SCHOLASTIC APTITUDE TEST – 2012

TIME: 90 MINUTES   **MAX MARKS: 90**

Instructions to The Candidates

Read the following instructions carefully before you answer the questions.

1. Answers are to be given on a **SEPARATE ANSWER SHEET**.

2. Please write your **twelve digits Roll Number** very clearly on the **Test–booklet** and **Answer Sheet** as given in your admission card.

3. Please note and **follow the instructions**, given on the answer sheet for writing the answers.

4. **Darken the circle with pen for answering** the question in the appropriate space against the number corresponding to the questions you are answering.

5. There are 90 questions in this test.

6. Since **all questions are compulsory**, do not try to read the whole question paper before beginning to answer it.

7. If you do not know the answer to any question, do not spend much time on it and pass on to the next one. If time permits, you can come back to the questions, which you have left in the first instance and try them again.

8. Since the time allotted for this question paper is very limited you should make the best use of it by not spending too much time on any one question.

9. Rough work can be done anywhere in the Test booklet but not on the Answer sheet/loose paper.

10. Every correct answer will be awarded one mark.

11. Please return the Answer Sheet to the invigilator after the examination.

1. An object is placed in front of a concave mirror of radius of curvature 15 cm, at a distance of 10 cm. The position and nature–of the image formed is :

   (a) +30 cm, virtual and erect

   (b) + 30 cm, real and inverted

   (c) – 30 cm, virtual and erect

   (d) –30 cm, real and inverted

   Sol: (d)

   $u = -10$ cm, $f = -\dfrac{15}{2}$ cm

   $\dfrac{1}{v}+\dfrac{1}{u}=\dfrac{1}{f} \Rightarrow v = -30$ cm

   I is real and inverted

2. The far point of a myopic person is 40 cm. To see the distant objects clearly, the focal length and the power of the lens used should be :

   (a) – 40 cm, – 2.5 D

   (b) – 25 cm, – 4.0 D

   (c) + 40 cm, + 2.5 D

   (d) – 40 cm, + 2.5 D

   Sol: (a)

   $\dfrac{1}{v}-\dfrac{1}{u}=\dfrac{1}{f}, u=-\infty$

   $\Rightarrow$ f = - 40 cm, P = –2.5 D

3. An electric lamp whose resistance is 10 ohm and a conductor of 2 ohm resistance are connected in series with a 6 V battery. The total current through the circuit and the potential difference across the electric lamp are :

   (a) 3.6 A, 6 V

   (b) 0.5 A, 5 V

   (c) 2 .0 A, 0.2 V

   (d) 0.3 A, 3 V

Sol: (b)

R = 10 Ω + 2 Ω = 12Ω

$$\Rightarrow I = \frac{6v}{12\Omega} = 0.5A$$

$$\Rightarrow \quad V_{Lamp} = IR = 5V$$

4. Several electric bulbs designed to be used on a 220 V electric supply are rated 20 W each. How many lamps can be connected in parallel with each other across the two wires of 220 V line if the maximum allowable current is 5 A?

(a) 50

(b) 110
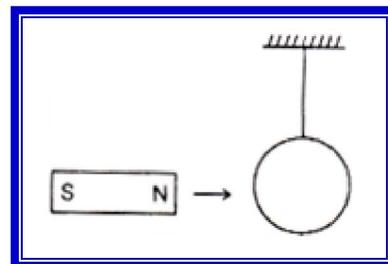
(c) 55

(d) 60

Sol: (c)

For a Bulb, V_i = 20W

$$i = \frac{1}{11} A$$

$$I = ni \Rightarrow 5A - n\left(\frac{1}{11}A\right)$$

n = 55

5. A copper ring is suspended by a thread in a vertical plane. If one end of a magnet is brought horizontally towards the ring as shown, the ring will:

(a) move towards the magnet.

(b) not change its position.

(c) move away from the magnet.

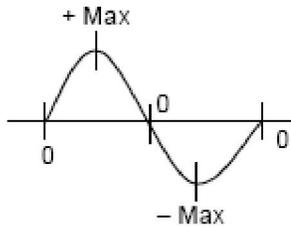(d) first move towards and then move away from the magnet.

Sol: (b)

Ring will be at rest. As flux is zero always

6. What is meant by one cycle of a.c. ?

(a) going from zero to + maximum.

(b) going from + maximum to zero.

(c) going from zero to – maximum and – maximum to zero.

(d) all the three mentioned above combined together in same order.

Sol: (d)

One AC cycle

7. If the temperature is increased, what will be the effect on the resistance of a conductor?

(a) does not change

(b) decreases

(c) increases

(d) cannot say

Sol: (c)

Conductivity increases for metals with rise in temp.

