AGA KHAN UNIVERSITY EXAMINATION BOARD

SECONDARY SCHOOL CERTIFICATE

CLASS IX

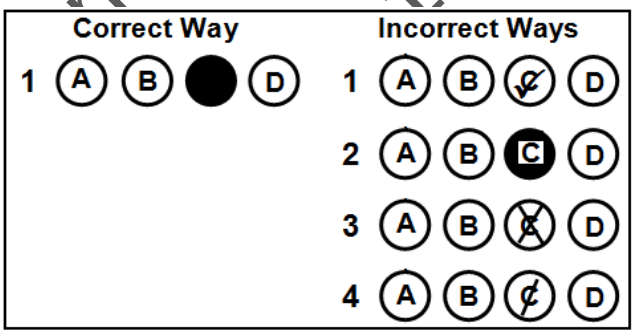
ANNUAL EXAMINATIONS 2022

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.

1. If Z, *W*, *N* and *Q* are sets with usual notations, then which of the following statements is CORRECT?

   A. $N \cup Q = N$
   B. $Z \cap Q = Q$
   C. $W \cup Z = Z$
   D. $W \cap N = \phi$

2. For two non-empty sets *A* and *B*, $A \Delta B$ is given by

   A. $(A \cup B) \cup (A \cap B)$.
   B. $(A \cup B) \cap (A \cap B)$.
   C. $(A \cup B) - (A \cap B)$.
   D. $(A \cup B)^c - (A \cap B)^c$.

3. If the points $P(2x+1, 8)$ and $Q(7, 3x-1)$ have the same abscissa, then the value of the ordinate of *Q* will be

   A. 2
   B. 5
   C. 7
   D. 8

4. The CORRECT statement for the distributive property of union over intersection is

   A. $A \cup (B \cap C) = (A \cup B) \cap (A \cup C)$.
   B. $A \cup (B \cap C) = (A \cup B) \cup (A \cup C)$.
   C. $A \cap (B \cup C) = (A \cap B) \cap (A \cap C)$.
   D. $A \cap (B \cup C) = (A \cap B) \cup (A \cap C)$.

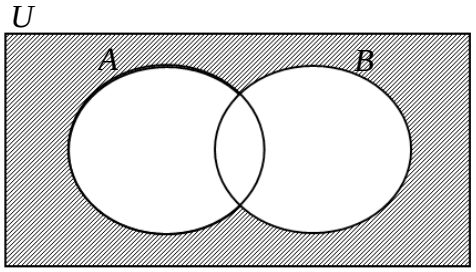
5. If $U = \{a, b, c, d, e, f, g, h\}$ and $A^c \cup B^c = \{a, b, g, h\}$, then $A \cap B$ is equal to

