



QUANTITATIVE APTITUDE

1. ABC is a right-angled triangle, right angled at A and AD is the altitude on BC. If $AB : AC = 3 : 4$, what is the ratio of BD to DC?

- (a) 3 : 4 (b) 9 : 16 (c) 2 : 3 (d) 1 : 2

2. ABC and PQR are two triangles such that $AB = AC = PQ = PR$, $\angle B = \angle BAC = \alpha$ and $\angle C = \angle QPR = \beta$, and $\alpha + \beta = 90^\circ$. What is the relation between α and β , such that the area of $\triangle ABC = \text{area of } \triangle PQR$?

- (a) $\alpha = 2\beta$ (b) $\alpha = \beta$ (c) $\alpha = 2\beta$ (d) $\alpha = \beta$

3. A solid sphere is cut into four equal parts. If the total surface area of each part now is x times that of the sphere, then what is the value of x ?

- (a) 1,4
(b) 1,2
(c) 3,4
(d) 3,8

4. Two spheres of radii 6 cm and 1 cm are inscribed in a right circular cone. The bigger sphere touches the smaller one and also the base of the cone. What is the height of the cone?

- (a) 14 cm (b) 15 cm (c) 856 cm (d) 725 cm

5. ABCD is a cyclic quadrilateral whose side AB is a diameter of the circle through the points A, B, C and D. If $\angle ADC = 130^\circ$, what is the value of $\angle BAC$?

- (a) 30° (b) 40° (c) 50° (d) 60°

6. Triangles ABC and DEF are similar. If the length of the perpendicular AP from A on the opposite side BC is 2 cm and the length of the perpendicular DQ from D on the opposite side EF is 1 cm, then what is the area of the triangle ABC?

- (a) One and half times the area of the triangle DEF
(b) Four times the area of the triangle DEF
(c) Twice the area of the triangle DEF
(d) Three times the area of the triangle DEF

7. A semi-circular thin sheet of metal of diameter 28 cm is bent and an open conical cup is made. What is the ratio of radius to slant height of the conical cup?

(a) 1 : 2 (b) 1 : 3 (c) 2 : 3 (d) 1 : 4

8. s and t are transversals cutting a set of parallel lines such that a segment of length 3 in s corresponds to a segment of length 5 in t . What is the length of segment in t corresponding to a segment of length 12 in s ?

(a) 20 (b) 365 (c) 14 (d) 54

9. Squares ABDE and ACFH are drawn externally on the sides AB and AC respectively, of a scalene triangle ABC. Which one of the following is correct?

(a) $BH = CE$ (b) $AD = AF$
(c) $BF = CD$ (d) $DF = EH$

10. O and O' are the centres of the two circles with radii 7 cm and 9 cm respectively. The distance between the centres is 20 cm. If PQ be the transverse common tangent to the circles, which cuts OO' at R, what is the length of OR?

(a) 10 cm (b) 12 cm (c) 354 cm (d) 454 cm

11. In $\triangle PQR$, $QR = 10$, $RP = 11$ and $PQ = 12$. D is the mid-point of PR. DE is drawn parallel to PQ meeting QR in E. EF is drawn parallel to RP meeting PQ in F. What is the length of DF?

(a) 112 (b) 6 (c) 334 (d) 5

12. In a locality there are 500 households out of which 260 households have no land and total land possessed by the rest 240 households is 500 acres. What is the mean landholding per household?

(a) 240 acres (b) 1 acre (c) 2512 acres (d) Mean cannot be computed with the given data

13. The proportions of male students and female students in a class are equal. The average height of male students of the class is 128 cm and average height of all the students of the class is 127 cm. What is the average height of female students of the class?

(a) 126 cm (b) 125 cm (c) 134 cm
(d) Average cannot be computed with the given data

14. The length of a rectangle R is 10% more than the side of a square S. The width of the rectangle R is 10% less than the side of the square S. What is the ratio of the area of

A
B C P E
D
F Q

OBJECTIVE -TYPE QUESTIONS

R to that of S?

- (a) 1 : 1 (b) 99 : 100
(c) 199 : 200 (d) 201 : 200

15. If an angle of a triangle remains unchanged but each of its two including sides is doubled, then by what factor does the area get multiplied?

- (a) 2 (b) 3 (c) 4 (d) 6

16. Shadow of a person X, when angle of elevation of the sun is α , is equal in length to the shadow of a person Y, when angle of elevation of the sun is $(\) \alpha$

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. Which one of the following is correct?

- (a) Person X is shorter than person Y
(b) Person X is twice as tall as Y
(c) Person X is taller than person Y but is not twice as tall as Y
(d) Both X and Y are of equal height

17. What is the value of

$$\frac{1 - \sin A}{\cos A} \cdot \frac{\sec A - \cos A}{\cos A}$$

A A

A A ecA

. $\sin A - \cos A$

$\sin A \cos A$

2 2

3 3

A A

A A +

?

- (a) $\cos A$ (b) $\sec A$ (c) $\sin A$ (d) $\operatorname{cosec} A$

18. If $\cos^2 \alpha + \sin^2 \alpha = 2 \cos \alpha$, then what is the value of $\cos^2 \alpha - \sin^2 \alpha$?

- (a) $2 \cos \alpha$ (b) $2 \sin \alpha$ (c) 2 (d) 1

19. What is the value of

$$\frac{\sin^2 24^\circ \sin^2 48^\circ \dots \sin^2 84^\circ}{\cos^2 24^\circ \cos^2 48^\circ \dots \cos^2 84^\circ}$$

$$\frac{2^4 \cdot 6^8 \cdot 8^8}{8^8 \cdot 8^6 \cdot 8^4 \cdot 2}$$

$$\frac{8^8 \cdot 8^6 \cdot 8^4 \cdot 2}{? \cdot ? \cdot ? \cdot ?}$$

$$\frac{? \cdot ? \cdot ? \cdot ?}{? \cdot ? \cdot ? \cdot ?}$$

$$\frac{? \cdot ? \cdot ? \cdot ?}{? \cdot ? \cdot ? \cdot ?}$$

$$\frac{? \cdot ? \cdot ? \cdot ?}{? \cdot ? \cdot ? \cdot ?}$$

- (a) 0 (b) 1 (c) 2 (d) 4

20. How many solutions does the equation $\sin^2 x + \cos^2 x = 2$ have?

- (a) It has no solution

- (b) It has only one solution
- (c) It has two solutions
- (d) It has infinite number of solutions

21. What is the value of $(\tan A + \cot A + \sec A)(\tan A + \cot A - \sec A)$?

- (a) $\sin^2 A$ (b) $\operatorname{cosec}^2 A$ (c) $\cos^2 A$ (d) $\sec^2 A$

22. What is the value of the expression

$$\frac{3 \tan^2 \pi \pi \pi}{6} \cdot \frac{4}{3 \cdot 6} \cdot \frac{1}{2 \cdot 4} \cdot \frac{2 \cdot 3 + \cos \pi - \cot \pi}{2} \cdot \frac{3 \sin^2 \pi}{3} + \frac{1}{8 \sec^4 \pi} \cdot \frac{\pi}{3} ?$$

- (a) 3 (b) 2 (c) 4 (d) 5

23. If $x = a(1 + \cos \phi)$, $y = b(1 + \cos \phi)$ and $z = c(1 + \sin \phi)$ then which one of the following is correct?

- (a) $x^2 + y^2 + z^2 = a^2 + b^2 + c^2 = 1$
- (b) $\frac{x}{a} + \frac{y}{b} + \frac{z}{c} = 1$
- (c) $x^2 + y^2 + z^2 = a^2 + b^2 + c^2$
- (d) $\frac{x}{a} + \frac{y}{b} + \frac{z}{c} = 1$

24. If $x = a \cos^2 \theta \sin \theta$, $y = a \sin^2 \theta \cos \theta$, then which one of the following expressions is independent of θ ?