8. The area under velocity–time graph gives:

(a) acceleration

(b) distance

(c) displacement

(d) velocity

Sol: (c)

$\Delta x = v \Delta t$

Displacement $=$ velocity $\times$ time

$=$ area of v-t graph

9. A ball of mass 50 g is thrown upwards. It rises to a maximum height of 100 m. At what height its kinetic energy will be reduced to 70 %?

(a) 30m

(b) 40m

(c) 60m

(d) 70m

Sol: (a)

$$H = \frac{u^2}{2g}$$

$$h = \frac{u^2}{2g} - \frac{v^2}{2g} = 0.3\frac{u^2}{2g} = 30m$$

10. The Moon is constantly falling towards the Earth.

(a) This statement is absurd.

(b) This statement is correct.

(c) This statement is wrong.

(d) Nothing can be said.

Sol: (b)

11. Voice of which of the following is likely to have maximum frequency?

(a) man

(b) cow

(c) bird

(d) dog

Sol: (c)

12. Match the terms in column I with those of column II.

Column I	Column II
i. Electric fuse	A. chemical effect
ii. Relay	B. electric discharge
iii. CFL	C. magnetic effect
iv. Button Cell	D. heating effect

(a) i–C, ii–B, iii–A, iv–D

(b) i–B, ii–A, iii–C, iv–D

(c) i–D, ii–C, iii–B, iv–A

(d) i–D, ii–B, iii–C, iv–A

Sol: (c)

Electric fuse works on heating effect of current CFL works on electric discharge

13. The rate of evaporation increases with:

(a) Increase of surface area,

increase of temperature,

decrease in humidity and

increase in wind speed.

(b) Increase of surface area,

decrease of temperature,

decrease in humidity and

decrease in wind speed.

(c) decrease of surface area,

increase of temperature,

Increase in humidity and

increase in wind speed.

(d) decrease of surface area,

increase of temperature,

decrease in humidity and

decrease in wind speed.

Sol: (a)

14. The number of atoms in 8g oxygen molecules are :

(a) 6.022×10^{23}

(b) 3.011×10^{23}

(c) 1.51×10^{23}

(d) 12.044×10^{23}

Sol: (b)

$$n = 2\left\{\frac{N_A}{4}\right\} = \frac{6.023 \times 10^{23}}{2} = 3.011 \times 10^{23}$$

15. Bromine atom is available In two isotopes, $^{79}_{35}Br$ (49.7%) and $^{81}_{35}Br$ (50.3%), the average atomic mass of bromine atom is :

(a) 79.016

(b) 80.076

(c) 80.006

(d) 81.016

Sol: (c)

Average atomic wt = $\left(79 \times \frac{49.7}{100} + 81 \times \frac{50.3}{100}\right)$

= 80.006

16. Choose the correct from the following

i. Salt of a strong acid and a strong base are neutral with pH value Of 7.

ii. Salt of a strong acid and a weak base are basic with pH value more than 7.

iii. Salt of a weak acid and a strong base are acidic with pH value less than 7.

(a) i and ii are correct.

(b) ii and iii are correct.

(c) only i is correct.

(d) i and iii are correct.

Sol: (c)

17. Which of the following statement is correct?

i. German silver is an alloy of silver, copper and zinc.

ii. There is no zinc in brass.

iii. Bronze is an alloy of copper and tin.

(a) i, ii and iii

(b) only iii

(c) i and iii

(d) i and ii

Sol: (b)

18. Two metals which will displace hydrogen and two metals which will not displace hydrogen from dilute acids, respectively are :

    (a) potassium, calcium, aluminium and zinc

    (b) sodium, calcium, zinc and iron

    (c) zinc, iron, copper and mercury

    (d) copper, mercury, silver and gold

    Sol: (c)

19. Which out of following hydrocarbons undergo addition reactions?

    C_2H_6, C_3H_8, C_3H_6, C_2H_2 and CH_4

    (a) C_2H_6 and C_3H_8

    (b) C_3H_6 and C_2H_2

    (c) CH_4 and C_2H_6

    (d) C_3H_8 and C_2H_2

    Sol: (b)

20. Arrange the following atoms in the order of increasing atomic radius:

    F, Cl, C, O

    (a) F, Cl, O, C

    (b) C, O, F, CI

    (c) O, C, F, Cl

    (d) F, O, C, Cl

    Sol: (d)

21. The pH of solution formed by mixing of 40 ml of 0.10 M HCl and 10 ml of 0.45 M of NaOH is :

    (a) 10

    (b) 12

    (c) 8

    (d) 6

Sol: (b)

Net $[OH^-] = (4.5 \text{ mmol} - 4\text{mmol})$

$= 0.5$ mmol

$= [OH^-] \dfrac{0.5 \text{ mmol}}{50\,\text{ml}} \times 10^{-3} \times 1000 = 0.01\text{M}$

