

MOTION

Nurturing potential through education

NATIONAL LEVEL SCIENCE TALENT SEARCH EXAMINATION

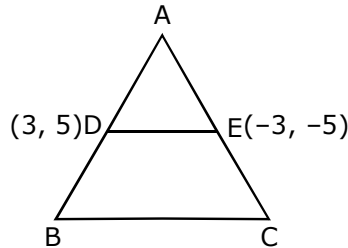
CLASS - X

ANSWER KEY

1. (B) 2. (B) 3. (C) 4. (B) 5. (A, D) 6. (C) 7. (A)
8. (C) 9. (A) 10. (C) 11. (D) 12. (D) 13. (A) 14. (D)
15. * 16. (C) 17. (A) 18. (B) 19. (D) 20. (A) 21. (B)
22. (C) 23. (B) 24. (A) 25. (B) 26. (C) 27. (B) 28. (B)
29. (A) 30. (D) 31. (D) 32. (C) 33. (D) 34. (D) 35. (C)
36. (A) 37. (C) 38. (B) 39. (B) 40. (C) 41. (D) 42. (D)
43. (C) 44. (C) 45. (C) 46. (C) 47. (C) 48. (B) 49. (A)
50. (D) 51. (D) 52. (C) 53. (C) 54. (B) 55. (B) 56. (B)
57. (C) 58. (B) 59. (B) 60. (B) 61. (B) 62. (C) 63. (B)
64. (B) 65. (A) 66. (C) 67. (A) 68. (B) 69. (B) 70. (D)
71. (B) 72. (A) 73. (A) 74. (B) 75. (C) 76. (D) 77. (D)
78. (D) 79. (A) 80. (A) 81. (C) 82. (C) 83. (C) 84. (B)
85. (A) 86. (A) 87. (B) 88. (A) 89. (C) 90. (B) 91. (A)
92. (D) 93. (B) 94. (B) 95. (C) 96. (B) 97. (A) 98. (C)
99. (C) 100. (C)

SOLUTIONS

1. (B) Let son's age be x years
 Man's age is x^2 years
 $x^2 - 1 = 8(x - 1)$
 $x^2 - 1 = 8x - 8$
 $x^2 - 8x + 7 = 0$
 $x^2 - x - 7x + 7 = 0$
 $(x - 1)(x - 7) = 0$
 $x = 1, 7$



2. (B)

$$BC = 2DE$$

$$DE = \sqrt{25 + 64} = 10$$

$$BC = 20$$

3. (C) $\cos\theta + \frac{1}{\cos\theta} = \frac{5}{2}$

$$\cos^2\theta + \sec^2\theta + 2 = \frac{25}{4}$$

$$\cos^2\theta + \sec^2\theta = \frac{25}{4} - 2 = \frac{17}{4}$$

4. (B) $36 - 48 + k = 0$
 $k = 12$

5. (D) $4^{x+y} = 256$ $256^{x-y} = 4$
 $4^{x+y} = 4^4$ $4^{4(x-y)} = 4^1$

$$x + y = 4$$

$$x - y = \frac{1}{4}$$

$$\frac{2x}{4} = \frac{17}{4}$$

$$\& \quad 4x - 4y = 1$$

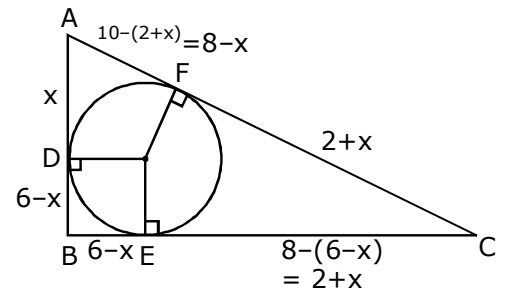
$$x - y = 1/4$$

$$x = \frac{17}{8}, y = \frac{15}{8}$$

6. (C) $\frac{a+17d}{a+10d} = \frac{3}{2}$
 $2a + 34d = 3a + 30d$
 $a = 4d$... (1)

$$\frac{a+28d}{a+4d} \Rightarrow \frac{32d}{8d} \Rightarrow 4:1$$

7. (A)