- 1. $\frac{x}{y} + \frac{y}{x} = 2$
 - 2. $\frac{x}{y} + \frac{y}{x} = 2 \cos^2 \theta$
- Select the correct answer using the codes given below:
Codes:
(a) 1 only (b) 2 only
(c) Both 1 and 2 (d) Neither 1 nor 2

25. If $2 \sin \theta = \sec \theta$, what is the value of $\sin^4 \theta + \cos^4 \theta$?
If $\sin \theta + \cos \theta = 1$ then what is the value of $\sin^2 \theta + \cos^2 \theta$, where $0 \leq \theta < \pi$?

- (a) 30° (b) 45° (c) 60° (d) 90°

27. Let A, B, C be subsets of the universal set X represented by the circles. Let A', B' and C' denote their complements in X.

X. Then which of below corresponds to the shaded portion in the figure given above?

- (a) $A \cap B \cap C$ (b) $A \cap B \cap C \cup v$
 (c) $A \cap B \cap C \cup v'$ (d) $A \cap B \cap C \cup v \cup v'$

28. Match List-I with List-II and select the correct answer using the codes given below the lists:

List-I List-II

- A. $(-)'(-)E \cap A \cap E \cap A$. 1. ϕ
 B. $E \cap A \cap A \cap A - ((-)'(-))$. v 2. A
 C. $(E \cap A \cap A \cap v . (-)')$ 3. A'
 D. $((-)'(-)) - E \cap A \cap \phi$. 4. E

Here A' is the complement set of A, E is the universal set and ϕ is an empty set.

Codes:

A B C D

- (a) 4 1 2 3
 (b) 4 3 2 1
 (c) 2 3 4 1
 (d) 2 1 4 3

A
 B
 C

OBJECTIVE -TYPE QUESTIONS

29. 1 man or 2 women or 3 boys can do a piece of work in 55 days. In how many days can 1 man, 1 woman and 1 boy do the same work?

- (a) 27 days (b) 30 days
 (c) 36 days (d) 42 days

30. A number when divided by 765 leaves a remainder 42. What will be the remainder if the number is divided by 17?

- (a) 8 (b) 7 (c) 6 (d) 5

31. Match List-I (*Product*) with List-II (*Digit in the Unit Place*) and select the correct answer using the codes given below the Lists:

List-I List-II

(*Product*) (*Digit in the Unit Place*)

- A. $(1827)_{16}$ 1. 1
 B. $(2153)_{19}$ 2. 3
 C. $(5129)_{21}$ 3. 5
 4. 7
 5. 9

Codes:

A B C

- (a) 1 4 3
 (b) 4 2 3
 (c) 4 2 5
 (d) 1 4 5

32. Let $(-)'(-) A \cap B \cap A \cap B \dots v = .$

Consider the following:

1. A is a proper subset of B.

2. B is a proper subset of A.
Which of the statements given above is/are correct?

- (a) 1 only (b) 2 only
(c) Both 1 and 2 (d) Neither 1 nor 2

33. What least number x must be subtracted from 797 so that $(797 - x)$ on being divided by 8, 9 and 11 leaves in each case the same remainder 4?

- (a) 0 (b) 1 (c) 2 (d) 3

34. A mixture (40 litres) contains wine and water in the ratio 3 : 1. To make the ratio 5 : 2, how much additional amount of water is required?

- (a) 5 litres (b) 4 litres
(c) 3 litres (d) 2 litres

35. A train leaves Amritsar at 6 a.m. and reaches Delhi at 12 Noon. Another train leaves Delhi at 8 a.m. and reaches Amritsar at 5 p.m. At what time do the two trains cross one another?

- (a) 10 : 00 a.m. (b) 10 : 12 a.m.
(c) 10 : 20 a.m. (d) 10 : 24 a.m.

36. What is the first value of n , for which $n^2 + n + 41$ is **not** a prime?

- (a) 1 (b) 10 (c) 20 (d) 40

37. A dishonest dealer professes to sell his goods at cost price but uses a false weight and thus gains 111 9 %. For a kg, what is the weight used by him?

- (a) 960 gm (b) 940 gm
(c) 900 gm (d) 990 gm

38. If 11, 109, 999 is divided by 1111, then what is remainder?

- (a) 1098 (b) 11888 (c) 1010 (d) 1110

39. When a certain number is multiplied by 18, the product consists entirely 2's. What is the minimum number of such 2's in the product?

- (a) 7 (b) 8 (c) 9 (d) 10

40. Which one of the following is divisible by $(1 + a + a^2)$ and $(1 + a^2 + a^4)$ individually?

- (a) $(1 + a + a^2 + a^3 + a^4 + a^5 + a^6 + a^7 + a^8 + a^9 + a^{10} + a^{11} + a^{12} + a^{13} + a^{14} + a^{15} + a^{16} + a^{17} + a^{18})$
(b) $(1 + a + a^2 + a^3 + a^4 + a^5 + a^6 + a^7 + a^8 + a^9 + a^{10} + a^{11} + a^{12} + a^{13} + a^{14} + a^{15} + a^{16} + a^{17} + a^{18})$
(c) $(1 + a + a^2 + a^3 + a^4 + a^5 + a^6 + a^7 + a^8 + a^9 + a^{10} + a^{11} + a^{12} + a^{13} + a^{14} + a^{15} + a^{16} + a^{17} + a^{18})$
(d) $(1 + a + a^2 + a^3 + a^4 + a^5 + a^6 + a^7 + a^8 + a^9 + a^{10} + a^{11} + a^{12} + a^{13} + a^{14} + a^{15} + a^{16} + a^{17} + a^{18})$

41. If the difference in roots of the equation

$x^2 - px + q = 0$ is unity, then which one of the following is correct?

- (a) $p^2 + 4q = 1$ (b) $p^2 - 4q = 1$
 (c) $p^2 + 4q = -1$ (d) $p^2 - 4q = -1$

42. What is the value of $\log_4 \log_3 \log_2 512$?

- (a) 1 (b) 2 (c)

1

2 (d)

1

4

43. If

$\frac{1}{a} \frac{1}{b} \frac{1}{c}$

$++ =$

1

1

$\frac{1}{a} \frac{1}{b} \frac{1}{c} ++$ where $a + b + c \neq 0$,

$abc \neq 0$, what is the value of $(a + b)(b + c)(c + a)$?

- (a) 0 (b) 1 (c) -1 (d) 2

44. If $x^4 + y^4 = 17$ and $x + y = 1$, what is the value of $x^2 y^2 - 2xy$?

- (a) 8 (b) 10 (c) 12 (d) 16

45. What is the GCD of $(x^4 + 4y^4)$ and $(x^3 - x^2 y + 2y^3)$?

(a) $x^2 + 2y^2 + 2xy$ (b) $x^2 + 2y^2 - 2xy$

(c) $x^2 - 2y^2 - 2xy$ (d) $x^2 - 2y^2 + 2xy$

46. If $\sin A =$

$\frac{2}{m}$

$\frac{2}{n}$

$\frac{mn}{m+n}$

$\frac{m-n}{m+n}$ what is the value of $\tan A$?

(a)

$\frac{2}{m}$

$\frac{2}{n}$

$\frac{mn}{m+n}$

$\frac{m-n}{m+n}$

(b)

$\frac{2}{m}$

$\frac{2}{n}$

$\frac{mn}{m+n}$

$\frac{m-n}{m+n}$

(c)

$\frac{m-n}{m+n}$

$\frac{mn}{m+n}$

$\frac{2}{m}$

$\frac{2}{n}$

-

(d)

$\frac{m-n}{m+n}$

$\frac{mn}{m+n}$

$\frac{2}{m}$

$\frac{2}{n}$

+
-

47. AB is the hypotenuse of a right-angled triangle ABC. If $BC = x$ and $AB + AC = y$, then which one of the following is correct?

