CDS - II 2017
Elementary Maths Question Paper

1. What is the value of $\alpha(\alpha \neq 0)$ for which $x^2 - 5x + \alpha$ and $x^2 - 7x + 2\alpha$ have a common factor?
   A. 6 B. 4
   C. 3 D. 2
2. How many numbers from 1 to 1000 are divisible by 2, 3, 4 and 5?
   A. 16 B. 17
   C. 32 D. None of the above
3. What are the factors of $x^3 + 4x^2 - 11x - 30$?
   A. $(x-2), (x+3)$ and $(x+5)$
   B. $(x+2), (x+3)$ and $(x-5)$
   C. $(x+2), (x-3)$ and $(x+5)$
   D. $(x+2), (x-3)$ and $(x-5)$
4. If x = 111……1 (20 digits), y = 333….3 (10 digits) and z = 222…….2 (10 digits), then what is $\frac{x-y^2}{z}$ equal to?
   A. $\frac{1}{2}$ B. 1
   C. 2 D. 3
5. What is the positive value of m for which the roots of the equation $12x^2 + mx + 5 = 0$ are in the ratio 3:2?
   A. $5\sqrt{10}$ B. $\frac{5\sqrt{10}}{12}$
   C. $\frac{5}{12}$ D. $\frac{12}{5}$
6. Let f(x) and g(x) be two polynomials (with real coefficients) having degrees 3 and 4 respectively. What is the degree of f(x)g(x)?
   A. 12 B. 7
   C. 4 D. 3
7. $5x^3 + 5x^2 - 6x + 9$ is divided by $(x+3)$, then the remainder is
   A. 135 B. -135
   C. 63 D. -63
8. The product of two non-zero expressions is $(x+y+z)p^3$. If their HCF is p^2, then their LCM is
   A. $(x+y+z)$ B. $(x+y+z)p^2$
   C. $(x+y+z)p^5$ D. $(x+y+z)p$
9. If the points P and Q represent the real numbers $0.8\overline{3}$ and $0.6\overline{2}$ on the number line, then the distance between P and Q is
   A. $\frac{21}{90}$ B. $\frac{19}{90}$
   C. $\frac{21}{100}$ D. $\frac{56}{90}$
10. Sudhir purchased a chair with three consecutive discounts of 20%, 12.5% and 5%. The actual deduction will be
    A. 33.5% B. 30%
    C. 32% D. 35%
11. A fruit seller has a certain number of mangoes of which 5% are rotten. He sells 75% of the remainder and he is left with 95 mangoes. How many mangoes did he have originally?
    A. 500 B. 450
    C. 400 D. 350
12. If a train crosses a km-stone in 12 seconds, how long will it take to cross 91 km-stones completely if its speed is 60 km/hr?
    A. 1 hr 30 min
    B. 1 hr 30 min 12 sec
    C. 1 hr 51 min
    D. 1 hr 1 min 3 sec
13. In a 100 m race, A runs at 6 km/hr. If A gives B a start of 8 m and still beats him by 9 seconds, what is the speed of B?
    A. 4.6 km/hr B. 4.8 km/hr
    C. 5.2 km/hr D. 5.4 km/hr
14. The quotient of $8x^3 - y^3$ when divided by $2xy + 4x^2 + y^2$ is
    A. $2x + y$ B. $x + 2y$
    C. $2x - y$ D. $4x - y$
15. If $(x+2)$ is a common factor of $x^2 + ax + b$ and $x^2 + bx + a$, then the ratio $a : b$ is equal to
    A. 1 B. 2
    C. 3 D. 4
16. Let
    $f(x) = a_0x^n + a_1x^{n-1} + a_2x^{n-2} + \ldots + a_{n-1}x + a_n$,
    where $a_0, a_1, a_2, \ldots, a_n$ are real numbers. If $f(x)$ is divided by $(ax - b)$, then the remainder is
    A. $f\left(\frac{b}{a}\right)$ B. $f\left(-\frac{b}{a}\right)$
    C. $f\left(\frac{a}{b}\right)$ D. $f\left(-\frac{a}{b}\right)$
17. Consider the following numbers:
    1. 2222 B. 11664
    C. 343343 D. 220347
    Which of the above are not perfect squares?
    A. 1, 2 and 3 B. 1, 2 and 4
    C. 2, 3 and 4 D. 1, 3 and 4

18. The product of the polynomials $(x+2),(x-2),(x^3-2x^2+4x-8)$ and (x^3+2x^2+4x+8) is
A. x^8-256 B. $(x^4-16)^2$
C. $(x^4+16)^2$ D. $(x^2-4)^2$

19. The factors of $x(x+2)(x+3)(x+5)-72$ are
A. $x,(x+3),(x+4)$ and $(x-6)$
B. $(x-1),(x+6)$ and $(x^2-2x-12)$
C. $(x-1),(x+6)$ and $(x^2+5x+12)$
D. $(x+1),(x-6)$ and $(x^2-5x-12)$

20. If the HCF of polynomials $f(x)=(x-1)(x^2+3x+a)$ and $g(x)=(x+2)(x^2+2x+b)$ is (x^2+x-2), then what are the values of a and b respectively?
A. 2, 2 B. 2, -3
C. -1, -3 D. -2, -1

21. a, b, c, d are non-zero integers such that (ab) divides (cd). If a and c are coprime, then which one of the following is correct?
A. a is a factor of c B. a is a factor of b
C. a is a factor of d D. d is a factor of a

22. If the roots of the equation $a(b-c)x^2+b(c-a)x+c(a-b)=0$ are equal, then which one of the following is correct?
A. $2b=a+c$ B. $b^2=ac$
C. $\frac{2}{b}=\frac{1}{a}+\frac{1}{c}$ D. $\frac{1}{b}=\frac{1}{a}+\frac{1}{c}$

23. The non-zero solution of the equation $\frac{a-x^2}{bx}-\frac{b-x}{c}=\frac{c-x}{b}-\frac{b-x^2}{cx}$, where $b\neq 0, c\neq 0$ is
A. $\frac{b^2+ac}{b^2+c^2}$ B. $\frac{b^2-ac}{b^2-c^2}$
C. $\frac{b^2-ac}{b^2+c^2}$ D. $\frac{b^2+ac}{b^2-c^2}$

24. If k is an integer, then $x^2+7x-14\left(k^2-\frac{7}{8}\right)=0$ has
A. Both integral roots
B. At least one integral root
C. No integral root
D. Both positive integral roots

25. How many numbers between 500 and 1000 are divisible by 13?
A. 36 B. 37
C. 38 D. 39

26. To maintain 8 cows for 60 days, a milkman has to spend ₹ 6,400. To maintain 5 cows for n days, he has to spend ₹4,800. What is the value of n?
A. 46 days B. 50 days
C. 58 days D. 72 days

27. A student has to secure 40% of marks to pass an examination. He gets only 45 marks and fails by 5 marks. The maximum marks are
A. 120 B. 125
C. 130 D. 150

28. What is the value of u in the system of equations $3(2u+v)=7vu, 3(u+3v)=11uv$?
A. 0 B. $\frac{1}{4}$
C. $\frac{1}{2}$ D. 1

29. Five years ago, Ram was three times as old as Shyam. Four years from now, Ram will be only twice as old as Shyam. What is the present age of Ram?
A. 30 years B. 32 years
C. 36 years D. 40 years

30. Ram buys 4 chairs and 9 stools for ₹1,340. If he sells chairs at 10% profit and stools at 20% profit, he earns a total profit of ₹188. How much money did he have to pay for the chairs?
A. ₹200 B. ₹400
C. ₹800 D. ₹1,600

31. Which one of the following is a correct statement?
A. {x : x + 5 = 5} = ϕ
B. {x : x + 5 = 5} = {0}
C. {x : x + 5 = 5} = 0
D. {x : x + 5 = 5} = $\{\phi\}$

32. If $ab+bc+ca=0$, then what is the value of $\frac{a^2}{a^2-bc}+\frac{b^2}{b^2-ca}+\frac{c^2}{c^2-ab}$?
A. 3 B. 0
C. 1 D. -1

33. In an examination, 35% students failed in Hindi, 45% students failed in English and 20% students failed in both the subjects. What is the percentage of students passing in both the subjects?
A. 0 B. 20
C. 30 D. 40

34. What is $\frac{(x-y)(y-z)(z-x)}{(x-y)^3+(y-z)^3+(z-x)^3}$ equal to?
A. $-\frac{1}{3}$ B. $\frac{1}{3}$
C. 3 D. -3

35. The value of $\sqrt{1+\sqrt{1+\sqrt{1+\ldots}}}$

A. Equals to 1

B. Lies between 0 and 1

C. Lies between 1 and 2

D. Is greater than 2

36. If $\log_{10} 8 = 0.9031$, then what is the value of $\log_{10} 8000 + \log_{10} 600$?

A. 4.6813 B. 5.5813

C. 1.5813 D. 6.6813

37. 30 men can complete a job in 40 days. However, after 24 days some men out of the assigned 30 left the job. The remaining people took another 40 days to complete the job. The number of men who left the job is

A. 24 B. 18

C. 12 D. 6

38. 4 goats or 6 sheep can graze a field in 50 days. 2 goats and 3 sheep will graze it in

A. 200 days B. 150 days

C. 100 days D. 50 days

39. A tap can fill a tub in 10 hours. After opening the tap for 5 hours it was found that a small outlet at the bottom of the tub was open and water was leaking through it. It was then immediately closed. It took 7 hours to fill the tub after closing the outlet. What time will be taken by the outlet to empty the full tub of water?

A. 35 hours B. 25 hours

C. 20 hours D. 17 hours

40. A boy went to his school at a speed of 12 km/hr and returned to his house at a speed of 8 km/hr. If he has taken 50 minutes for the whole journey, what was the total distance walked?

A. 4 km B. 8 km

C. 16 km D. 20 km

41. If 78 is divided into 3 parts which are proportional to $1, \frac{1}{3}, \frac{1}{6}$, then the middle part is

A. $\frac{28}{3}$ B. 13

C. $\frac{52}{3}$ D. $\frac{55}{3}$

42. There are 350 boys in the first three standards. The ratio of the number of boys in first and second standards is 2:3, while that of boys in second and third standards is 4:5. What is the total number of boys in first and third standards?

A. 302 B. 280

C. 242 D. 230

43. The difference between the compound interest (compounded annually) and simple interest on a sum of money deposited for 2 years at 5% per annum is ₹15. What is the sum of money deposited?

A. ₹ 6,000 B. ₹ 4,800

C. ₹ 3,600 D. ₹ 2,400

44. When prices rise by 12%, if the expenditure is to be the same, what is the percentage of consumption to be reduced?

A. $16\frac{2}{3}\%$ B. $10\frac{2}{7}\%$

C. $16\frac{3}{5}\%$ D. $10\frac{5}{7}\%$

45. A man rows down a river 18 km in 4 hours with the stream and returns in 10 hours. Consider the following statements:

1. The speed of the man against the stream is 1.8 km/hr.

2. The speed of the man in still water is 3.15 km/hr

Which of the above statements are correct?

A. 1 and 2 only B. 2 and 3 only

C. 1 and 3 only D. 1, 2 and 3

46. If a triangle has sides 5, 13 and 12 units and θ is the acute angle of the triangle, then what is value of $(\sin\theta + \cos\theta)$?