$pOH = -\log [OH^-] = -\text{lag} \left[1.0 \times 10^{-2}\right]$

$pOH = 2$

$pH = 14 - 2 \Rightarrow 12$

22. Food cans are coated with tin and not with zinc because:

(a) zinc is costlier than tin

(b) zinc has a higher melting point than tin

(c) zinc is more reactive than tin

(d) zinc is less reactive than tin

Sol: (c)

23. Match the following.

Natural Source	**Acid**
i. Vinegar	P. tartaric acid
ii. Orange	Q. oxalic acid
iii. Tamarind	R. acetic acid
iv. Tomato	S. citric acid

(a) i–Q, ii–R, iii–P, iv–S

(b) i–R, ii–Q, iii–P, iv–S

(c) i–R, ii–S, iii–P, iv–Q

(d) i–S, ii–Q, iii–R, iv–P

Sol: (c)

24. Which of the following class of animals has coelomic cavity filled with blood?

(a) Nematoda

(b) Annelida

(c) Arthropoda

(d) Mallusca

Sol: (c)

25. Which of the following causes Kalaazar?

   (a) Leishmania

   (b) Trypanosoma

   (c) Ascaris lumbricoides

   (c) Helicobacter pylori

   Sol: (a)

26. Hydrochloric acid facilitates the action of which enzyme?

   (a) salivary amylase

   (b) pepsin

   (c) Trypsin

   (d) lipase

   Sol: (b)

27. Lipids and proteins constituting the cell membrane are synthesized at :

   (a) endoplasmic reticulum

   (b) mitochondria

   (c) Golgi apparatus

   (d) Lysosome

   Sol: (a)

28. Connective tissue with a fluid matrix is :

   (a) ligament

   (b) tendons

   (c) blood

   (d) cartilage

   Sol: (c)

29. Normally in a healthy adult the daily initial filtrate in the kidneys is :

(a) 18 L

(b) 1.8 L

(c) 180 L

(d) 9 L

Sol: (c)

30. Which part of the heart receives deoxygenated blood?

(a) right atrium

(b) right ventricle

(c) left atrium

(d) left ventricle

Sol: (a)

31. Choose the right from the following.

i. In light, hormone auxin, helps the cells to grow longer in plants.

ii. Plant hormone gibberellins help in growth of a stem.

iii. Cytokininis inhibits cell division.

iv. Abscisic acid promotes growth in plants.

(a) i and iii are correct.

(b) ii and iv are correct.

(c) i and ii are correct.

(d) i and iv are correct.

Sol: (c)

32. Asexual reproduction takes place through budding in:

(a) amoeba

(b) yeast

(c) plasmodium

(d) leishmania

Sol: (b)

33. Sperm formation requires _____ temperature as in the normal body temperature.

(a) same

(b) high

(c) low

(d) not sure

Sol: (c)

34. The experiment conducted by Stanley L. Miller and Harold C. Drey in 1953 to show how organic molecules arise in nature, they assembled an atmosphere consisted of :

(a) ammonia, methane and oxygen.

(b) ammonia, hydrogen sulphide and oxygen.

(c) ammonia, hydrogen sulphide and methane.

(d) methane, hydrogen sulphide and oxygen.

Sol: (c)

35. An example of homologous organs is :

(a) our arm and a dog's fore–leg.

(b) our teeth and an elephant's tusks.

(c) potato and runners of grass.

(d) all of the above

Sol: (d)

36. How many members are there in the security council of United Nation?

(a) 15

(b) 20

(c) 17

(d) 22

Sol: (a)

37. What is 'Zero Hour?'

(a) When the proposals of the opposition are considered.

(b) When the matters of utmost importance are raised.

(c) When money bill is introduced in the Lok Sabha.

(d) Interval between the morning and the evening session.

Sol: (b)

38. In India seats are reserved for women in:

(a) Lok Sabha

(b) Rajya Sabha

(c) Panchayati Raj

(d) Cabinet

Sol: (c)

39. Which of the following is not a permanent member, of UN Security Council?

(a) China

(b) France

(c) Japan

(d) Russia

Sol: (c)

40. Which one of the following is a directly elected house?

(a) Parliament

(b) Rajya Sabha

(c) Lok Sabha

(d) Vidhan Parishad

Sol: (c)

41. Who said that religion can never be separated from the politics ?

(a) Acharya Vinoba Bhave

(b) Mahatma Gandhi

(c) Sarojini Naidu

(d) Dr. Rajendra Prasad

Sol: (b)

42. Who among the following is a part of Political Executive?

(a) District collector

(b) Secretary of the ministry of Home Affairs

(c) Home Minister

(c) Director General of Police

Sol: (c)