$$8 - x = x$$

$$2x = 8$$

$$x = 4$$

$$\text{So, } BD = 6 - 4 = 2$$

$$\text{So, radius of circle} = 2$$

$$\text{Circumference} = 2\pi \times (2)$$

$$= 4\pi$$

8. (C) n sides figure have $\rightarrow \frac{1}{2}n(n-3)$
 diagonals

$$\frac{1}{2}n(n-3) = 90$$

$$n^2 - 3n - 180 = 0$$

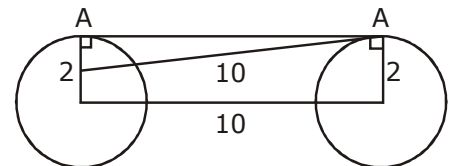
$$n^2 - 15 + 12n - 180 = 0$$

$$n(n-15) + 12(n-15) = 0$$

$$(n-15)(n+12) = 0$$

$$n = 15, -12$$

9. (A)



$$AB = \sqrt{10^2 - 6^2} = 8$$

10. (C) Arun's age $\rightarrow x$ years
 Tarun's age $\rightarrow y$ years

$$x + \frac{y}{2} = 4$$

$$\frac{x}{2} + 2y = 5$$

$$2x + y = 8 \quad \dots (i) \quad x + 6y = 15 \quad \dots (ii)$$

$$2x + y = 8$$

$$\underline{-2x + 12y = 30}$$

$$\underline{-11y = -22}$$

$$y = 2$$

$$x = 3$$

$$x + y = (3 + 2) = 5$$

11. (D) $p(x) = 2x^2 + 6x - 6$
 $\alpha + \beta = \frac{-b}{a} = \frac{-6}{2} \Rightarrow -3$

$\alpha\beta = \frac{-6}{2} \Rightarrow -3$

clearly, $\alpha + \beta = \alpha\beta$

12. (D) $\cos 30^\circ \cdot \cos 45^\circ - \sin 30^\circ \cdot \sin 45^\circ$

$\Rightarrow \frac{\sqrt{3}}{2} \cdot \frac{1}{\sqrt{2}} - \frac{1}{2} \cdot \frac{1}{\sqrt{2}}$

$\Rightarrow \frac{2\sqrt{6} - 2\sqrt{2}}{8} \Rightarrow \frac{\sqrt{6} - \sqrt{2}}{4}$

$\Rightarrow \frac{\sqrt{2}(\sqrt{3} - 1)}{4}$

13. Largest cube from a sphere has its diagonal equal to the diameter of sphere.

Let ABCD be one face of cube

then, $BD = 12\sqrt{3}$

In $\triangle BCD$,

$2x^2 = 144 \times 3$

$x^2 = 72 \times 3 \Rightarrow x = 6\sqrt{6}$

So,

Total surface = $6x^2$

Area of cube = $6 \times (6\sqrt{6})^2$

14. (D) $x^2 - 8x + r = 0, \alpha - \beta = 2$

$\alpha - \beta = \sqrt{(\alpha + \beta)^2 - 4\alpha\beta}$

$2 = \sqrt{8^2 - 4r}$

$4 = 64 - 4r$

$4r = 60$

$r = 15$

15. (A) 3, 13, 23,

$S_n = \frac{n}{2}[2 \times 3 + (n-1)10]$

$= n[3 + 5n - 5]$

$= 5n^2 - 2n \rightarrow \text{correct}$

(B) $S_n = 3n^2 - 8n$

$d = S_2 - 2S_1$

$\Rightarrow 3(2)^2 - 8(2) - 2[3(1)^2 - 8(1)]$

$\Rightarrow (12 - 16) - 2[3 - 8]$

$\Rightarrow -4 + 10$

$\Rightarrow 6$

16. (C) Let the Quotient be x
then, $8x + 5 = n$
 $2x + 4 = 16x + 14$

$\therefore \frac{2n+4}{8} \Rightarrow \frac{16x+14}{8}$

So, Remainder = 6

17. (A) We know that, $BC = 2DE$

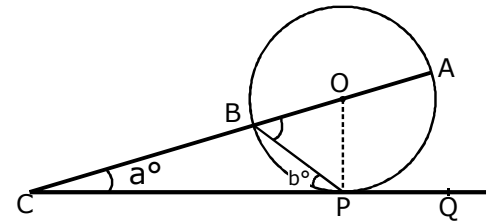
$z - 33 = 2(z - 37)$

$z - 33 = 2z - 74$

$z = 74 - 33$

$z = 41$

18. (B)