A. $\frac{5}{13}$ B. $\frac{7}{13}$

C. $\frac{12}{13}$ D. $\frac{17}{13}$

47. If $0 < x < \frac{\pi}{2}$, then $(\sin x + \cos x)$ is

A. >2 B. <2

C. ≥2 D. ≤2

48. If $\sin\theta = \frac{m^2-n^2}{m^2+n^2}$ and $0 < \theta < \frac{\pi}{2}$, then what is the value of $\cos\theta$?

A. $\frac{2mn}{m^2+n^2}$ B. $\frac{2mn}{m^2-n^2}$

C. $\frac{m^2+n^2}{2mn}$ D. $\frac{m^2-n^2}{2mn}$

49. If angle A of triangle ABC is 30° and circum-radius of the triangle is 10 cm, then what is the length of side BC?
A. 5 cm B. 10 cm
C. $5\sqrt{3}$ cm D. $10\sqrt{3}$ cm

50. If $A = \frac{\sin 45° - \sin 30°}{\cos 45° + \cos 60°}$ and $B = \frac{\sec 45° - \tan 45°}{cosec\ 45° + \cot 45°}$, then which one of the following is correct?
A. A = B B. A > B > 0
C. A < B D. B < A < 0

51. If θ measured in radians is the angle between the hour hand and the minute hand of a clock when the time is 4 : 36 pm, then which one of the following is correct?
A. $\frac{3\pi}{5} < \theta < \frac{4\pi}{5}$ B. $\frac{2\pi}{5} < \theta < \frac{3\pi}{5}$
C. $\frac{\pi}{5} \leq \theta \leq \frac{2\pi}{5}$ D. $\frac{7\pi}{15} \leq \theta \leq \frac{8\pi}{15}$

52. Consider the following statements:
1. If 45° < θ < 60°, then $\sec^2\theta + cosec^2\theta = \alpha^2$ for some real number $\alpha > 1$.
2. If 0° < θ < 45°, then $\frac{1+\cos\theta}{1-\cos\theta} = x^2$ for some real number $x > 2$.
3. If 0° < θ < 45°, then $\frac{\cos\theta}{1-\tan\theta} + \frac{\sin\theta}{1-\cot\theta} \geq 2$

What is the number of true statements?
A. Zero B. One
C. Two D. Three

53. Let AB represent a building of height h metre with A being its top, B being its bottom. Let A'B' represent a tower of height (h+x) metre (x>0) with A' being its top and B' being its bottom. Let BB' = d metre. Let the angle of elevation of A' as seen from A be 45°.
Consider the following statements:
Statement I: h + x > d
Statement II: The angle of depression of B as seen from A' is less than 45°.
Which one of the following is correct in respect of the above statements?
A. Both Statement I and Statement II are true and Statement II is the correct explanation of Statement I
B. Both Statement I and Statement II are true but Statement II is not the correct explanation of Statement I
C. Statement I is true but Statement II is false
D. Statement I is false but Statement II is true

54. A man, standing at a point X on the bank XY of a river that cannot be crossed, observes a tower to be N α^0 E on the opposite parallel bank. He then walks 200 m along the bank to the point Y towards East, and finds the tower to be N β^0 W. From these observations, the breadth of the river will be
(Given that $\tan\alpha^0 = 2$ and $\tan\beta^0 = 0.5$)
A. 60 m B. 70 m
C. 80 m D. 90 m

55. The value of $\frac{\sin 1°}{\sin 1^c}$ where 1^c represents 1 radian is
A. Equal to 1
B. Less than 1
C. Greater than 1 but less than 2
D. Greater than 2

56. The diameters of two given circles are in the ratio 12:5 and the sum of their areas is equal to the area of a circle of diameter 65 cm. What are their radii?
A. 12 cm and 5 cm
B. 24 cm and 10 cm
C. 60 cm and 25 cm
D. 30 cm and 12.5 cm

57. A hollow cube is formed by joining six identical squares. A rectangular cello tape of length 4 cm and breadth 0.5 cm is used for joining each pair of edges. What is the total area of cello tape used?
A. 12 square cm B. 24 square cm
C. 36 square cm D. 48 square cm

58. Two straight lines AB and AC include an angle. A circle is drawn in this angle which touches both these lines. One more circle is drawn which touches both these lines as well as the previous circle. If the area of the bigger circle is 9 times the area of the smaller circle, then what must be the angle A?
A. 45° B. 60°
C. 75° D. 90°

59. An isosceles triangle is drawn outside on one of the sides of a square as base in such a way that the perimeter of the complete figure is $\frac{7}{6}$ times the perimeter of the original square. What is the ratio of area of the triangle to the area of the original square?

A. 1 : 1 B. 2 : 3

C. 1 : 2 D. 1 : 3

60. What is the area of the triangle whose sides are 51 cm, 37 cm, and 20 cm?

A. 300 square cm B. 305 square cm

C. 306 square cm D. 307 square cm

61. Segment QR of length r is a tangent at Q to a circle of radius r with centre at P. What is the area of the part of the triangle PQR, which is outside the circular region?

A. $\frac{\pi r^2}{16}$ B. $\frac{r^2}{2} - \frac{\pi r^2}{8}$

C. $\frac{r^2}{2} - \frac{\pi r^2}{16}$ D. $\frac{r^2}{4} - \frac{\pi r^2}{8}$

62. In a triangle ABC, AD is perpendicular on BC. If ∠BAC = 90°, AB = c, BC = a, CA = b and AD = p, then which one of the following is correct?

A. $p = abc$ B. $p^2 = bc$

C. $p = \frac{bc}{a}$ D. $p = \frac{ab}{c}$

63. AB and CD are parallel chords of a circle 3 cm apart. If AB = 4 cm, CD = 10 cm, then what is the radius of the circle?

A. 7 cm B. $\sqrt{19}$ cm

C. $\sqrt{29}$ cm D. 14 cm

64. The diagonals of a cyclic quadrilateral ABCD intersect at P and the area of the triangle APB is 24 square cm. If AB = 8 cm and CD = 5 cm, then what is the area of the triangle CPD?

A. 24 square cm B. 25 square cm

C. 12.5 square cm D. 9.375 square cm

65. In an equilateral triangle ABC, BD is drawn perpendicular to AC. What is BD^2 equal to?

A. AD^2 B. $2AD^2$

C. $3AD^2$ D. $4AD^2$

66. The distance between the centres of two circles having radii 9 cm and 4 cm is 13 cm. What is the length of the direct common tangent of these circles?

A. 12 cm B. 11 cm

C. 10 cm D. 9.5 cm

67. If PL, QM and RN are the altitudes of triangle PQR whose orthocentre is O, then Q is the orthocentre of the triangle

A. OPQ B. OQR

C. PLR D. OPR

68. In a triangle ABC, ∠C = 90° and CD is the perpendicular from C to AB. If $(CD)^{-2} = (BC)^{-2} + (CA)^{-2}$, then which one of the following is correct?

A. BC.CD = AB.CA

B. AB.BC = CD.CA

C. $CA^2 + CB^2 = 2(AD^2 + CD^2)$

D. AB.CD = BC.CA

69. If a point O in the interior of a rectangle ABCD is joined with each of the vertices A, B, C and D, then $OB^2 + OD^2$ will be equal to

A. $2OC^2 + OA^2$ B. $OC^2 - OA^2$

C. $OC^2 + OA^2$ D. $OC^2 + 2OA^2$

70. A cylinder of height 2x is circumscribed by a sphere of radius 2x such that the circular ends of the cylinder are two small circles on the sphere. What is the ratio of the curved surface are of the cylinder to the surface area of the sphere?

A. $\sqrt{3} : 4$ B. $\sqrt{3} : 3$

C. $\sqrt{3} : 2$ D. $\sqrt{3} : 1$

71. A cylindrical vessel 60 cm in diameter is partially filled with water. A sphere 30 cm in diameter is gently dropped into the vessel and is completely immersed. To what further height will the water in the cylinder rise?

A. 20 cm B. 15 cm

C. 10 cm D. 5 cm

72. The vertical angle of right circular cone is $\frac{\pi}{2}$ and the slant height is $\sqrt{2}$ r cm. What is the volume of the cone in cubic cm?

A. πr^3 B. $9\pi r^3$

C. $\frac{\pi r^3}{3}$ D. $3\pi r^3$

73. The radii of the frustum of a right circular cone are in the ratio 2 : 1. What is the ratio of the volume of the frustum of the cone to that of the whole cone?
A. 1 : 8 B. 1 : 4
C. 3 : 4 D. 7 : 8

74. From a solid cylinder whose height is 8 cm and of base radius 6 cm, a conical cavity of height 8 cm and of base radius 6 cm is formed by hollowing out. What is the inner surface area of the cavity?
A. 6π square cm B. 8π square cm
C. 10π square cm D. 60π square cm

75. A tent has been constructed which is in the form of a right circular cylinder surmounted by a right circular cone whose axis coincides with the axis of the cylinder. If the radius of the base of the cylinder is 50 m, the height of the cylinder is 10 m and the total height of the tent is 15 m, then what is the capacity of the tent in cubic metres?
A. 37500π B. $\frac{87500\pi}{3}$
C. $\frac{26500\pi}{3}$ D. 25000π

76. Two rectangular sheets of sizes 2π X 4π and π X 5π are available. A hollow right circular cylinder can be formed by joining a pair of parallel sides of any sheet. What is the maximum possible volume of the circular cylinder that can be formed this way?
A. 4 π^2 B. 8 π^2
C. 1.25 π^2 D. 6.25 π^2

77. In a triangle ABC, the medians AD and BE intersect at G. A line DF is drawn parallel to BE such that F is on AC. If AC = 9 cm, then what is CF equal to?
A. 2.25 cm B. 3 cm
C. 4.5 cm D. 6 cm

78. In a triangle PQR, X is a point on PR Y is a point on QR such that PR = 10 cm, RX = 4 cm, YR = 2 cm, QR = 5 cm. Which one the following is correct?
A. XY is parallel to PQ
B. PQ = 2XY
C. PX = QY
D. PQ = 3XY

79. Consider the following statements in respect of three straight lines A, B and C on a plane:
1. If A and C are parallel and B and C are parallel; then A and B are parallel.
2. If A is perpendicular to C and B is perpendicular to C; then A and B are parallel.
3. If the acute angle between A and C is equal to the acute angle between B and C; then A and B are parallel.
Which of the above statements are correct?
A. 1, 2 and 3
B. 1 and 2 only
C. 1 and 3 only
D. 2 and 3 only

80. The diagonals of a rhombus are of length 20 cm and 48 cm. What is the length of a side of the rhombus?
A. 13 cm B. 26 cm
C. 36 cm D. 39 cm

81. An arc of a circle subtends an angle π at the centre. If the length of the arc is 22 cm, then what is the radius of the circle?
(Take $\pi = \frac{22}{7}$)
A. 5 cm B. 7 cm
C. 9 cm D. 11 cm

82. One-fifth of the area of a triangle ABC is cut off by a line DE drawn parallel to BC such that D is on AB and E is on AC. If BC = 10 cm, then what is DE equal to?
A. $\sqrt{5}$ cm B. $2\sqrt{5}$ cm
C. $3\sqrt{5}$ cm D. $4\sqrt{5}$ cm

83. There are 8 lines in a plane, no two of which are parallel. What is the maximum number of points at which they can intersect?
A. 15
B. 21
C. 28
D. None of the above

84. A closed polygon has six sides and one of its angles is 30° greater than each of the other five equal angles. What is the value of one of the equal angles?
A. 55° B. 115°
C. 150° D. 175°

85. Consider the following statements:
1. The point of intersection of the perpendicular bisectors of the sides of a triangle may lie outside the triangle.
2. The point of intersection of the perpendiculars drawn from the vertices to the opposite sides of a triangle may lie on two sides.
Which of the above statements is/are correct?
A. 1 only B. 2 only
C. Both 1 and 2 D. Neither 1 nor 2

For the next five (05) items that follow:
In a University there are 1200 students studying four difference subjects, Mathematics, Statistics, Physics and Chemistry. 20% of the total number of students are studying Mathematics, one-fourth of the total number of students are studying Physics, 320 students are studying Statistics and remaining students are studying Chemistry. Three-fifth of the total number of students studying Chemistry are girls. 150 boys are studying Mathematics. 60% of students studying Physics are boys. 250 girls are studying Statistics.

