AGA KHAN UNIVERSITY EXAMINATION BOARD

SECONDARY SCHOOL CERTIFICATE

CLASS IX

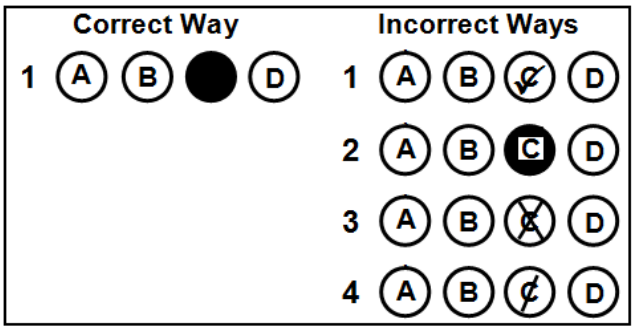
ANNUAL EXAMINATIONS 2021

Mathematics

Time: 1 hour 40 minutes Marks: 50

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 50 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. The marks obtained on the 50 MCQs will be equated to the total marks of 75 for the theory examination results.
8. You may use a simple calculator if you wish.

Use the given information to answer Q.1 and Q.2.

It is given that $M = \{0,1,2,3\}$ and $N = \{1,3,4,5\}$.

1. The set $M - N$ is equal to

   A. $\{0\}$.
   B. $\{0,2\}$.
   C. $\{4,5\}$.
   D. $\{1,3\}$.

2. The set $N \cup M$ is equal to

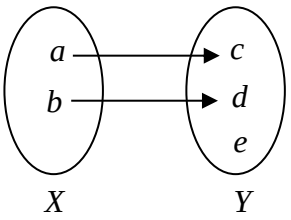
   A. $\{1,3\}$.
   B. $\{0,2,4,5\}$.
   C. $\{0,1,2,3,4,5\}$.
   D. $\{0,1,1,2,3,3,4,5\}$.

3. For the Cartesian product $P \times Q = \{(1,m),(1,3),(4,m),(4,3),(7,m),(7,3)\}$, the number of elements in set Q is

   A. 6
   B. 5
   C. 3
   D. 2

Use the given information to answer Q.4 and Q.5.

A mapping from set X to set Y is given in the diagram.



4. The given mapping shows a/ an

   A. into function only.
   B. one-one function only.
   C. one-one and into function.
   D. one-one and onto function.

5. If the element e is removed from the set Y, then the given mapping will become a/ an

   A. onto function only.
   B. one-one function only.
   C. one-one and into function.
   D. one-one and onto function.

6. If $A = \{1, 2, 3\}$ and $A \cup B = \{1, 2, 3, 4, 5\}$, then the possible set(s) B will be

I. $\{3, 4, 5\}$.
II. $\{1, 3, 5\}$.
III. $\{2, 4, 5\}$.

A. I only
B. II only
C. I and III
D. II and III

7. Consider two sets $A = \{2, 3, 4\}$ and $B = \{a, b\}$. The binary relation $\{(2, b), (3, b), (4, b)\}$ is

A. not a function.
B. an into function.
C. an onto function.
D. an one-one function.

8. If $A = \{a, b\}$ and $B = \{10, 20\}$, then which of the following option(s) is/ are binary relation from A to B?

I. $\{(a, 10), (b, 20)\}$
II. $\{(10, a), (20, b)\}$
III. $\{(a, 20)\}$
IV. $\{(10, b)\}$

A. I only
B. II only
C. I and III
D. II and IV

9. If a universal set is defined as $U = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$ and E is the set of even numbers, then E^C is