43. Apartheid was the name of a system unique to :

(a) South America

(b) South Africa

(c) Asia

(d) Europe

Sol: (b)

44. When was Universal Adult Franchise granted in India?

(a) 1948

(b) 1950

(c) 1952

(d) 1954

Sol: (b)

45. Which state has more than 30 Lok Sabha constituencies?

(a) Assam

(b) Kerala

(c) Rajasthan

(d) Tamil Nadu

Sol: (d)

46. Who wrote the book 'Hind Swaraj'?

(a) Pt. Jawahar Lal Nehru

(b) Moti Lal Nehru

(c) Mahatma Gandhi

(d) Subhash Chandra Bose

Sol: (c)

47. In Which "Congress Session" the resolution on Poorna Swaraj was passed?

(a) Calcutta Session

(b) Karachi Session

(c) Lahore Session

(d) Tripura Session

Sol: (c)

48. When the French Revolution was took place?

(a) 1789

(b) 1786

(c) 1795

(d) 1781

Sol: (a)

49. The "Great Depression was a period of

(a) Political crisis

(b) Global crisis

(c) Social crisis

(d) Economic crisis

Sol: (d)

50. Printing was first developed in :

(a) Japan

(b) Portugal

(c) China

(d) Germany

Sol: (c)

51. Which one of the following is the ancient name of Tokyo?

(a) Osaka

(b) Nagam

(c) Edo

(d) Gifu

Sol: (c)

52. In which city of India the first cotton mill was established?

(a) Ahmadabad

(b) Surat

(c) Bombay (Mumbai)

(d) Kanpur

Sol: (c)

53. Which battle established the British supremacy in India?

(a) The battle of Panipat

(b) The battle of Plassey

(c) The battle of Buxor

(d) The battle of Mysore

Sol: (c)

54. By selling which of the items to china, did the British regulary collect money for purchasing tea from China?

(a) Opium

(b) Jute

(c) Cotton

(d) Sugarcane

Sol: (a)

55. 'Raikas' the Pastoral community lived in which of the Indian state?

(a) Andhra Pradesh

(b) Jharkhand

(c) Chhattisgarh

(d) Rajasthan

Sol: (d)

56. In which year the southernmost point of the Indian union – 'Indira Point' submerged under the sea water.

(a) 2000

(b) 2002

(c) 1998

(d) 2004

Sol: (d)

57. _____ Drainage pattern develops where hard and soft rocks exist parallel to each other.

(a) Dendritic

(b) Rectangular

(c) Trellis

(d) Radial

Sol: (c)

58. Which one of the following causes rainfall during winter in the north western part of India?

(a) Cyclonic depression

(b) Western disturbances

(c) Retreating monsoon

(d) South west monsoon

Sol: (b)

59. In India which of the following river forms a second biggest waterfall?

(a) Narmada

(b) Godavari

(c) Kaveri

(d) Krishna

Sol: (c)

60. Sugarcane crop grows well in the areas with a rainfall of _____.

(a) 100 – 150 cm

(b) 75 – 100 cm

(c) 150 – 200 cm

(d) 200 cm and above

Sol: (b)

61. On which of the following rivers Sardar Sarovar Dam is built?

(a) Kaveri

(b) Krishna

(c) Narmada

(d) Satluj

Sol: (c)

62. Which port was developed in the wake of loss of Karachi port ?

(a) Mumbai

(b) Paradeep

(c) Kandla

(d) Marmagoa

Sol: (c)

63. India's total area accounts _____ per cent of the total geographical area of the world.

(a) 5.0

(b) 4.0

(c) 2.8

(d) 2.4

Sol: (d)

64. Majuli, the largest inhabited riverine island is found in the _____ river.

(a) Ganga

(b) Brahmaputra

(c) Satluj

(d) Yamuna

Sol: (b)

65. El Nino are the _____ .

(a) cold ocean current

(b) warm ocean current

(c) trade winds

(d) north east winds

Sol: (b)

66. Which of the following is a non farm activity?

(a) Multiple cropping

(b) Crop rotation

(c) Dairy farming

(d) Modern farming

Sol: (c)

67. Which one of the following organization prepares 'Human Development report'?

(a) UNO

(b) WHO

(c) IMF

(d) UNDP

Sol: (d)

68. What is the life expectancy of Indians, as per the 2001 Census?

(a) 72 Yrs.

(b) 53 Yrs.

(c) 64 Yrs.

(d) 70 Yrs.