86. What is the total number of boys studying Statistics and Physics?
A. 180 B. 240
C. 250 D. 310

87. The number of girls studying Statistics is what percent (approximate) of the total number of students studying Chemistry?
A. 58.8 B. 73.5
C. 78.7 D. 80.6

88. In which subjects is the difference between the number of boys and girls equal?
A. Mathematics and Chemistry
B. Statistics and Chemistry
C. Mathematics and Physics
D. Mathematics and Statistics

89. What is the difference between the number of boys studying Mathematics and the number of girls studying Physics?
A. 20 B. 30
C. 60 D. 80

90. What is the ratio of the total number of boys to the total number of girls?
A. 67 : 83
B. 17 : 26
C. 27 : 19
D. 189 : 179

91. Frequency density of a class is computed by the ratio
A. Class frequency to the class width
B. Class frequency to total frequency
C. Class frequency to total number of classes
D. Cumulative frequency up to that class to total frequency

92. A small company pays each of its 5 category 'C' workers ₹ 20,000, each of its 3 category 'B' workers ₹ 25,000 and a category 'A' worker ₹ 65,000. The number of workers earning less than the mean salary is
A. 8 B. 5
C. 4 D. 3

93. A man travelled 12 km at a speed of 4 km/hr and further 10 km at a speed of 5 km/hr. What was his average speed?
A. 4.4 km/hr
B. 4.5 km/hr
C. 5.0 km/hr
D. 2.5 km/hr

94. The pie diagrams on the monthly expenditure of two families A and B are drawn with radii of two circles taken in the ratio 16 : 9 to compare their expenditures.
Which one of the following is the appropriate data used for the above mentioned pie diagrams?
A. ₹ 16,000 and ₹ 9,000
B. ₹ 8,000 and ₹ 4,500
C. ₹ 25,600 and ₹ 8,100
D. ₹ 4,000 and ₹ 3,000

95. Consider the following statements:
Statement I : The value of a random variable having the highest frequency is mode.
Statement II : Mode is unique.
Which one of the following is correct in respect of the above statements?

A. Both Statement I and Statement II are true and Statement II is the correct explanation of Statement I

B. Both Statement I and Statement II are true but Statement II is not the correct explanation of Statement I

C. Statement I is true but Statement II is false

D. Statement I is false but Statement II is true

96. Which one of the following is **not** correct?

The proportion of various items in a pie diagram is proportional to the

A. Areas of slices

B. Angles of slices

C. Lengths of the curved arcs of the slices

D. Perimeters of the slices

97. The geometric mean of x and y is 6 and the geometric mean of x, y and z is also 6. Then the value of z is

A. 12 B. $\sqrt{6}$

C. 6 D. $\sqrt[3]{6}$

98. The total number of live births in a specific locality during different months of a specific year was obtained from the office of the Birth Registrar. This set of data may be called

A. Primary data B. Secondary data

C. Recorded data D. Countable data

99. The heights (in cm) of 5 students are 150, 165, 161, 144 and 155. What are the values of mean and median (in cm) respectively?

A. 165 and 161 B. 155 and 155

C. 160 and 155 D. 155 and 161

100. The average height of 22 students of a class is 140 cm and the average height of 28 students of another class is 152 cm. What is the average height of students of both the classes?

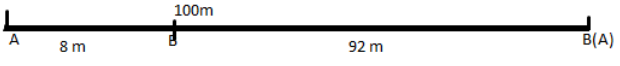
A. 144.32 cm B. 145.52 cm

C. 146.72 cm D. 147.92 cm

SOLUTIONS

1. Answer. A
Let (x - a) is the factor of both quadratic equation.
i.e. x = a is the root of both equation.
Then x = a will satisfy both the equation.
So, $a^2 - 5a + \alpha = 0$ .....(i)
$a^2 - 7a + 2\alpha = 0$ .....(ii)
$Using\ quadratic\ formula\ for\ both (i) and\ (ii), we\ get$
a = $\frac{5\pm\sqrt{25-4\alpha}}{2}$ (from (i))
and a = $\frac{7\pm\sqrt{49-8\alpha}}{2}$ (from (ii))
Now,
$\frac{5\pm\sqrt{25-4\alpha}}{2} = \frac{7\pm\sqrt{49-8\alpha}}{2}$
$=>5 \pm \sqrt{25-4\alpha} = 7 \pm \sqrt{49-8\alpha}$
$=>\sqrt{25-4\alpha} - \sqrt{49-8\alpha} = 7 - 5$
$=>\sqrt{25-4\alpha} - \sqrt{49-8\alpha} = 2$
Squaring both sides, we get
$25 - 4\alpha + 49 - 8\alpha + 2\sqrt{(25-4\alpha)(49-8\alpha)} = 4$
$=> (6\alpha - 35)^2 = (25-4\alpha)(49-8\alpha)$
$=>1225 - 396\alpha = 32\alpha^2 = 36\alpha^2 + 1225 - 420\alpha$
$=>4\alpha^2 - 24\alpha = 0$
$=>4\alpha(\alpha - 6) = 0$
$=>\alpha = 0\ or\ \alpha = 6$
Hence option (a)
2. Answer. A
LCM of 2, 3, 4 and 5 is 60.
Number or numbers divisible by 60 from 1 to 600 = 10
Number of numbers divisible by 60 from 601 to 900 i.e. from 300 numbers= 5
Number divisible by 60 from 901 to 1000 = 1
Total numbers = 10+5+1 = 16
Hence option (a)
3. Answer. C
The given 'polynomial is of the form $ax^3 + bx^2 + cx + d$
Let A, B and C be three zeroes of the given polynomial
Then, sum of the zeroes i.e. A + B + C = $\frac{-b}{a}$ = - 4
Product of the zeroes (taken two at a time) i e. = AB+BC+CA = $\frac{c}{a}$ = -11
Product of the zeroes (individual) i.e. ABC = $\frac{-d}{a}$ = 30
Now, we will check each option for the correct
In option (a) we have 2, -3 and -5 as three zeroes.
Sum of these zeroes is - 6 and product of these zeroes is 30.
In option (b), we have -2, -3 and 5 as three zeroes.
Sum of these zeroes is 0 and product of these zeroes is 30
In option (c) we have -2, 3 and -5 as three zeroes.
Sum of these zeroes is - 4 and product of these zeroes is 30.
In option (d) we have -2, 3 and 5 as three zeroes.
Sum of these zeroes is 6 and product of these zeroes is 30.
Out of these options, only results of option (c) matches with the results calculated above.
Thus, our correct option is (c)
Hence option (c)
4. Answer. B
Given that
x = 111……1 (20 digits)
y = 333……3 (10 digits)
Therefore, $\frac{x-y^2}{z} = \frac{1111\ldots\ldots(20 digits) - (333\ldots\ldots3)^2(10\ digits)}{2222\ldots.2(10\ digits)}$
$= \frac{1111\ldots\ldots(20digits) - 3^2\ (111\ldots.1)^2(10\ digits)}{2222\ldots.2(10\ digits)}$
$= \frac{1111\ldots\ldots(20digits)}{2(111\ldots.1)10digits} - \frac{9(111\ldots1)(10\ digits)}{2}$
Since $\frac{111111}{111} = 1001, therefore$
$\frac{1111\ldots\ldots(20digits)}{2(111\ldots.1)10digits} - \frac{9(111\ldots1)(10\ digits)}{2} = \frac{10000000001-999\ldots9(10digits)}{2}$
Now, since 1001-999 = 2
Therefore $\frac{10000000001-999\ldots9(10digits)}{2} = \frac{2}{2} = 1$
Hence option (b)
5. Answer. A
Let the two roots be 3x and 2x,
Let $\alpha = 3x\ and\ \beta = 2\ x$, sum of root a+b = 3x + 2x = $\frac{-m}{12}$
=> 5 x = $\frac{-m}{12}$
=> m = -60x ------ (i)
Products of roots,
$\alpha\beta = 3x \times 2x = \frac{5}{12}$
=> $6x^2 = \frac{5}{12}$
=> $x^2 = \frac{5}{72}$
=> $x = \pm\frac{\sqrt{5}}{\sqrt{72}} = \pm\frac{\sqrt{5}}{6\sqrt{2}}$
Putting this value of x in (i), we get m = -60× $(\pm\frac{\sqrt{5}}{6\sqrt{2}})$
Since we need positive value of m therefore
m = 60× $(\frac{\sqrt{5}}{6\sqrt{2}}) = 5\sqrt{10}$
Hence option (a)
6. Answer. B
Let f(x) = $ax^3 + bx^2 + cx + d$
And g(x) = $ax^4 + bx^3 + cx^2 + dx + e$
Then f(x)g(x) = $(ax^3 + bx^2 + cx + d) \times (ax^4 + bx^3 + cx^2 + dx + e)$
= $a^2x^7 + abx^6 + acx^5 \ldots\ldots d^2x + de$
Thus, it is clear that degree of f(x)g(x) = 7
Hence option (b)
7. Answer. D
Let f(x) = $5x^3 + 5x^2 - 6x + 9$ and g(x) = x+3
To find the remainder g(x) should be equal to zero
Therefore g(x) = x+3 => x = -3
Putting this value in f(x) we get
f(x) = $5(-3)^3 + 5(-3)^2 - 6(-3) + 9$

f(x) = - 63
Hence option (d)
8. Answer. D
We are given that HCF = p^2 and product of two non-zero expressions = $(x+y+z)p^3$
We know that HCF×LCM = product of two numbers
Therefore,
P^2×LCM = $(x+y+z)p^3$
=> LCM = $\frac{(x+y+z)p^3}{p^2} = (x+y+z)p$
Hence option (d)
9. Answer. B
We have
P = $0.8\bar{3}$ and Q = $0.6\bar{2}$
The distance between P and Q = $0.2\bar{1}$ = x
Expressing this distance in the form of rational numbers, we assume $0.2\bar{1}$ = x
Number of digit with bar = 1
Number of digit without bar = 1
Therefore, the denominator would be 90
Number of digit after the decimal = 2
Therefore, the nominator = 21 – 2 = 19
Thud x = $\frac{19}{90}$
Hence option (b)
10. Answer. A
As, the discount taking two at a time 20% & 12.5%
Single equivalent discount = $\left(x+y-\frac{xy}{100}\right)\%$ = $\left(20+12.5-\frac{20\times12.5}{100}\right)\% = 30\%$
No consider 30% and 5%
Final reduction = $\left(30+5-\frac{30\times5}{100}\right) = 33.5\%$
Hence option (a)
11. Answer. C
Let the number of mangoes the fruit seller has originally be 100x
5% of total mangoes are rotten i.e. 5x mangoes are rotten, remaining mangoes = 95x
Seller sells 75% mangoes of remaining i.e. $95x \times \frac{75}{100}$
Remaining mangoes = 95x – 71.25x = 95 => x = 4
Seller has initially 100x mangoes = 100×4 = 400 mangoes
Hence option (c)
12. Answer. B
Here, we need to find the time that will take to cross 91 km stones completely.
Given that, in 1 hr. train travels 60 km i.e. 60 km is travelled in 60 min.
This means in 1 minute 1 km is travelled.
Therefore, 90 km is travelled in 90 minutes i.e. 1 hour 30 minutes
And the remaining 1 km in 12 seconds.
Thus, the total time taken is 1 hr. 30 min. 12 sec.
Hence option (b)
13. Answer. B