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

6. The given Venn diagram represents

   I. $A^c \cup B^c$
   II. $A^c \cap B^c$
   III. $(A \cup B)^c$

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



7. For two non-empty sets A and B, $A \cap B = \{2,4,6\}$ and $A \Delta B = \{1,3\}$, the set $A \cup B$ is

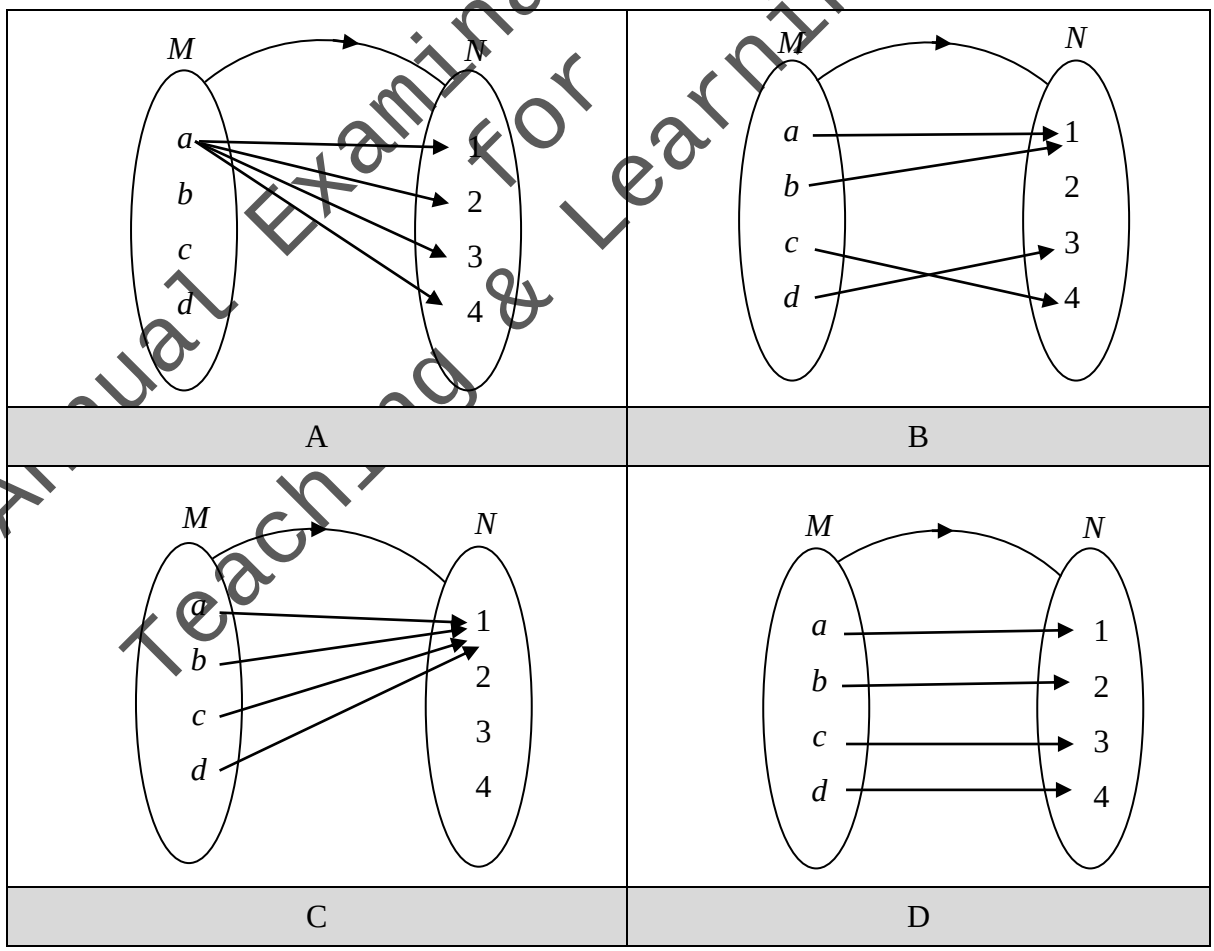
   A. ϕ.
   B. $\{1,3\}$.
   C. $\{2,4,6\}$.
   D. $\{1,2,3,4,6\}$.

8. It is given that X = {1, 2, 3, 4} and Y = {a, b, c}. If a relation from X to Y is defined as f = {(1, a), (2, b), (3, c)}, then f is a/ an

   I. binary relation
   II. into function
   III. one-one function

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

9. Which of the following diagrams DOES NOT represent a function from M to N?



10. Common notation of the number 1.0034216×10^6 is

A. 0.00000010034216
B. 0.0000010034216
C. 1003421.6
D. 10034216

11. If $\log_a 125 = -3$, then the value of *a* is

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

12. In single logarithm, the expression $\log 3x - \log x^2 + \log(x - y)$ will be equal to

A. $\log(4x - x^2 - y)$.
B. $\log 3x^3(x - y)$.
C. $\log \frac{3x - x^2}{x - y}$.
D. $\log \frac{3x(x - y)}{x^2}$.

13. The logarithmic form of $\left(\frac{1}{9}\right)^{\frac{1}{2}} = \frac{1}{3}$ is

A. $\log_{\frac{1}{2}} \frac{1}{9} = \frac{1}{3}$
B. $\log_{\frac{1}{9}} \frac{1}{3} = \frac{1}{2}$
C. $\log_{\frac{1}{3}} \frac{1}{9} = \frac{1}{2}$
D. $\log_{\frac{1}{9}} \frac{1}{2} = \frac{1}{3}$

14. If $\log 2 = 0.30103$ and $\log 5 = 0.69897$, then the value of $\log \frac{32}{10}$ is

A. -3.78235
B. 0.50515
C. 1.50515
D. 1.10721

15. In the given table, the CORRECT option that has a rational expression and a polynomial is

	Rational Expression	Polynomial
A	$\sqrt{2x^2+1}$	$\frac{1}{2x^2+1}$
B	$\frac{1}{2x^2+1}$	$2x^2+1$
C	$2x^2+\frac{1}{\sqrt{x}}$	$2x^2+\frac{1}{x}$
D	$2x^2+\frac{1}{x}$	$2x^2+\frac{1}{\sqrt{x}}$

