AGA KHAN UNIVERSITY EXAMINATION BOARD

SECONDARY SCHOOL CERTIFICATE

CLASS IX

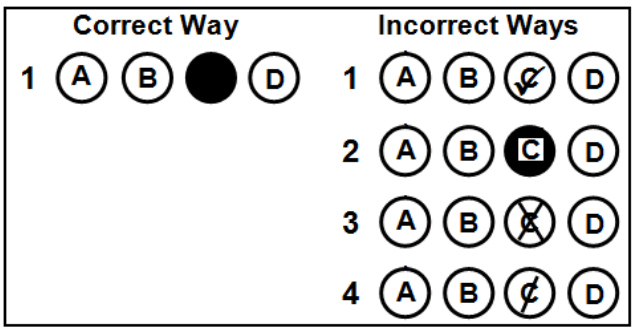
MODEL EXAMINATION PAPER 2023 AND ONWARDS

Mathematics Paper I

Time: 1 hour and 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.

Aga Khan University Examination Board

List of Formulae for Mathematics IX

Note:

- All symbols used in the formulae have their usual meaning.
- The same formulae will be provided in the annual and re-sit examinations.

Sets and Functions

$A\Delta B = (A \cup B) - (A \cap B)$ $\quad (A \cap B)^c = A^c \cup B^c$ $\quad (A \cup B)^c = A^c \cap B^c$

Real and Complex Numbers

$x^m \times x^n = x^{m+n}$ $\quad (x \times y)^n = x^n \times y^n$ $\quad (x^m)^n = x^{mn}$

$\left(\frac{x}{y}\right)^n = \frac{x^n}{y^n}$ $\quad \frac{x^m}{x^n} = x^{m-n}$ $\quad a^{-m} = \frac{1}{a^m}$

Exponents and Logarithms

$\log_a (m \times n) = \log_a m + \log_a n$ $\quad \log_a \left(\frac{m}{n}\right) = \log_a m - \log_a n$ $\quad \log_a b = n \Leftrightarrow a^n = b$

$\log_a (m)^n = n \log_a m$ $\quad \log_a n = \log_b n \times \log_a b$ $\quad \log_a n = \frac{\log_b n}{\log_b a}$

Algebraic Formulae and Applications/Factorisation

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

$(a-b)^3 = a^3 - 3a^2b + 3ab^2 - b^3$ $\quad a^2 - b^2 = (a+b)(a-b)$

$a^3 - b^3 = (a-b)(a^2 + ab + b^2)$ $\quad (a+b)^2 + (a-b)^2 = 2(a^2 + b^2)$

$(a+b+c)^2 = a^2 + b^2 + c^2 + 2ab + 2bc + 2ca$ $\quad (a+b)^3 = a^3 + 3a^2b + 3ab^2 + b^3$

$a^3 + b^3 = (a+b)(a^2 - ab + b^2)$ $\quad (a+b)^2 - (a-b)^2 = 4ab$

Matrices and Determinants

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

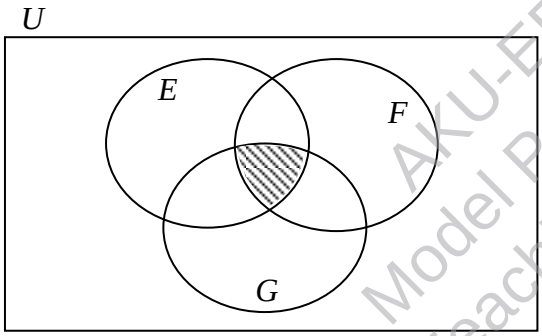
1. Given that $A = \{1, 2\}$ and $B = \{1, \{2, 3\}\}$, then $A \cap B$ will be

   A. {1}.
   B. {1, 2}.
   C. {1, {2}}.
   D. {{1, 2}}.

2. Consider the sets $S = \{d, e, f\}$, $T = \{f, h, z\}$ and $V = \{d, e, h, z\}$. The set *V*, in terms of *S* and *T* will be equal to

   A. $S \cup T$.
   B. $S \cap T$.
   C. $S - T$.
   D. $S \Delta T$.

3. Observe the given Venn diagram.



   The shaded region in the given Venn diagram represents

   A. $E \cap (F \cap G)$.
   B. $E \cup (F \cup G)$.
   C. $E \cup (F \cap G)$.
   D. $E \cap (F \cup G)$.

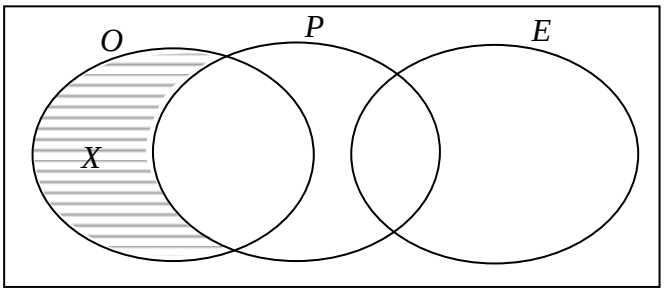
4. If $E = \{0, 1, 2, 3\}$ and $F = \{(0, 4)\}$ are two sets, then which of the given options is the range of a relation from *F* to *E* ?