Given that A gives B a start of 8 m.
This means B starts from the point where A finishes its 8 m. therefore B covers 92 m.
Given that A runs at 6 km/hr.
i.e. A runs at $\frac{6\times1000m}{60\ min} = 100m/min$
It is also given that even after giving B a start of 8 m, A reaches early than B by 9 seconds.
Therefore, if A takes 60 seconds to complete 100 m race, then B takes (60 + 9) seconds
i.e. 69 seconds to complete 92 m.
$\frac{D}{T} = \frac{92}{69}m/S = \frac{92}{69}\times\frac{18}{5} = \frac{24}{5}km/hr$ = 4.8km/hr
Hence option(b)
14. Answer. C
$8x^3 - y^3 = (2x)^2 - (y)^3 = (2x-y)(4x^2+y^2+2xy)$
Quotient = $\frac{(2x-y)(4x^2+y^2+2xy)}{2xy+4x^2+y^2}$ = 2x – y
Hence option (c)
15. Answer. A
Given that (x+2) is a common factor of x^2+ax+b and x^2+bx+a
Let f(x) = x^2+ax+b
And g(x) =x^2+bx+a
Let p(x) = x+2 this means x+2 = 0
=>x = - 2, so -2 is a zero of f(x) and g(x)
Therefore $ax^2+ab+b = (-2)^2-2a+b = 4-2a+b$ and
$x^2+bx+a = (-2)^2-2b+a$
Both polynomials are same
Thus,
4-2a+b – 4 -2b+a
=> b+2b = a+2a => 3a = 3b => $\frac{3a}{3b} = 1$
=> a:b = 1:1
Hence option (a)
16. Answer. A
As, $f(x) = a_0x^n + a_1x^{n-1} + a_2x^{n-2} + \ldots + a_{n-1}x + a_n$, where $a_0, a_1, a_2, \ldots, a_n$ are real numbers.
When f(x) will be divided by (ax - b) then from Remainder theorem,
ax – b = 0 => x = $\frac{b}{a}$
Thus, remainder = f($\frac{b}{a}$)
Hence option (a)
17. Answer. D
As, square root of 2222 = 47.13, so, 2222 is not a perfect square.
Square root of 11664 = 108, so, 11664 is a perfect square.
Square root of 343343 = 585.95, so, 343343 is not a perfect square.
Square root of 220347 = 469.41, so, 220347 is not a perfect square.
Thus, A, C and D are not a perfect square.
Hence option (d)
18. Answer. B
As,
$(x+2)(x-2) = (x^2-2^2) = (x^2-4)$ .....(i)
$(x^3-2x^2+4x-8)(x^3+2x^2+4x+8)$

$= \left((x^3+4x)-(2x^2+8)\right)\left((x^3+4x)+(2x^2+8)\right)$
$= ((x^3+4x)^2-(2x^2+8)^2)$
$=((x^6+16x^2+8x^4)-(4x^4+64+32x^2))$
$= (x^6+4x^4-16x^2-64)$ .....(ii)
From (i) and (ii)
$\left((x^2-4)(x^6+4x^4-16x^2-64)\right)$
$= (x^8-4x^6+4x^6-16x^4-16x^4+64x^2-64x^2+256)$
$= (x^8-32x^4+256)$
$=(x^4-16)^2$
Thus, product of $(x+2),(x-2),(x^3-2x^2+4x-8)$ and (x^3+2x^2+4x+8) be $(x^4-16)^2$
Hence option (b)
19. Answer. C
As, $x(x+2)(x+3)(x+5)-72$
$= \left((x^2+2x)(x^2+8x+15)-72\right)$
$=(x^4+2x^3+8x^3+16x^2+15x^2+30x-72)$
$=(x^4+10x^3+31x^2+30x-72)$
$=(x^4-x^3+11x^3-11x^2+42x^2-42x+72x-72)$
$=(x^3(x-1)+11x^2(x-1)+42x(x-1)+72(x-1))$
$= \left((x-1)(x^3+11x^2+42x+72)\right)$
$=\left((x-1)(x^3+6x^2+5x^2+30x+12x+72)\right)$
$=\left((x-1)(x^2(x+6)+5x(x+6)+12(x+6))\right)$
$=\left((x-1)(x+6)(x^2+5x+12)\right)$
Hence factor of $x(x+2)(x+3)(x+5)-72 = \left((x-1)(x+6)(x^2+5x+12)\right)$
Hence option (c)
20. Answer. B
Since HCF of two polynomials is (x^2+x-2), therefore splitting this polynomial by middle term, we get
x(x+2)-(x+2) = (x-1)(x+2)
Being the HCF of the given polynomial, we conclude that (x-1) and (x+2) is a factor of f(x)
and g(x)
By HCF we give the value of a and b
Now, $\frac{(x-1)(x^2+3x+a))}{(x-1)(x+2)} = \frac{x^2+3x+a}{x+2}$
And $\frac{(x+2)(x^2+2x+b)}{(x-1)(x+2)} = \frac{x^2+2x+b}{x-1}$
Since x is a factor of (x^2+3x+a), therefore x = - 2 will satisfied the polynomial. Thus
$x^2+3x+a = 0$
⇨ $(-2)^2+3(-2)+a = 0$
⇨ $a = 2$
Also, since (x - 1) is a factor of (x^2+2x+b), therefore x = 1 will satisfied this polynomial. Thus,
$x^2+2x+b = 0$, b = -3
Hence a = 2 and b = - 3
Hence option (b)
21. Answer. C
Since we are given that a and c are co-prime
i.e. HCF of a and c is 1, therefore we can say that a definitely divides d exactly.
So, a is a factor of d.
Hence option (c)
22. Answer. C
Since the roots of the given equation are equal, therefore the discriminant of the given equation is zero. Thus, $b^2-4ac=0$
⇨ $[b^2(c-a)^2-4a(b-c).c(a-b)]=0$
⇨ $[b^2(c^2+a^2-2ac)-4ac(ab-b^2-ac+bc)] = 0$
⇨ $[(ab)^2+(bc)^2+(-2ac)^2+2ab^2c-4a^2bc-4abc^2] = 0$
⇨ $[(ab)^2+(bc)^2+(-2ac)^2+2ab.bc+2ab(-2ac)+2bc(-2ac)] = 0$
⇨ $[b^2c^2+b^2a^2-12ab^2c-4a^2bc+4ab^2c-4abc^2] = 0$
⇨ $(ab+bc-2ac)^2 = 0$
⇨ $ab+bc-2ac = 0$
⇨ $ab+bc = 2ac$
⇨ $b(a+c) = 2ac$
⇨ $\frac{2}{b} = \frac{a+c}{ac}$
⇨ $\frac{2}{b} = \frac{1}{c}+\frac{1}{a}$
Hence option (c)
23. Answer. A
As,
$\frac{a-x^2}{bx}+\frac{b-x^2}{cx} = \frac{c-x}{b}+\frac{b-x}{c}$
$=>\frac{ac-cx^2+b^2-bx^2}{bcx} = \frac{c^2-cx+b^2-bx}{bc}$
$=> ac-cx^2+b^2-bx^2 = x(c^2-cx+b^2-bx)$
$=>ac-cx^2+b^2-bx^2 = c^2x-cx^2+b^{2x}-bx^2$
$=>c^2x+b^2x = ac+b^2$
$=>x = \frac{b^2+ac}{b^2+c^2}$
Hence option (a)
24. Answer. C
we are given that $x^2+7x-14\left(k^2-\frac{7}{8}\right)=0$ let us check the nature of the roots, we have
D = $b^2-4ac = 7^2-4\times1\times14\left(k^2-\frac{7}{8}\right)$
$= 49+56k^2-49 = 56$
Now,
x= $\frac{-b\pm\sqrt{D}}{2a} = \frac{-7\pm\sqrt{56k^2}}{2} = \frac{-7\pm2k\sqrt{14}}{2}$
Since $\sqrt{14}$ is an irrational number, therefore any value of k will give an irrational number only.
Therefore, the given equation has no integral roots.
Hence option (c)
25. Answer. C
Using the concept of AP,
As, a = 507, b = 988, d = 13
$n = \frac{b-a}{d}+1$,
$n = \frac{988-507}{13}+1$
$n = 37+1 = 38$
Hence option (C)
26. Answer. D
To maintain M1 cows for D1 days a milk man spends W1 and to maintain M2 cows for D2 days, a milk man spend W2
Then $\frac{M1D1}{W1} = \frac{M2D2}{W2}$

⇨ $\frac{8\times60}{6400}=\frac{5n}{4800}$

⇨ $\frac{3}{40}=\frac{n}{960}$

⇨ n = $\frac{3\times960}{40}=3\times24=72$

Hence milk man need 72 days for maintenance

Hence option (d)

27. Answer. B

Here, the maximum marks are 100% and according to the question,

45+5 = 40%

i.e. 50= 40%

Therefore, by unitary method, 1% = $\frac{50}{40}$

100% = $\frac{50}{40}\times100=125$

Hence option (b)

28. Answer. D

$3(2u+v)=7vu$

$3(u+3v)=11$

$6u+3v=7uv$ …… (1)

$3u+9v=11uv$ …….(2)

$dividing\ equation\ 1\ and\ equation\ 2\ by\ uv\ we\ get$

$\frac{6}{v}+\frac{3}{u}=7$

$\frac{3}{v}+\frac{9}{u}=11$

$let\ \frac{1}{u}=x\ and\ \frac{1}{v}=y$

$6y+3x=7$ …….. (3)

$3y+9x=11$ …….. (4)

$multiply\ equation\ 4\ by\ 2\ we\ get\quad 6y+18x=22$ …….. (5)

$solve\ equation\ (5) and\ (3)\ we\ get\ x=1$ & $x=\frac{1}{u}=1 \Rightarrow u=1$

Hence option (d)

29. Answer. b

Let present age of Ram be x and Shyam be y

From question,

(x - 5) = 3(y – 5) => x – 3y = -10 ……. (i)

(x+ 4) = 2(y + 4) => x – 2y = 4 …….. (ii)

After solving equation (i) and (ii) we get

x = 32

Hence present age of Ram be 32 years

Hence option (b)

30. Answer. C

Let CP of chair be x and CP of stools be y,

According to question,

4x+9y = 1340 ….. (i)

10%of 4x + 20% of 9y = 188 => 4x + 18 y = 1880 …… (ii)

Solving the equation (i) and (ii) by elimination method, we get

y = 60

Putting the value of y in equation (i), we get

4x = 800,

Thus, the money paid for the chair be Rs. 800

Hence option (c)

31. Answer. B

When we solve the given equation for x,

Then x + 5 = 5 => x = 5 – 5 = 0

Thus, in the given set we have only one element viz. 0

Element φ is a null set i.e. no element in the set.