(a) \sin

()

$\frac{x}{y}$

$\frac{x}{y}$

=

+

2

$\frac{x^2}{y^2}$ (b) \sin

()

$\frac{x}{y}$

$\frac{x}{y}$

=

-

2

$\frac{x^2}{y^2}$

(c) \sin

()

$\frac{x}{y}$

$\frac{x}{y}$

$\frac{x}{y}$

=

+

2

$\frac{x^2}{y^2}$ (d) \sin

()

$\frac{x}{y}$

$\frac{x}{y}$

$\frac{x}{y}$

=

+

2

48. What is the value of

$\sin^2 x \cos^2 y + \cos^2 x \sin^2 y + \sin^2 x \sin^2 y + \cos^2 x \cos^2 y$?

(a) 0 (b) -1 (c) 1 (d)

1

2

49. What is the angle of elevation of sun for length of shadow to be same as height of the person?

(a) 0° (b) 30° (c) 45° (d) 60°

50. There are 256 farmers in a village. In a season, out of these, 130 farmers did not use any pesticide while the remaining 126 farmers used some pesticides and total expenditure on pesticides by these 126 farmers was Rs 8,780. What is the median expenditure per farmer in the village?

(a)

8780

- 126 (b)
8780
256
(c) 0 (d) Median cannot be computed

51. Which one of the following statements is *not* correct for a bar graph?

- (a) All bars have different thickness
(b) Distance between two consecutive bars is the same
(c) The bars can touch each other
(d) The thickness has no significance

52. A person made 165 telephone calls in the month of May in a year. There was Friday on 1st May of the year. The average telephone call on Sundays of the month was 7. What was the average calls per day on the rest days of the month?

- (a)
165
31 (b) 5
(c)
137
26 (d)
137
27

53. Out of three circles having centres P, Q and R, each circle touches remaining two circles externally. If $PQ = 4$ cm, $QR = 6$ cm and $PR = 8$ cm, what is sum of the radii of the circles?

- (a) 18 cm (b) 15 cm
(c) 12 cm (d) 9 cm

54. ABC is an isosceles triangle with $AB = AC$. Side BA is produced to D, such that $AB = AD$.

Consider the following:

1. $\triangle ACD$ is an isosceles triangle.
2. $\triangle BCD$ is an isosceles triangle.
3. $\triangle BCD$ is a right-angled triangle.

Which of the statements given above are correct?

- (a) 1 and 2 (b) 1 and 3
(c) 2 and 3 (d) 1, 2 and 3

55. A circle touches all the four sides of a quadrilateral ABCD. Which one of the following is always correct?

- (a) $AB + BC = CD + DA$
(b) $AB + AD = BC + CD$
(c) $AB + CD = BC + DA$
(d) $AB + BC + CD + DA = 4$ times the diameter of the circle

56. What are the values of A and B respectively, if
5 1

5 1
 5 1
 5 1
 5
 -
 ?
 +
 +
 +
 -
 = + A B

(a) 3, 0 (b) 0, 3 (c) 0, 0 (d) 3, 3

Directions:

The following **five (5)** items consist of two statements: one labelled as the 'Assertion (A)' and the other as 'Reason (R)'. You are to examine these two statements carefully and select the answers to these items using the codes given below:

Codes:

(a) Both A and R are individually true and R is the correct explanation of A

(b) Both A and R are individually true but R is *not* the correct explanation of A

(c) A is true but R is false

(d) A is false but R is true

57. Assertion (A):

The system of the equations $2x + 4y + 1 = 0$
 $4x + 8y + 3 = 0$ has no solution.

Reason (R):

The system of equations $a_1x + b_1y + c_1 = 0$
 $a_2x + b_2y + c_2 = 0$ has no solution, if a

a
 b
 b
 1
 2
 1
 2
 = .

58. Assertion (A):

$\sin x$ lies between 0 and + 1 for $0 < x < 90^\circ$.

Reason (R):

$\sin x$ increases as x increases from 0 to 90° .

59. Assertion (A):

$\log_{10}(1 + 2 + 3) = \log_{10} 1 + \log_{10} 2 + \log_{10} 3$

Reason (R):

$\log_{10}(a + b + c) = \log_{10} a + \log_{10} b + \log_{10} c$
 where a, b, c are positive real numbers.

60. Assertion (A):

(()) $3\sqrt{3}$ is irrational number.

Reason (R):

(()) $a\sqrt{a}$ is always irrational if a is irrational.

61. Assertion (A):

3

13

2

5

2

7

5

$3^2x^2 + x^3 + x^4$ is a rational expression.

Reason (R):

Every polynomial is a rational expression.

62. In a triangle ABC, the angle C is obtuse. Which one of the following is correct?

(a) $AB^2 > AC^2 + BC^2$

(b) $AB^2 < AC^2 + BC^2$

(c) $AC^2 > AB^2 + BC^2$

(d) $BC^2 > AB^2 + AC^2$

63. V_1, V_2, V_3 and V_4 are the volumes of four cubes of side lengths x cm, $2x$ cm, $3x$ cm and $4x$ cm respectively. Some statements regarding these volumes are given below:

1. $V_1 + V_2 + 2V_3 < V_4$

2. $V_1 + 4V_2 + V_3 < V_4$

3. $2(V_1 + V_3) + V_2 = V_4$

Which of the above are correct?

(a) 1 and 2 (b) 1 and 3

(c) 2 and 3 (d) 1, 2 and 3

64. If the total length of diagonals of a cube is 12 cm, what is the total length of edges of the cube?

(a) 15 cm (b) 12 cm

(c) 6 cm (d) 12 cm

65. A circle of 5 cm radius is drawn and another circle of 3 cm radius is cut out of this circle. What is the radius of a circle which has the same area as the area of the bigger circle excluding the cut one?

(a) 2 cm (b) 3 cm

(c) 4 cm (d) 4.5 cm

66. Except for one face of a given cube, identical cubes are glued through their faces to all the other faces of the given cube. If each side of the given cube measures 3 cm, then what is the total surface area of the solid body thus formed?

(a) 225 cm^2 (b) 234 cm^2

(c) 270 cm^2 (d) 279 cm^2

67. Two concentric spheres A and B, have radii r and $2r$ respectively. A cone is inscribed in the latter so as to

circumscribe the former. What is the curved surface area of the cone?

- (a) $2\sqrt{2}\pi r$ (b) $4\sqrt{2}\pi r$
 (c) $6\sqrt{2}\pi r$ (d) $8\sqrt{2}\pi r$

68. A spherical iron ball is dropped into a cylindrical vessel of base diameter 14 cm, containing water. The water level is increased by 9

1
 3 cm. What is the radius of the ball?

- (a) 3.5 cm (b) 7 cm
 (c) 9 cm (d) 12 cm

69. The external and internal diameters of a hemispherical bowl are 10 cm and 8 cm respectively. What is the total surface area of the bowl?

- (a) 257.7 cm^2 (b) 286 cm^2
 (c) 292 cm^2 (d) 302 cm^2

70.

If in the figure given above, $MN = x$, what is the area of the shaded region?

- (a)
 πx^2
 2
 (b)
 πx^2
 4
 (c) πx^2 (d) $4\sqrt{2}\pi x$

71. The radius and height of a right solid circular cone are r and h respectively. A conical cavity of radius

r
 2 and
 height
 h

2 is cut out of the cone. What is the whole surface area of the rest of the portion?

- (a)
 $\pi r^2 + \pi r h + \pi r^2$
 4
 5 $3\sqrt{2}\pi r^2 + \pi r h + \pi r^2$ (b)
 5
 4
 $2\sqrt{2}\pi r^2 + \pi r h + \pi r^2$
 (c)
 3
 4
 $2\sqrt{2}\pi r^2 + \pi r h + \pi r^2$ (d)
 3
 7
 $2\sqrt{2}\pi r^2 + \pi r h + \pi r^2$

72. The radius of a cylindrical cistern is 10 metres and its height is 15 metres. Initially the cistern is empty. We start

filling the cistern with water through a pipe whose diameter is 50 cm. Water is coming out of the pipe with a velocity of 5 m/s. How many minutes will it take in filling the cistern with water?