   A. {}
   B. {0, 4}
   C. {(0, 4)}
   D. {0, 1, 2, 3}

5. If $A = \{a, e, i\}$ and $B = \{1, 2, 3, 4\}$, then one of the functions from *A* to *B* is

   A. $\{(a,1),(e,2)\}$.
   B. $\{(a,1),(e,1),(i,1)\}$.
   C. $\{(a,1),(a,2),(a,3),(a,4)\}$.
   D. $\{(a,1),(e,2),(i,3),(a,4)\}$.

6. There are 10 balls in a bag. The balls are numbered as 1 to 10. Aman wants to separate the balls in three sets of even (E), odd (O) and prime (P) numbers as shown in the given Venn diagram.



The shaded region, represented by X, will contain the balls numbered as

A. $\{2, 4, 6, 8, 10\}$.
B. $\{3, 5, 7, 9\}$.
C. $\{1, 3, 5, 7\}$.
D. $\{1, 9\}$.

7. For $a \in R$ and $b \in R$, $a + b \in R$. This property of addition is called

(**Note**: R is the set of real number.)

A. closure property.
B. associative property.
C. commutative property.
D. additive identity property.

8. In exponential form, $\frac{1}{\sqrt[b]{x^a}}$ equals to

A. $-x^{\frac{a}{b}}$.
B. $-x^{\frac{b}{a}}$.
C. $x^{-\frac{b}{a}}$.
D. $x^{-\frac{a}{b}}$.

9. If $2(\sqrt{-9}-2)$ is written in the form of $z=a+bi$, then it will be equal to

(**Note**: $i=\sqrt{-1}$)

A. $6-4i$.
B. $-4+6i$.
C. $-18-4i$.
D. $-4-18i$.

10. The product of $z_1=\frac{a(1+i)}{b}$ and $z_2=\frac{b(1-2i)}{a}$ is

A. $\frac{a^2}{b^2}(3-i)$.
B. $\frac{a^2}{b^2}(3+i)$.
C. $3-i$.
D. $3+i$.

11. In scientific notation, $(0.002)\times(0.002)$ is equal to

A. 4×10^{3}
B. 4×10^{-3}
C. 4×10^{6}
D. 4×10^{-6}

12. The logarithmic expression $\frac{\log_3 x}{\log_3 y}$ can also be written as

A. $\log_x y$.
B. $\log_y x$.
C. $\log_3 \frac{x}{y}$.
D. $\log_3(x-y)$.

13. For $\log_2 x=-1$, the value of x is

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

14. The value of $\log_{\sqrt{a}} a$ is

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

15. If $\log_{10} 2 = 0.3010$ and $\log_{10} 7 = 0.8450$, then the value of $\log_{10} \frac{32}{7}$ is equal to

A. 0.660
B. 1.505
C. 1.7810
D. 2.3500

16. One of the examples of a polynomial expression is

A. $5\sqrt{x} + 5$
B. $3x^3 + 4x^{\frac{2}{3}} + 6$
C. $3x^{-3} + 2x^2 + 3$
D. $5x^3 - \frac{4}{3}x^2 + \sqrt{3}$

17. For $x = -3$ and $y = \sqrt{3}$, the value of $\sqrt{x^2 - y^2 - 6}$ is

A. -3
B. 0
C. $\sqrt{-18}$
D. $\sqrt{-15}$

18. On simplification of $2 + \sqrt{3} - 1 + 2\sqrt{3}$, we get

A. $-1 + 3\sqrt{6}$
B. $-1 + 3\sqrt{3}$
C. $1 + 3\sqrt{6}$
D. $1 + 3\sqrt{3}$

19. The simplest form of $\frac{(a+b)^2}{a^2+ab}$ is

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

20. If $3a-2b=10$ and $ab=2$, then the value of $27a^3-8b^3$ will be

A. 640
B. 940
C. 1,060
D. 1,360

21. If $P=\frac{1}{2-\sqrt{5}}$, then $\frac{1}{P}$ is equal to

A. $2+\sqrt{5}$
B. $2-\sqrt{5}$
C. $-2+\sqrt{5}$
D. $-2-\sqrt{5}$

22. The expression having factors $(x-7)$ and $(x-7)$, can be written as

A. x^2-49
B. x^2+49
C. $x^2+14x-49$
D. $x^2-14x+49$

23. The factorised form of $1-(x-y)^2$ is

A. $(1-x-y)(1+x+y)$.
B. $(1-x+y)(1+x+y)$.
C. $(1-x+y)(1+x-y)$.
D. $(1-x+y)(1-x+y)$.

24. For a positive integer *m*, the area of a rectangle is $81m^4 + 36m^2 + 16$. If one of the sides of the rectangle is $9m^2 - 6m + 4$, then the other side would be