16. The product of the rational expressions $\frac{12a}{5}$ and $\frac{a^3b^4}{a^4\times 4b^2}$ is

A. $\frac{5b^2}{48a^2}$.

B. $\frac{48a^2}{5b^2}$.

C. $\frac{3b^2}{5}$.

D. $\frac{b^2}{4a}$.

17. The value of a in the expression $\frac{b-2c}{a}=d$, for $b=3$, $d=5$ and $c=-1$, will be

A. 0

B. $\frac{1}{5}$

C. 1

D. 5

18. The value of $\frac{1}{a^3}-a^3$ for $a-\frac{1}{a}=1$ is

A. -4

B. -1

C. 1

D. 4

19. The simplest form of the sum of $\sqrt{a-2}$, $\sqrt{a}$ and $\sqrt{a-1}$ is

(**Note**: $a-2$, $a-1$ are non-negative)

A. $\sqrt{3a-3}$
B. $\sqrt{3a}-3$
C. $3\sqrt{a}-3$
D. $\sqrt{a-2}+\sqrt{a}+\sqrt{a-1}$

20. The product of $a-1$, a^3+1 and a^2+a+1 is

A. $(a^3+1)^2$
B. $(a^3-1)^2$
C. a^6-1
D. a^6+1

21. If $s^2+(-2t)^2+\left(u^2\right)^2=16$ and $su^2-2st-2tu^3=10$, then the value of $\left(s-2t+u^2\right)^2$ will be

A. $\sqrt{26}$
B. 6
C. 26
D. 36

22. The expression $(x-3)^2-2(3-x)+(x-3)$ is equal to the product

A. $-(x-3)$.
B. $x(x-3)$.
C. $(x+4)(x-3)$.
D. $(x-4)(x-3)$.

23. The completely factorised form of $5+50r+125r^2$ is

A. $(1+5r)^2$.
B. $(5+25r)^2$.
C. $5(1+5r)^2$.
D. $5(5+10r+25r^2)$.

24. On factorising the polynomial $p^2-(h^2-2h+1)$, we get

A. $(p+h-1)(p-h-1)$.
B. $(p+h-1)(p-h+1)$.
C. $(p+h+1)(p-h-1)$.
D. $(p-h+1)(p+h+1)$.

25. One of the zeros of the polynomial $p(x) = 2x^3 - x - 1$ is

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

26. One of the factors of the polynomial $p(x) = x^3 - 2x + 1$ is

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

27. The factorised form of the expression $\frac{1}{27} + 27a^3$ will be

A. $\left(3a + \frac{1}{3}\right)\left(9a^2 + a + \frac{1}{9}\right)$.
B. $\left(3a + \frac{1}{3}\right)\left(9a^2 - a + \frac{1}{9}\right)$.
C. $3\left(a + \frac{1}{3}\right)\left(9a^2 - a + \frac{1}{9}\right)$.
D. $3\left(a + \frac{1}{3}\right)\left(9a^2 + a + \frac{1}{9}\right)$.

28. On factorising the polynomial $1 + 4c^4$, we get

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

29. If $x - 1$ is a factor of the polynomial $p(x) = x^3 - ax^2 + 1$, then the value of a will be

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

30. To factorise the expression $(x-2)(x-1)(x+2)(x+3)+15$, the option(s) for the essential arrangement(s) is/ are

I. $(x-1)(x-2)$ and $(x+2)(x+3)$
II. $(x-1)(x+2)$ and $(x-2)(x+3)$
III. $(x-1)(x+3)$ and $(x-2)(x+3)$

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

31. The matrix $\begin{bmatrix} 5 & 0 \\ 0 & -5 \end{bmatrix}$ is a/ an

I. diagonal matrix.
II. symmetric matrix.
III. identity matrix.

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

32. If the additive inverse of the matrix $\begin{bmatrix} -a & 5 \\ 0 & 0 \end{bmatrix}$ is $\begin{bmatrix} -3 & -5 \\ 0 & 0 \end{bmatrix}$, then the value of a is