Sol: (c)

69. The National Rural Employment Guarantee Act enacted by legislation on :

(a) July 20th 2006

(b) August 25th 2005

(c) August 25th 2004

(d) July 20th 2000

Sol: (b)

70. Which one of the following is associated with Primary Sector?

(a) Lawyer

(b) Doctor

(c) Priest

(d) Gardner

Sol: (d)

71. Number of real solutions of

$$\left(x^2 - 7x + 11\right)^{x^2 - 11x + 30} = 1 \text{ is:}$$

(a) 4

(b) 5

(c) 6

(d) no solution

Sol:

$(x^2 - 7x + 11)^{x^2 - 11x + 30} = 1$

If $x^2 - 7x + 11 = 1$ $\qquad$ or $\qquad$ $x^2 - 11x + 30 = 0$

$x^2 - 7x + 10 = 0$

$x = 2, 5 \qquad\qquad x = 5, 6$

72. If $\tan^2\alpha .\tan^2\beta + \tan^2\beta .\tan^2\gamma + \tan^2\gamma .\tan^2\alpha + 2\tan^2\alpha .\tan^2\beta .\tan^2\gamma = 1$ then the value of $\sin^2\alpha + \sin^2\beta + \sin^2\gamma$ is :

(a) 0

(b) –1

(c) 1

(d) $\dfrac{1}{2}$

Sol: (c)

$\tan^2\alpha\tan^2\beta + \tan^2\beta\tan^2\gamma + \tan^2\gamma \tan^2\alpha + 2\tan^2\alpha\tan^2\beta\tan^2\gamma = 1$

$$\Rightarrow \frac{\sin^2\alpha}{\cos^2\alpha} \times \frac{\sin^2\beta}{\cos^2\beta} + \frac{\sin^2\beta}{\cos^2\beta} \times \frac{\sin^2\gamma}{\cos^2\gamma} + \frac{\sin^2\gamma}{\cos^2\gamma} \times \frac{\sin^2\alpha}{\cos^2\alpha} + 2\frac{\sin^2\alpha}{\cos^2\alpha} . \frac{\sin^2\beta}{\cos^2\beta} . \frac{\sin^2\gamma}{\cos^2\gamma} = 1$$

$$\Rightarrow \sin^2\alpha\sin^2\beta\cos^2\gamma + \cos^2\alpha\sin^2\beta\sin^2\gamma + \sin^2\alpha\cos^2\beta\sin^2\gamma + 2\sin^2\alpha\sin^2\beta\sin^2\alpha$$

$$= \cos^2\alpha\cos^2\beta\cos^2\gamma$$

$$\Rightarrow \sin^2\alpha \sin^2\beta(1 - \sin^2\gamma) + (1 - \sin^2\alpha)\sin^2\beta\sin^2\gamma + \sin^2\alpha(1 - \sin^2\beta)\sin^2\gamma$$

$$+ 2\sin^2\alpha \sin^2\beta\sin^2\gamma$$

$$= \left(1 - \sin^2 \alpha\right)\left(1 - \sin^2 \beta\right)\left(1 - \sin^2 \gamma\right)$$

$$\Rightarrow \quad \sin^2 \alpha + \sin^2 \beta + \sin^2 \gamma = 1$$

73. If $3 \sin\theta + 5 \cos\theta = 5$, then the value of $5\sin\theta - 3\cos\theta = ?$

(a) ±4

(b) ±3

(c) ±5

(d) ±2

Sol: (b)

$$3 \sin\theta + 5 \cos\theta = 5$$

$$\left(3\sin\theta + 5\cos\theta\right)^2 = 25$$

$$9\sin^2\theta + 25\cos^2\theta + 30\sin\theta\cos\theta = 25$$

$$9(1 - \cos^2\theta) + 25(1 - \sin^2\theta) + 30\sin\theta\cos\theta = 25$$

$$9\cos^2\theta + 25\sin^2\theta - 30\sin\theta\cos\theta = 9$$

$$\left(5\sin\theta - 3\cos\theta\right)^2 = 9$$

$$5\sin\theta - 3\cos\theta = \pm 3$$

74. An aeroplane is flying horizontally at a height of 3150 m above a horizontal plane ground. At a particular instant it passes another plane vertically below it. At this instant, the angles of elevation of the planes from a point on the ground are 30° and 60°. Hence, the distance between the two planes at that instant is:

(a) 1050 m

(b) 2100 m

(c) 4200 m

(d) 5250 m

Sol: (b)

$$\frac{3150 - x}{y} = \tan 30^\circ = \frac{1}{\sqrt{3}}$$
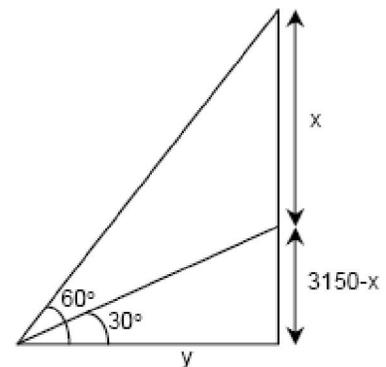
$$\frac{3150}{y} = \tan 60^\circ = \sqrt{3}$$