A. $9m^2 + 4$
B. $9m^2 - 4$
C. $9m^2 + 6m - 4$
D. $9m^2 + 6m + 4$

25. The factorised form of the polynomial $x^3 + 3x^2 + 3x + 1$ will be

A. $(x-1)^3$
B. $(x+1)^3$
C. $(x-1)(x^2 + x + 1)$
D. $(x+1)(x^2 - x + 1)$

26. On factorisation of $4c^2 + 4^3$, we get

A. $4(c+1)^2$
B. $4(c+4)^2$
C. $4(c^2+1)$
D. $4(c^2+4^2)$

27. For the polynomial $P(x) = (1-r^2)r - r^3x$, the linear expression that leaves a remainder '*r*' will be

A. $x - r$
B. $x - 1$
C. $x + r$
D. $x + 1$

28. Which of the following is NOT a factor of the polynomial $p(x) = (x^2 - 9)(x-1)$?

A. $x - 1$
B. $x - 3$
C. $x + 3$
D. $x - 9$

29. If $a:b = 1:5$ and $b:c = 3:2$, then $a:b:c$ will be

A. 1:15:2
B. 3:15:6
C. 5:15:10
D. 3:15:10

30. If $a:b::c:d$, then according to componendo property

A. $a+b:b::c+d:d$.
B. $a-b:b::c-d:d$.
C. $a+b:a::c+d:c$.
D. $a-b:a::c-d:c$.

31. If $a:b::c:d$, then according to dividendo property, we get

A. $\frac{a-c}{a}=\frac{b-d}{b}$.
B. $\frac{a-c}{b}=\frac{b-d}{d}$.
C. $\frac{a-b}{a}=\frac{c-d}{c}$.
D. $\frac{a-b}{b}=\frac{c-d}{d}$.

32. Aliya bought an energy efficient washing machine that saves 10 gallons of water per load. If she washes 15 loads of laundry, then the number of gallons of water she saves will be

A. 0.15
B. 1.5
C. 15
D. 150

33. If $T=\begin{bmatrix}1 & 0\\ 0 & 1\end{bmatrix}$ and $TN=\begin{bmatrix}2\\ -2\end{bmatrix}$, then the order of the matrix N is

A. 1×1
B. 1×2
C. 2×1
D. 2×2

34. If $A=\begin{bmatrix}1 & 3\\ 2 & 0\end{bmatrix}$, then $I\times A^t$ is equal to

(**Note**: Here *I* is the multiplicative identity matrix.)

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

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

C. $\begin{bmatrix}1 & 0\\ 0 & 1\end{bmatrix}$.

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

35. In the matrix equation $3X-\begin{bmatrix}6 & 3\\ 0 & 1\end{bmatrix}=\begin{bmatrix}0 & 0\\ 0 & 0\end{bmatrix}$, the matrix *X* will be equal to

A. $\begin{bmatrix}2 & 1\\ 0 & \frac{1}{3}\end{bmatrix}$.

B. $\begin{bmatrix}3 & 0\\ -3 & -2\end{bmatrix}$.

C. $\begin{bmatrix}-9 & -6\\ -3 & -4\end{bmatrix}$.

D. $\begin{bmatrix}-2 & -1\\ 0 & -\frac{1}{3}\end{bmatrix}$.

36. If the matrix $P=\begin{bmatrix}-a & b\end{bmatrix}$, then the additive inverse of P is

A. $-\begin{bmatrix}a & b\end{bmatrix}$.

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

C. $\begin{bmatrix}a & -b\end{bmatrix}$.

D. $-\begin{bmatrix}-a & -b\end{bmatrix}$.

37. If $A=\begin{bmatrix}2 & 3\end{bmatrix}$ and $B=\begin{bmatrix}1\\ 5\end{bmatrix}$, then $A\times B$ is

A. $\begin{bmatrix}17\end{bmatrix}$.

B. $\begin{bmatrix}2\\ 15\end{bmatrix}$.

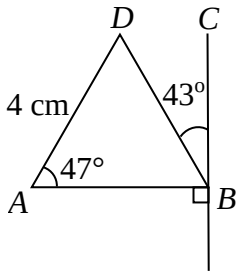
C. $\begin{bmatrix}2 & 15\end{bmatrix}$.