A. -5
B. -3
C. 3
D. 5

33. If $A=\begin{bmatrix} 1 & 0 \\ 2 & 0 \end{bmatrix}$, $B=\begin{bmatrix} 1 \\ 0 \end{bmatrix}$ and $C=\begin{bmatrix} 0 & 2 \end{bmatrix}$, then the possible product(s) is/ are

I. $A \times B$
II. $A \times C$
III. $B \times A$

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

34. The determinant of the matrix $A = \begin{bmatrix} a & -a \\ 1 & 0 \end{bmatrix}$ is

A. $-a$
B. 0
C. a
D. $2a$

35. The adjoint of the matrix $W = \begin{bmatrix} -1 & -a \\ 0 & 1 \end{bmatrix}$ is

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

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

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

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

36. The matrix form of the simultaneous linear equations $1 - x + y = 0$ and $x - 3 = 0$ is

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

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

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

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

37. Using Crammer's rule, the value of y for $x+y=1$ and $x-y=3$ is

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

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

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

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

38. X and Y are two square matrices such that $XY=YX=I$. If I is the identity matrix, then X and Y are

A. multiplicative inverses of each other.
B. additive inverses of each other.
C. transpose of each other.
D. singular matrices.

39. The multiplicative inverse of the matrix $\begin{bmatrix} 2 & 6 \\ -1 & -3 \end{bmatrix}$

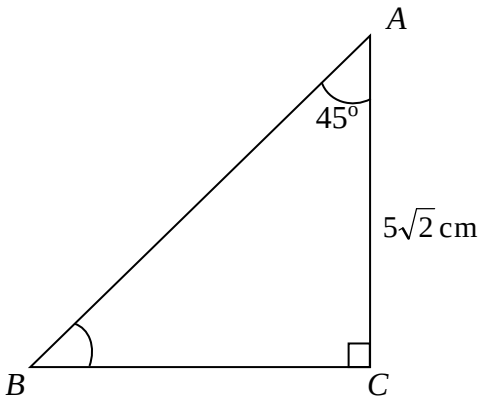
A. is $\begin{bmatrix} -3 & -6 \\ 1 & 2 \end{bmatrix}$.

B. is $-\dfrac{1}{12}\begin{bmatrix} -3 & -6 \\ 1 & 2 \end{bmatrix}$.

C. is $\dfrac{1}{12}\begin{bmatrix} -3 & -6 \\ 1 & 2 \end{bmatrix}$.

D. does not exist.

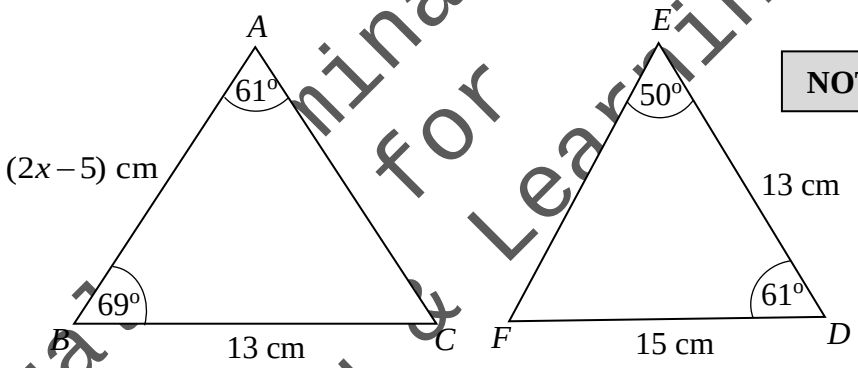
40. In the triangle *ABC*, the length of BC is



NOT TO SCALE

A. 5 cm.
B. 6 cm.
C. 10 cm.
D. $5\sqrt{2}$ cm.

41. In the given correspondence $\Delta ABC \leftrightarrow \Delta DFE$, if $\Delta ABC \cong \Delta DFE$, then the value of x is

