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Your Personal Exams Guide

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SSC CGL 2018 (Tier-II: Quant) Previous Year Paper (11-Sep-2019)

Total Time: 2 Hour **Total Marks:** 200

Instructions

Sl No.	Section Name	No. of Question	Maximum Marks	Negative Marks	Positive Marks
1	Quantitative Aptitude	100	200	0.5	2

1.) A total of 120 minutes is allotted for the examination.

2.) The server will set your clock for you. In the top right corner of your screen, a countdown timer will display the remaining time for you to complete the exam. Once the timer reaches zero, the examination will end automatically. The paper need not be submitted when your timer reaches zero.

3.) There will, however, be sectional timing for this exam. You will have to complete each section within the specified time limit. Before moving on to the next section, you must complete the current one within the time limits.

Quantitative Aptitude

1. One of the factors of $(8^{2k} + 5^{2k})$, where k is an odd number, is: **(+2, -0.5)**

a. 88

b. 86

c. 89

d. 84

---

2. $\left(\frac{1-tan\theta}{1-\cot\theta}\right)^2 + 1 = ?$ **(+2, -0.5)**

a. $\cos^2\theta$

b. $\sin^2\theta$

c. $\text{cosec}^2\theta$

d. $\sec^2\theta$

---

3. In what ratio, sugar costing Rs. 60 per kg be mixed with sugar costing Rs. 42 per kg such that by selling the mixture at Rs. 56 per kg there is a gain of 12%? **(+2, -0.5)**

a. 8 : 9

b. 4 : 5

c. 5 : 7

d. 5 : 6

---

4. The value of $\frac{7+8\times8\div8 \ of \ 8+8\div8\times4 \ of \ 4}{4\div4 \ of \ 4+4\times4\div4-4\div4 \ of \ 2}$ is: **(+2, -0.5)**

a. 7.8

b. 8.7

c. 6.4

d. 4.6

---

5. The sum of the digits of a two-digit number is 1/7 of the number. The units digit is 4 less than the tens digit. If the number obtained on reversing its digits is divided by 7, the remainder will be: **(+2, -0.5)**

a. 5

b. 6

c. 1

d. 4

---

6. In ΔABC, AB = 7, BC = 10 cm, and AC = 8 cm. If AD is the angle bisector of ∠BAC, where D is a point on BC, then BD is equal to: **(+2, -0.5)**

a. 17/4 cm

b. 15/4 cm

c. 16/3 cm

d. 14/3 cm

---

7. Raghav spends 80% of his income. If his income increases by 12% and the savings decrease by 10%, then what will be the percentage increase in his expenditure? **(+2, -0.5)**

a. 16

b. 22

c. 17.5

d. 20.5

---

8. PQRS is a cyclic quadrilateral in which PQ = 14.4 cm, QR = 12.8 cm and SR = 9.6 cm. If PR bisects QS, what is the length of PS? **(+2, -0.5)**

a. 15.8 cm

b. 13.6 cm

c. 16.4 cm

d. 19.2 cm

---

9. The ratio of copper to zinc in alloys A and B are 3 : 4 and 5 : 9 respectively. A and B are taken in the ratio 2 : 3 and melted to form a new alloy C. What is the ratio of copper to zinc in C? **(+2, -0.5)**

a. 3 : 5

b. 8 : 13

c. 27 : 43

d. 9 : 11

---

10. A sum of Rs. 18,000 is lent at 10% p.a compound interest, compounded annually, what is the difference between the compound interest for 3 rd **(+2, -0.5)**

year and 4 th year?

a. Rs. 217.80

b. Rs. 220.60

c. Rs. 215.40

d. Rs. 221.80

---

11. A and B started their journeys from X to Y and Y to X, respectively. After crossing each other, A and B completed the remaining parts of their journeys in $6\frac{1}{8}$ h and 8 h respectively. If the speed of B is 28 km/h, then the speed (in km/h) of A is: **(+2, -0.5)**

a. 40

b. 32

c. 42

d. 36

---

12. If θ lies in the first quadrant and $\cos^2\theta - \sin^2\theta = 1/2$ then the value of $\tan^2 2\theta + \sin^2 3\theta$ is: **(+2, -0.5)**

a. 7/2

b. 3

c. 4/3

d. 4

---

13. When an article is sold for Rs. 355, there is a loss of 29%. To gain 21% it should be sold for Rs. **(+2, -0.5)**

a. 580.80

b. 635

c. 605

d. 629.20

---

14. If $x + y + z = 11$, $x^2 + y^2 + z^2 = 133$ and $x^3 + y^3 + z^3 = 881$, then the value of $\sqrt[3]{(xyz)}$ is: **(+2, -0.5)**

a. -8

b. -6

c. 6

d. 8

---

15. A right circular cylinder of the maximum volume is cut out from a solid wooden cube. The material left is what percent of the volume (nearest to an integer) of the original cube? **(+2, -0.5)**

a. 21

b. 28

c. 23

d. 19

---

16. If the radius of the base of a cone is doubled, and the volume of the new cone is three times the volume of the original cone, then what will be the ratio of the height of the original cone to that of the new cone? **(+2, -0.5)**

a. 2 : 9

b. 9 : 4

c. 4 : 3

d. 1 : 3

---

17. When 7897, 8110 and 8536 are divided by the greatest number x, then the remainder in each case is the same. The sum of the digits of x is: **(+2, -0.5)**

a. 6

b. 5

c. 14

d. 9

---

18. In a constituency, 55% of the total number of voters are males and the rest are females. If 40% of the males are illiterate and 40% of the females are literate, then by what percent is the number of literate males more than that of illiterate females? **(+2, -0.5)**

a. $18\frac{2}{9}$

b. $18\frac{2}{11}$

c. $22\frac{8}{11}$

d. $22\frac{2}{9}$

---

19. Let a, b and c be the fractions such that a < b < c. If c is divided by a, the result is 5/2, which exceeds b by 7/4, If $a+b+c=1\frac{11}{12}$, then (c – a) will be equal to: **(+2, -0.5)**

a. 1/6

b. 2/3

c. 1/3

d. 1/2

---

20. If the radius of a right circular cylinder is decreased by 20% while its height is increased by 40% then the percentage change in its volume will be by: **(+2, -0.5)**

a. 1.04% increase

b. 10.4% increase

c. No increase or decrease

d. 10.4% decrease

---

21. The base of the right prism is a trapezium whose parallel sides are 11 cm and 15 cm and the distance between them is 9 cm. If the volume of the prism is 1731.6 cm^3, then the height (in cm) of the prism will be: **(+2, -0.5)**

a. 14.2

b. 15.6

c. 14.8

d. 15.2

---

22. Let x = $(633)^{24} - (277)^{38} + (266)^{54}$. What is the units digit of x? **(+2, -0.5)**

a. 6

b. 4

c. 8

d. 7

---

23. If each interior angle of a regular polygon is $(128\frac{4}{7})°$, then what is the sum of the number of its diagonals and the number of its sides? **(+2, -0.5)**

a. 19

b. 17

c. 15

d. 21

---

24. A sum of Rs. 8,400 amounts to Rs. 11,046 at 8.75% p.a simple interest in a certain time. What is the simple interest on the sum of Rs. 9,600 at the same rate for the same time? **(+2, -0.5)**

a. Rs. 3,012

b. Rs. 2,990

c. Rs. 2,686

d. Rs. 3,024

25. If $a^2 + b^2 + c^2 + 96 = 8(a + b - 2c)$, then $\sqrt{(ab - bc + ca)}$ is equal to: **(+2, -0.5)**

a. 6

b. $2\sqrt{3}$

c. $2\sqrt{2}$

d. 4

---

26. The value of $\left(2\frac{6}{7} of\ 4\frac{1}{5} \div \frac{2}{3}\right) \times 1\frac{1}{9} \div \left(\frac{3}{4} \times 2\frac{2}{3} of \frac{1}{2} \div \frac{1}{4}\right)$ is: **(+2, -0.5)**

a. 1/5

b. 8

c. 5

d. 1/8

---

27. The value of $\frac{(\cos 9^\circ + \sin 81^\circ)\,(sec 9^\circ + cosec 81^\circ)}{\sin 56^\circ \sec 34^\circ + \cos 25^\circ cosec 65^\circ}$ is: **(+2, -0.5)**

a. 1/4

b. 4

c. 2

d. 1/2

---

28. A train travelling at the speed of x km/h crossed a 200 m long platform in 30 seconds and overtook a man walking in the same direction at the speed of 6 km/h in 20 seconds. What is the value of x? **(+2, -0.5)**

a. 60

b. 54

c. 50

d. 56

---

29. If $x = \sqrt{1+\frac{\sqrt{3}}{2}} - \sqrt{1-\frac{\sqrt{3}}{2}}$ then the value of $\frac{\sqrt{2}-x}{\sqrt{2}+x}$ will be closest to: **(+2, -0.5)**

a. 0.12

b. 1.4

c. 1.2

d. 0.17

---

30. If $a^3 + b^3 = 218$ and $a + b = 2$, then the value of ab is: **(+2, -0.5)**

a. 34

b. -31

c. -35

d. 32

---

31. What will be the compound interest on a sum of Rs. 31,250 for 2 years at 12% p.a, if the interest is compounded 8-month? **(+2, -0.5)**

a. Rs. 8,15

b. Rs. 8,116

c. Rs. 8,106

d. Rs. 8,016

---

32. The value of the expression $(\cos^6\theta + \sin^6\theta - 1)(\tan^2\theta + \cot^2\theta + 2)$ is: **(+2, -0.5)**

a. -1

b. 0

c. -3

d. 1

---

33. When 12,16, 18, 20 and 25 divide the least number x, the remainder in each case is 4 but x is divisible by 7. What is the digit at the thousands' place in x? **(+2, -0.5)**

a. 5

b. 3

c. 8

d. 4

---

34. In ΔABC, D and E are the points on sides AB and BC respectively such that DE|| AC. If AD : DB = 5 : 3, then what is the ratio of the area of ΔBDE to that of the trapezium ACED? **(+2, -0.5)**

