set, then which of the following conditions is FALSE?

    A. $E \cup E = E$
    B. $E \cap E = E$
    C. $E \cup \phi = E$
    D. $E \cap \phi = E$

18. If a relation from one set to another set is {(1, 2), (3, 5), (4, 6), (4, 9)}, then the domain of this relation is

A. {1, 3, 4}.
B. {2, 6, 9}.
C. {1, 3, 4, 4}.
D. {2, 5, 6, 9}.

19. In simplest form, $\frac{a^{-2}}{a^{-3}}$ can be written as

A. $-a$.
B. $-\frac{1}{a}$.
C. a.
D. $\frac{1}{a}$.

20. The exponential form of $\frac{1}{\sqrt[7]{7^5}}$ is

A. $-7^{\frac{7}{5}}$
B. $-7^{\frac{5}{7}}$
C. $7^{-\frac{7}{5}}$
D. $7^{-\frac{5}{7}}$

21. The radical form of $a^{-\frac{2}{3}}$ is

A. $-\sqrt[3]{a^2}$.
B. $-\sqrt{a^3}$.
C. $\frac{1}{\sqrt[3]{a^2}}$.
D. $\frac{1}{\sqrt{a^2}}$.

22. In ordinary form, the number 3.75×10^2 is equal to

A. 0.00375
B. 0.0375
C. 375
D. 3750

23. The exponential form of $\log_b b = 1$ is

A. $b^b = 1$
B. $b^1 = b$
C. $1^b = b$
D. $\left(\frac{1}{b}\right)^b = 1$

24. For $\log_{\sqrt{a}} a = x$, the value of x is equal to

A. $\frac{1}{2}$
B. a
C. $2a$
D. 2

25. After applying laws of logarithm, $\log\sqrt{\frac{x}{y}}$ is equal to

A. $\frac{1}{2}\log x - \log y$.
B. $\frac{1}{2}\log x + \log y$.
C. $\frac{1}{2}\log x - \frac{1}{2}\log y$.
D. $\frac{1}{2}\log x + \frac{1}{2}\log y$.

26. If the value of $(a + b)^2 = 625$ and $(a - b)^2 = 25$, then the value of ab will be equal to

A. 150
B. 300
C. 325
D. 600

27. In its lowest form, $\frac{3x-6y}{(2y-x)^2}$ will become

A. $\frac{3}{x-2y}$.

B. $\frac{3}{x+2y}$.

C. $-\frac{3}{x+2y}$.

D. $-\frac{3}{x-2y}$.

28. The simplest form of $\frac{x^2-x}{(x+1)^2}\times\frac{2x+2}{4(x-1)}$ will be

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

B. $\frac{x}{2(x-1)}$.

C. $\frac{x}{2(x+1)}$.

D. $\frac{(x+1)^2}{2(x-1)}$.

29. The value of the expression $\sqrt{x^3-3x-1}$ at $x = -1$ is

A. $\sqrt{5}$

B. 0

C. 1

D. $\sqrt{-5}$

30. If the value of $a - b = 3$ and $2ab = 108$, then the value of a^2+b^2 will be equal to

A. 99

B. 105

C. 111

D. 117

31. On simplification of $\sqrt{8}+\sqrt{18}$, we get

A. $\sqrt{13}$
B. $5\sqrt{2}$
C. $\sqrt{26}$
D. $13\sqrt{2}$

32. The polynomial $3x^2y-6xy$ is equal to

A. $3xy(x-3)$.
B. $3xy(x-2)$.
C. $3xy(y-2)$.
D. $3xy(x-6)$.

33. The factors of $2y^2-\frac{1}{2}$ are

A. $2y-\frac{1}{4}$ and $y+1$
B. $2\left(y+\frac{1}{4}\right)$ and $y-1$
C. $2\left(y+\frac{1}{2}\right)$ and $\left(y-\frac{1}{2}\right)$
D. $\left(y+\frac{1}{4}\right)$ and $\left(y-\frac{1}{4}\right)$

34. Which of the following multiplications results as $2y^2-20y+50$?

A. $2(y-5)(y+5)$
B. $2(y-5)(y+10)$
C. $2(y-5)(y-5)$
D. $2(y-5)(y-10)$

35. For the divisor $x + 1$, the remainder of polynomial $2x^3+3x^2-3x$ will be

A. -2
B. -8
C. 2
D. 4

36. If one of the zeros of the polynomial $2x^2 - bx + 5$ is -1, then the value of b will be

A. -7
B. -1
C. 1
D. 7

37. The point $(-9, 8)$ lies in the

A. quadrant I.
B. quadrant II.
C. quadrant III.
D. quadrant IV.

38. The line $y = 10$ is parallel to

A. x axis and passes through point (0, 10).
B. y axis and passes through point (10, 0).
C. x axis and passes through point (10, 0).
D. y axis and passes through point (0, 10).