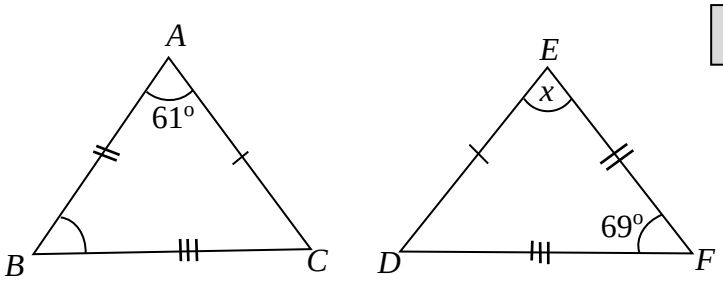


NOT TO SCALE

A. 4
B. 5
C. 9
D. 10

42. In the given correspondence $\Delta ABC \leftrightarrow \Delta EFD$, $AB = EF$, $BC = FD$ and $\angle ABC = \angle EFD$. In the given conditions, the value of x is

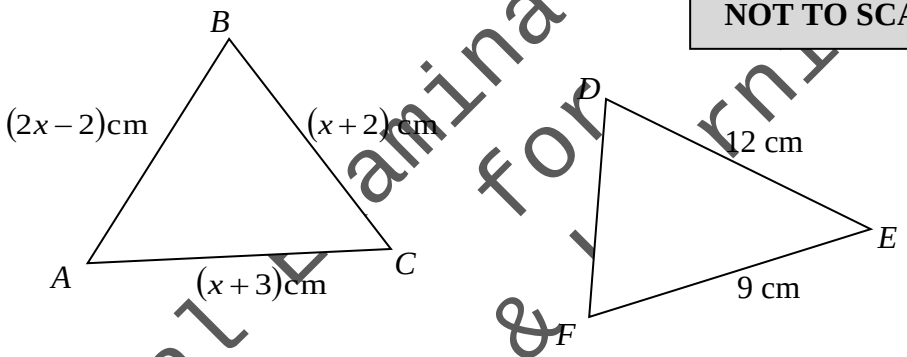
NOT TO SCALE



A. 50^o
B. 61^o
C. 69^o
D. 119^o

43. In the given correspondence $\Delta ABC \leftrightarrow \Delta DEF$, if $\Delta ABC \cong \Delta DEF$, then the length of DF is

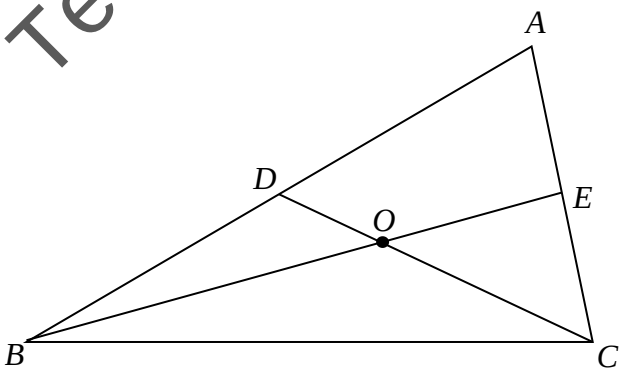
NOT TO SCALE



A. 6 cm.
B. 7 cm.
C. 10 cm.
D. 14 cm.

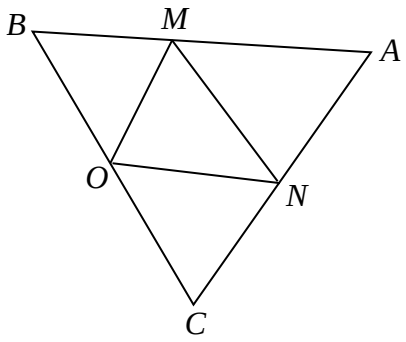
44. In the given triangle ABC, CD and BE are the medians of the triangle intersecting at point O. If $OB = 6\,\text{cm}$ and $OE = (x-1)\,\text{cm}$, then the value of x will be

NOT TO SCALE



A. 3
B. 4
C. 6
D. 7

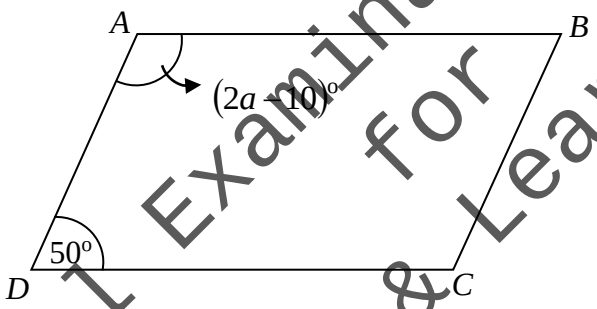
45. In the given triangle *ABC*, *M* and *N* are the midpoints of the sides *AB* and *AC* respectively. If $BC = 14\,\text{cm}$ and $MN = (2x-1)\,\text{cm}$, then the value of *x* will be