(a) 20 (b) 40 (c) 60 (d) 80

73. A sphere of radius 13 cm is cut by a plane whose distance from the centre of the sphere is 5 cm. What is the circumference of the plane circular section?

(a) 10π cm (b) 12π cm (c) 24π cm (d) 26π cm

74. A square of side a cm is cut from each corner of a rectangular sheet of metal of 10 cm by 14 cm. The resulting projections are folded up and the seams welded to construct an open box. What is the volume of the box thus obtained?

(a) $140a - 48a^2 + 4a^3$

(b) $140a + 48a^2 + 4a^3$

(c) $140a + 24a^2 + a^3$

(d) $140a - 24a^2 + a^3$

75. A right circular cone is cut by two planes parallel to the base and trisecting the altitude. What is the ratio of the volumes of the three parts: top, middle and bottom respectively?

(a) 1 : 7 : 19 (b) 1 : 2 : 3

(c) 1 : 8 : 27 (d) 1 : 7 : 18

76. Two rectangles A and B are such that the length of A equals the sum of the diagonal and the greater side of B, while the breadth of A equals the difference of the diagonal and the greater side of B. Which one of the following is correct?

(a) Area of A is greater than the area of B

(b) Area of A is equal to the area of B

(c) Area of A is equal to the area of a square with its side equal to the smaller side of B

(d) Area of A is equal to the area of a rectangle whose dimensions are those of the diagonal and the shorter side of B

77. What is the least number by which 3675 be multiplied so that the product is a perfect square?

(a) 2 (b) 3 (c) 5 (d) 7

78. A sum of money placed at compound interest trebles itself in 5 years. In how many years will it amount to nine times itself?

(a) 10 years (b) 12 years

(c) 15 years (d) 18 years

79. The area of a circle varies as the square of its radius.

If the area of circle of radius 10 cm is 300 cm^2 , then what is the area of circle with radius 12 cm?

- (a) 360 cm^2 (b) 423 cm^2
(c) 432 cm^2 (d) 452.5 cm^2

80. A machine is sold at a profit of 10%. Had it been sold for Rs 40 less, there would have been a loss of 10%. What is the cost price of the machine?

- (a) Rs 175 (b) Rs 200
(c) Rs 250 (d) Rs 400

81. What is the LCM of

3
8
5
36
7
72

, , and

15
96 ?

- (a)
105
4 (b)
4
105 (c)
105
8 (d)
105
288

82. 12 workers, after working for 10 hours a day assemble some instruments in 15 days. How much number of days is required to assemble the same number of instruments if 15 workers are employed working 8 hours a day?

- (a) 10 days (b) 12 days
(c) 15 days (d) 18 days

83. A train started from a station with certain number of passengers. At the first halt, half of the passengers got down and 120 passengers got in. At the second halt, half of the passengers got down, and then the train left for its destination with 360 passengers. How many passengers were there in the train when it started from the first station?

- (a) 800 (b) 900 (c) 1000 (d) 1200

84. A man can walk uphill at the rate of $2 \frac{1}{2}$

km/hr

and downhill at the rate of $3 \frac{1}{4}$

km/hr. If the total time

required to walk a certain distance up the hill and return to the starting point was 4 hr 36 min, then what was the distance he walked up the hill?

- (a) 6 1
 2 km (b) 5 1
 2 km
 (c) 4 1
 2 km (d) 4 km

85. In an election a total of 5,00,000 voters participated. A candidate got 2,55,000 votes which was 60% of the total valid votes. What was the percentage of invalid votes?

- (a) 10% (b) 12% (c) 15% (d) ()% 300
 17

86. x, y and z are three sums of money such that y is simple interest on x and z is simple interest on y for the same time and rate. Which one of the following is correct?

- (a) $x^2 = yz$ (b) $y^2 = zx$
 (c) $z^2 = xy$ (d) $xyz = 1$

87. If one root is common in equations $x^2 + bx + a = 0$ and $x^2 + ax + b = 0$ and $a \neq b$, then which one of the following is correct?

- (a) $a + b = -1$ (b) $a + b = 1$
 (c) $a - b = 1$ (d) $a - b = -1$

88. What is the nature of the roots of the equation $px^2 - (p - q)x - q = 0$ where p, q are integers and $p \neq 0$?

- (a) Both roots are always integers
 (b) Both roots are always rationals
 (c) One root is rational and other is irrational
 (d) Both roots are always of opposite sign

89. Let l, m and n be real numbers such that $l + n = m$. What is the quotient on dividing $l^3 - m^3 + n^3 + 3lmn$ by $(l - m + n)$?

- (a) $l^2 + m^2 + n^2 - lm - mn - ln$
 (b) $l^2 + m^2 + n^2 + lm + mn - ln$
 (c) $l^2 - m^2 + n^2 + lm + mn - ln$
 (d) $l^2 - m^2 + n^2 - lm - mn + ln$

90. Consider the following statements:

- $a_n + b_n$ is divisible by $a + b$ if $n = 2k + 1$, where k is a positive integer.
- $a_n - b_n$ is divisible by $a - b$ if $n = 2k$, where k is a positive integer.

Which of the statements given above is/are correct?

- (a) 1 only (b) 2 only
 (c) Both 1 and 2 (d) Neither 1 nor 2

91. If the roots of the equation $x^2 + x + 1 = 0$ are α and β , and the roots of the equation $x^2 + ax + b = 0$ are α^2 and β^2 , then

?

and

?

α , what is the value of α ?

(a) 1 (b) 2 (c) -1 (d) -2

92. What is the remainder when $x^4 + 1$ is divided by $x - 2$?

(a) 17 (b) 15 (c) 7 (d) 1

93. If the value of $\log_y 10 =$

1

x

, then what will be the value of $\log_{10} ($

y

10)?

(a)

x

10 (b) 10x (c) x - 1 (d)

1

10x

94. If $x + y + z = 0$ and $xyz \neq 0$, then what is the value of

$\frac{1}{x} + \frac{1}{y} + \frac{1}{z}$

$\frac{1}{x^2} + \frac{1}{y^2} + \frac{1}{z^2}$ (a) 0 (b) 1 (c) -1 (d)

+

+

+

+

?

(a) 0 (b) 1 (c) -1 (d)

1

2

95. If $\log_{10} x + \log_{10} y = \log_{10} (x + y)$, then what is the value of $\log_{10} x - \log_{10} y$?

(a) $\log_{10} (x - y)$ (b) $\log_{10} (y - 1)$

(c) $\log_{10} (1 - y)$ (d) $-\log_{10} (y - 1)$

96. If α and β are the roots of the equation

$x^2 + ax + b = 0$, then what are the roots of the equation

$x^2 - ax + b = 0$?

(a) α, β (b) $-\alpha, -\beta$ (c) $\alpha, -\beta$ (d) α, β

97. For what value of p is the coefficient of x^2 in the product $(2x - 1)(x - k)(px + 1)$ equal to 0 and the constant term equal to 2?

(a) 2 (b)

2

5 (c)

5

2 (d) 5

98. If m and n are natural numbers such that $2^m - 2^n = 960$, what is the value of m ?

(a) 10 (b) 12

(c) 16 (d) Cannot be determined

99. When $x^3 + 2x^2 + 4x + b$ is divided by $x + 1$, the quotient is $x^2 + ax + 3$ and remainder is $-3 + 2b$. What are the values of a and b respectively?

(a) 1, 0 (b) -1, 0 (c) 1, 1 (d) -1, -1

100. If y

z

$+ 1$

$= 1$ and x

y

$+ 1$

$= 1$ what is the value of

xyz ?