D. not possible.

38. If the determinant of the matrix $\begin{bmatrix} 2 & 1 \\ k & -2 \end{bmatrix}$ is 4, then k is equal to

A. -8
B. -4
C. 0
D. 8

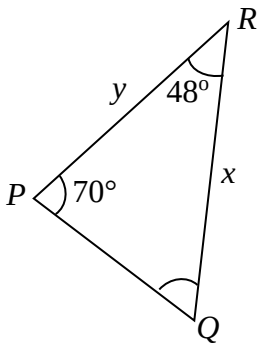
39. In the given figure, line BC is perpendicular to the side AB of the triangle ABD. The length of the side BD is

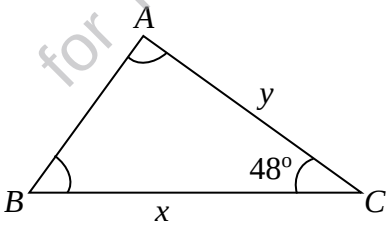


NOT TO SCALE

A. 2.92 cm.
B. 4 cm.
C. 5 cm.
D. 5.47 cm.

40. In the correspondence $\Delta ABC \leftrightarrow \Delta PQR$, $\Delta ABC \cong \Delta PQR$. If $\angle P = 70^\circ$ and $\angle C = 48^\circ$, then $\angle B$ will be

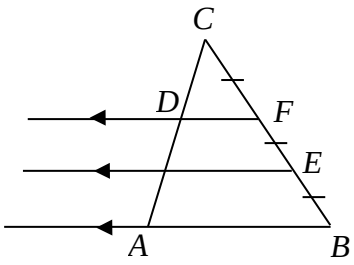




NOT TO SCALE

A. 48°
B. 52°
C. 62°
D. 70°

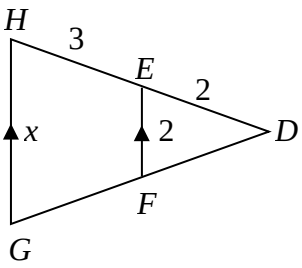
41. The given figure shows a triangle AB whose sides AC and BC are intercepted by three parallel lines. If AC = 12 cm, then the length of DC will be



NOT TO SCALE

A. 2 cm.
B. 3 cm.
C. 4 cm.
D. 6 cm.

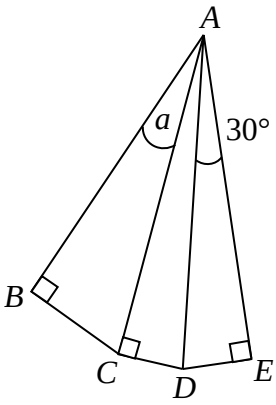
42. In the given diagram, the value of *x* will be equal to



NOT TO SCALE

A. 2
B. 3
C. 4
D. 5

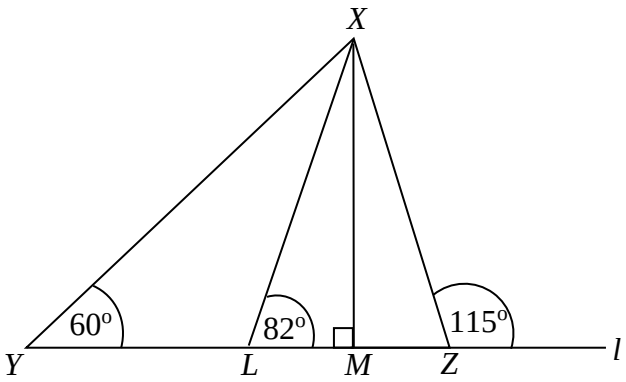
43. In the given figure, $\angle CAE = \angle BAC$ and $CD = ED$. If $\angle DAE = 30°$, then the value of *a* will be



NOT TO SCALE

A. 15°
B. 30°
C. 60°
D. 120°

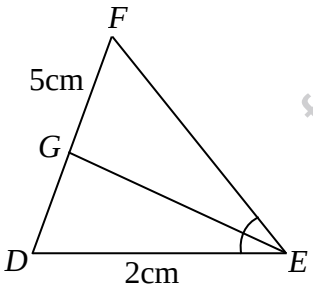
44. The given diagram shows various routes to destinations *Y*, *L*, *M* and *Z* which lie on a straight line *l*. If four different ants travel at an equal speed, starting their journeys together from point *X*, then the ant which will reach the destination at the earliest will follow the route



NOT TO SCALE

A. *XY*.
B. *XL*.
C. *XM*.
D. *XZ*.

45. In the given triangle *FDE*, if *GE* is the angle bisector of $\angle DEF$, then the length of *EF* is equal to



NOT TO SCALE

A. 6
B. 7
C. 10
D. 12

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