$\angle OPB + b^\circ = 90^\circ$

$\angle PBP + b^\circ = 90^\circ \quad (\because \angle OBP = \angle OPB)$

$a^\circ + b^\circ + b^\circ = 90^\circ$

(extension angle property)

$a^\circ + 2b^\circ = 90^\circ$

19. (D)

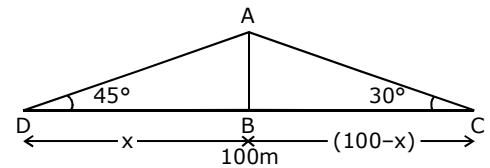
A \overline{AB} B
 $(7,1) \quad P(x,y) \quad (-1,7)$

$x = \frac{7-1}{2} = 3$

$\therefore 4x = 3y$

$y = \frac{1+7}{2} = 4$

20.



In $\triangle ABD$

$\tan 45^\circ = \frac{AB}{BD}$

$AB = BD = x \text{ m} \quad \dots(1)$

In $\triangle ABC$

$\tan 30^\circ = \frac{AB}{BC} \Rightarrow \frac{1}{\sqrt{3}} = \frac{AB}{(100-x)}$

$AB = \frac{(100-x)}{\sqrt{3}} \quad \dots(2)$

From (1) & (2)

$$\frac{100 - x}{\sqrt{3}} = x$$

$$\sqrt{3}x + x = 100$$

$$x = \frac{100}{\sqrt{3} + 1} = 36.6 \text{ m}$$

21. (B) Let the diameter be x cm

$$r = \frac{x}{2}$$

$$2\pi \times \frac{x}{2} = x + 30$$

$$x(\pi - 1) = 30 \Rightarrow x \left(\frac{15}{7} \right) = 30$$

$$x = 14 \text{ cm}$$

$$r = 7 \text{ cm}$$

22. (C) No such pair exists as with H.C.F. 15. No. two numbers can have L.C.M. 100.

23. (B) $4x + 6y = 14$
 $4ax + 2(a + b)y = 56$

$$\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$$

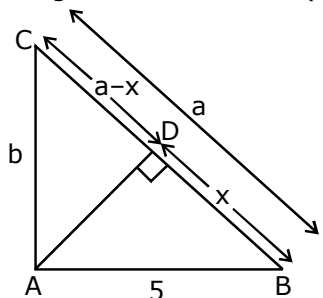
$$\frac{4}{4a} = \frac{6}{2a+2b} = \frac{14}{56}$$

$$\frac{1}{a} = \frac{3}{a+b}$$

$$a + b = 3a$$

$$2a = b$$

24. (A) Strength of class is L.C.M. of (910, 1001) = 91



25. (B)

In $\triangle ADC$,
 $AD^2 = AC^2 - CD^2 = b^2 - (a - x)^2 \dots (i)$

In $\triangle ADB$,
 $AD^2 = AB^2 - BD^2 = 25 - x^2 \dots (ii)$

from (i) and (ii)

$$b^2 - a^2 - x^2 + 2ax = 25 - x^2$$

$$x = \frac{a^2 - b^2 + 25}{2a}$$

26. (C) $R_1 = \frac{\rho L_1}{A_1}$

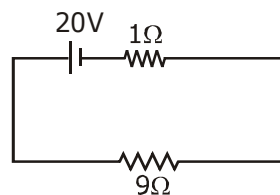
$$\rho \frac{L_1}{A_1} = \frac{L_2 \rho}{A_2}$$

$$12 = \frac{2.5L}{5A}$$

$$= 0.5 \times 12$$

$$= 6\Omega$$

27. (B)



28. (B)

$$V = 9 \times 2 = 18V$$

29. (A)

30. (D) Ammeter always connected in series and voltmeter is connected in parallel.