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

10. If a number 0.0101 can also be expressed as 1.01×10^p, then the value of p is equal to

A. -2
B. -1
C. 1
D. 2

11. On converting $10^{-3} = 0.001$ into the logarithmic form $\log_{10} m = n$, the value of m will be

A. -3
B. 0.001
C. 1
D. 10

12. The value of $\log_x\left(\frac{1}{x^2}\right)$ is equal to

A. -1
B. 1
C. 2
D. -2

13. In a single logarithm, $\log a^2 - 3\log b + \log a$ can be written as

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

14. If $2^{-x} = \frac{1}{16}$, then the value of x is

A. -4
B. $-\frac{1}{4}$
C. $\frac{1}{4}$
D. 4

15. On simplification, $\frac{y^0 \times x}{x^0 \times y}$ is equal to

A. $\frac{x}{y}$
B. $\frac{y}{x}$
C. 1
D. 0

16. If $b-a=2$ and $\frac{1}{2}(b+a)=1$, then the value of b^2-a^2 is equal to

A. 1
B. 4
C. $\frac{1}{2}$
D. $\frac{1}{4}$

17. The value of $(2+4)-\sqrt{4}+\sqrt{2}$ is equal to

A. $4+\sqrt{2}$
B. $4+\sqrt{6}$
C. $6-\sqrt{2}$
D. $6-\sqrt{6}$

18. The value of $\left[\frac{1}{2}(a+x)\right]^3$, when $a=1-x$, is equal to

A. $\frac{1}{6}$
B. $\frac{1}{8}$
C. $\frac{3}{2}$
D. $\frac{3}{8}$

19. One of the examples of polynomial expression is

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

20. On simplification of $\left(\frac{a^2+a^2b}{1-b^2}\right)$, we get

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

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

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

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

21. The value of $(x-y)\times\left(x^2-xy+y^2\right)$ at $x = 1$ and $y = -1$ is

A. 2
B. 4
C. 5
D. 6

22. On complete factorisation, $3-3p^2$ is equal to

A. $3(1-p)^2$.

B. $3(3-p)^2$.

C. $3(1+p)(1-p)$.

D. $3(3+p)(3-p)$.

23. The expression $r^2-3+6r+12$ can also be written as

A. $(r+3)^2$

B. $(r-3)^2$

C. $(r-3)^2+6^2$

D. $(r+3)^2+6^2$

24. If a polynomial q^3x+q^3+1 is divided by a linear expression, then the remainder is 1. The linear expression must be

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

25. On factorisation of $x(x+2)+1$, we get

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

26. On complete factorisation of $x+y-(x-y)(x+y)$, we get

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

27. On complete factorisation of $x^2-2x+2-1$, we get

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

28. On factorisation of $b^3-\frac{1}{b^3}$, we get

A. $\left(b-\frac{1}{b}\right)\left(b^2-1+\frac{1}{b^2}\right)$.
B. $\left(b-\frac{1}{b}\right)\left(b^2-1-\frac{1}{b^2}\right)$.
C. $\left(b-\frac{1}{b}\right)\left(b^2+1-\frac{1}{b^2}\right)$.
D. $\left(b-\frac{1}{b}\right)\left(b^2+1+\frac{1}{b^2}\right)$.

29. The polynomial ax^3-x^2-x is divided by $x+1$ and the remainder is 1. The value of *a* will be

A. -3
B. -1
C. 1
D. 3

30. The option which represents one of the zeros of the polynomial $x^3 + 2x^2 - x - 2$ is

A. -1
B. 0
C. 2
D. -3

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

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

32. If $N = \begin{bmatrix} 0 & 0 \\ 1 & 1 \end{bmatrix}$, then the transpose of N is

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

Use the given information to answer Q.33, Q.34 and Q.35.

Given that $E = \begin{bmatrix} 0 & -1 \end{bmatrix}$, $F = \begin{bmatrix} -1 \\ 0 \end{bmatrix}$ and $G \times F = \begin{bmatrix} 4 \\ 3 \end{bmatrix}$

33. The order of matrix G

A. is 2×1
B. is 1×2
C. is 2×2
D. cannot be determined

34. The product of matrices E and F, i.e., $E \times F$ is

A. $\begin{bmatrix} -1 \\ -1 \end{bmatrix}$.

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

C. $[-2]$.

D. $[0]$.

35. The multiplicative inverse of E^2

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

B. is $\begin{bmatrix} 0 \\ 1 \end{bmatrix}$.

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

D. does not exist.

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

A. unit matrix.
B. scalar matrix.
C. square matrix.
D. diagonal matrix.

37. If the matrix $\begin{bmatrix} a & -a \\ b & b \end{bmatrix}$ is a singular matrix, then the condition will be

A. $ab = \frac{1}{2}$

B. $ab = 0$

C. $ab = -\frac{1}{2}$

D. $a = -b$

38. If a matrix equation is $3X - \begin{bmatrix} 6 & 3 \\ 0 & 1 \end{bmatrix} = \begin{bmatrix} 0 & 0 \\ 0 & 0 \end{bmatrix}$, then the matrix X will be

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

39. The matrix form of the given simultaneous linear equations $x - 2y = 3$ and $y = -1$, will be

A. $\begin{bmatrix} 1 & -2 \\ 0 & 1 \end{bmatrix} \times \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} -3 \\ 1 \end{bmatrix}$.