a. 9 : 64

b. 1 : 6

c. 9 : 55

d. 4 : 25

---

35. In ΔABC, D is a point on side BC such that ∠ADC = ∠BAC. If CA = 12 cm, CD = 8 cm, then CB is equal to: **(+2, -0.5)**

a. 12 cm

b. 15 cm

c. 16 cm

d. 18 cm

---

36. In ΔABC, ∠A = 52° and O is the orthocentre of the triangle (BO and CO meet AC and AB at E and F respectively when produced). If the bisectors of ∠OBC and ∠OCB meet at P, then the measure of ∠ BPC is: **(+2, -0.5)**

a. 132°

b. 138°

c. 154°

d. 124°

---

37. Three solid metallic spheres whose radii are 1cm, x cm and 8 cm, are melted and recast into a single solid sphere of diameter 18 cm. The surface area (in cm^2) of the sphere with radius x cm is: **(+2, -0.5)**

a. 100π

b. 64π

c. 72π

d. 144π

---

38. If a cuboid of dimensions 32 cm × 12 cm × 9 cm is melted and recast into two equal cubes of the same size, what will be the ratio of the total surface area of the cuboid to the total surface area of the two cubes? **(+2, -0.5)**

a. 32 : 39

b. 37 : 48

c. 65 : 72

d. 24 : 35

---

39. A certain number of persons can complete a work in 34 days working 9 h a day. If the number of persons is decreased by 40% then how many hours a day should the remaining persons work to complete the work in 51 days? **(+2, -0.5)**

a. 10

b. 8

c. 12

d. 9

---

40. Anu sold an article for Rs. 480 at some profit. Had she sold it for Rs. 400, then there would have been a loss equal to one-third of the initial profit. What was the cost price of the article? **(+2, -0.5)**

a. Rs. 450

b. Rs. 420

c. Rs. 430

d. Rs. 425

---

41. In a trapezium ABCD, DC || AB, AB = 12 cm and DC = 7.2cm. What is the length of the line segment joining the mid-points of its diagonals? **(+2, -0.5)**

a. 2.4 cm

b. 2.6 cm

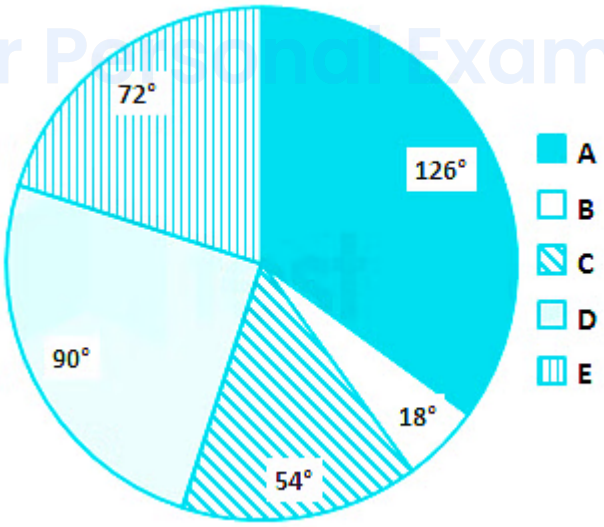
c. 3.6 cm

d. 4.8 cm

---

42. Direction : The given pie chart shows the breakup of the total number of the employees of a company working in different offices (A, B, C, D and E). **(+2, -0.5)**

Total Number of employees = 2400



If 40% of the number of employees in office A are shifted equally to office B and E, then what is the difference between the number of

employees in B and that in C?

a. 72

b. 130

c. 120

d. 82

---

43. The sides AB and AC of ΔABC are produced to P and Q respectively. The bisectors of ∠CBP and ∠BCQ meet at R. If the measure of ∠A = 44°, the find the measure of ∠BRC/2. **(+2, -0.5)**

a. 34°

b. 33°

c. 32°

d. 38°

---

44. The ratio of the volume of two cylinders is x : y and the ratio of their diameters is a : b, what is the ratio of their heights? **(+2, -0.5)**

a. xb : ya

b. $xb^2 : ya^2$

c. $xa^2 : yb^2$

d. xa : yb

---

45. If a nine-digit number 389x6378y is divisible by 72, then the value of √(6x + 7y) will be: **(+2, -0.5)**

a. 8

b. √46

c. 6

d. √13

---

46. If $2\sqrt{2}x^3 - 3\sqrt{3}y^3 = (\sqrt{2}x - \sqrt{3}y)(Ax^2 + By^2 + Cxy)$, then the value of $A^2 + B^2 - C^2$ is: **(+2, -0.5)**

a. 19

b. 7

c. 10

d. 11

---

47. If $\sqrt{86 - 60\sqrt{2}} = a - b\sqrt{2}$, then what will be the value of $\sqrt{a^2 + b^2}$, correct to one decimal place? **(+2, -0.5)**

a. 7.2

b. 7.8

c. 8.2

d. 8.4

---

48. To do a certain work, the ration of efficiency of A to that of B is 3 : 7 Working together, they can complete the work in $10\frac{1}{2}$ days. They work together for 8 days. 60% of the remaining work will be completed by A alone in: **(+2, -0.5)**

a. 4 days

b. $6\frac{1}{2}days$

c. $5\frac{1}{2}days$

d. 5 days

---

49. Abhi rows upstream a distance of 28 km in 4 h and rows downstream a distance of 50 km in 2 h to row a distance of 44.8 km in still water, he will take: **(+2, -0.5)**

a. 2.4 h

b. 2.8 h

c. 3.2 h

d. 2.2 h

---

50. The graph of the equation x – 7y = -42 intersects the y-axis at P(α, β) and the graph of 6x + y – 15 = 0, intersects the x-axis at Q(γ, δ) what is the value of α + β + γ + δ? **(+2, -0.5)**

a. 6

b. 17/2

c. 9/2

d. 5

---

51. If (a + b) : (b + c) : (c + a) = 7 : 6 : 5 and a + b + c = 27, then what will be the value of 1/a : 1/b : 1/c? **(+2, -0.5)**

a. 3 : 6 : 4

b. 3 : 4 : 2

c. 3 : 2 : 4

d. 4 : 3 : 6

---

52. The sides of a triangle are 11 cm, 60 and 61 cm. What is the radius of the circle circumscribing the triangle? **(+2, -0.5)**

a. 31 cm

b. 30 cm

c. 30.5 cm

d. 31.5 cm

---

53. One year ago, the ratio of the age (in years) of A to that of b was of 4 : 3 the ratio of their respective ages, 3 years from now, will be 6 : 5. What will be the ratio of respective ages of A and B, 9 years from now? **(+2, -0.5)**

a. 8 : 7

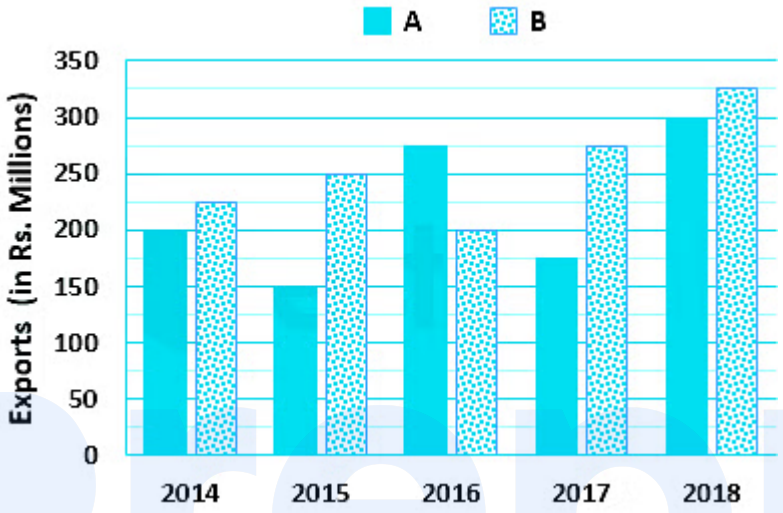
b. 10 : 9

c. 7 : 6

d. 9 : 8

---

54. **Direction :** The bar graph shows the exports of cars of Type A and B (in Rs millions). **(+2, -0.5)**



The total exports of cars of type A in 2014 to 2017 is approximately what percentage less than the total exports of cars of type B in 2015 to 2018?

a. 31.3

b. 30.4

c. 23.8

d. 14.3

---

55. A shopkeeper bought 120 quintals of wheat. 20% of it was sold at 25% loss. At what percent gain should he sell the rest to gain 25% on the whole transaction? **(+2, -0.5)**

a. 35

b. 40

c. $37\frac{1}{2}$

d. $36\frac{1}{2}$

---

56. Travelling at 60 km/h, a person reaches his destination at a certain time. He covers 60% of his journey in 2/5 th of the time. At what speed (in km/h) should he travel to cover the remaining journey so that he reaches the destination right on time? **(+2, -0.5)**

a. 36

b. 48

c. 42

d. 40

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57. A sum of Rs. 5,000 is divided into two parts such that the simple interest on the first part for $4\frac{1}{5}$ years at $6\frac{2}{3}\%$ p.a is double the simple interest on the second part for $2\frac{3}{4}$ years at 4% p.a. What is the difference between the two parts? **(+2, -0.5)**

a. Rs.600

b. Rs.620

c. Rs.560

d. Rs.680

---

58. What is the value of $\text{cosec}(65^\circ + \theta) - \sec(25^\circ - \theta) + \tan^2 20^\circ - \text{cosec}^2 70^\circ$? **(+2, -0.5)**

a. 0

b. 2

c. -1

d. 1

---

59. The lateral surface area of a cylinder is 352 cm^2. If its height is 7 cm, then its volume (in cm) is : Take $\pi=22/7$ **(+2, -0.5)**

a. 1408

b. 891

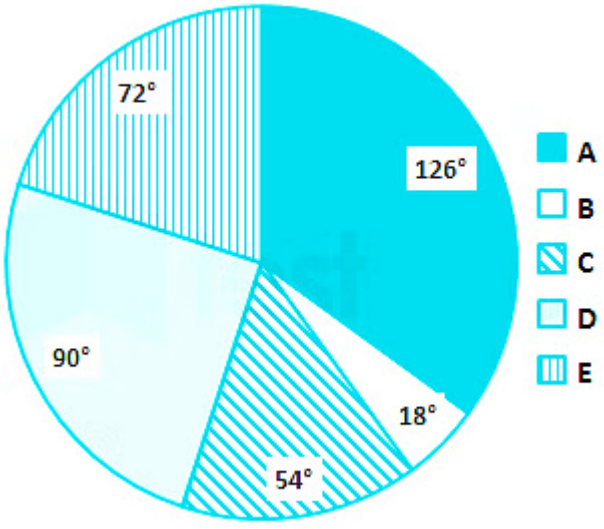
c. 1078

d. 1243

---

60. Direction : The given pie chart shows the breakup of the total number of the employees of a company working in different offices (A, B, C, D and E). **(+2, -0.5)**