NOT TO SCALE

A. 3 cm.
B. 4 cm.
C. 7 cm.
D. 7.5 cm.

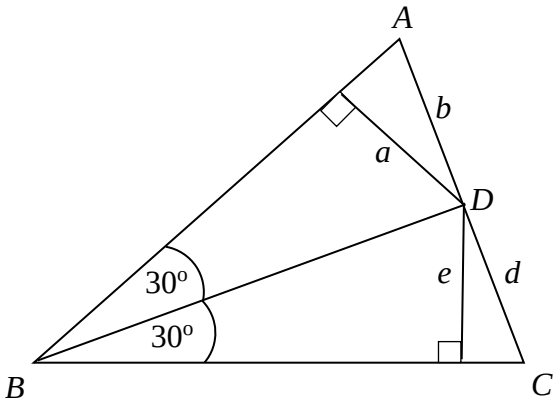
46. In the given parallelogram *ABCD*, the value of *a* is



NOT TO SCALE

A. 30
B. 60
C. 70
D. 130

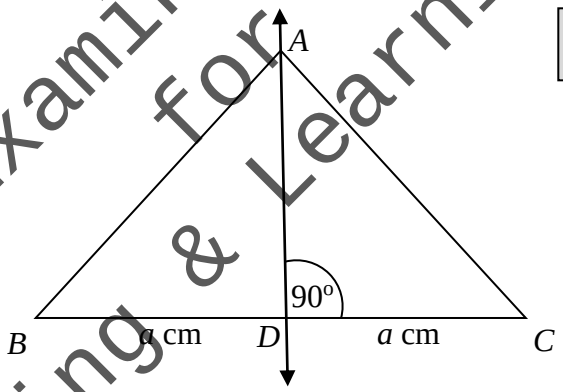
47. In the given diagram, the CORRECT relation between the lengths represented by *a*, *b*, *d* and *e* is



NOT TO SCALE

A. $a = e$.
B. $a = d$.
C. $b = d$.
D. $b = e$.

48. In the given diagram, the CORRECT relation between the lengths is



NOT TO SCALE

A. $AB = AD$.
B. $AB = AC$.
C. $BC = AB$.
D. $AC = DC$.

49. In the given triangle *RST*, if the sides are represented as *r*, *s* and *t*, then which of the following statements is FALSE about these sides of the triangle?

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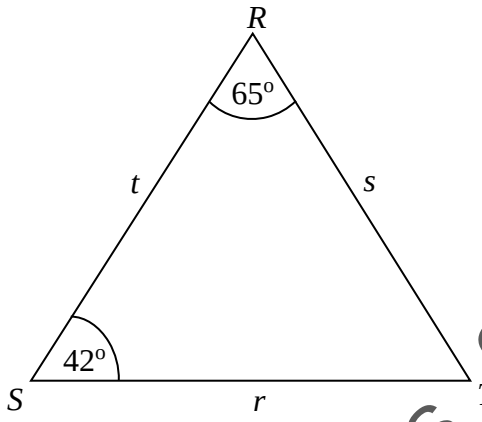
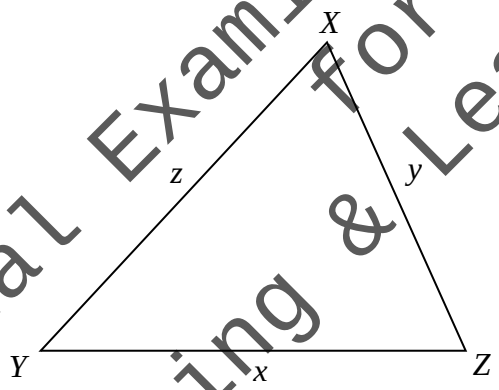


A. $t > s$
B. $t > r$
C. $s > r$
D. $t > r > s$

50. In the given triangle *XYZ*, the possible values of *x*, *y* and *z* respectively would be

NOT TO SCALE



A. 5 cm, 5 cm and 10 cm.
B. 5 cm, 6 cm and 12 cm.
C. 3 cm, 1 cm and 5 cm.
D. 7 cm, 7 cm and 13 cm.

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