39. For $x = 5$, the value of $y = \frac{x}{25} + 1$ is equal to

A. 6
B. $\frac{6}{5}$
C. $\frac{2}{5}$
D. 5

40. One of the examples of row matrices is

A. $\begin{bmatrix} 1 \\ 2 \\ 3 \end{bmatrix}$.
B. $\begin{bmatrix} 1 & 2 & 3 \end{bmatrix}$.
C. $\begin{bmatrix} 1 & 0 \\ 2 & 0 \\ 3 & 0 \end{bmatrix}$.
D. $\begin{bmatrix} 1 & 2 & 3 \\ 0 & 0 & 0 \end{bmatrix}$.

41. An example of symmetric matrix is

A. $\begin{bmatrix} 5 & 0 & 5 \\ 0 & 0 & 0 \\ 5 & 5 & 5 \end{bmatrix}$.

B. $\begin{bmatrix} 5 & 5 & 5 \\ 0 & 5 & 0 \\ 5 & 0 & 5 \end{bmatrix}$.

C. $\begin{bmatrix} 5 & 0 & 5 \\ 0 & 5 & 0 \\ 5 & 0 & 5 \end{bmatrix}$.

D. $\begin{bmatrix} 0 & 0 & 0 \\ 0 & 5 & 5 \\ 0 & 0 & 5 \end{bmatrix}$.

42. If $A = \begin{bmatrix} 1 & 2 \\ 4 & 3 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$, then $2A - B$ will be equal to

A. $\begin{bmatrix} 1 & 2 \\ 5 & 2 \end{bmatrix}$.

B. $\begin{bmatrix} 1 & 2 \\ 4 & 3 \end{bmatrix}$.

C. $\begin{bmatrix} 0 & 0 \\ 2 & -2 \end{bmatrix}$.

D. $\begin{bmatrix} 0 & 0 \\ 1 & -1 \end{bmatrix}$.

43. Three matrices are given as $X = \begin{bmatrix} 2 & 3 & 1 \\ 1 & 2 & 3 \end{bmatrix}$, $Y = \begin{bmatrix} 1 & 1 \\ 1 & 1 \end{bmatrix}$ and $Z = \begin{bmatrix} a \\ b \\ c \end{bmatrix}$.

For the given matrices, which of the following matrix multiplication is possible?

A. $X \times Z$
B. $X \times Y$
C. $Y \times Z$
D. $Z \times Y$

44. If $X+\begin{bmatrix} a & c \\ b & d \end{bmatrix}\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}=\begin{bmatrix} a & c \\ b & d \end{bmatrix}$, then the matrix X will be equal to

(**Note**: Here a, b, c and d are non-zero constants.)

A. $\begin{bmatrix} 0 & 0 \\ 0 & 0 \end{bmatrix}$.

B. $\begin{bmatrix} a & c \\ b & d \end{bmatrix}$.

C. $\begin{bmatrix} 2a & c \\ b & 2d \end{bmatrix}$.

D. $\begin{bmatrix} 2a & 2c \\ 2b & 2d \end{bmatrix}$.

45. A matrix equation representing system of simultaneous linear equations is given by $\begin{bmatrix} 3 & -1 \\ 2 & 1 \end{bmatrix}\begin{bmatrix} x \\ y \end{bmatrix}=\begin{bmatrix} -1 \\ 1 \end{bmatrix}$.

As per Crammer's rule, the value of x for the given matrix equation is

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

B. $\dfrac{\begin{vmatrix} 1 & -1 \\ 1 & 1 \end{vmatrix}}{\begin{vmatrix} 3 & -1 \\ 2 & 1 \end{vmatrix}}$.

C. $\dfrac{\begin{vmatrix} -1 & -1 \\ 1 & 1 \end{vmatrix}}{\begin{vmatrix} 3 & -1 \\ 2 & 1 \end{vmatrix}}$.

D. $\dfrac{\begin{vmatrix} 3 & -1 \\ 2 & 1 \end{vmatrix}}{\begin{vmatrix} -1 & -1 \\ 1 & 1 \end{vmatrix}}$.

END OF PAPER

Please use this page for rough work

Please use this page for rough work

Please use this page for rough work

Please use this page for rough work