Total Number of employees = 2400



If the percentage of male employees in office c is 20% and that of female employees in E is 40% then what is the ratio of the number of female employees in C to that of female employees in E?

a. 2 : 3

b. 3 : 2

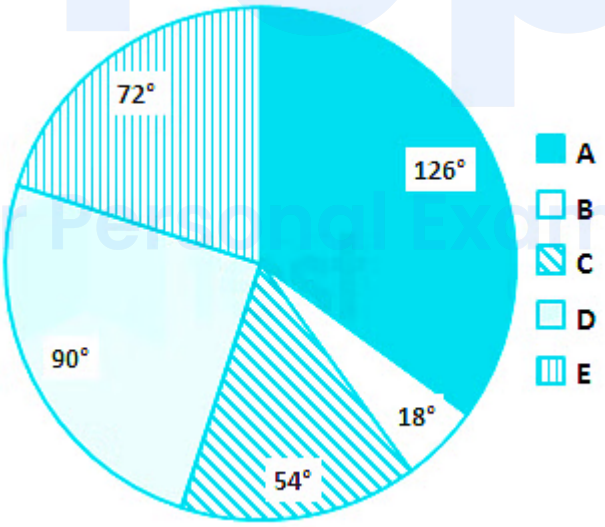
c. 3 : 8

d. 5 : 4

---

61. Direction : The given pie chart shows the breakup of the total number of the employees of a company working in different offices (A, B, C, D and E). **(+2, -0.5)**

Total Number of employees = 2400



What is the number of offices in which the number of employees in the company is between 350 and 650?

a. 1

b. 2

c. 4

d. 3

---

62. The average of thirteen numbers is 47. The average of the first three numbers is 39 and that of the next seven numbers is 49. The 11 th number is two times the 12 th number and the 12th number is 3 less than the 13 th number. What is the average of 11 th and 13 th numbers? **(+2, -0.5)**

a. 55.5

b. 56

c. 57

d. 54.5

---

63. A person marks his goods x% above the cost price and allows a discount of 30% on the market price. If his profit is 5% then the value of x will be : **(+2, -0.5)**

a. 35

b. 60

c. 45

d. 50

---

64. The value of $\frac{(253)^3 + (247)^3}{25.3 \times 25.3 - 624.91 + 24.7 \times 24.7}$ is 50 × 10 ^{k}, where the value of k is : **(+2, -0.5)**

a. 3

b. 2

c. -3

d. 4

---

65. If 5 sin θ – 4 cos θ = 0, 0° < θ < 90°, then the value of $\frac{5\sin\theta-2\cos\theta}{5\sin\theta+3\cos\theta}$ is : **(+2, -0.5)**

a. 5/8

b. 3/8

c. 2/7

d. 3/7

---

66. The ratio of investment by A to that by B in business is 14 : 15 and the ratio of their respective profits at the end of a year is 2 : 5 If A invested the money for 3 months, then for how much time (in months) B invested his money? **(+2, -0.5)**

a. 9

b. 7

c. 5

d. 6

---

67. The ratio of the income of A to that of B is 5 : 7. A and B saves Rs. 4,000 and Rs. 5,000 respectively. If the expenditure of A is equal to $66\frac{2}{3}\%$ of the expenditure of B, then the total income of A and B is : **(+2, -0.5)**

a. Rs.28,800

b. Rs.26,400

c. Rs.25,200

d. Rs.24,000

---

68. If the diameter of the base of a cone is 42 cm and its curved surface area is 2310 cm^2, then what will be its volume (in cm^3) **(+2, -0.5)**

a. 12936

b. 19404

c. 25872

d. 38808

---

69. Radha marks her goods 25% above the cost price. She sells 35% of goods at the marked price, 40% at 15% discount and the remaining at 20% discount. What is her overall percentage gain? **(+2, -0.5)**

a. 10

b. 11.75

c. 12.75

d. 11.25

---

70. If $\sin\theta = \sqrt{3}\cos\theta$, $0° < \theta < 90°$, then the value of $2\sin^2\theta + \sec^2\theta + \sin\theta\sec\theta + \text{cosec}\,\theta$ is : **(+2, -0.5)**

a. $\frac{19 + 10\sqrt{3}}{6}$

b. $\frac{19 + 10\sqrt{3}}{3}$

c. $\frac{33+10\sqrt{3}}{6}$

d. $\frac{33+10\sqrt{3}}{3}$

---

71. The graphs of the equations $3x + y - 5 = 0$ and $2x - y - 5 = 0$ intersect at the point $P(\alpha, \beta)$. What is the value of $(3\alpha + \beta)$? **(+2, -0.5)**

a. -5

b. 5

c. 4

d. 3

---

72. A and B can do a piece of work in 6 days and 8 days, respectively. With the help of C, they completed the work in 3 days and earned Rs. 1,848. What was the share of C? **(+2, -0.5)**

a. Rs. 693

b. Rs. 231

c. Rs. 462

d. Rs. 924

---

73. The volume of a right pyramid is $45\sqrt{3}cm^3$ and its base is an equilateral triangle with side 6 cm. What is the height (in cm) of the pyramid? **(+2, -0.5)**

a. 12

b. 18

c. 20

d. 15

---

74. $\sqrt{\frac{\cot\theta + \cos\theta}{\cot\theta - \cos\theta}}$ is equal to : **(+2, -0.5)**

a. sec θ – tan θ

b. 1 + sec θ tan θ

c. 1 – sec θ tan θ

d. sec θ + tan θ

---

75. A number is first increased by 16% and then increased by 14% The number, so obtained, is now decreased by 30% What is the net increase or decrease percent in the original number (nearest to an integer)? **(+2, -0.5)**

a. 6% increase

b. 9% decrease

c. No increase or decrease

d. 7% decrease

---

76. A circle is inscribed in ΔABC, touching AB, BC and AC at the points P, Q and R respectively. If AB - BC = 4 cm, AB - AC = 2 cm and the perimeter of ΔABC = 32 cm, then PB + AR is equal to: **(+2, -0.5)**

a. 33/5 cm

b. 13 cm

c. 12 cm

d. 38/3 cm

---

77. The internal and external radii of a hollow hemispherical vessel are 6cm and 7cm respectively. What is the total surface area (in cm^2) of the vessel? **(+2, -0.5)**

a. 177π

b. 174π

c. 189π

d. 183π

---

78. The number of students in a class is 75, out of which $33\frac{1}{3}\%$ are boys and the rest are girls. The average score in mathematics of the boys is $66\frac{2}{3}\%$ more than that of the girls. If the average score of all the students is 66, then the average score of the girls is: **(+2, -0.5)**

a. 58

b. 55

c. 52

d. 54

---

79. Chord AB of a circle is produced to a point P, and C is a point on that circle such that PC is a tangent to the circle. If PC = 18 cm, and BP = 15 cm, then AB is equal to: **(+2, -0.5)**

a. 5.8 cm

b. 8.5 cm

c. 6.6 cm

d. 6.2 cm

---

80. If $(\sqrt{2} + \sqrt{5} - \sqrt{3}) \times k = -12$, then what will be the value of k? **(+2, -0.5)**

a. $(\sqrt{2} + \sqrt{5} + \sqrt{3})(2 - \sqrt{5})$

b. $\sqrt{2} + \sqrt{5} + \sqrt{3}$

c. $(\sqrt{2} + \sqrt{5} + \sqrt{3})(2 - \sqrt{10})$

d. $(\sqrt{2} + \sqrt{5} - \sqrt{3})(2 + \sqrt{5})$

---

81. If the radius of a sphere is increased by 4 cm, its surface area is increased by 464 π cm^2What is the volume (in cm^3) of the original sphere? **(+2, -0.5)**

a. 15625π/8

b. 11979π/2

c. 35937π/8

d. 15625π/6

---

82. In ΔABC, ∠A = 58°. If I is the in-centre of the triangle, then the measure of ∠BIC is: **(+2, -0.5)**

a. 112°

b. 119°

c. 123°

d. 109°

---

83. A shopkeeper allows 28% discount on the marked price of an article and still makes a profit of 20% If he gains Rs. 30.80 on the sale of one article, then what will be the cost price of the article? **(+2, -0.5)**

a. Rs. 164

b. Rs. 160

c. Rs. 154

d. Rs. 145

---

84. Pipes A, B and C can fill a tank in 30 h, 40 h and 60 h respectively. Pipes A, B and C are opened at 7 a.m., 8 a.m and 10 a.m., respectively on the same day. When will the tank be full? **(+2, -0.5)**

a. 10:00 p.m

b. 9:40 p.m

c. 9:20 p.m

d. 10:20 p.m

---

85. 'A' started a business with a capital of Rs. 54,000 and admitted 'B' and 'C' after 4 months and 6 months, respectively. At the end of the year, the **(+2, -0.5)**

profit was divided in the ratio 1: 4 : 5. What is the difference between the capitals invested by 'B' and 'C'?