(a) 1 (b) -1 (c) 0 (d)

1

2

ANSWERS With EXPLANATIONS

1. (b) $\triangle ABC$ is a rt \triangle , $\angle A = 90^\circ$ $AB : AC = 3 : 4$

$\therefore \sin A = \frac{BC}{AC} = \frac{5}{4}$

Let $BD = x$, $\therefore DC = 5 - x$

$AD = AB \cdot \frac{BD}{AC} = DC \cdot \frac{AD}{AC}$

$\Rightarrow 9 \cdot \frac{x}{5} = (5 - x) \cdot \frac{x}{5}$, $x = 18$

10

$\therefore DC = 32$

10

$BD : DC =$

18

10

32

10

$\therefore = 9 : 16$

2. (a) ar $\triangle ABC =$ ar $\triangle PQR$. 1

2 $AB \cdot AC \cdot \sin \alpha$

$= 1$

2 $PQ \cdot PR \cdot \sin \beta$, $\sin \alpha = \sin \beta$.

But $\alpha + \beta = 180^\circ$

$\therefore \sin \alpha = \sin \beta$. 180 [Q If $\sin \alpha = \sin \beta$ then

either $\angle = \alpha$ or $\angle = 180 - \alpha$

3. (b) $A = x.4 \ 2 \ \pi r .$

4

4

2

2

$2 \ 2 \ \pi \ r \ r + . = x.4 \ 2 \ \pi r . x =$

1

2

4. (d). $\triangle OAB \sim \triangle OCD \sim$

$\triangle OAC$

OC

AB

CD

$\angle h$

h

1

2

1

6

=

h AP

h CP

$\angle(\)$

-

= 1

6 =

h

h

$\angle(\)$

-

1 6 6

6

++

= 1

6 . h = 72

5

5. (b) Q AB is a diameter

$\angle ACB = 90^\circ$

$\angle ADC = 130^\circ$

$\angle ABC = 180^\circ - 130^\circ = 50^\circ$

$\angle BAC = 90^\circ - 50^\circ = 40^\circ$

6. (b) As $\triangle ABC$ and $\triangle DEF$ are similar

$\triangle ABC \sim \triangle DEF$

.

.

=

AP

DQ

2

2 = ()

AP

DQ

$$2 = (\)^2$$

1

2

$$\text{ar } \triangle ABC = 4 (\text{ar } \triangle DEF)$$

7. (a) $d = 28$ cm

. Slant height of open conical

cup =

28

2

$$= 14 \text{ cm}$$

$$\text{Circumference of base of cone} = \pi r = \pi \times 14$$

$$2 \pi \times 14 = R \pi \cdot R = 7$$

$$R : l = 7 : 14 = 1 : 2$$

8. (a)

3

12

5 = .

$$x \times x = 20$$

9. (a) $\angle BAH = 90^\circ + \angle BAC$

$$\angle CAE = 90^\circ + \angle BAC$$

$$\therefore \angle BAH = \angle CAE$$

$$AB = AE, AH = AC$$

... BAH EAC (SAS)

$$\therefore BH = CE \text{ (C.P.C.T.)}$$

10. (d) $OO' = 20$ cm

$$\text{Let } OR = x$$

$$\therefore O'R = 20 - x$$

$$\therefore \triangle OPR \sim \triangle OQR$$

$$\frac{OR}{OR}$$

$$\frac{OR}{OR}$$

$$\frac{OP}{OQ}$$

$$\frac{OQ}{OQ}$$

$$= .$$

$$x$$

$$x \times 20 =$$

$$= 7$$

$$9$$

$$\therefore x =$$

$$45$$

$$4$$

11. (d) In $\triangle PQR$, D is the mid point of PR

E is the mid point of QR

$EF \parallel PR$. F is the mid point of PQ

In $\triangle PQR$, D and F are the

mid points of PR and PQ respectively

$$\therefore DF =$$

$$1$$

$$2 QR =$$

$$1$$

$$2 \times 10 = 5 \text{ cm}$$

12. (b)

13. (a) $M : F = x : x$ A.T.S. $127 \ 2 \ 128 \ ?x \ x$

x

- = 126

14. (b) Let the side of a square be a

A.T.S.

() () a a

a

? ? ?

=

110

100

90

100 99

100 2

15. (c) $A =$

1

$2 ab \sin.$

A

B C D

3 4

$A' =$

1

$2 (2a) (2b) \sin. \ . A' = 4 ($

1

$2 ab \sin.)$

$A' = 4A$

16. (c)

17. (c) 1

1 1

-sin cos

cos (

cos

-

sin

)

A A

A

A A

.

$(\sin \cos)(\sin \cos)$

$(\sin \cos)(\sin \cos \sin \cos)$

A A A A

A A A A A A

- +

+ + - 2 2

$= \sin A \sin^2 A + \cos^2 A = 1$

$a_3 + b_3 = (a + b) (a_2 + b_2 - ab)$

18. (b) $\cos\alpha + \sin\alpha = 2 \cos\alpha$

$\sin\alpha = 2 (\cos\alpha) - \cos\alpha$

$\sin\alpha = (2 - 1) \cos\alpha$

$\cos\alpha = \sin$

-

α

2 1

$\times 2$

2

$+$

$+$

$$\cos \alpha = 2 \sin \alpha + \sin \alpha$$

$$\cos \alpha - \sin \alpha = 2 \sin \alpha$$

19. (b) $\sin(90^\circ - \alpha) = \cos \alpha$. $\cos 88^\circ = \sin 2^\circ$

$$\cos 2^\circ = \sin 88^\circ$$

$$\cos(90^\circ - \alpha) = \sin \alpha$$

20. (a) $\sin \alpha + \cos \alpha = 2$

Dividing by $\sqrt{2}$

$$= \sqrt{2} (\sin \frac{\alpha}{\sqrt{2}} + \cos \frac{\alpha}{\sqrt{2}})$$

1

2

$$+(\cos \frac{\alpha}{\sqrt{2}}) \times$$

1

2

$$= \sqrt{2} (\sin \frac{\alpha}{\sqrt{2}} + \cos \frac{\alpha}{\sqrt{2}}) = 2$$

$$= 2 (\sin (\frac{\alpha}{\sqrt{2}} + 45^\circ)) = 2$$

$$\text{But } -1 < \sin \alpha < 1$$

\therefore No solution

21. (b) Given $\exp = (\tan A + \cot A)^2 - \sec^2 A$

$$= \tan^2 A + \cot^2 A + 2 \tan A \cot A - \sec^2 A$$

$$= \tan^2 A + \cot^2 A + 2 - \sec^2 A$$

$$= \cot^2 A + 2 - (\sec^2 A - \tan^2 A)$$

$$= (\cot^2 A + 1) + 1 - (1) = \operatorname{cosec}^2 A$$

22. (a) Value = $3(\frac{1}{3} + \frac{1}{3} + \frac{1}{3} - \frac{1}{3})$

1

3

$)^2 +$

4

3

3

2

$2(\frac{1}{3} -$

$\frac{1}{3})$

$2(\frac{1}{3} -$

$\frac{2}{3})$

3

$(\frac{1}{3} -$

$\frac{3}{3})$

2

2

$+$

1

8

$(\frac{1}{3} -$

$\frac{1}{3})$

$$4 = 3$$

23. (a) $(-)(-)(-)(-) \times a$

a

y

b

z

c

2

2

2

$+$

$$\begin{aligned}
 & - \\
 & + \\
 & = \cos^2 \phi + \sin^2 \phi \\
 & = \cos^2 \phi + \sin^2 \phi \\
 & = \cos^2 \phi + \sin^2 \phi
 \end{aligned}$$

24. (c) $x^2 + y^2 = a^2 \cos^2 \phi + a^2 \sin^2 \phi = a^2 (\cos^2 \phi + \sin^2 \phi) = a^2$

$$\begin{aligned}
 & (x^2 + y^2) \\
 & = a^2
 \end{aligned}$$

$$\begin{aligned}
 & + \\
 & = \\
 & a
 \end{aligned}$$

$$\begin{aligned}
 & a \\
 & 6 \ 6 \ 6 \\
 & 4 \ 6 \ 6 \\
 & \cos \sin \\
 & \cos \sin
 \end{aligned}$$

$$\begin{aligned}
 & \dots \\
 & \dots \\
 & = a^2
 \end{aligned}$$

which is independent of ϕ .

$$\begin{aligned}
 & \text{Sly} \\
 & x \ y \\
 & xy \\
 & 2 \ 2 \\
 & 3
 \end{aligned}$$

$$\begin{aligned}
 & + \\
 & = a \\
 & a
 \end{aligned}$$

$$\begin{aligned}
 & \cos \sin \\
 & \cos \sin \\
 & \dots
 \end{aligned}$$

$$\begin{aligned}
 & \dots \\
 & 2 \\
 & 3 \\
 & = a \\
 & 1
 \end{aligned}$$

3 independent of ϕ .