Hence option (b)

32. Answer. C

As, ab + bc + ca = 0

=>ab + ca = -bc

=>$a=\frac{-bc}{b+c}$ and $a^2=\frac{b^2c^2}{(b+c)^2}$

Now,

$\frac{a^2}{a^2-bc}+\frac{b^2}{b^2-ca}+\frac{c^2}{c^2-ab}$

$=\frac{\frac{b^2c^2}{(b+c)^2}}{\frac{b^2c^2}{(b+c)^2}-bc}+\frac{b^2}{b^2-c\left(\frac{-bc}{b+c}\right)}+\frac{c^2}{c^2-b\left(\frac{-bc}{b+c}\right)}$

$=\frac{b^2c^2}{b^2c^2-(b+c)^2bc}+\frac{b^2(b+c)}{b^2(b+c)+bc^2}+\frac{c^2(b+c)}{c^2(b+c)+b^2c}$

$=\frac{bc}{bc-(b+c)^2}+\frac{b(b+c)}{b(b+c)+c^2}+\frac{c(b+c)}{c(b+c)+b^2}$

$=\frac{bc}{-(b^2+c^2+bc)}+\frac{b(b+c)}{b^2+bc+c^2}+\frac{c(b+c)}{b^2+c^2+bc}$

$=\frac{-bc+b^2+bc+c^2+bc}{b^2+c^2+bc}$

$=\frac{b^2+bc+c^2}{b^2+bc+c^2}$

=1

Hence option (c)

33. Answer. D

Let the total number of students be 100%

Numbers of student failed in Hindi = 35%

Numbers of student failed in English = 45%

Number of students failed in both subject = 20%

Total numbers of students failed = (35+45 - 20)% = 60%

Numbers of students passed in both the subject = (100- 60)% = 40 %

Hence option (d)

34. Answer. B

Let, (x - y) = a, (y - z) = b and (z - x) = c

Now, a + b + c = x – y + y – z + z – x = 0

So, $a^3+b^3+c^3-3abc=(a+b+c)(a^2+b^2+c^2+ab+bc+ca)$

=> $a^3+b^3+c^3-3abc=0$ [As, a + b + c = 0]

Again,

$a^3+b^3+c^3=3abc$

=>$\frac{abc}{a^3+b^3+c^3}=\frac{1}{3}$

Hence,

$\frac{(x-y)(y-z)(z-x)}{(x-y)^3+(y-z)^3+(z-x)^3}=\frac{1}{3}$

Hence option (b)

35. Answer. C

As,

$\sqrt{x+\sqrt{x+\sqrt{x+\ldots}}}$ = y(say)

$Now, y=\sqrt{x+y}$

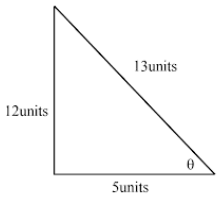
Squaring both sides,

$y^2=x+y \Rightarrow y^2-y-x=0 \Rightarrow y=\frac{\sqrt{4x+1}+1}{2}$

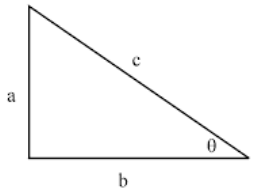
if $\sqrt{x+\sqrt{x+\sqrt{x+\ldots}}}$ then its value is $\frac{\sqrt{4x+1}+1}{2}$

According to question $\frac{\sqrt{4x+1}+1}{2} = \frac{\sqrt{4\times1+1}+1}{2}$ $\frac{\sqrt{5}+1}{2} = \frac{3.236}{2}$ = 1.618
which lies between 1 and 2
Hence option (c)
36. Answer. D
$\log_{10} 8000 + \log_{10} 600 = \log_{10} 8 * 10^3 + \log_{10} 6 * 10^2$
$= \log_{10} 8 + \log_{10} 10^3 + \log_{10} 6 + \log_{10} 10^2$
$= 0.9031 + 3\log_{10} 10 + log_{10}6 + 2\log_{10} 10$
$= 0.9031 + 3 + 2 + 0.7782$
= 6.6813
Hence option (d)
37. Answer. B
If M1 can do the work in D1 days and M2 man can do the job in M2 days (where all man can work at the same rate),
Then $\frac{M_1D_1}{W_1} = \frac{M_2D_2}{W_2}$
According to the question,
M1 = 30, D1 = 40 W1 = 1, M2 = x, D2 = 40 W2 = 16/40
Thus $\frac{M_1D_1}{W_1} = \frac{M_2D_2}{W_2} = \frac{30\times40}{1} = \frac{x\times40}{\frac{16}{40}} = 1200$
$\frac{40x\times40}{16} = 1200 => x = \frac{1200\times16}{40\times40} = 12$
Thus, the number of man who left the job = (30-12) = 18
Hence option (b)
38. Answer. D
Given 4 goat = 6 sheep i.e. efficiency of goat = 6 and efficiency of sheep = 5
Total field required to graze = 4×6×50 = 1200
Required time = $\frac{1200}{2\times6+2\times5} = 50days$
Hence option (d)
39. Answer. B
Let us assume the capacity of the tub is 100L.
It is given that a tap can fill 100L in 10 hrs.
This means, in 1 hr. a tap can fill only 10L.
Therefore, in 7 hrs a tap can fill only 70L.
This means in 5 hrs a tap fills only 30L but actually the tap should fill 50L in 5 hrs.
This means that there is a leakage of 20L which has duration of 5 hrs.
If 20L of water is leaked in 5 hrs, then 1L water is leaked in $\frac{5}{20} = \frac{1}{4}hrs$
This means 100L water is leaked in $\frac{1}{4}\times100$ = 25 hrs.
Hence option (b)
40. Answer. B
Distance travelled by the boy from house to school in 1 hr. i.e. 60 minutes = 12 km
Distance travelled by the boy from house to school in 1 minute = $\frac{12}{60} = \frac{1}{5}km$
Similarly,
distance travelled by the boy from school to house in 60 minutes = 8 km
Distance travelled by the boy from school to house in
1 minute= $\frac{8}{16} = \frac{2}{15}km$
This means, total distance travelled in 2 minutes
Therefore, total distance travelled in I minutes = $\frac{1}{5} + \frac{2}{15} = \frac{1}{3}km$
Therefore, total distance travel in 1 minute = $\frac{1}{3\times2} = \frac{1}{6}km$
Thus, total distance travelled in 50 minutes = $\frac{1}{6}\times50 = 8.3333 \approx 8km$
Hence option (b)
41. Answer. C
Given that 3 parts are proportional to $1, \frac{1}{3}, \frac{1}{6}$
LCM of denominator is 6
Therefore the ratio will be $\frac{1\times6}{6} = \frac{6}{6}:\frac{1\times2}{3\times2} = \frac{2}{6}:\frac{1}{6}$ i.e. 6 : 2 : 1
Sum of the ratio part is 9, the middle part of 78 is $\frac{78}{9}\times2 = \frac{52}{3}$
Hence option (c)
42. Answer. D
Given that the ratio of the number of boys in the first and the second standards is 2 : 3 and the ratio
The number of boys in the second and third standards is 4 :5
Now, we calculate a common ratio for all the three standards 2 : 3 and 4 : 5will be 2×4:3×4 = 8 : 12 and 4×3 : 5×3 = 12 : 15
Therefore, the common ratio for all the three standards 8 : 12 : 15
Sum of the ratio pats = 8 + 12+ 15 = 35
Numbers of the boys in the first standard = $\frac{8}{35}\times350$ = 80
Number of boys in third standard = $\frac{15}{35}\times350 = 150$
Total number of boys in the both standards = 80+150= 230
Hence option (d)
43. Answer. A
The difference between the compound interest (compounded annually) and simple interest on a sum or money deposited for 2 years at R% p.a. be
$P\left(\frac{R}{100}\right)^2 = 15$
$=> P\left(\frac{5}{100}\right)^2 = 15$
$=> P\left(\frac{1}{20}\right)^2 = 15$
$=> \frac{P}{400} = 15$
=> P = 6000
Hence option (a)
44. Answer. D
Decrease in consumption = $\left[\frac{\%\ Price\ increase}{100 + \%\ Price\ Increase}\right]\times100$
$= \left[\frac{12}{100+12}\right]\times100 = 10\frac{5}{7}$
Hence, consumption of onion should be decreased by $10\frac{5}{7}$ % so that there is no change in the expenditure

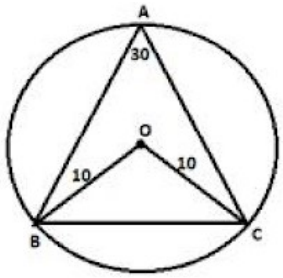
45. Answer. D
Let the speed of the man in still water be x km/hr and
let the speed of the stream be y km/hr
Speed of the man downstream = x + y km/hr
Speed of the man upstream = x -y km/hr
Therefore $x + y = \frac{18}{4}$ ….. (i)
$x - y = \frac{18}{10} = 1.8km/h$ …….. (ii)
Solving these equations by elimination method, we get
$2x = \frac{18}{4} + 1.8 = 4.5 + 1.8 = 6.3 => x = 3.15km/h$ …….(iii)
$3.15 - y = 1.8 => y = 1.35km/h$ ……(iv)
Therefore, equations (ii), (iii) and (iv) implies that all the given statements are correct
Hence option (d)
46. Answer. D



Since we know that 5, 13 and 12 forms a Pythagorean triplet, the side with 13 units is the longest
side and the angle between the other two sides is 90^0
Therefore $sin\theta = \frac{P}{H} = \frac{12}{13}\ and\ cos\theta = \frac{B}{H} = \frac{5}{13}$
Thus $sin\theta + cos\theta = \frac{12}{13} + \frac{5}{13} = \frac{17}{13}$
Hence option (d)
47. Answer. B
As, 0 < x < $\frac{\pi}{2}$
Then, $sin0^0 < sinx < sin\frac{\pi}{2}$ => 0 < sinx < 1 ……(i)
0 < x < $\frac{\pi}{2}$
Then, $cos0^0 > cosx > cos\frac{\pi}{2}$ => 1 > cosx > 0 ……(ii)
Adding (i) and (ii), we get,
$0 < sinx + \cos x < 2$
Hence option (b)
48. Answer. A
Suppose we have right angled triangle with sides a, b and c where c is the longest side.

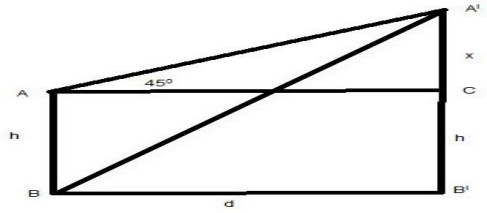


Now, we see that $sin\theta = \frac{a}{c}\ and\ cos\theta = \frac{b}{c}$
Here, we can see that in both the denominators we have the same hypotenuse which means from
all the given options,
Only option (a) has the same hypotenuse as given in the question i.e. $m^2 + n^2$
49. Answer. B

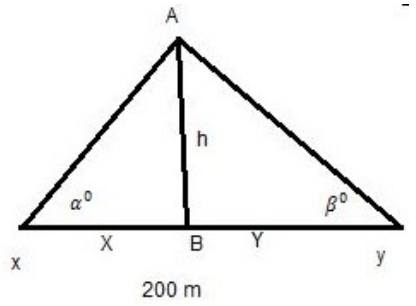


Since $\angle A = 30°$ and we know that the angle subtended by an arc at the centre of a circle is double
the angle subtended by it at any point the remaining part of the circle, therefore in the centre,
$\angle O = 2 \times 30° = 60°$
Also, since triangle OBC is an isosceles triangle so, its base angles will he equal i.e. ∠B and ∠C
are equal.
Let these angles be x.
Therefore, by angle sum property of a triangle,
∠O + ∠B + ∠C = 180 degree => $60° + x + x = 180°$
⇨ $60° + 2x = 180° => 2x = 120° => x = 60°$
Thus, we say that triangle OBC is an equilateral triangle and hence, BC is also equal to 10 cm.
Hence option (b)
50. Answer. A
As, $A = \frac{\sin 45° - \sin 30°}{\cos 45° + \cos 60°} = \frac{\frac{1}{\sqrt{2}} - \frac{1}{2}}{\frac{1}{\sqrt{2}} + \frac{1}{2}} = \frac{2-\sqrt{2}}{2+\sqrt{2}} = \frac{(2-\sqrt{2})(2-\sqrt{2})}{(2+\sqrt{2})(2-\sqrt{2})} = \frac{4+2-4\sqrt{2}}{4-2}$
$= \frac{2(3-2\sqrt{2})}{2}$ = (3 - 2×1.41) = 0.18
Now, $B = \frac{\sec 45° - \tan 45°}{cosec\ 45° + \cot 45°} = \frac{\sqrt{2}-1}{\sqrt{2}+1} = \frac{(\sqrt{2}-1)(\sqrt{2}-1)}{(\sqrt{2}+1)(\sqrt{2}-1)} = \frac{2+1-2\sqrt{2}}{2-1}$
= (3-2√2) = (3 - 2×1.41) = 0.18
Hence, A = B
Hence option (a)
51. Answer. B
For calculating the angle between the hour hand and the minute hand of a clock when the time is 4 : 36 pm, we can say that the angle will be approximately equal to the angle made from 4 :20 pm to 4 : 36 pm.
Thus, we need to calculate the angle made by the hands of a clock in 16 minutes.
In 60 minutes, the angle made by the hands of a clock is 360°.
So, the angle made by the hands of a clock in 16 minutes = $\frac{360}{60} \times 16 = 96^0$
Thus, the angle lies between 72° to 108° i.e.
$\frac{2\pi}{5}\ to\ \frac{3\pi}{5}$
Hence, $\frac{2\pi}{5} < \theta < \frac{3\pi}{5}$
Hence option (b)
52. Answer. D
Statement 1:
As, $45^0 < \theta < 60^0$
If we consider θ = 45^0
Then, $sec^2\theta + cosec^2\theta = sec^2 45^0 + cosec^2 45^0 = 2 + 2 = 4$