a. Rs. 2,16,000

b. Rs. 1,08,000

c. Rs. 1,62,000

d. Rs. 3,24,000

---

86. In quadrilateral ABCD, the bisectors of ∠A and ∠B meet at O and ∠AOB = 64°. ∠C + ∠D is equal to: **(+2, -0.5)**

a. 128°

b. 136°

c. 116°

d. 148°

---

87. An article is sold at a certain price. If it is sold at $33\frac{1}{3}\%$ of this price, there is a loss of $33\frac{1}{3}\%$ What is the percentage profit when it is sold at 60% of the original selling price? **(+2, -0.5)**

a. 20

b. $33\frac{1}{3}$

c. $17\frac{1}{3}$

d. 1

---

88. If $x^8 - 1442x^4 + 1 = 0$, then a possible value of $x - 1/x$ is: **(+2, -0.5)**

a. 5

b. 4

c. 8

d. 6

---

89. The value of $22.\bar{4} + 11.5\overline{67} - 33.5\bar{9}$ is: **(+2, -0.5)**

a. $0.\overline{32}$

b. $0.4\overline{12}$

c. $0.3\bar{1}$

d. $0.\overline{412}$

---

90. When x is added to each of 2, 3, 30 35 then the numbers obtained in this order, are in proportion. What is the mean proportional between (x + 7) and (x - 2)? **(+2, -0.5)**

a. 5

b. 4

c. 7

d. 6

---

91. In ΔABC, AB = 6 cm, AC = 8 cm, and BC = 9 cm. The length of the median AD is: **(+2, -0.5)**

a. $\frac{\sqrt{313}}{2}cm$

b. $\frac{\sqrt{119}}{2}cm$

c. $\frac{\sqrt{317}}{2}cm$

d. $\frac{\sqrt{115}}{2}cm$

---

92. When the price of an item was reduced by 25% then its sale was increased by x%. If there is an increase of 20% in the receipt of the revenue, then the value of x will be: **(+2, -0.5)**

a. 45

b. 75

c. 50

d. 60

---

93. $\frac{(1+\cos\theta)^2+\sin^2\theta}{(cosec^2\theta-1)\sin^2\theta}=?$ **(+2, -0.5)**

a. cosθ (1 + sinθ)

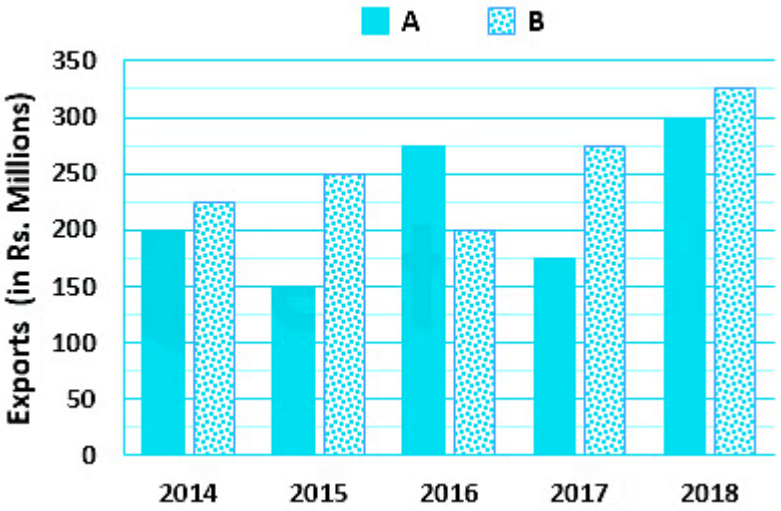
b. secθ(1 + sinθ)

c. 2 cos θ(1 + secθ)

d. 2 secθ(1 + secθ)

---

94. **Direction :** The bar graph shows the exports of cars of Type A and B (in Rs millions). **(+2, -0.5)**



In which year, the average exports (per year) car of Type A over the five years was 10% more than the exports of cars of type A?

a. 2016

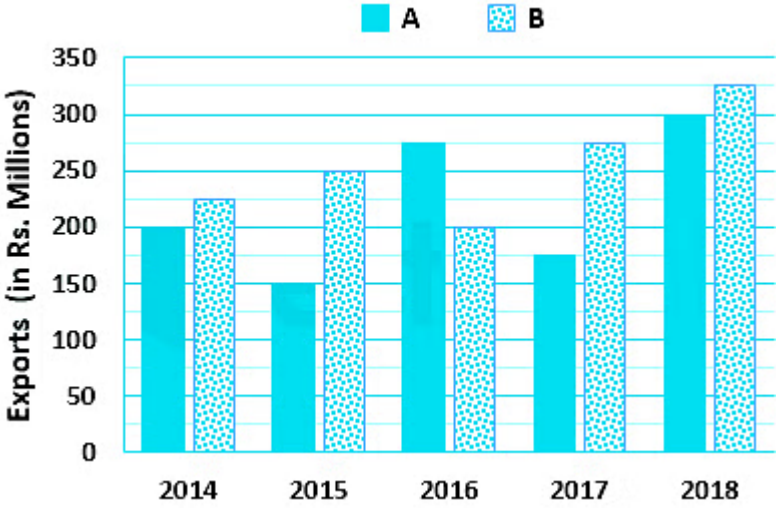
b. 2015

c. 2014

d. 2017

---

95. **Direction :** The bar graph shows the exports of cars of Type A and B (in Rs millions). **(+2, -0.5)**



What is the ratio of the total exports of cars of type A in 2014 and 2018 to the total export of cars of type B in 2015 and 2016?

a. 11 : 10

b. 5 : 4

c. 10 : 9

d. 3 : 2

---

96. If A is 28% more than B and C is 25% less than the sum of A and B, then by what percent will C be more than A (correct to one decimal place)? **(+2, -0.5)**

a. 33.6%

b. 32.2%

c. 43%

d. 28%

---

97. In a school, 4/9 of the number of students are girls and the rest are boys. 3/5 of the number of boys are below 12 years of age and 5/12 of the number of girls are 12 years or above 12 years of age. If the number of students below 12 years of age is 480, then 5/18 of the total number of students in the school will be equal to: (+2, -0.5)

a. 315

b. 270

c. 225

d. 240

---

98. $\frac{(2\sin A)(1+\sin A)}{1+\sin A+\cos A}$ is equal to: (+2, -0.5)

a. 1 + sin A cos A

b. 1 + sin A - cos A

c. 1 - sin A cos A

d. 1 + cos A - sin A

---

99. From the top of a tower, the angles of depression two objects on the ground on the same side of it, observed to be 60° and 30° respectively and the distance between the objects is 400√3 m. The height (in m) of the tower is: (+2, -0.5)

a. 800

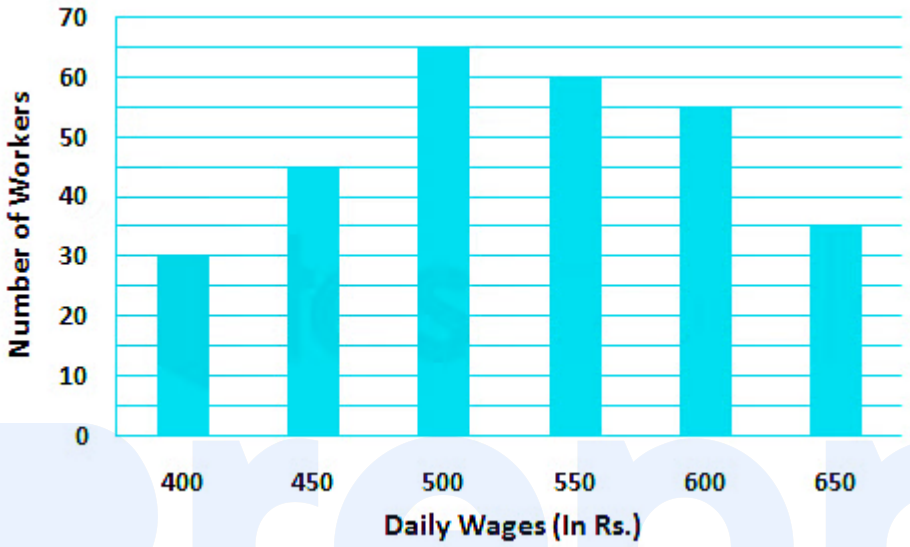
b. 600√3

c. 600

d. 800√3

---

100. Study the graph and answer the question that follows. **(+2, -0.5)**



What is the ratio of the total number of the workers whose daily wages are less than Rs. 500 to the total number of workers whose daily wages are Rs. 600 and above?

a. 5 : 6

b. 15 : 11

c. 6 : 7

d. 3 : 4

Answers

1. **Answer: c**

Explanation:

$\Rightarrow (8^{2k} + 5^{2k})$

Given, k is an odd number so, Let k = 1 (smallest odd number)

$\Rightarrow (8^2 + 5^2)$

$\Rightarrow (64 + 25)$

$\Rightarrow 89$

$\therefore$ One of the factors of $(8^{2k} + 5^{2k})$ is 89.

---

2. **Answer: d**

Explanation:

Short Trick:

$\left(\frac{1-tan\theta}{1-\cot\theta}\right)^2 + 1$

Put θ = 60°

$\Rightarrow \left(\frac{1-\sqrt{3}}{1-\frac{1}{\sqrt{3}}}\right)^2 + 1$

$\Rightarrow \left[\frac{\sqrt{3}(1-\sqrt{3})}{-(1-\sqrt{3})}\right]^2 + 1$

$\Rightarrow (-\sqrt{3})^2 + 1$

$\Rightarrow 3 + 1$

⇒ 4

Put θ = 60° in the given options

⇒ sec ^{2}θ = sec ^{2}60°

⇒ 2 ^{2}= 4 (satisfied)

So, the correct option is option (4).