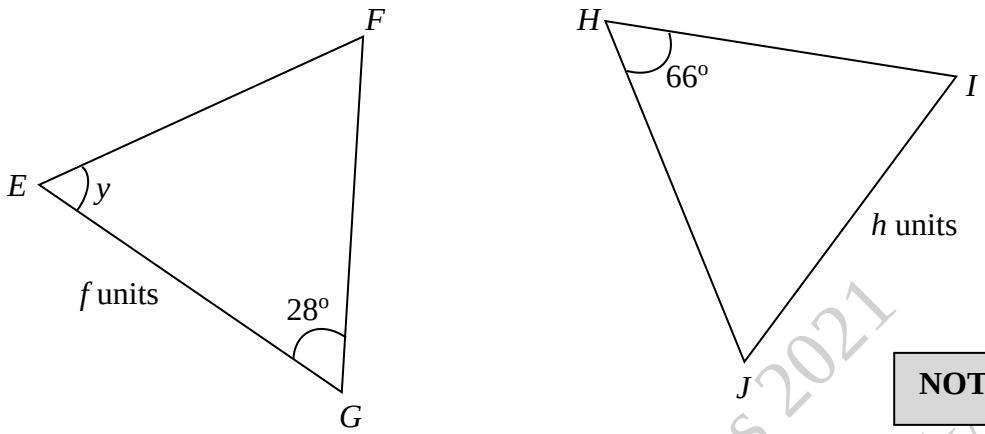
B. $\begin{bmatrix} 1 & -2 \\ 0 & 1 \end{bmatrix} \times \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 3 \\ -1 \end{bmatrix}$.

C. $\begin{bmatrix} 1 & -2 \\ 1 & 0 \end{bmatrix} \times \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} -3 \\ 1 \end{bmatrix}$.

D. $\begin{bmatrix} 1 & -2 \\ 1 & 0 \end{bmatrix} \times \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 3 \\ -1 \end{bmatrix}$.

Use the given information to answer Q.40 and Q.41.

In the given diagram, ΔEFG and ΔHIJ are congruent.



NOT TO SCALE

40. If $\angle E = y$, then the value of y

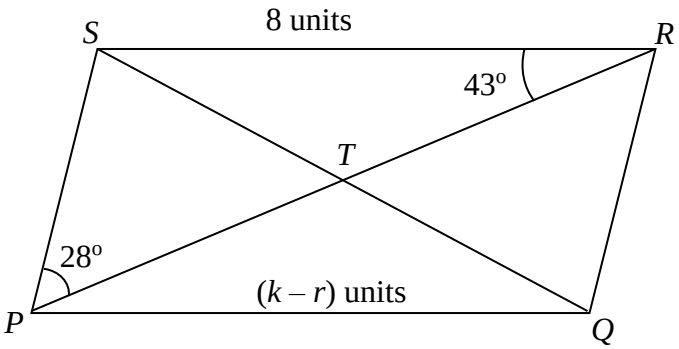
A. is 66^o
B. is 86^o
C. is 94^o
D. cannot be determined

41. The sum of the lengths FG and HJ is

A. $2f$ units.
B. hf units.
C. $2h$ units.
D. $f + h$ units.

Use the given information to answer Q.42 and Q.43.

In the given diagram, *PQRS* is a parallelogram.



NOT TO SCALE

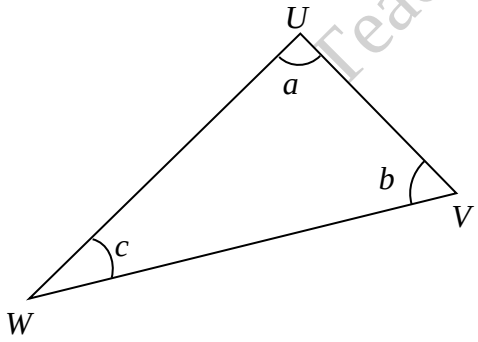
42. If $k = 24$, then the value of r is equal to

A. 3
B. 8
C. 16
D. 32

43. The value of $\angle SRQ$ is equal to

A. 15°
B. 28°
C. 43°
D. 71°

44. In the given triangle, *VW* is the longest side and *UV* is the smallest side.

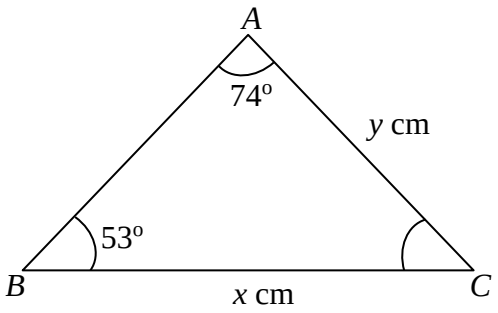


NOT TO SCALE

The CORRECT relationship between the angles is

A. $c > a$
B. $b > a$
C. $a > c$
D. $c > b$

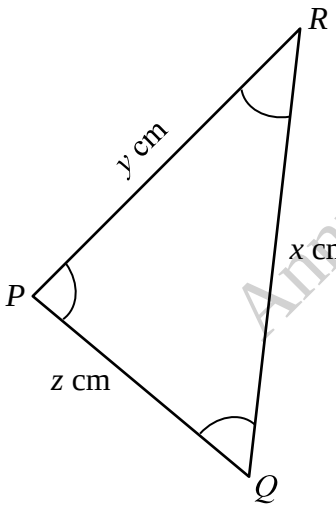
45. For the given triangle *ABC*, the length of side *AB* is