So, $\alpha^2 = 4 \Rightarrow \alpha = 2 > 1$
If we consider $\theta = 60^0$
Then, $\sec^2\theta + \text{cosec}^2\theta = \sec^2 60^0 + \text{cosec}^2 60^0 = 4 + \frac{4}{3} = \frac{16}{3}$
So, $\alpha^2 = \frac{16}{3} \Rightarrow \alpha = 2.31 > 1$
Thus, statement 1 is correct.
Statement 2:
As, $0^0 < \theta < 45^0$
If we consider $\theta = 0^0$
Then, $\frac{1+cos\theta}{1-cos\theta} = \frac{1+cos0^0}{1-cos0^0} = \infty$
So, $x^2 = \infty \Rightarrow x = \infty$
If we consider $\theta = 45^0$
Then, $\frac{1+cos\theta}{1-cos\theta} = \frac{1+cos45^0}{1-cos45^0} = \frac{(\sqrt{2}+1)}{(\sqrt{2}-1)} = \frac{(\sqrt{2}+1)(\sqrt{2}+1)}{(\sqrt{2}-1)(\sqrt{2}+1)}$
$= \frac{2+1+2\sqrt{2}}{1} = 3 + 2\sqrt{2} = 5.828$
So, $x^2 = 5.828 \Rightarrow x = 2.414 > 2$
Hence statement 2 is correct.
Statement 3:
As, $0^0 < \theta < 45^0$
If we consider $\theta = 45^0$
Then, $\frac{cos\theta}{1-tan\theta} + \frac{sin\theta}{1-cot\theta} = \frac{cos45^0}{1-tan45^0} + \frac{sin45^0}{1-cot45^0} = \frac{\frac{1}{\sqrt{2}}}{1-1} + \frac{\frac{1}{\sqrt{2}}}{1-1} = \infty \geq 2$
Hence statement 3 is correct.
Hence all the three statements are correct.
Hence option (d)
53. Answer. C



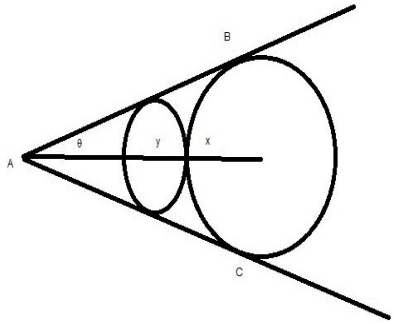
In triangle AA′C:
$\tan 45^0 = \frac{A'C}{AC} = \frac{x}{AC} \Rightarrow \frac{x}{AC} = 1 \Rightarrow AC = BB' = x \Rightarrow x = d$
Adding h on both sides, we get
$h + x = h + d$
So, $h + x > d$
Hence statement 1 is correct.
In triangle A′BB′:
If we take angle be 45^0
Then, $\tan 45^0 = \frac{A'B'}{BB'} = \frac{h+x}{d} \Rightarrow \frac{h+x}{d} = 1 \Rightarrow d = h + x$
But, by statement 1, this is not possible.
Thus, $\theta \neq 45^0$
Now, either $\theta < 45^0$ or $\theta > 45^0$
Let, $\theta = 60^0 > 45^0$
In triangle A′BB′
$\tan 60^0 = \frac{A'B'}{BB'} = \frac{h+x}{d} \Rightarrow \sqrt{3} = \frac{h+x}{d} \Rightarrow d\sqrt{3} = h + x$ ……. (i)
Let, $\theta = 30^0 < 45^0$
In triangle A′BB′
$\tan 45^0 = \frac{A'B'}{BB'} = \frac{h+x}{d} \Rightarrow \frac{1}{\sqrt{3}} = \frac{h+x}{d} \Rightarrow d = \sqrt{3}(h + x)$ ……. (ii)
From (i), we can conclude that either LHS = RHS or, LHS > RHS
But, from (ii), clearly LHS < RHS
Hence, we cannot conclude that the angle of depression of B from A′ is less than 45^0
Hence statement 2 is incorrect.
Hence option (c)
54. Answer. C



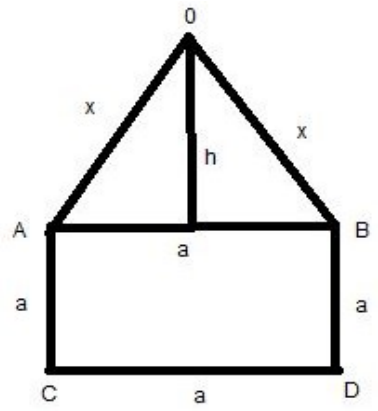
Here, AB is the breadth of river.
In triangle ABX:
$\tan\alpha^0 = \frac{AB}{XB} = \frac{h}{x} \Rightarrow 2 = \frac{h}{x} \Rightarrow x = \frac{h}{2}$
In triangle ABY:
$\tan\beta^0 = \frac{AB}{BY} = \frac{h}{y} \Rightarrow 0.5 = \frac{h}{y} \Rightarrow y = 2h$
Given, x + y = 200
$\Rightarrow \frac{h}{2} + 2h = 200$
$\Rightarrow h = \frac{200\times2}{5} = 80$
Hence the breadth of river be 80 m
Hence option (c)
55. Answer. B
As,
$\frac{sin1^0}{sin1^c} = \frac{0.0174}{\sin(\frac{180}{\pi})} = \frac{0.0174}{\sin(\frac{180}{3.14})} = \frac{0.0174}{sin57.32^0} = \frac{0.0174}{0.8417} = 0.0206 < 1$
Hence option (b)
56. Answer. D
Let the radius of two circle are 12r and 5r
And, sum of area of two circles = $\pi(12r)^2 + \pi(5r)^2$
Area of circles whose diameter is 65 cm = $\pi\left(\frac{65}{2}\right)^2$
According to question,

$\pi(144r^2) + \pi(25r^2) = \pi\left(\frac{4225}{4}\right)$
$\Rightarrow 169r^2 = \left(\frac{4225}{4}\right) \Rightarrow r^2 = \frac{4225}{4\times169}$
$\Rightarrow r = \frac{65}{26} = \frac{5}{2}$
Hence radius of the circles are $\left(12 \times \frac{5}{2}\right) = 30\ cm\ and\ \left(5 \times \frac{5}{2}\right) = 12.5cm$
Hence option (d)
57. Answer. B
Given that a rectangular cello tape of length 4 cm and breadth 0.5 cm is used for joining each pair of edges.
Thus, area of the cello tape used for each face of the cube is x^2.

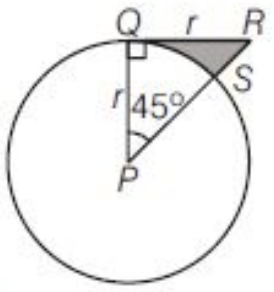
Thus, total area of the cello tape used is $6x^2$.
Now, we have $6x^2 = 6(4 \times 0.5)(4 \times 0.5) = 6 \times 2 \times 2 = 24$ sq. cm.
Hence option (b)
58. Answer. B



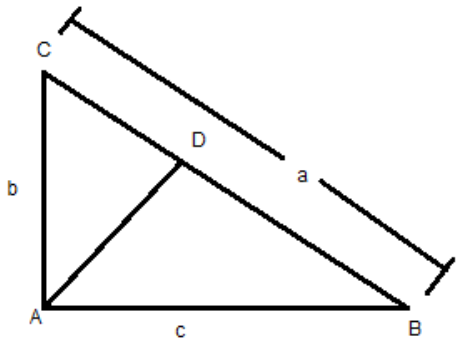
Let the radius of bigger circle be x and radius of the smaller circle be y.
Then the angle made by direct common tangents when two circles of radius x and y touch externally is given by
$\Theta = 2\sin^{-1}\frac{x-y}{x+y}$
Given that area of the bigger circle = 9 ×(area of the smaller circle)
$=>\pi x^2 = 9\pi y^2 => x^2 = 9y^2 => x = 3y$
Let us consider Angle BAC = θ
Then, $\theta = 2\sin^{-1}\frac{x-y}{x+y} = 2\sin^{-1}\frac{3y-y}{3y+y} = 2\sin^{-1}\frac{2y}{4y} = 2\sin^{-1}\frac{1}{2}$
$= 2\times 30^0 = 60^0$
Hence option (b)
59. Answer. D



Let the side of each of the square be a and the other two sides of the triangle be x
Given, Perimeter of the complete figure = $\frac{7}{6}$(perimeter of the original square)
$=>3a + 2x = \frac{7}{6}(4a) => 3a + 2x = \frac{7}{3}(2a)$
=>3(3a + 2x) = 14a
=>9a + 6x = 14a
=>6x = 5a ……(i)
Using Pythagoras theorem
In upper triangle:
$h = \sqrt{x^2 - \left(\frac{a}{2}\right)^2} = \sqrt{\left(\frac{5a}{6}\right)^2 - \frac{a^2}{4}} = \sqrt{\frac{25a^2}{36} - \frac{a^2}{4}} = \sqrt{\frac{25a^2 - 9a^2}{36}}$
$= \sqrt{\frac{16a^2}{36}} = \frac{4a}{6} = \frac{2a}{3}$
Again,
Ratio of the area of triangle to the original square = $\frac{\frac{1}{2}\times a\times\frac{2a}{3}}{a^2} = \frac{\frac{a^2}{3}}{a^2} = \frac{1}{3}$
Hence required ratio be 1 : 3
60. Answer. C
By using Heron's formula:
Semi perimeter(S) = $\frac{a+b+c}{2} = \frac{51+37+20}{2} = \frac{108}{2} = 54$
[As, a = 51, b = 37 and c = 20]
Area of triangle = $\sqrt{s(s-a)(s-b)(s-c)}$ = $\sqrt{54(54-51)(54-37)(54-20)}$
$= \sqrt{54\times 3\times 17\times 34}$ = $\sqrt{(3\times 3\times 3\times 2)\times 3\times 17\times (17\times 2)} = 3\times 3\times 2\times 17 = 306\ sq.cm$
Hence option (c)
61. Answer. B

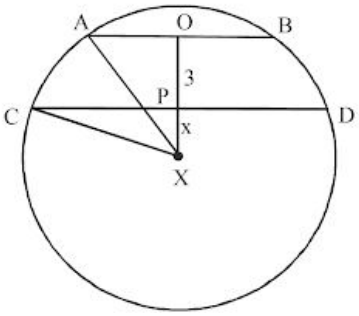


As, PQR is a triangle and QR = r
Radius of circle = r
Area of shaded region = area of triangle PQR – area of sector PQSP
=> Area of shaded region = $\frac{1}{2}r^2 - \frac{45^0}{360^0}\times\pi r^2 = \frac{r^2}{2} - \frac{\pi r^2}{8}$
Hence option (b)
62. Answer. C