Detailed solution:

$\Rightarrow \left(\frac{1-tan\theta}{1-\cot\theta}\right)^2 + 1$

$\Rightarrow \left(\frac{1-\frac{sin\theta}{cos\theta}}{1-\frac{\cos\theta}{\sin\theta}}\right)^2 + 1$

$\Rightarrow \left(\frac{\frac{cos\theta-sin\theta}{cos\theta}}{\frac{sin\theta-\cos\theta}{\sin\theta}}\right)^2 + 1$

$\Rightarrow \left[\frac{cos\theta-\sin\theta}{\cos\theta} \times \frac{\sin\theta}{-(\cos\theta-\sin\theta)}\right]^2 + 1$

⇒ [(sinθ)/(-cosθ)] ^{2}+ 1

⇒ tan ^{2}θ + 1

⇒ sec ^{2}θ [∵ sec ^{2}θ – tan ^{2}θ = 1]

---

3. **Answer: b**

Explanation:

SP of the mixture = 56

CP of the mixed sugar = 56 × (100/112) = 50

Using allegation method

60 42

50

8 : 10

Required ratio = 8 : 10 = 4 : 5

---

4. Answer: c

Explanation:

Concept used:

Use the BODMAS rule to solve the given expression

B	Brackets in order (), {}, []	ब्रैकेट (), {}, [] क्रम में
O	of	का
D	Division (÷)	विभाजन (÷)
M	Multiplication (×)	गुणा (×)
A	Addition (+)	जोड़ (+)
S	Subtraction (–)	घटाव (–)

Calculation:

$\Rightarrow \frac{7+8\times8\div8 \ of \ 8+8\div8\times4 \ of \ 4}{4\div4 \ of \ 4+4\times4\div4-4\div4 \ of \ 2}$

$\Rightarrow \frac{7+8\times8\div64+8\div8\times16}{4\div16+4\times1-4\div8}$

$\Rightarrow \frac{7+8\times\frac{8}{64}+1\times16}{\frac{4}{16}+4-\frac{4}{8}}$

$\Rightarrow \frac{7+1+16}{\frac{1}{4}+4-\frac{1}{2}}$

$\Rightarrow \frac{24}{\frac{1+16-2}{4}}$

⇒ (24 × 4)/15

⇒ 6.4

5. **Answer: b**

Explanation:

Let the unit digit of the number be x and tens digit of the number be y

So number = 10y + x

According the question

⇒ x + y = (10y + x) × 1/7

⇒ 7(x + y) = 10y + x

⇒ 7x + 7y = 10y + x

⇒ 7x – x = 10y – 7y

⇒ 6x = 3y

⇒ x : y = 1 : 2

The unit digit is 4 less than the tens digit, then

⇒ 2 – 1 unit = 4

⇒ 1 unit = 4

Unit digit = 4 × 1 = 4

Tens digit = 2 × 4 = 8

Then number 84

If the numbered on reversing its digit is divided by 7, then remainder will be 6.

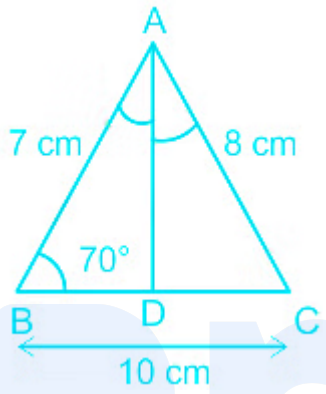
6. **Answer: d**

Explanation:

Given:

AB = 7, BC = 10 cm, and AC = 8 cm

Calculations:



As we know,

IF AD bisect ∠BAC, then

⇒ AB/AC = BD/DC

⇒ 7/8 = BD/DC

⇒ DC = 8BD/7

⇒ BD + DC= BC

⇒ BD + 8BD/7 = 10

⇒ 15BD/7 = 10

⇒ BD = 10 × 7/15

⇒ BD = 14/3

---

7. Answer: c

Explanation:

Let the income of raghav be Rs. x

His expenditure = x × (80/100) = 0.80x

His savings = x – 0.8x = 0.2x

If his income increase by 12%, then his new income = x × (112/100) = 1.12x

If his savings decreased by 10%, then his new savings = 0.2x × (90/100) = 0.18x

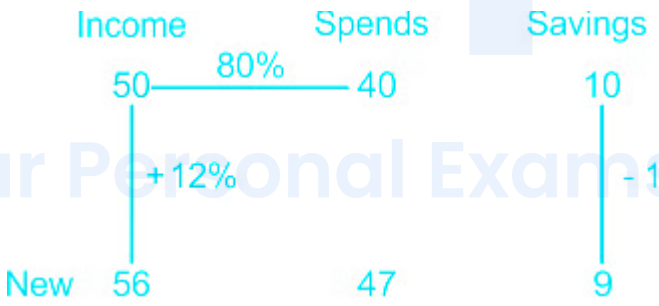
His new expenditure = 1.12x – 0.18x = 0.94x

His expenditure increased by = 0.94x – 0.80x = 0.14x

His expenditure increased by (in%) = (0.14x/0.80x) × 100 = 17.5

Short trick:

Let the income be 50.

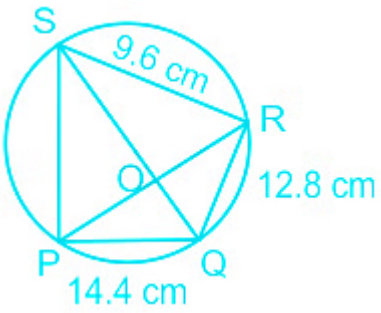


Required percentage = [(47 – 40)/40] × 100 = 17.5%

---

8. **Answer: d**

Explanation:



From the following figure

As we know,

ΔPOQ ~ ΔSOR

⇒ PQ/SR = OQ/OR

⇒ OQ/OR = 14.4/9.6

⇒ OQ/OR = 3/2

Given, OQ = OS

⇒ OS/OR = 3/2 ----(1)

As we know,

ΔPOS ~ ΔQOR

⇒ OS/OR = PS/QR

⇒ OS/OR = PS/12.8 ----(2)

From equation (1) and equation (2)

⇒ PS/12.8 = 3/2

⇒ PS = (12.8 × 3)/2

⇒ PS = 19.2 cm

Theorem: (remember this result):

If either of the diagonals of a cyclic quadrilateral bisects the other diagonal, then the opposite side of the quadrilateral are in the same ratio, see the figure,

PS/QR = PQ/SR

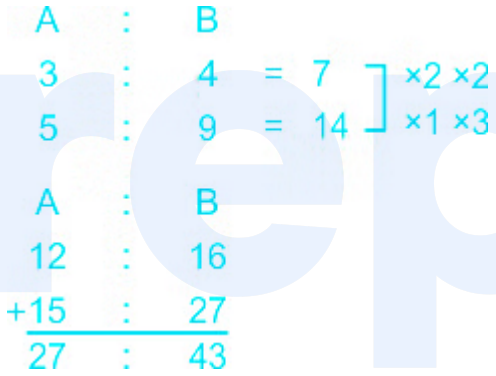
⇒ PS/12.8 = 14.4/9.6

⇒ PS = 19.2 cm

---

9. **Answer: c**

Explanation:



Ratio of copper to zinc in alloy A = 3 : 4 ---(1) (3 + 4 = 7)

Ratio of copper to zinc in alloy B = 5 : 9 ---(2) (5 + 9 = 14)

We will have to make an equal quantity and take alloys A and B in 2 : 3 ratio.

Multiply by 2 × 2 in equation (1) and multiply by 3 in equation (2)

Ratio of copper to zinc in alloy A = 12 : 16

Ratio of copper to zinc in alloy B = 15 : 27

Ratio of copper to zinc in alloy C = (12 + 15) : (16 + 27) = 27 : 43

---

10. **Answer: a**

Explanation:

P = 18,000, r = 10% and t = 2 years, then

$A = P (1 + r/100)^2$

$A = 18,000 (1 + 10/100)^2 = 18,000 \times (11/10) \times (11/10) = 21,780$

So, Compound interest for 3 rd year = 21780 × (10/100) = 2178

Amount will be after 3 year = 21780 + 2178 = 23958

So, compound interest for 4 th year = 22958 × (10/100) = 2395.8

So, Difference of compound interest for 3 rd year and 4 th year = 2395.8 – 2178 = 217.80

Short Trick:

Compound interest rate for 1 st year = 10%

Compound interest rate for 2 nd year = 10% × (110/100) = 11%

Compound interest rate for 3 rd year = 11% × (110/100) = 12.1%

Compound interest rate for 4 th year = 12.1% × (110/100) = 13.31%

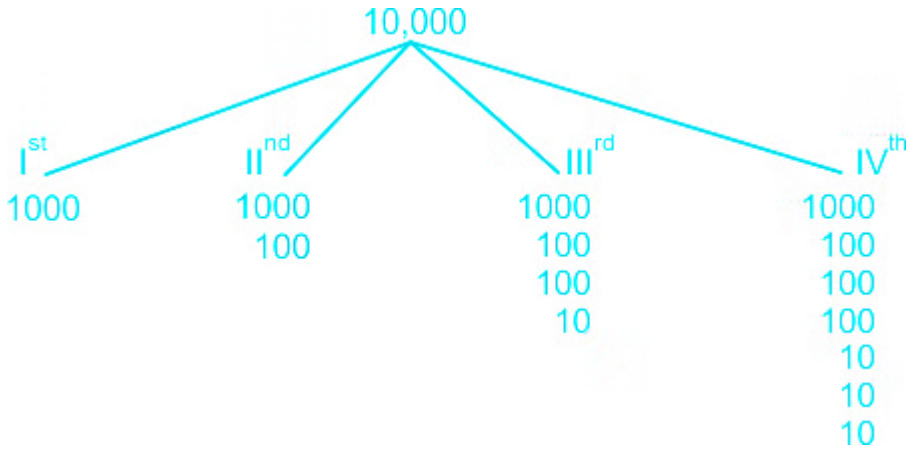
Difference of rates of compound interest for 4 th and 3 rd year = 13.31% - 12.1% = 1.21%

So, required difference = 18,000 × (1.21/100) = 217.80

Sort Trick Hint:

Required difference always divisible by interest rate (10%) if, more options are divisible by rate of percentage (10%),then go on detailed or short trick method.