$$\frac{3150 - x}{3150} = \frac{1}{3}$$

3(3150 - x) = 3150

3x = 6300

x = 2100

75. Given that a(a + b) = 36 and b(a + b)= 64, where a and b are positive, (a–b) equals :

(a) 2.8

(b) 3.2

(c) –2.8

(d) –2.5

Sol: (c)

a(a + b) = 36   and   b (a + b) = 64

a(a+b) +b(a+b) = 36+64

(a + b)(a + b) = 100

$(a + b)^2 = 100$

a + b = 10

∴   10a = 36   10b = 64

⇒   10(a – b) = –28

⇒   a – b = – 2.8

76. If a, b, c are positive, then $\dfrac{a+c}{b+c}$ is

(a) always smaller than $\dfrac{a}{b}$

(b) always greater than $\dfrac{a}{b}$

(c) greater than $\dfrac{a}{b}$ only if a > b.

(d) greater than $\dfrac{a}{b}$ only if $a < b$

Sol: (d)

$\dfrac{a+c}{b+c} > \dfrac{a}{b}$

$\Rightarrow \quad ab + bc > ab + ca$

$\Rightarrow \quad bc > ca$

$\Rightarrow \quad b > a$

$\Rightarrow \quad a < b$

77. $\sqrt[2010]{2\sqrt{7} - 3\sqrt{3}} \times \sqrt[4020]{55 + 12\sqrt{21}} = ?$

(a) -1

(b) 1

(c) 0

(d) 2

Sol: (b)

$\sqrt[2010]{2\sqrt{7} - 3\sqrt{3}} \times \sqrt[4020]{55 + 12\sqrt{21}}$

$\sqrt[2010]{2\sqrt{7} - 3\sqrt{3}} \times \sqrt[4020]{(2\sqrt{7} + 3\sqrt{3})^2}$

$\sqrt[2010]{2\sqrt{7} - 3\sqrt{3}} \times \sqrt[2010]{(2\sqrt{7} + 3\sqrt{3})}$

$\sqrt[2010]{2\sqrt{7} - 3\sqrt{3}\left(2\sqrt{7} + 3\sqrt{3}\right)} = 1$

78. If the quotient of

$x^4 - 11x^3 + 44x^2 - 76x + 48$. When divided by $(x^2 - 7x + 12)$ is $Ax^2 + Bx + C$, then the

descending order of A, B, C is :

(a) A, B, C

(b) B, C, A

(c) A, C, B

(d) C, A, B

Sol: (d)

On dividing $x^4 - 11x^3 + 44x^2 - 76x + 48$ by $x^2 - 7x + 12$ we obtain the quotient

$x^2 – 4x + 4$ So $Ax^2 + Bx + C = x^2 – 4x + 4$

$\therefore$ A = 1,   B = –4, C = 4

In descending order C, A, B

79. The roots of $(x + a)(x + b) – 8K = (K–2)^2$ are real and equal, where a, b, c $\in$ R, then

(a) a + b = 0

(b) a = b

(c) k = – 3

(d) k = 0

Sol: (b)

We can write $(x + a)(x + b) – 8K = (K - 2)^2$

as $x^2 + (a + b)x + ab – 8k – (k^2–4K+ 4) = 0$

or $x^2 + (a + b)x + ab – k^2 – 4K – 4 = 0$

or $x^2 + (a + b) x + ab – (K + 2)^2 = 0$

As roots are real and equal, so

$(a + b)^2 - 4 (ab - (K + 2)^2 = 0$

or $(a - b)^2 + 4 (K + 2)^2 = 0$

$\therefore$ a – b = 0 and K + 2 = 0

or   a = b   and K = – 2

80. In the given figure, AD = AE $\angle$BAD = $\angle$EAC, then
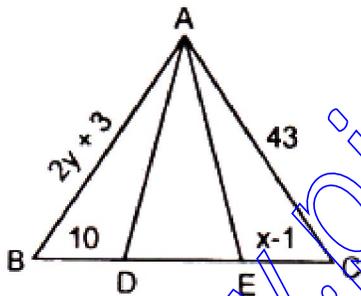
(a) x = 11

(a) x = 13

(a) y = 21

(a) y = 11

Sol: (a)

$\triangle$ ADE is isosceles (as   AD =AE given)
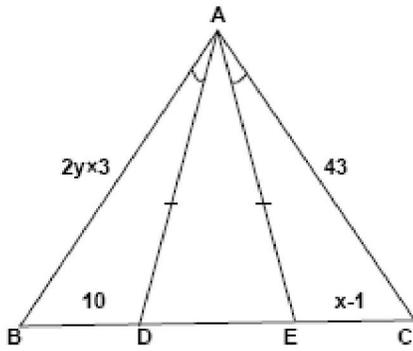
So $\angle$ ADE = $\angle$ AED