25. (b) $\sin^4 \phi + \cos^4 \phi = (\sin^2 \phi + \cos^2 \phi)^2 - 2 \sin^2 \phi \cos^2 \phi$

$$\begin{aligned}
 & = 1^2 - 2 (\sin \phi \cos \phi)^2 = 1 - 2 \sin^2 2\phi \\
 & = 1 - 2 \sin^2 2\phi
 \end{aligned}$$

$$\begin{aligned}
 & 1 \\
 & 2 \\
 & 2 \sin \phi = \sec \phi = \\
 & 1
 \end{aligned}$$

$$\begin{aligned}
 & \cos \phi \\
 & \sin \phi \cos \phi = \\
 & 1 \\
 & 2
 \end{aligned}$$

$$\begin{aligned}
 &) \\
 & 26. (a) \\
 & \sin \\
 & \cos
 \end{aligned}$$

$$\begin{aligned} & \cdot \\ & \cdot 1+ \\ & + 1+ \cos \\ & \sin \\ & \cdot \\ & \cdot \\ & = 4 \\ & \sin (\cos) \\ & (\cos) \sin \\ & 2 2 1 \\ & 1 \end{aligned}$$

$$\begin{aligned} & \cdot \cdot \\ & \cdot \cdot \\ & + + \\ & + = 4 \end{aligned}$$

$$\begin{aligned} & \cdot \\ & + + + \\ & + \\ & \sin \cos \cos \\ & (\cos) \sin \\ & 2 2 1 2 \\ & 1 \end{aligned}$$

$$\begin{aligned} & \cdot \cdot \cdot \\ & \cdot \cdot = 4 \\ & \sin \cos \cos \\ & (\cos) \sin \\ & 2 2 1 2 \\ & 1 \\ & 4 \end{aligned}$$

$$\begin{aligned} & \cdot \cdot \cdot \\ & \cdot \cdot \\ & + + + \\ & + \\ & = \end{aligned}$$

$$\begin{aligned} & \cdot \\ & + \\ & + \\ & 2 1 \\ & 1 \\ & (\cos) \\ & (\cos) \sin \end{aligned}$$

$$\begin{aligned} & \cdot \\ & \cdot \cdot \\ & = 4 \\ & \cdot \sin = \end{aligned}$$

$$\begin{aligned} & 1 \\ & 2 = \sin 30 . = ? . 30 \end{aligned}$$

27. (b)

28. (a) (A - B) means the set of all elements which belong to A but do not belong to B.

$$29. (b) 1M = 2W = 3B$$

$$1M + 1W + 1B = 3B +$$

3

$$2 B + 1B =$$

11

2

B

3 Boys can do the work in 55 days

11

2 boys can do the work in = 55 2

11

3 ? ? = 30 days

30. (a) No. = $x \times 765 + 42 = x \times 17 \times 45 + 2 \times 17 + 8$
 $= 17(45x + 2) + 8$. R = 8

31. (d) 7_4 gives unit's digit 1

. $(1827)_{4 \times 4}$ gives unit's digit 1

3_4 gives unit's digit 1

3_3 gives unit's digit 7

. $(3_4)_4$. 3_3 gives 7 as unit's digit

9_2 gives unit's digit 1

$(5129_2)_{10}$. 5129 gives 9 as unit's digit

A B C

1 4 5

32. (d)

33. (b) L.C.M. of 8, 9, 11 = 792.

No. div by 8, 9, 11 leaving remainder 4

$= 792 + 4 = 796$. $x = 1$

34. (d) Milk = ? 40 3

4 = 30 l. Water = 10 l

A.T.S.

30

10+ x

= 5

2

. $x = 2$

35. (d) Let the distance between Amritsar and Delhi be x

Time taken by first train = 6 hrs

. $S_1 =$

x

6 km/hr and that by second train = 9 hrs

$S_2 =$

x

9 km/hr

Let the time taken (after 8 a.m.) by the two trains to cross each other be t hrs.

A.T.S (2x

x

6 +

x

6 t) +

x

9 t = x . t = 2 hrs 24 mins

. Trains cross each other at 10.24 a.m.

36. (d) $40_2 + 40 + 41 = 1681 = 41_2$

37. (c) Gain% =

Error

True Error -

?100.100

9

= x

x 1000 -

$\times 100$. $x = 100$

. Weight used = 1000 - 100 = 900 gms

38. (d)

39. (c) $18 = 2 \times 9$

No. should be div by 9 also

Product consists of 2's only

. Min no. of such 2's = 9

Q $2 + 2 + \dots$ 9 times = $2 \times 9 = 18$ which is div. by 9

40. (d)

41. (a) Let the roots be α and $\alpha + 1$

. Sum of roots = $\alpha + \alpha + 1 = p$. $\alpha =$

$\frac{p-1}{2}$

2

Product of roots = $\alpha (\alpha + 1) = q$

(

$\frac{p-1}{2}$

) (

$\frac{p-1}{2}$

2

$1 +) = q$, $p^2 + 4q = 1$

42. (c) $\log_2 512 = \log_2 2^9 = 9 \log_2 2 = 9 \times 1 = 9$

. $\log_4 \log_3 9 = \log_4 \log_3 3^2 (\log_3 e = 1$

$= \log_4 2 = \log_4 () 4$

1

$2 \log m = n \log m$

$\log_3 3^2 = 2 \log_3 3 = 2 \times 1 = 2$

$=$

1

$2 \log_4 4 =$

1

$2 \times 1 =$

1

2

43. (a)

$1 \ 1 \ 1$

$a \ b \ c$

$++ = 1$

$a \ b \ c \ ++$

.

$1 \ 1$

$a \ b$

$++ = 1$

$a \ b \ c \ ++$

-

1

c

$b \ a$

ab

$+$

$=$

$c \ a \ b \ c$

$c \ a \ b \ c$

$---$

$() \ ++ .$

$a \ b$

ab

$+$

$=$

$-()$

$()$

$a^2 b$
 $c a b c$
 $+$
 $++$
 $.$
 $a^2 b$
 ab
 $+$
 $+$
 $a^2 b$
 $c a b c$
 $+$
 $++ () = 0$
 $.(a + b) [$
 $c a b c ab$
 $abc a b c$

$()$
 $()$
 $+++$
 $++$
 $] = 0$

$.(a + b) [ca + bc + c^2 + ab] = 0$
 $Q abc \neq 0, a + b + c \neq 0$
 $.(a+b)(b+c)(c+a) = 0$

44. (a) $x + y = 1$

Squaring we get, $x^2 + y^2 + 2xy = 1$. $x^2 + y^2 = 1 - 2xy$

Again squaring, $x^4 + y^4 + 2x^2 y^2 = 1 + 4x^2 y^2 - 4xy$

$. 17 + 2x^2 y^2 - 4x^2 y^2 + 4xy = 1$. $x^2 y^2 - 2xy = 8$

45. (b) $x^4 + 4y^4 = x^4 + 4y^4 + 4x^2 y^2 - 4x^2 y^2 = (x^2 + 2y^2)^2 - (2xy)^2$