Using Tree Method:



10% = (1/10) if t = 4 years, then $(10)^4 = 10000$ 1

Suppose P = 10000, then

CI for 3 rd year = 1000 + 100 + 100 + 10 = 1210

CI for 4 th year = 1000 + 100 + 100 + 100 + 10 + 10 +10 + 1 = 1331

Difference of 4 th year CI to 3 rd year CI = 1331 – 1210 = 121

10000 unit represents = 18,000

1 unit represents = 18000/10000

121 unit represents = (18000/10000) × 121 = 217.80

---

11. Answer: b

Explanation:

Speed of A = ?

Time taken by A after crossing $T_1 = 6\frac{1}{8} = \frac{49}{8} hrs$

Speed of B = 28 km/h

Time taken by B after crossing T_2 = 8 hr

As we know,

Speed of A/speed of B = $\sqrt{(T_2/T_1)}$

(Speed of A)/28 = $\sqrt{[8/(49/8)]}$

(Speed of A)/28 = $\sqrt{(64/49 = 8/7}$

Speed of A = (8 × 28)/7 = 32 km/hr

---

12. **Answer: d**

Explanation:

$\cos^2\theta - \sin^2\theta = 1/2$

As we know, θ lies in first quadrant, then put $\theta = 30°$

$\Rightarrow 3/4 - 1/4 = 1/2$

$\Rightarrow 1/2 = 1/2$ (Satisfied)

Now $\tan^2 2\theta + \sin^2 3\theta$

$\Rightarrow \tan^2 60° + \sin^2 90°$

$\Rightarrow (\sqrt{3})^2 + 1$

$\Rightarrow 3 + 1$

$\Rightarrow 4$

Detailed Solution:

$\Rightarrow \cos^2\theta - \sin^2\theta = 1/2$

$\Rightarrow \cos 2\theta = 1/2$

$\Rightarrow \cos 2\theta = \cos 60°$

$\Rightarrow 2\theta = 60^\circ$

$\Rightarrow \theta = 30^\circ$

Now, $\tan^2 2\theta + \sin^2 3\theta$

$\Rightarrow \tan^2 60^\circ + \sin^2 90^\circ$

$\Rightarrow (\sqrt{3})^2 + 1$

$\Rightarrow 3 + 1$

$\Rightarrow 4$

---

13. **Answer: c**

Explanation:

SP of the article = 355

Let the CP of the article be x

$\Rightarrow x \times 71/100 = 355$

$\Rightarrow x = 355 \times (100/71) = 500$

CP of the article = 500

To gain 21% profit then the new SP of the article = $500 \times (121/100) = 605$

Short trick:

CP	SP	New SP
100	71	121

$\Rightarrow 71$ unit = 355

$\Rightarrow 1$ unit = 5

$\Rightarrow 121$ unit $= 121 \times 5 = 605$

14. **Answer: b**

Explanation:

Short Trick:

Given, $x^2 + y^2 + z^2 = 133$

As we know, square of 2, 3, 4, 5, 6, 7, 8, 9 and 10 are 4, 16, 25, 36, 49, 64, 81 and 100.

Pick the three square which sum is 133 so,

$\Rightarrow 16 + 36 + 81 = 133$

$\Rightarrow 133 = 133$ (satisfied)

So now we can say, $x = \pm 4$, $y = \pm 6$ and $z = \pm 9$

$\Rightarrow x + y + z = 11$

$\Rightarrow (-4) + 6 + 9 = 11$

$\Rightarrow 11 = 11$ (satisfied)

Now,

$\Rightarrow \sqrt[3]{(xyz)} = \sqrt[3]{[(-4) \times 6 \times 9]} = -6$

Detailed Solution:

As we know,

$\Rightarrow (x + y + z)^2 = x^2 + y^2 + z^2 + 2(xy + yz + zx)$

$\Rightarrow 11^2 = 133 + 2(xy + yz + zx)$

$\Rightarrow 121 = 133 + 2(xy + yz + zx)$

$\Rightarrow (xy + yz + zx) = (121 - 133)/2$

$\Rightarrow xy + yz + zx = (-12)/2 = -6$

$\Rightarrow x^3 + y^3 + z^3 - 3xyz = (x + y + z)\,[(x + y + z)^2 - 3(xy + yz + z)]$

$\Rightarrow 881 - 3xyz = 11[11^2 - 3 \times (-6)]$

$\Rightarrow 881 - 3xyz = 11[121 + 18]$

$\Rightarrow 881 - 3xyz = 11 \times 139$

$\Rightarrow 881 - 3xyz = 1529$

$\Rightarrow -3xyz = 1529 - 881 = 648$

$\Rightarrow -xyz = 648/3$

$\Rightarrow xyz = (-216)$

$\Rightarrow \sqrt[3]{xyz} = \sqrt[3]{(-216)} = -6$

---

15. Answer: a

Explanation:

Let the side of the cube be a cm.

As we know,

Volume of cube $= a^3$

Volume of cylinder $= \pi r^2 h$

Then radius of cylinder $= a/2$

Height of the cylinder (h) $= a$

Volume of cylinder $= \pi r^2 h = \pi \times (a/2)^2 \times a = 3.14a^3/4 = 0.785a^3$

Volume of waste $= a^3 - 0.785a^3 = 0.215a^3$

Volume of waste percentage = $[0.215a^3/a^3] \times 100 = 21\%$ (approx)

---

16. **Answer: c**

Explanation:

Let the radius of the cone be r cm and height of the cone be $h_1$cm, then

Volume of cone = $(1/3) \times \pi r^2 h_1 = (\pi r^2 h_1)/3$

If the radius of the base of the cone is doubled, and let the height of the new cone be h_2

Volume of new cone = $(1/3) \times \pi \times (2r)^2 \times h_2 = 4(\pi r^2 h_2)/3$

According to the question

$\Rightarrow [(\pi r^2 h_1)/3] / [4(\pi r^2 h_2)/3] = 1/3$

$\Rightarrow h_1/h_2 = 4/3$

Required ratio $h_1 : h_2 = 4 : 3$

---

17. **Answer: a**

Explanation:

$$213\overline{)426}(2 \quad \underline{426} \quad X$$

$$213\overline{)639}(3 \quad \underline{639} \quad X$$

8110 – 7897 = 213, 8536 – 8110 = 426 and 8536 – 7897 = 639

HCF of 213, 426 and 639 is 213

So, sum of digit of 213 is = 2 + 1 + 3 = 6

18. **Answer: d**

Explanation:

Let total number of person in the constituency be 100x

Number of male in the constituency = 100x × (55/100) = 55x

Number of female in the constituency = 100x – 55x = 45x

Number of illiterate males in the constituency = 55x × (40/100) = 22

Number of literate males = 55x – 22x = 33x

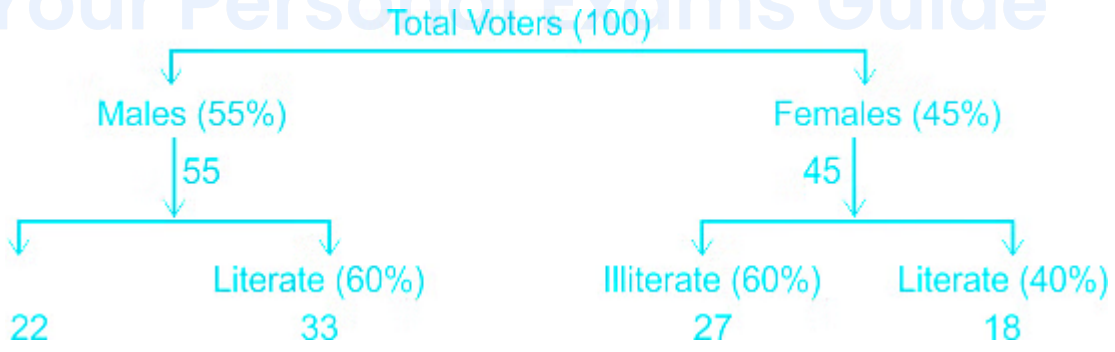
Number of literate females = 45 × (40/100) = 18x

Number of illiterate females = 45x – 18x = 27x

Number of literate males more than of illiterate females by = 33x – 27x = 6x

Number of literate males more than that of illiterate females by (in%) = (6x/27x) × 100 = 22 $\frac{2}{9}\%$

Short Trick:



Required percentage = [(33 – 27)/27] × 100 = 22 $\frac{2}{9}\%$

19. **Answer: d**

Explanation:

According to the first condition when c is divided by a, the result is 5/2, then

⇒ c/a = 5/2

Or, c : a = 5x : 2x

According Second condition 5/2 exceeds b by 7/4, so

⇒ b = 5/2 – 7/4 = (10 -7)/4 = 3/4

If $a+b+c=1\frac{11}{12}$,

⇒ a + 3/4 + C = 23/12

⇒ a + c = 23/12 – 3/4 = 7/6

⇒ 5x + 2x = 7/6

⇒ 7x = 7/6

⇒ x = 1/6

Now, c – a

⇒ 5x – 2x

⇒ 3x

⇒ 3/6

⇒ 1/2

---

20. Answer: d

Explanation:

Let the radius of the cylinder be r cm and height of the cylinder be h cm

As we know,

Volume of the cylinder = $\pi r^2 h$

If radius of the cylinder decreased by 20%, then new radius of the cylinder = $r \times (80/100) = 0.8r$

If height of the cylinder increased by 40% then new height of the cylinder = $h \times (140/100) = 1.4h$

New volume of the cylinder = $\pi (0.8r)^2 \times 1.4 = 0.896\pi r^2 h$

Volume decreased by = $\pi r^2 h - 0.896\pi r^2 h = 0.104\pi r^2 h$

Volume decreased by (in %) = $[0.104\pi r^2 h/\pi r^2 h] \times 100 = 10.4\%$

Short Trick:

$\Rightarrow (-20) + (-20) + [(-20) \times (-20)/100] = (-40) + 4 = (-36\%)$

$\Rightarrow 40 - 36 - (40 \times 36)/100 = 4 - 14.4 = (-10.4)$ %

Short Trick:

$\Rightarrow$ 20% = 1/5 and 40% = 2/5

5	4
5	4
5	7
125	112

Required percentage = $[(125 - 112)/125] \times 100 = 10.4\%$ (decrease)

---

21. Answer: c

Explanation:

Given:

Distance between parallel sides = 9 cm

Volume of the prism = 1731.6 cm 3

Formulae Used:

Area of trapezium = (1/2) × (Sum of Parallel side) × distance between parallel sides

The volume of trapezium = Base area of trapezium × height

Calculation:

Area of trapezium = (1/2) × (11 + 15) × 9 × h = (1/2) × 26 × 9 × h = 117 h

Volume of prism = 1731.6

⇒ 117 × h = 1731.6

⇒ h = 1731.6/117

⇒ h = 14.8 cm

---

22. Answer: c

Explanation:

⇒ $x = (633)^{24} - (277)^{38} + (266)^{54}$

⇒ $x = 3^{24} - 7^{38} + 6^{54}$

⇒ $x = 3^{4} - 7^{2} + 6^{2}$

⇒ x = 1 − 9 + 6

⇒ x = 7 − 9

Or x = 17 − 9

⇒ x = 8

Unit digit of a number is digits in the one's place of the number.