180° - $\angle$ ADE = 180° – $\angle$ AED

$\angle$ ADB = $\angle$ AEC

Now in $\triangle$ ADB and $\triangle$ AEC

$\angle$ BAD = $\angle$ EAC (given)

AD = AE (given)

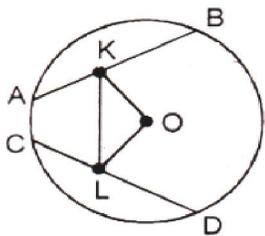$\angle$ ADB = $\angle$ AEC (proved)

$\therefore \triangle$ ADB $\cong \triangle$ AEC   (ASA congruence)

So AB = AC   and   BD = CE (cpct)

or   2y + 3 = 43   and x – 1 = 10

so y = 20,   x = 11

81. In the given circle with centre 'O', the mid points of two equal chords AB & CD are K & L respectively. If $\angle$ OLK = 25°. Then $\angle$ LKB =?

(a) 125°

(b) 115°

(c) 105°

(d) 90°

Sol: (b)

O is the centre of circle. K and L are mid points of Chords AB and CD respectively.
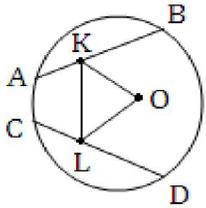
$\therefore$ OK $\perp$ AB and OL $\perp$ CD

As AB = CD

$\therefore$ OK = OL. (equal chords are equidistant from centre)

So $\triangle$OKL is an isosceles.

$\therefore$ $\angle$OKL = $\angle$OLK = 25º (given)

Therefore $\angle$LKB = $\angle$OKL+ $\angle$OKB = 25º + 90º = 115º

82. If $\sqrt{a} + \sqrt{b} - \sqrt{c} = 0$, then the value of $((a + b-c)^2$ is :

(a) 2ab

(b) 2bc

(c) 4ab

(d) 4ac

Sol: (b)

$\sqrt{a} + \sqrt{b} - \sqrt{c} = 0$

$\Rightarrow \sqrt{a} + \sqrt{b} = \sqrt{c}$

$\Rightarrow \left(\sqrt{a} + \sqrt{b}\right)^2 = c$

$\Rightarrow a+b+ 2\sqrt{a}\sqrt{b} = c$

$\Rightarrow a + b-c = -2\sqrt{a}\sqrt{b}$

$\Rightarrow (a+b-c)^2 = \left(-2\sqrt{a}\sqrt{b}\right)^2 = 4ab$

83. The length 'L' of a tangent, drawn from & a point 'A' to a circle is $\dfrac{4}{3}$ of the radius 'r'.

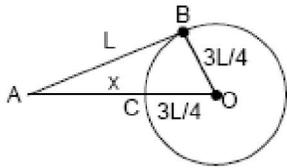The shortest distance from A to fee circle is:

(a) $\dfrac{1}{2}r$

(b) r

(c) $\dfrac{1}{2}$ L

(d) $\dfrac{2}{3}$ L

Sol: (c)

Given the length of tangent L = $\dfrac{4}{3}$ r, where r is the radius.

or $\qquad$ r = $\dfrac{3L}{4}$.

From the figure $L^2 + \left(\dfrac{3L}{4}\right)^2 = \left(x + \dfrac{3L}{4}\right)^2$

$L^2 + \left(\dfrac{3L}{4}\right)^2 = x^2 + \left(\dfrac{3L}{4}\right)^2 + 2x\left(\dfrac{3L}{4}\right)$

$x^2 + 2\left(\dfrac{3L}{4}\right)x - L^2 = 0$

$2x^2 + 3Lx - 2L^2 = 0$

or $(x + 2L)(2x - L) = 0$

$\Rightarrow x = -2L$ or $\dfrac{L}{2}$

we reject x = –2L. Hence x = $\dfrac{L}{2}$

84. A set of numbers has the sum 'S'. Each number of the set is increased by 20, them multiplied by 5, and then decreased by 20. The sum of the numbers in the new set thus obtained is :

(a) S + 20 n

(b) 5S + 80 n

(c) 5S + 4 n

(d) 5S

Sol: (b)

Let there be n numbers

$x_1, x_2, \ldots, x_n$.

So $x_1 + x_2 + \ldots + x_n = S$.