$.(x^2 + 2y^2 - 2xy)(x^2 + 2y^2 + 2xy)$

$x^3 - x^2 y + 2y^3 = x^3 + y^3 - x^2 y + y^3$

$= (x + y)(x^2 - xy + y^2) - y(x^2 - y^2)$

$= (x + y)(x^2 - xy + y^2) - y(x - y)(x + y)$

$= (x + y)[x^2 - xy + y^2 - xy + y^2]$

$= (x + y)(x^2 + 2xy^2 - 2y)$. G.C.D. = $x^2 + 2y^2 - 2xy$

46. (b) $\cos A = 1/2$ - $\sin A = 1$

2

2^2

$2 - ()$

mn

$m n +$

$=$

$m n$

$m n$

2^2

2^2

$-$

$+$

$\tan A =$

\sin

\cos

A

A

$=$

2

2^2

mn

$m n -$

47. (a) Let $AB = a$. $AC = y - a$

$$AB^2 = BC^2 + AC^2$$

$$a^2 = x^2 + (y-a)^2$$

$$x^2 + y^2 - 2ay + a^2 = a^2$$

$$x^2 + y^2 - 2ay = 0$$

$$2ay = x^2 + y^2$$

$$a = \frac{x^2 + y^2}{2y}$$

$$AB = \frac{x^2 + y^2}{2y}$$

$$BC = \frac{x^2 + y^2}{2y} - a$$

$$BC = \frac{x^2 + y^2}{2y} - \frac{x^2 + y^2}{2y}$$

$$AB = \frac{x^2 + y^2}{2y}$$

$$BC = \frac{x^2 + y^2}{2y} - a$$

$$BC = \frac{x^2 + y^2}{2y} - a$$

$$BC = \frac{x^2 + y^2}{2y} - a$$

$$x^2 + y^2 - 2ay = 0$$

$$2ay = x^2 + y^2$$

$$a = \frac{x^2 + y^2}{2y}$$

$$2ay = x^2 + y^2$$

$$xy = x^2 + y^2$$

$$x^2 + y^2 = xy$$

48. (c) $\sin 2x \cos 2y + \cos 2x \sin 2y + \sin 2x \sin 2y + \cos 2x \cos 2y$

$$= \sin 2x \cos 2y + \sin 2x \sin 2y + \cos 2x \sin 2y + \cos 2x \cos 2y$$

$$= \sin 2x (\cos 2y + \sin 2y) + \cos 2x (\sin 2y + \cos 2y)$$

$$= \sin 2x \cdot 1 + \cos 2x \cdot 1 = 1 (\sin 2x + \cos 2x = 1)$$

49. (c) $\tan \theta = \frac{P}{B}$

$$P = x$$

$$B = 1$$

$$x = 1$$

$$x = 1$$

$$= \tan 45^\circ \therefore \theta = 45^\circ$$

50. (d) 51. (a)

52. (b) On 1st May it was Friday

. On 3rd May it was Sunday-3, 10, 17, 24, 31

. In May there were 5 Sundays

A

B

C

X

X

X

$$\text{No. of calls on 5 Sundays} = 5 \times 7 = 35$$

$$\text{Remaining days} = 26 \text{ . Reqd average} = \frac{165}{26}$$

$$= 6.35$$

$$26$$

$$- 165$$

$$= 5$$

53. (d) $PQ = r_1 + r_2 = 4$

$$QR = r_2 + r_3 = 6$$

$$PR = r_3 + r_1 = 8$$

$$\text{Adding, } 2(r_1 + r_2 + r_3) = 18$$

$$\therefore r_1 + r_2 + r_3 = 9$$

54. (b) In $\triangle ABC$, $AB = AC$. $\therefore \angle B = \angle C$

$$AB = AD \text{ . } AC = AD$$

$$\text{In } \triangle ACD, AC = AD \text{ . } \therefore \angle ACD = \angle ADC$$

$$\text{In } \triangle BCD, \angle B + (\angle C + \angle ACD) + \angle ADC = 180^\circ$$

$$\therefore \angle B + (\angle C + \angle ACD) + \angle ACD = 180^\circ$$

$$\text{or } \angle B + \angle C = 90^\circ \text{ . } \therefore \triangle BCD \text{ is a rt } \triangle$$

$$\text{In } \triangle ACD, AC = AD \text{ . } \therefore \triangle ACD \text{ is an isosceles } \triangle$$

(1) and (3) true

55. (c) $AP = AS$

$BP = BQ$

$CR = CQ$

$DR = DS$

Adding $AP + BP + CR + DR = AS + BQ + CQ + DS$

or $AB + CD = (AS + DS) + (BQ + CQ) = AD + BC$

56. (a) () ()

() ()

5 1 5 1

5 1 5 1

2 2 - + +

+ -

= A + B 5

On solving, $3 = A + B 5$.A = 3, B = 0

57. (a)

a

a

1

2

=

2

4

1

2

= ,

b

b

1

2

4

8

1

2

= = ,

c

c

1

2

1

3

=

Q

a

a

b

b

c

c

1

2

1

2

1

2

= . . It has no solution

58. (a)

59. (c) $\log (1+2+3) = \log 6 = \log (1 \times 2 \times 3)$

= $\log 1 + \log 2 + \log 3$

But $\log (m + n) \neq \log m + \log n$

60. (c) $((3) 3) 3 = (3) 3 = 3 \times 3 \times 3 = 3^3$ irrational

If $a = 2$ $((2)^2)^2 = (2)^2 = 2$ rational no.

2 is an irrational

61. (a)

62. (a) $AB^2 = BD^2 + AD^2$ (in rt. $\triangle ABD$)

$$= BD^2 + (CD + AC)^2$$

$$= BD^2 + CD^2 + AC^2$$
 In rt. $\triangle BCD$,

$$+ 2CD \cdot AC \quad BC^2 = BD^2 + CD^2$$

$$= BC^2 + AC^2 + 2CD \cdot AC > BC^2 + AC^2$$

$$Q \quad 2CD \cdot AC > 0$$

63. (d) $V_1 = x^3, V_2 = (2x)^3 = 8x^3, V_3 = 27x^3, V_4 = 64x^3$

64. (d) 65. (c) $\pi r^2 = (5^2 - 3^2) = 16 \pi \therefore r = 4$ cm

66. (b) T.S.A. of body = $4(4a^2) + 5a^2 + (3a \times a + 2a^2) = 26a^2$

$$= 26 \times 9 = 234 \text{ cm}^2$$

67. (c) 68. (b)

4

3

14

2

28

3

$$7 \times 3 \times 2 \times \pi \times r = ? \therefore ()$$

69. (b) T.S.A. of hemispherical bowl

$$= 2 \times 2 \pi R + 2 \times 2 \pi r + () \pi \times R^2 - . 3 \times 2 \pi R + \pi r^2$$