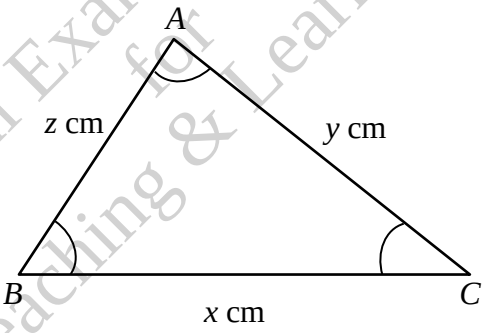


NOT TO SCALE

A. x cm.
B. y cm
C. $x - y$ cm.
D. $x - \frac{y}{2}$ cm.

46. In the correspondence of $\Delta ABC \leftrightarrow \Delta PQR$, If $AB = PQ$, $BC = QR$ and $CA = RP$, then the correct relation between the angles will be

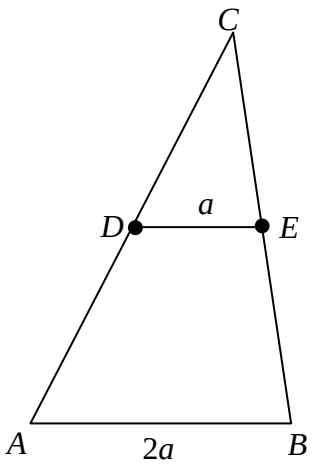




NOT TO SCALE

A. $\angle A = \angle R$.
B. $\angle B = \angle R$.
C. $\angle A = \angle Q$.
D. $\angle B = \angle Q$.

47. In the given triangle *ABC*, *DE* is parallel to *AB*. The CORRECT relation between the sides is

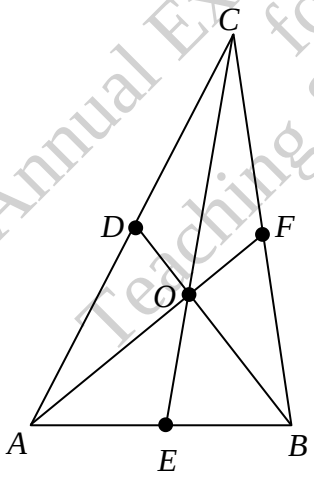


NOT TO SCALE

A. *AC* = *BC*.
B. *AD* = *DC*.
C. *DC* = *EC*.
D. *AC* = 2*BE*.

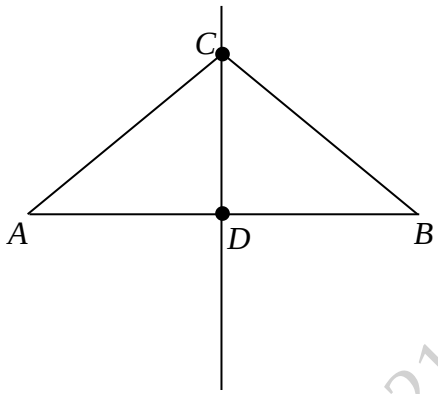
48. In the given triangle *ABC*, the points *D*, *E* and *F* are the midpoints of the sides *AC*, *AB* and *BC* respectively. The line segments *AF*, *BD* and *CE* are the

A. altitudes.
B. medians.
C. right bisectors.
D. angle bisectors.



NOT TO SCALE

49. In the given diagram, AB is a line segment and $AC = BC$.



NOT TO SCALE

The CORRECT relation of AD, BD and $\angle D$ is

A. $AD \neq BD$ and $\angle D \neq 90^o$
B. $AD \neq BD$ and $\angle D = 90^o$
C. $AD = BD$ and $\angle D = 90^o$
D. $AD = BD$ and $\angle D \neq 90^o$

50. The CORRECT measures of the sides of a triangle are

A. 5 cm, 7 cm and 13 cm.
B. 6 cm, 6 cm and 12 cm.
C. 7 cm, 7 cm and 10 cm.
D. 9 cm, 3 cm and 14 cm.

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