According to equation new sum is

$\{5(x_1+20)-20\}+\{5(x_2+20)-20\} + \ldots+ \{5(x_n+20) -20\}$

$= \quad 5(x_1 + x_2 + \ldots + x_n)+ 80 + 80 + \ldots 80$

$= \quad 5s + 80n$

85. A bag contains 5 red balls and some blue balls. If the probability of drawing a blue ball is double that of a red ball, then the number of blue balls in the bag are:

(a) 20

(b) 15

(c) 12

(d) 10

Sol: (d)

Number of red balls = 5

Let number of blue balls $\quad = \quad x$

Probability $\quad$ of blue ball = 2 $\times$ $\quad$ Probability of red ball

or $\quad \dfrac{x}{x+5} = 2 \times \dfrac{5}{x+5}$

$\Rightarrow \quad x \quad = 10$

86. Consider the points A $(a, b+c)$, B $(b, c+a)$, and C$(c, a + b)$ be the vertices of $\triangle ABC$. The area of $\triangle ABC$ is:

(a) $2(a^2+b^2 + c^2)$

(b) $a^2+b^2+c^2 . 6$

(c) $(ab + bc + ca)$

(d) none of these

Sol:

A $(a, b + c)$, B$(b, c + a)$, c$(c, a + b)$

Area $(\triangle ABC) = \dfrac{1}{2}|a(c+a)-b(b+c)+b(a+b)-c(c+a)+c(b+c)-a(a+b)| = 0$

87. The centre of a clock is taken as origin. At 4.30 pm, the equation of line along minute hand is x=0. Therefore at this instant the equation of the line along the hour hand will be :
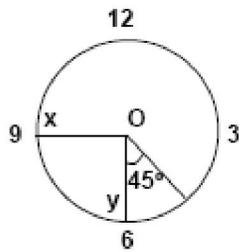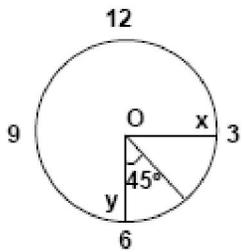
(a) $x + y = 0$

(b) $x - y = 0$

(c) $y = \sqrt{2}\, x$

(d) $y = \dfrac{x}{\sqrt{2}}$

Sol:

If the centre of the clock is origin and x = 0 or y-axis is along minute hand at 4:30 pm then hour hand can have equation

y = x

or y = -x

i.e. x – y = 0

or x + y = 0

88. A conical vessel of radius 6 cm and height 8 cm is completely filled with water. A metal sphere is now lowered into the water. The size of the sphere is such that when it touches the inner surface, it just gets immersed. The fraction of water that overflows from the conical vessel is :
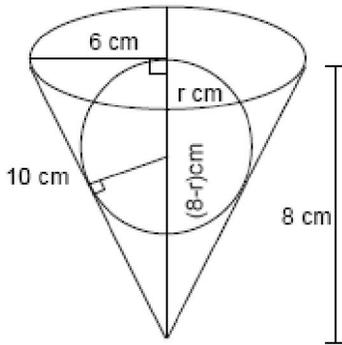
(a) $\dfrac{3}{8}$

(b) $\dfrac{5}{8}$

(c) $\dfrac{7}{8}$

(d) $\dfrac{5}{16}$

Sol: (a)

From the similarity of triangles $\dfrac{8-r}{10} = \dfrac{r}{6}$

48 – 6r = 10r

r = 3

Fraction of water overflows $= \dfrac{\text{volume of sphere}}{\text{volume of cone}} = \dfrac{\frac{4}{3}\pi(3)^3}{\frac{1}{3}\pi(6)^2(8)} = \dfrac{3}{8}$

89. If the eight digit number 2575d568 is divisible by 54 and 87, the value of the digit 'd' is :

(a) 4

(b) 7

(c) 0

(d) 8

Sol: (b)

So that 2575 d 568 may be divisible by 54 and 87 it should be divisible by 2, 27 and 29. The number is always divisible by 2. So as to make it divisible by 27, it must be divisible by 3 at least. So d = 1, 4 or 7.

Hence d = 7

90. $\left\{\dfrac{3\cos 43°}{\sin 47°}\right\}^2 - \dfrac{\cos 37°.\,\text{Co sec } 53°}{\tan 5°.\tan 25°.\tan 45°.\tan 65°.\tan 85°} = ?$

(a) 7

(b) 0

(c) 1

(d) 8

Sol: (d)

$$\left(\dfrac{3\cos 43°}{\sin 47°}\right)^2 - \dfrac{\cos 37° \cos ec 53°}{\tan 5°.\tan 25°.\tan 45°,\tan 65°.\tan 85°}$$

$$= \left(\dfrac{3\cos 47°}{\sin 47°}\right)^2 - \dfrac{\cos 37°}{\sin 53°} \times \dfrac{1}{\tan 5° \tan 25°(1)\cot 25° \cot 5°}$$

$$= 3^2 - \dfrac{\sin 53°}{\sin 53°} \times \dfrac{1}{\dfrac{\tan 5°}{\tan 5°} \times \dfrac{\tan 25°}{\tan 25°}}$$

$$= \quad 9 - 1 = 8$$