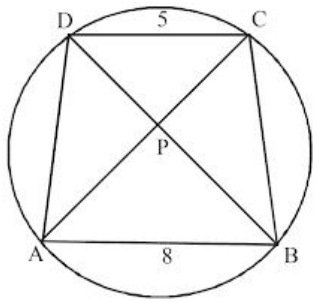


In triangle ABC:
AD is perpendicular on BC
Angle BAC = 90^0
As, AB = c, BC = a, CA = b and AD = p
Area of triangle ABD = area of triangle ACD
$=>\frac{1}{2}AC\times BC = \frac{1}{2}BC\times AD$
$=>AC\times BC = BC\times AD$
$=>bc = pa$
$=>p = \frac{bc}{a}$
Hence option (c)

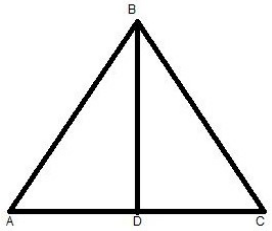
63. Answer. C



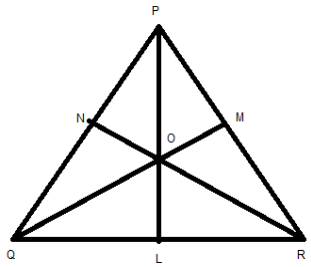
Given that AB = 4 cm and CD = 10 cm
Let the radius of the circle be r cm
Since the perpendicular from the center of a circle to a chord bisects the chord
So, AO = OB = 2 cm and CP = PD = 5 cm
In triangle AOX:
By using Pythagoras theorem,
$2^2 + (3 + x)^2 = r^2$
$=>4 + 9 + x^2 + 6x = r^2$
$=>13 + x^2 + 6x = r^2$ …….(i)
In triangle CPX:
$5^2 + x^2 = r^2$
$=>25 + x^2 = r^2$ …….(ii)
From equation (i) and (ii), we get
$13 + x^2 + 6x = 25 + x^2$
$=>6x = 12$
$=>x = 2$
From equation (ii), we get
$r^2 = 25 + 2^2 = 25 + 4 = 29$
$=>r = \sqrt{29}$ cm
Hence option (c)
64. Answer. D



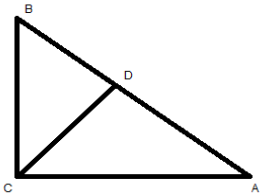
Since ABCD is a cyclic quadrilateral and a trapezium so, AB parallel CD
In triangle APB and triangle CPD:
Angle CDP = angle ABP (Alternate interior angle)
Angle DCP = angle PAB (Alternate interior angle)
Thus, by AA similarity criteria triangle APB ~ triangle CPD
Now, the ratio of areas of similar triangles is equal to ratio of the squares of one of its proportional sides
Thus,
$$\frac{area\ of\ triangle\ APB}{area\ of\ triangle\ CPd} = \frac{AB^2}{CD^2}$$
$$=>\frac{24}{area\ of\ triangle\ CPD} = \frac{8^2}{5^2} = \frac{64}{25}$$
=>area of triangle CPD = $\frac{24\times25}{64} = \frac{3\times25}{8} = \frac{75}{8} = 9.375\ sq.cm$
Hence option (d)
65. Answer. C



Since ABC is an equilateral triangle and BD is a perpendicular, therefore AD = DC
In triangle BCD, using Pythagoras theorem,
$Bc^2 = BD^2 + CD^2$
$=>BD^2 = BC^2 - CD^2$
$=>BD^2 = AC^2 - CD^2$ [As, BC = AC]
$=>BD^2 = (AD + DC)^2 - CD^2$
$=> BD^2 = AD^2 + DC^2 + 2ADCD - CD^2$
$=>BD^2 = AD^2 + 2DC^2$ [As, CD = AD]
$=>BD^2 = AD^2 + 2AD^2$ [As, DC = AD]
$=> BD^2 = 3AD^2$
Hence option (c)
66. Answer. A
Given that radius of first circle(R) = 9 cm
radius of second circle(r) = 4 cm
Distance between the centers of two circles(d) = 13 cm
The length of the direct common tangent of these circles = $\sqrt{d^2 - (R - r)^2}$
$= \sqrt{13^2 - (9 - 4)^2}$ $=\sqrt{169 - 25}$ = $\sqrt{144}$ = 12 cm
Hence option (a)
67. Answer. A

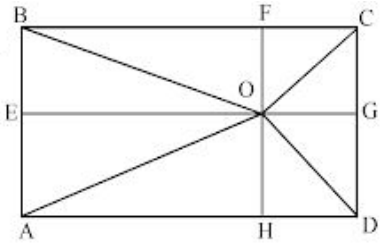


From the figure, clearly Q is outside the triangle OPR.
Also, triangle OPR is an obtuse angled triangle.
Since, orthocenter of an obtuse angled triangle is always outside the triangle.
Thus, Q is orthocenter of the triangle OPR.
Hence option (a)
68. Answer. D

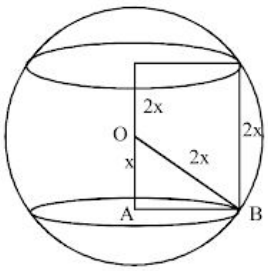


$(CD)^{-2} = (BC)^{-2} + (CA)^{-2}$

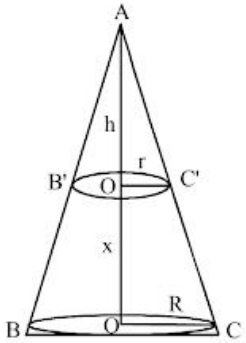
$=>\frac{1}{(CD)^2}=\frac{1}{(BC)^2}+\frac{1}{(CA)^2}$
$=>\frac{1}{(CD)^2}=\frac{(CA)^2+(BC)^2}{(BC)^2(CA)^2}$
$=>\frac{1}{(CD)^2}=\frac{(AB)^2}{(BC)^2(CA)^2}$ [As, $(CA)^2+(BC)^2=(AB)^2$]
$=>(CD)^2=\frac{(BC)^2(CA)^2}{(AB)^2}$
$=>(CD)^2(AB)^2=(BC)^2(CA)^2$
$=>(CD)(AB)=(BC)(CA)$
Thus, $(AB)(CD)=(BC)(CA)$
Hence option (d)
69. Answer. C



As, ABCD is a rectangle with point O inside the rectangle.
Draw lines OA, OB, OC and OD
Again draw from point O perpendicular to the sides i.e. OE, OF, OG and OH.
We can use Pythagorean theorem in different right angled triangle in above figure.
$OA^2=AH^2+OH^2=AH^2+AE^2$ [As, OH =AE].....(i)
$OC^2=CG^2+OG^2=EB^2+HD^2$ [As, CG = EB and OG = HD]……(ii)
$OB^2=EO^2+BE^2=AH^2+BE^2$ [As, EO = AH]……(iii)
$OD^2=HD^2+OH^2=HD^2+AE^2$ [As, OH = AE]……(iv)
Adding (i) and (ii), we get
$OA^2+OC^2=AH^2+HD^2+AE^2+EB^2$ .....(v)
Adding (iii) and (iv), we get
$OB^2+OD^2=AH^2+HD^2+AE^2+EB^2$ .....(vi)
From (v) and (vi), we get
$OA^2+OC^2=OB^2+OD^2$
Hence option (c)
70. Answer. A



In triangle OAB, by using Pythagoras theorem
Radius of triangle = $\sqrt{OB^2-OA^2}=\sqrt{(2x)^2-x^2}=\sqrt{3x^2}=\sqrt{3}x$
Curved surface area of cylinder = 2πrh = 2π(√3x)(2x) [As, r = √3x and h = 2x]
= $4\sqrt{3}\pi x^2$
Surface area of the sphere = $4\pi r^2=4\pi(2x)^2=16\pi x^2$
Hence required ratio = $\frac{4\sqrt{3}\pi x^2}{16\pi x^2}=\frac{4\sqrt{3}}{16}=\frac{\sqrt{3}}{4}$
Hence required ratio be √3 : 4
Hence option (a)
71. Answer. D
Since the sphere is dropped in the cylindrical vessel partially filled with water and is completely immersed.
Therefore, the volumes of both will be equal.
Let r be the radius of cylinder and R be the radius of the sphere.
Thus, volume of cylinder = volume of sphere
$=>\pi r^2h=\frac{4}{3}\pi R^3$
$=>30\times30\times h=\frac{4}{3}\times15\times15\times15$ [As, r = 30 and R = 15]
$=>h=\frac{4\times15\times15\times15}{3\times30\times30}=5$
Hence height of water in the cylinder rise = 5 cm
Hence option (d)
72. Answer. C
Let the radius of base circle of cone be r cm
Given that slant height(l) = √2r cm
Then, height of cone (h) = $\sqrt{l^2-r^2}=\sqrt{\left(\sqrt{2}r\right)^2-r^2}=\sqrt{r^2}=r$
Hence volume of cone = $\frac{1}{3}\pi r^2h=\frac{1}{3}\pi r^2r=\frac{\pi r^3}{3}$
Hence option (c)
73. Answer. D



Let the radii of frustum of a cone be R and r
Given that, $\frac{R}{r}=\frac{2}{1}$ .....(i)
Let angle AC′O′ = angle ACO = θ
Now, in triangle AC′O′:
tan θ = $\frac{h}{r}=\frac{h}{k}$ [As, $\frac{R}{2}=\frac{r}{1}=k$].....(ii)
In triangle ACO,
tan θ = $\frac{h+x}{R}=\frac{h+x}{2k}$ ……(iii)
From (ii) and (iii), we get
$\frac{h}{k}=\frac{h+x}{2k}$
$=>h=\frac{h+x}{2}$
=>2h = h + x
=>h = x
Therefore, H = h + x = h + h = 2h
$=>\frac{H}{h}=\frac{2}{1}$
Now, volume of frustum of cone = $\frac{\pi h}{3}(R^2+Rr+r^2)$
and volume of cone = $\frac{1}{3}\pi r^2H$

Hence required ratio = $\frac{\frac{\pi h}{3}(R^2+Rr+r^2)}{\frac{1}{3}\pi r^2 H} = \frac{h(R^2+Rr+r^2)}{R^2H} = \frac{h(4r^2+r^2+2r^2)}{4r^2\times 2h} = \frac{7r^2}{8r^2} = \frac{7}{8}$

Hence required ratio be 7 : 8

Hence option (d)

74. Answer. D

As, the conical cavity in the cylinder is hollowed out.

Therefore, inner surface area of the cavity is curved surface area of the cone.

Thus, curved surface area of cone = $\pi rl =$ $\pi \times 6 \times \sqrt{8^2+6^2}$ $= \pi \times 6 \times \sqrt{100} = \pi \times 6 \times 10 = 60\pi$

Hence inner surface area of cavity = 60π sq. cm

Hence option (d)

75. Answer. B

As, volume of cylinder = $\pi r^2 h = \pi(50)^2(10) =$ $25000\pi\ cubic\ meter$ [As, r = 50 m and h = 10 m]

Volume of cone = $\frac{1}{3}\pi r^2 h = \frac{1}{3}\pi(50)^2(15-10) =$ $\frac{1}{3}\pi \times 2500 \times 5 = \frac{12500\pi}{3}\ cubic\ meter$ [As, h = 15 – 10 = 5]

Total volume = $25000\pi + \frac{12500\pi}{3} = \frac{87500\pi}{3} cubic\ meter$

76. Answer. B

The maximum possible volume of the circular cylinder that can be formed from a rectangular sheet will have the largest length and breadth.

So, we will consider the rectangular sheet with length 4π and breadth 2π.

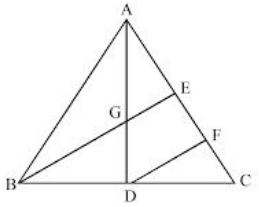
The length of the rectangular sheet = circumference of the cylinder

=>4 π = 2 πr

=>r = 2

Volume of cylinder = $\pi r^2 h = \pi \times 4 \times 2\ \pi = 8\ \pi^2$

77. Answer. A



Since BE is the median of AC.