31. (D)

32. (C) QS

33. (D)

34. $R = \frac{\rho L}{A}$

$$4.21 = \rho \times \frac{80 \times 10^{-2}}{A}$$

$$\frac{\rho}{A} = \frac{4.2}{80 \times 10^{-2}}$$

(D) $R^1 = \frac{\rho L^1}{A}$

$$5.6 = \frac{4.5}{80 \times 10^{-2}} \times L^1$$

$$L^1 = \frac{5.6 \times 80 \times 10^{-2}}{4.2} = 106.67 \text{ cm}$$

35. (C)

36. (A) As ray entering from rarer to denser, It must bent towards normal.

37. (C)

38. (B) scattering

39. (B)

40. (C) In series current is same.

41. (D)

42. (D)

43. (C)

44. (C) $i_1 = r_2$
 45. (C)
 46. (C) $V = IR$
 47. (C) R
 G
 V
 48. (B)
 49. (A) $= \frac{40 \times 30}{60}$
 $\frac{20wh}{10^3} = \frac{20}{1000} = .02 \text{ kwh}$
 50. (D) $l = 12m$
 $A = 2.5 \times 10^{-7} \text{ m}^2$
 $P = 100 \times 10^{-8}$
 $\frac{100 \times 10^{-8} \times 12}{2.5 \times 10^{-7}} = 48\Omega$
 51. (D) The reduction of a silver salt to metallic silver.
 52. (C) Graphite
 53. (C) Potassium
 54. (B)

P	Q
Hydroxide	Sulfate

 Reaction \Rightarrow
 $\text{CuSO}_4 + 2\text{NaOH} \longrightarrow \text{Cu(OH)}_2 + \text{Na}_2\text{SO}_4$
 55. (B) $2\text{H}^+_{(\text{aq.})} + \text{SO}^{2-}_{4(\text{aq.})}$
 56. (B) 3
 57. (C) 4
 58. (B)

Metal	Electrolytes
Electron	Positive Negative Ions

 59. (B) There are more metallic elements than non-metallic elements in the periodic table.
 60. (B) Acid

$$\left[\begin{array}{l} \text{CaCO}_3 + 2\text{HCl} \longrightarrow \text{CaCl}_2 + \text{CO}_2 + \text{H}_2\text{O} \\ \text{Calcium Carbonate} \quad \text{Acid} \quad \quad \text{Calcium (Salt)} \end{array} \right]$$

 61. (B)

Substances	M.P.	B.P.	Ability to conduct electricity	
Q	-114°C	78°C	When liq.	in aq. Solution
			No	No

 62. (C) NaOH (Sodium Hydroxide)
 63. (B) greater in mass than element.
 (Metal + excess oxygen \longrightarrow Metal oxide)
 64. (B)
 Copper carbonate \longrightarrow Copper oxide + carbondioxide

$$\text{CuCO}_3 \xrightarrow[\text{Decomposition}]{\text{Thermal}} \text{CuO} + \text{CO}_2$$

65. (D) Mass of one mole of C_{60} = mole \times mass of carbon atom \times no. of carbon atom
 $= 1 \times 12 \times 60$
 $= 720 \text{ g}$
 66. (C) The total number of protons and electrons is 6.

$$\left[\begin{array}{l} {}^7_3\text{X} = \text{atomic no. (z)} = 3 \\ \text{mass no. (A)} = 7 \\ \text{no. of } e^- = 3 \\ \text{no. of } p^+ = 3 \\ \text{no. of } n^0 = 4 \end{array} \right]$$

 67. (A) $\text{NH}_3 + \text{H}_2\text{SO}_4 \longrightarrow (\text{NH}_4)_2\text{SO}_4 + \text{H}_2\text{O}$
 68. (B) Alloying
 69. (B) The liquid turns red litmus paper blue.
 70. (D) Sodium
 84. (B) Asphygmomanometes, blood pressure monitor, or blood pressure monitor, or blood pressure gauge pressure, composed of an intiatable cup of to collapse and then release a controlled manner, and mercury mechanical manometer to measure the pressure.