$$= \pi (3R^2 + r^2) =$$

22

$$7 (3 \times 5^2 + 4^2) = 286 \text{ cm}^2$$

70. (c) $LM^2 + LN^2 = MN^2 = x^2$

Shaded area = $\pi [() () ()] LM LN MN$

$$2 \times 2 \times 2$$

$$2 \times 2 \times 2 + +$$

=

π

4

$$2 \times 2 \times 2 () LM LN MN + + =$$

π

4

$$2 \times 2 () MN MN +$$

=

π

4

$$2 \times 2 \times x =$$

$$\pi x^2$$

2

71. (a) $\triangle OAB \sim \triangle OCD$

$\therefore OB$

$$OD =$$

AB

CD

$$OB \therefore = l$$

2

T.S.A. of rest portion

$$= \pi r^2 + \pi () r$$

2

$$2 + (\pi \times r \times r \times l \times l) - -$$

$$2 \times 2)$$

=

πr

$$4(5r + 3l) =$$

πr

$$4(5r + 3) \times 2 \times h \times r +$$

$$72. (d) D = S \times t$$

$$h = 5 \times t \text{ (length of water)}$$

$$\text{Vol. of a cylinder} = \pi r^2 h$$

$$\text{A.T.S. } \pi () 50$$

$$2 \times 100 ?$$

$$2 \times 5t = \pi(10)^2 \times 15 \cdot t$$

$$= 4800 \text{ sec} = 80 \text{ min}$$

$$73. (c) \text{ Radius of circular section} = 13.5 \times 2 = 27 = 12$$

$$. = C \times r \times 2 \times \pi \times \text{cm}$$

$$74. (a) \text{ Length of the remaining sheet} = 14 - 2a$$

$$= \text{Length of box}$$

$$\text{Breadth of box} = 10 - 2a, \text{ Height of box} = a$$

$$\cdot \text{ Vol of box} = (14 - 2a)(10 - 2a)a = 140a - 48a^2 + 4a^3$$

$$75. (a) h_1 =$$

h

$$3, h_2 =$$

2

3

h

$$r_1 : r_2 : r_3$$

$$\text{Let } r_1 = r, r_2 = 2r, r_3 = 3r$$

$$h_1 : h_2 : h = r : 2r : 3r$$

$$\text{Ratio of vol} =$$

1

3×1

2

$$1 \pi r^2 h : ($$

1

3

1

3×2

2

2×1

2

$$1 \pi \pi r^2 h r h -) :$$

$($

1

3

1

3×3

2

2

2

$$2 \pi \pi r^2 h r h -)$$

$$= r^2 \times 1$$

$$2 : [() \cdot 2 \times 2 \times 2 \times r \times r \times r \times x -] :$$

$$[(3r^2) 3r^2 - (2r^2) 2r^2] = 1 : 7 : 19$$

$$76. (c) l = d_1 + l, b = d_1 - l$$

$$\text{Area of A} = l \cdot b$$

$$= (d_1 + l)(d_1 - l)$$

$$= d_1^2$$

$$2 - l^2 = b^2$$

$$= \text{Area of a square with side} = \text{smaller side of B}$$

P

Q R
 A
 B
 C
 r_1
 r_2
 r_3
 A
 B C
 D
 $2 \frac{1}{3}$
 3
 4
 A
 B
 C
 D
 P
 Q
 R
 S

tangents from an
 ext pt to a circle
 are equal

B
 C A D
 B
 C
 A
 D
 $\frac{1}{P} \frac{1}{2}$
 $\frac{h}{2}$
 h
 O
 R=r

r_1
 r_2
 r_3
 h_1
 h_2
 h_3
 l
 b
 B
 d
 A
 d_2
 l'
 b'

77. (b) $3675 = 3 \times 1225 = 3 \times 35^2$. Reqd no. = 3

78. (a) $3x = x(1 +$

R
 $100)^5$ or $(1 +$

R
 $100)^5 = 3$

$9x = x(1 +$

R
 $100)^n \cdot 3^2 = (1 +$

R
 $100)^n \cdot [(1 +$

R
 $100)^5]^2$

$= (1 +$

R
 $100)^n \cdot (1 +$

R
 $100)^{10} = (1 +$

R
 $100)^n \cdot n = 10$ years

79. (c) $A = ka^2$, $k(10)^2 = 300$. $k = 3$

$A = k(12)^2 = 3(12)^2 = 432$

80. (b) Let C.P. = Rs 100. S.P. (I) = Rs 110

If Loss = 10%, S.P. = Rs 90

Diff = 110 - 90 = Rs 20
 If diff = Rs 20 then C.P. = Rs 100
 If diff is Rs 40 then C.P. = Rs 200

81. (a) L.C.M. of

3
 8
 5
 36
 7
 72
 15
 96
 , , ,
 =
 LCM of
 HCF of
 3 5 7 15
 8 36 72 96

, , ,
 , , ,
 =

105
 4

82. (c) Workers hrs days

12 10 15

15 8 x

more workers less days

15 : 12

Less hrs more days

8 : 10

. =

? ?

?

x

15 12 10

15 8

= 15

83. (d) Let the reqd no. of passengers be x

A.T.S.

x

x 2

120

2

360 1200

+

. =

84. (a) d d

5

2

13

4

+ = 4 +

36

60

6 1

2

. = d km (t =

D

Speed

)

85. (c) Valid votes = $25500 \times$

100

$60 = 425,000$

%age of invalid votes =

$\frac{500\,000 - 425\,000}{500\,000}$

$\frac{75\,000}{500\,000}$

$\frac{15}{100}$

, - ,

,

? = 15

86. (a) $y =$

$x^2 + 2x + 1$

x^2

$2x$

1

100

100

, $z =$

y^2

$2y$

1

y^2

$2y$

1

100

100

$100y$

x

$=$

$100z$

$y^2 = xz$

87. (a) Let the common root be α

$\alpha^2 + a\alpha + b = 0$... (i)

$\alpha^2 + a\alpha + b = 0$... (ii)

Solving we get $\alpha = 1$ (, -)

$1^2 + a \times 1 + b = 0 \Rightarrow a + b = -1$

88. (b) $S =$

$p^2 + q^2$

p^2

$-$

, $P =$

q^2

p^2

p, q are integers, $p \neq 0$

89. (b) $l^3 + n^3 - 3lmn = (l+n-m)(l^2 + n^2 + m^2 + l^2 + n^2 - l^2 - n^2 - m^2)$

$l^3 - m^3 + n^3 + 3lmn = (l+n+m)(l^2 + n^2 + m^2 + l^2 + n^2 - l^2 - n^2 - m^2)$

$= [l+(-m)+n] [l^2 + (-m)^2 + n^2 - l(-m) - (-m)n - nl]$

$= (l - m + n) (l^2 + m^2 + n^2 + lm + mn - nl)$

Clearly quotient = $l^2 + m^2 + n^2 + lm + mn - nl$

90. (c)

91. (a) $\alpha^2 + a\alpha + b = 1$

α

$?$

$?$

α

$+$

$\alpha ?$

$\alpha ?$

$2^2 +$

$=$

$() -$

$-$

$\alpha ? \alpha ?$

$\alpha ?$

$+$

$=$

2^2

a

$(-1) - -$

$2^2 1$

1

1

$?$

$= . = a a$

92. (a) $R = f(2) = 2^4 + 1 = 17$

93. (c) $\log_y 10 =$

1

x

$\log_{10} y = x, \log_{10} ($

y

$10) = \log_{10} y - \log_{10} 10 = x - 1$

94. (a) $x + y + z = 0, x + y = -z$

Squaring we get, $x^2 + y^2 + 2xy = z^2$

or $x^2 + y^2 - z^2 = -2xy$

Similarly $y^2 + z^2 - x^2 = -2yz$

$z^2 + x^2 - y^2 = -2xz$

Value =

$1 1$

2

1

$-2 -2 xy yz xz$

$+$

$-$

$+ = - 1$

2

$()$

$z x y$

xyz

$++$

$=0$

95. (a)

96. (c) $\alpha ? + = - a, \alpha ? = b . = - - \alpha ? a, (-\alpha) (-?) = b$

Clearly the reqd roots are $-\alpha, -?$

97. (b) $(2x - 1)(x - k)(px + 1) = 2px^3 - x^2p(2k + 1) + 2x^2$

$(pk - 2k - 1)x + k$

Constant term = $k = 2$

Coeff of $x^2 = 2 - p(2k + 1)$

$= 2 - p(2 \times 2 + 1) = 0. p =$

2

5

98. (a) $2^m - 2^n = 960 = 2^6 \times 3 \times 5 = 2^6 \times 15 = 2^6(16 - 1)$

$= 2^6(2^4 - 1) = 2^{10} - 2^6. m = 10$

99. (a) $x^3 + 2x^2 + 4x + b = (x + 1)(x^2 + ax + 3) + (-3 + 2b)$

Comparing the coeff of x^2 and constant terms,

$$a = 1, b = 0$$

$$100. (b) y +$$

$$1$$

$$2 = 1 \cdot yz + 1 = z$$

$$x +$$

$$1$$

$$y$$

$$= 1 \cdot xy + 1 = y$$

$$(xy + 1)z + 1 = z$$

$$\text{or } xyz + z + 1 = z$$

$$\text{or } xyz + 1 = 0$$

$$xyz = -1$$

$$\therefore 15 : x$$