Therefore, AE = EC

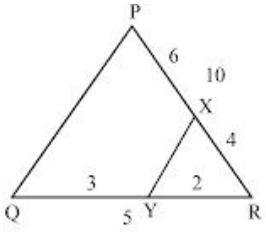
Also, AC = 9 cm

So, AE = EC = 3 cm

i.e. FC < EC

Thus, according to option FC = 2.25 cm

78. Answer. A



As, $\frac{RY}{YQ} = \frac{RX}{XP}$

=>$\frac{2}{3} = \frac{4}{6}$

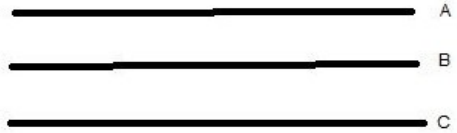
=>$\frac{2}{3} = \frac{2}{3}$

So, by converse of basic proportionality theorem XY parallel to PQ

Hence option (a)

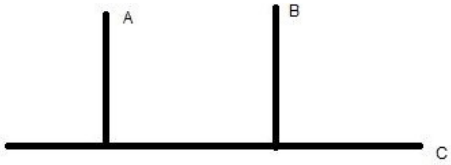
79. Answer. A

Statement 1:



Clearly, statement 1 is correct.

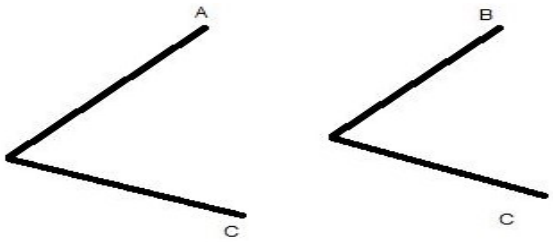
Statement 2:



Here, A is perpendicular to C and B is also perpendicular to B.

So, A must be parallel to B

Statement 3:

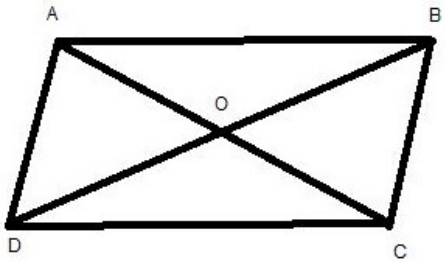


Clearly, A is parallel to B.

Hence all the three statements are correct.

Hence option (a)

80. Answer. B



Since the diagonals of rhombus bisect each other.

Thus, AO = OC = 10 cm and BO = OD = 24 cm

In triangle AOB:

Using Pythagoras theorem, we get

$AB = \sqrt{AO^2 + OB^2}$

=>$AB = \sqrt{10^2 + 24^2}$

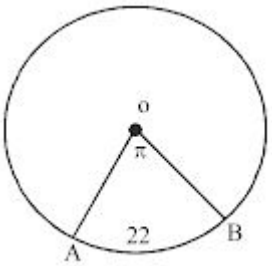
=>$AB = \sqrt{676}$

=>$AB = 26\ cm$

Hence side of rhombus be 26 cm

Hence option (b)

81. Answer. B



Length of arc = $\frac{\theta}{360} \times 2\pi r$

$=>22 = \frac{\pi}{360} \times 2\pi r$

For finding the value in degree, multiple with $\frac{180}{\pi}$ with RHS

Thus, $22 = \frac{180}{\pi} \times \frac{\pi}{360} \times 2\pi r$

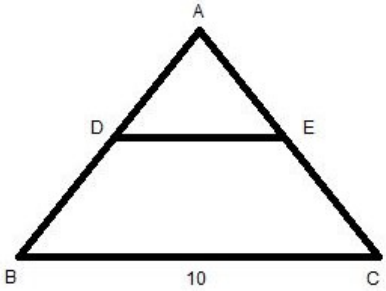
$=>\pi r = 22$

$=>r = \frac{22}{\pi} = \frac{22\times7}{22} = 7$

Hence radius of circle be 7 cm

Hence option (b)

82. Answer. B



According to question,

By basic proportionality theorem

$\frac{AD}{AB} = \frac{AE}{AC}$ and angle A is common

So, Triangle ADE ~ triangle ABC [By SAS similarity]

As, we know that the ratio of the areas of two similar triangles is equal to the square of its proportional sides

Thus, $\frac{area\ of\ triangle\ ADE}{area\ of\ triangle\ ABC} = \frac{DE^2}{BC^2}$ …..(i)

Given that,

$area\ of\ triangle\ ADE = \frac{1}{5}(area\ of\ triangle\ ABC)$ …….(ii)

From (i) and (ii), we get

$\frac{area\ of\ triangle\ ABC}{5(area\ of\ triangle\ ABC)} = \frac{DE^2}{10^2}$

$=>\frac{1}{5} = \frac{DE^2}{100}$

$=>DE = \sqrt{\frac{100}{5}} = 2\sqrt{5}$

Hence option (b)

83. Answer. C

As we know that, two non-parallel lines are always intersect at a point.

Thus, the maximum number of points at which they can intersect = ${}^8C_2 = \frac{8!}{2!\times6!} = \frac{8\times7\times6!}{2\times1\times6!} = 4 \times 7 = 28$

Hence option (c)

84. Answer. B

For finding the sum of the interior angles of a polygon is the same, whether the polygon is regular or irregular.

So, we would use the formula (n — 2) x 180°.

Where n is the number of sides in the polygon.

Let one angle of the polygon be x and other 5 equal angles be y.

According to the question,

x = y + 30…….(i)

$(n - 2)\times180^0 = x + 5y$……(ii)

From (i) and (ii), we get

$(n - 2)\times180^0 = y + 30 + 5y$

$=>(6 - 2) \times180^0 = 30 + 6y$

$=>4\times180^0 = 30 + 6y$

$=>6y = 690$

$=>y = \frac{690}{6} = 115^0$

Hence value of equal angles be 115^0

Hence option (b)

85. Answer. A

Statement 1:

Since the point of intersection of the perpendicular bisectors of the sides of a triangle is called circumcenter and the circumcenter for an obtuse triangle lie outside the triangle.

Hence statement 1 is correct.

Statement 2:

Also, since the point of intersection of the perpendiculars drawn from the vertices to the opposite sides of a triangle is called orthocenter and orthocenter cannot lie on two sides.

Hence statement 2 is incorrect.

Hence option (a)

86. Answer. C

Subject→ Girls/Boys↓	Mathematics	Physics	Statistics	Chemistry
Number of Girls	240 – 150 = 90	300 – 180 = 120	250	(3/5)×340 = 204
Number of Boys	150	60% of 300 = 180	320 – 250 = 70	136
Total	20% of 1200 = 240	1200/4 = 300	320	1200-(240 + 300 + 320) = 340

Total number of boys studying Statistics and Physics = 70 + 180 = 250

Hence option (c)

87. Answer. B

Number of girls studying Statistics = 250

Total Number of students studying Chemistry = 340
Thus, required percentage = $\frac{250}{340} \times 100 = 73.52 = 73.5(approx)$
Hence option (b)
88. Answer. C
Difference between the number of boys and girls in Mathematics = 150 – 90 = 60
Difference between the number of boys and girls in Physics = 180 – 120 = 60
Difference between the number of boys and girls in Statistics = 250 – 70 = 180
Difference between the number of boys and girls in Chemistry = 204 – 136 = 68
Hence Difference between the number of boys and girls in Mathematics and Physics are equal.
Hence option (c)
89. Answer. B
Number of boys studying Mathematics = 150
Number of girls studying Physics = 120
Difference between the number of boys studying Mathematics and the number of girls studying Physics = 150 – 120 = 30
Hence option (b)
90. Answer. A
Total number of Boys = 150 + 180 + 70 + 136 = 536
Total number of Girls = 90 + 120 + 250 + 204 = 664
The ratio of the total number of boys to the total number of girls = 536 : 664 = 67 : 83 (After dividing by 8)
Hence option (a)
91. Answer. A
As, we know that Frequency density of a class is the ratio of Class frequency to the class length
Or, Frequency density of a class is the ratio of Class frequency to the class width.
Hence option (a)
92. Answer. A

categories of workers	Number of workers	Salary per workers (in Rs.)	Total salary (in Rs.)
A	1	65000	65000×1 = 65000
B	3	25000	25000×3 = 75000
C	5	20000	20000×5 = 100000
	Total = 9		Total = 240000

Mean Salary of workers = $\frac{240000}{9} = 26666.67$
Clearly, workers of B and C categories are gaining salary which is less than the mean salary of the workers.
Hence the number of workers earning less than the mean salary = 3 + 5 = 8
Hence option (a)
93. Answer. A
As we know that,
$Average\ speed = \frac{Total\ distance}{Total\ time\ taken}$
$=> Average\ speed = \frac{12+10}{\frac{12}{4}+\frac{10}{5}} = \frac{22}{3+2} = \frac{22}{5} = 4.4\ km/hr$
Hence option (a)
94. Answer. A
We can solve this question according to given options.
Option (a):
If the monthly expenditure of families A would be Rs. 16000
If the monthly expenditure of families B would be Rs. 9000
Then, required ratio would be 16000 : 9000 = 16 : 9
Hence appropriate data used for the the pie diagrams on the monthly expenditure of two families
A and B be Rs. 16000 and Rs. 9000 respectively are drawn with radii of two circles taken in the
ratio 16 : 9 to compare their milk.
Hence option (a)
95. Answer. C
Statement 1:
As we know that the value of a random variable having the highest frequency is mode.
Hence statement 1 is correct
Statement 2:
A distribution having single mode is known as Unimodal and the distribution having more than
one mode bimodal, trimodal etc or in general multimodal.
Thus, mode is not unique.
Hence statement 2 is incorrect.
Hence option (c)
96. Answer. D
A pie chart is a circular statistical graphic which is divided into slices to illustrate numerical
proportion. In a pie chart, the arc length of each slice (and consequently its central angle and area), is proportional to the quantity it represents.
Hence the proportion of various items in a pie diagram is not proportional to the Perimeters of the slices.
Hence option (d)
97. Answer. C
As, geometric mean of x and y = $\sqrt{xy}$ = 6 …..(i)
Also, geometric mean of x, y and z = $\sqrt[3]{xyz}$ = 6 …..(ii)
From (i) and (ii), we get
$\sqrt{xy} = \sqrt[3]{xyz} => (xy)^{\frac{1}{2}} = (xyz)^{\frac{1}{3}}$
$Taking\ power\ 6\ both\ sides, we\ get$
$(xy)^3 = (xyz)^2$

$=>x^3y^3 = x^2y^2z^2$

$=>\frac{x^3y^3}{x^2y^2} = z^2$

$=>xy = z^2$

$=>6^2 = z^2$ (From equation (i))

Hence, z = 6

Hence option (c)

98. Answer. B

As we know that secondary data is the data collected from sources other than user itself.

Thus, The total number of live births in a specific locality during different months of a specific year was obtained from the office of the Birth Registrar. This set of data may be called secondary data.

Hence option (b)

99. Answer. B

The "Mean" is the "average" = $\frac{150+165+161+144++155}{5} = \frac{775}{5} = 155$

The "Median" is the "middle" value in the list of numbers, given number is 144,150,155,161 and 165, middle value of given numbers is 155 i.e. median of given number is 155

Mean = 155 and median = 155

Hence option (b)

100. Answer. C

Given average height of 22 students of a class is 140 cm

$\therefore$ total height of 22 students = $22 \times 140 = 3080$

And average height of 28 students of another class is 152 cm

$\therefore$ total height of 28 students

$= 28 \times 152 = 4256$

Now average height of total students = $\frac{height\ of\ total\ students}{number\ of\ total\ student} = \frac{7336}{50} = 146.72$

Hence option (c)

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