It is rightmost of the number. like 523417, 7 is the unit digit.

---

23. Answer: d

Explanation:

As we know,

If n = total number of sides of a regular polygon, then

Each interior angles of the polygon = [(n – 2) × 180]/n

⇒ [(n – 2) × 180]/n = $(128\frac{4}{7})$ ° = 900/7

⇒ (n – 2)/n = 5/7

⇒ 7 (n – 2) = 5n

⇒ 7n – 14 = 5n

⇒ 7n – 5n = 14

⇒ 2n = 14

⇒ n = 14/2 = 7

Number of sides n = 7

Number of diagonals = [n (n – 3)]/2 = [7 (7 – 3)]/2 = (7 × 4)/2 = 28/2 = 14

Sum of sides and diagonals = 14 + 7 = 21

---

24. Answer: d

Explanation:

Detailed Solution:

As we know,

Amount = SI + P

P = 8400, A = 11046, r = 8.75%

SI = 11046 – 8400 = 2646

SI = prt/100

⇒ 2646 = (8400 × 8.75 × t)/100

⇒ t = 2646/84 × 8.75 = 3.6

Now,

P = 9600, r = 8.75% & t = 3.6

SI = Prt/100

⇒ SI = (9600 × 8.75 × 3.6)/100

⇒ SI = 3024

Short Trick Hint:

SI = 11046 – 8400 = 2646

P = 9600, r = 8.75%

As we know,

t = [(SI × 100)/Pr] = (2646 × 100)/(8400 × 8.75)

SI = Prt/100

SI = (9600 × 8.75 × 2646 × 100)/(100 × 8400 × 8.75) = 3024

25. Answer: d

Explanation:

Short trick hint:

$a^2+b^2+c^2+96=8(a+b-2c)$

Or we can write this

$a^2+b^2+c^2+96=2(4a+4b-8c)$

Now, we can say coefficient of a, b and c are also the value of a, b and c respectively.

a = 4, b = 4 and c = -8

Now, put a, b and c value in $\sqrt{(ab-bc+ca)}$

$\Rightarrow \sqrt{[4\times4-4\times(-8)+(-8)\times4]}$

$\Rightarrow \sqrt{[16+32-32]}$

$\Rightarrow \sqrt{16}$

$\Rightarrow 4$

Detailed Solution:

$\Rightarrow a^2+b^2+c^2+96=8(a+b-2c)$

$\Rightarrow a^2+b^2+c^2+96=8a+8b-16c$

$\Rightarrow a^2+b^2+c^2+96-8a-8b+16c=0$

$\Rightarrow a^2-8a+16+b^2-8b+16+c^2+16c+64=0$

$\Rightarrow a^2-2\times a\times4+4^2+b^2-2\times a\times4+4^2+c^2+2\times a\times8+8^2=0$

$\Rightarrow (a-4)^2+(b-4)^2+(c+8)^2=0$

Now we can say,

$\Rightarrow (a-4)^2 = 0$

$\Rightarrow (a-4) = 0$

$\Rightarrow a = 4$

Similarly,

$\Rightarrow (b-4)^2 = 0$

$\Rightarrow (b-4) = 0$

$\Rightarrow b = 4$

Similarly,

$\Rightarrow (c+8)^2 = 0$

$\Rightarrow (c+8) = 0$

$\Rightarrow c = -8$

Now, put a, b and c value in $\sqrt{(ab - bc + ca)}$

$\Rightarrow \sqrt{[4 \times 4 - 4 \times (-8) + (-8) \times 4]}$

$\Rightarrow \sqrt{[16 + 32 - 32]}$

$\Rightarrow \sqrt{16}$

$\Rightarrow 4$

---

26. Answer: c

Explanation:

Follow BODMAS rule to solve this question, as per the order given below:

Step-1: Parts of an equation enclosed in 'Brackets' must be solved first, and in the bracket,

Step-2: Any mathematical 'Of' or 'Exponent' must be solved next,

Step-3: Next, the parts of the equation that contain 'Division' and 'Multiplication' are calculated

Step-4: Last but not least, the parts of the equation that contain 'Addition' and 'Subtraction' should be calculated.

$\Rightarrow \left(2\frac{6}{7} of\ 4\frac{1}{5} \div \frac{2}{3}\right) \times 1\frac{1}{9} \div \left(\frac{3}{4} \times 2\frac{2}{3} of \frac{1}{2} \div \frac{1}{4}\right)$

$\Rightarrow \left(\frac{20}{7} \times \frac{21}{5} \div \frac{2}{3}\right) \times \frac{10}{9} \div \left(\frac{3}{4} \times \frac{8}{3} \times \frac{1}{2} \div \frac{1}{4}\right)$

$\Rightarrow \left(12 \times \frac{3}{2}\right) \times \frac{10}{9} \div \left(\frac{3}{4} \times \frac{4}{3} \div \frac{1}{4}\right)$

$\Rightarrow 18 \times \frac{10}{9} \div \left(\frac{3}{4} \times \frac{4}{3} \times 4\right)$

$\Rightarrow 18 \times 10/9 \div 4$

$\Rightarrow 18 \times 10/9 \times (1/4)$

$\Rightarrow 5$

---

27. Answer: c

Explanation:

As we know,

$\cos\theta \sec\theta = 1$

$\sin\theta \operatorname{cosec}\theta = 1$

$\Rightarrow \frac{(\cos 9^\circ + \sin 81^\circ)\ (sec 9^\circ + cosec 81^\circ)}{\sin 56^\circ \sec 34^\circ + \cos 25^\circ cosec 65^\circ}$

$\Rightarrow \frac{[\cos 9^\circ + \sin(90 - 9^\circ)]\ [(sec 9^\circ + \operatorname{cosec}(90 - 9)]}{\sin 56^\circ \sec(90 - 56) + \cos 25^\circ\ \operatorname{cosec}(90 - 25)}$

$\Rightarrow \frac{(\cos 9 + \cos 9)\ (\sec 9 + \sec 9)}{\sin 56\ \operatorname{cosec} 56 + \cos 25\ \sec 25}$

$\Rightarrow \frac{2\cos 9 \times 2\sec 9}{1+1}$

$\Rightarrow 4/2$

$\Rightarrow 2$

---

28. Answer: a

Explanation:

Let the length of the train be l meter

Speed of the train = x km/h

Speed of the man = 6 km/h

According to the question

$\Rightarrow x \times 5/18 = (l + 200)/30$

$\Rightarrow l = (30x \times 5/18) - 200$ ---- (1)

$\Rightarrow (x - 6) \times 5/18 = l/20$

$\Rightarrow l = 20(x - 6) \times 5/18$ ---- (2)

Put the value of l in equation

$\Rightarrow 20(x - 6) \times 5/18 = [30x \times 5/18] - 200$

$\Rightarrow 100x - 600 = 150x - 3600$

$\Rightarrow 150x - 100x = 3600 - 600$

$\Rightarrow 50x = 3000$

$\Rightarrow x = 3000/50 = 60$ km/hr

---

29. **Answer: d**

Explanation:

Calculation:

We have $x = \sqrt{1 + \frac{\sqrt{3}}{2}} - \sqrt{1 - \frac{\sqrt{3}}{2}}$

Squaring on both sides

$\Rightarrow x^2 = 1 + (\sqrt{3}/2) + 1 - (\sqrt{3}/2) - 2\sqrt{(1 - 3/4)}$

$\Rightarrow x^2 = 2 - 2\sqrt{(1/4)}$

$\Rightarrow x^2 = 2 - 2(1/2)$

$\Rightarrow x^2 = 2 - 1$

$\Rightarrow x = \pm 1$

Taking, x = 1

Now,

$\Rightarrow (\sqrt{2} - x) / (\sqrt{2} + x)$

$\Rightarrow (\sqrt{2} - 1) / (\sqrt{2} + 1)$

$\Rightarrow [(\sqrt{2} - 1) / (\sqrt{2} + 1)] \times [(\sqrt{2} - 1) / (\sqrt{2} - 1)]$

$\Rightarrow (\sqrt{2} - 1)^2$

$\Rightarrow (\sqrt{2})^2 + 1^2 - 2\sqrt{2}$

$\Rightarrow 2 + 1 - 2\sqrt{2}$

$\Rightarrow 3 - 2 \times 1.41$

$\Rightarrow 3 - 2.82$

∴ The required value of expression is 0.17 (approx)

---

30. **Answer: c**

Explanation:

Short trick

$a^3 + b^3 = 218$ and $a + b = 2$

Put $a = 7$ and $b = (-5)$

$\Rightarrow 7^3 + 5^3 = 218$

$\Rightarrow 343 - 125 = 218$

$\Rightarrow 218 = 218$ (Satisfied)

$\Rightarrow ab$

$\Rightarrow 7 \times (-5)$

$\Rightarrow -35$

Detailed solution

$\Rightarrow a^3 + b^3 = (a + b)(a^2 + b^2 - ab)$

$\Rightarrow a^3 + b^3 = (a + b)[(a + b)^2 - 3ab)]$

$\Rightarrow 218 = 2[(a + b)^2 - 3ab)]$

$\Rightarrow 218/2 = 2^2 - 3ab$

$\Rightarrow 109 = 4 - 3ab$

$\Rightarrow -3ab = 109 - 4 = 105$

$\Rightarrow ab = -105/3$

⇒ ab = -35

---

31. Answer: b

Explanation:

P = 31,250, t = 2 years and r = 12%

If interest is compounded 8 months, then t = 3 and r = 8%

$CI = P[(1 + r/100)^{t} - 1]$

$CI = 31250[(1 + 8/100)^{3} - 1]$

$CI = 31250[(27/25)^{3} - 1]$

$CI = 31250 \times [19683/15625 - 1]$

$CI = 31250 \times [(19683 - 15625)/15625]$

$CI = 31250 \times (4058/15625)$

$CI = 2 \times 4058$

CI = 8116

---

32. Answer: c

Explanation:

$(\cos^{6}\theta + \sin^{6}\theta - 1)(\tan^{2}\theta + \cot^{2}\theta + 2)$

Put $\theta = 45^{\circ}$

$\Rightarrow (\cos^{6}45^{\circ} + \sin^{6}45^{\circ} - 1)(\tan^{2}45^{\circ} + \cot^{2}45^{\circ} + 2)$

$\Rightarrow \left[\left(\frac{1}{\sqrt{2}}\right)^6 + \left(\frac{1}{\sqrt{2}}\right)^6 - 1\right] (1 + 1 + 2)$

$\Rightarrow (1/8 + 1/8 - 1) \times 4$

$\Rightarrow (1/4 - 1) \times 4$

$\Rightarrow -3/4 \times 4$

$\Rightarrow -3$

---

33. Answer: c

Explanation:

2	12, 16, 18, 20, 25
2	6, 8, 9, 10, 25
2	3, 4, 9, 5, 25
2	3, 2, 9, 5, 25
3	3, 1, 9, 5, 25
3	1, 1, 3, 5, 25
5	1, 1, 1, 5, 25
5	1, 1, 1, 1, 5
	1, 1, 1, 1, 1

LCM = 2 × 2 × 2 × 2 × 3 × 3 × 5 × 5 = 3600

Given, 3600 should be divisible by 7,

Let (3600k + 4) is divisible by 7

So, we can write

(3600k + 4)/7

Put k = 1, 2, 3, 4, 5 ..... If we put k = 5, then (2k + 4) divisible by 7

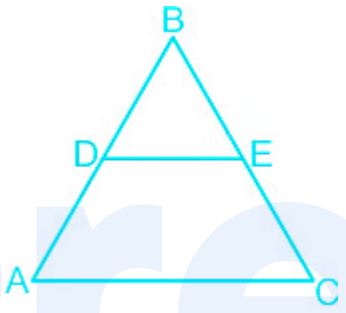
So, number become 3600 × 5 + 4 = 18004

Digit at the thousands place in 18004 is 8.

---

34. Answer: c

Explanation:



Given, AD/DB = 5/3

AB = AD + DB = 5 + 3 = 8

As we know,

ΔBDE ~ ΔBAC

Area of ΔBDE/Area of ΔBAC = $(DB/AB)^2 = (3/8)^2 = 9/64$

Let the area of ΔBDE be 9 unit.

And area of ΔBAC = 64 unit

Area of trapezium ACED = 64 – 9 = 55

Ratio of area of ΔBDE to area of trapezium ACED = 9 : 55

---

35. Answer: d

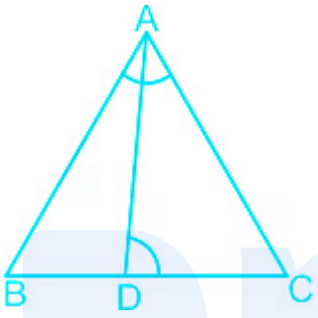
Explanation:

Given:

CA = 12 cm

CD = 8 cm

Calculation:



Considering ΔCAB and ΔCDA

∠ADC = ∠BAC (given)

∠ACD = ∠ACB (common)

Thus, by AA postulate

ΔCAB ~ ΔCDA

⇒ CA/CB = CD/CA

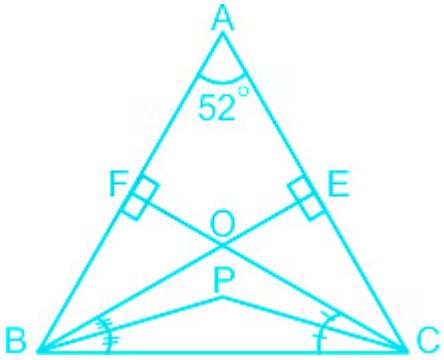
⇒ 12/CB = 8/12

⇒ CB = (12 × 12)/8 = 18 cm

---

36. **Answer: c**

Explanation:



Given, ∠A = 52°

As we know,

∠AFO = ∠AEO = 90°

In quadrilateral AFOE

⇒ ∠AFO + ∠FOE + 90 + 52 = 360

⇒ ∠FOE = 360° – 232°

⇒ ∠FOE = ∠BOC = 128° (Vertically opposite angle)

In ΔBPC

⇒ ∠B/2 + ∠C/2 + ∠BPC = 180°

⇒ ∠BPC = 180° – (∠B + ∠C)/2

⇒ ∠BPC = 180° – [(180° – ∠O)/2]

⇒ ∠BPC = 180° – 90° + ∠O/2

⇒ ∠BPC = 90° + 128/2

⇒ ∠BPC = 90° + 64° = 154°

Short trick

⇒ ∠BOC = 180° – ∠FAE

⇒ ∠BOC = 180° – 52° = 128°

⇒ ∠BPC = 90° + ∠BOC/2

⇒ ∠BPC = 90 + 128°/2

⇒ ∠BPC = 90° + 64° = 154°

---

37. Answer: d

Explanation:

As we know,

Volume of sphere = $(4/3)\pi r^3$

Radii of three spheres are 1cm, x cm and 8 cm

Radius of bigger sphere = 18/2 = 9 cm

According to the question

⇒ $(4/3)\pi \times 1^3 + (4/3)\pi \times x^3 + (4/3)\pi \times 8^3 = (4/3)\pi \times 9^3$

⇒ $(4/3)\pi \{1^3 + x^3 + 8^3\} = (4/3)\pi \times 9^3$

⇒ $1 + x^3 + 512 = 729$

⇒ $x^3 = 729 - 513 = 216$

⇒ $x^3 = 216$

⇒ x = 6

As we know,

Surface area of sphere = $4\pi r^2 = 4 \times \pi \times 6^2 = 4 \times 36 \times \pi = 144\pi$

Short trick

$1^3 + x^3 + 8^3 = 9^3$

$\Rightarrow x^3 = 729 - 1 - 512$

$\Rightarrow x^3 = 216$

$\Rightarrow x = 6$

As we know,

Surface area of sphere $= 4\pi r^2 = 4 \times \pi \times 6^2 = 4 \times 36 \times \pi = 144\pi$

---

38. Answer: c

Explanation:

As we know

Volume of cuboid = lbh

Total surface of area of cuboid = 2(lb + bh + hl)

Volume of cube $= a^3$

Total surface cube $= 6a^2$

Dimensions of cuboid = 32 cm × 12 cm × 9 cm

Let the side of the cube = a

According to the question

$\Rightarrow 2a^3 = 32 \times 12 \times 9$

$\Rightarrow a^3 = (32 \times 12 \times 9)/2$

$\Rightarrow a^3 = 16 \times 12 \times 9$

$\Rightarrow a = 12$

Total surface area of cuboid = 2(lb + bh + hl) = 2(32 × 12 + 12 × 9 + 9 × 32) = 2(384 + 108 + 288) = 2 × 780 = 1560

Total surface area of two cubes = $2 \times 6a^2 = 2 \times 6 \times 12 \times 12 = 1728$

Required ratio = 1560 : 1728 = 65 : 72

---

39. Answer: a

Explanation:

Let the total number be 5

As we know

Total work = Total work

$M_1 = 5$ persons, $D_1 = 34$ days, $T_1 = 9$ hr

$M_2 = 5 \times 60/100 = 3$ person, $D_2 = 51$, $T_2 = ?$

According to the question

$M_1 \times D_1 \times T_1 = M_2 \times T_2 \times D_2$

$\Rightarrow 5 \times 34 \times 9 = 3 \times 51 \times T_2$

$\Rightarrow T_2 = (5 \times 34 \times 9) / (51 \times 3)$

$\Rightarrow T_2 = 10$ hrs

---

40. Answer: b

Explanation:

Let the CP of the article be Rs. x

According to the question

⇒ (x – 400) = (480 – x) × (1/3)

⇒ 3 (x – 400) = 480 – x

⇒ 3x – 1200 = 480 – x

⇒ 3x + x = 480 + 1200

⇒ 4x = 1680

⇒ x = 1680/4

⇒ x = 420

Short Trick :

With the help of the options

Let CP of the article be Rs. 420, then

⇒ (1/3) (480 – 420) = (420 – 400)

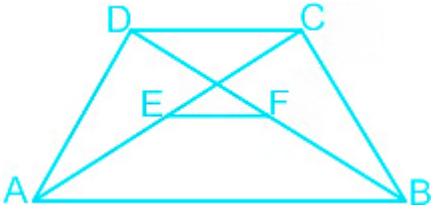
⇒ (1/3) × 60 = 20

⇒ 20 = 20 (satisfied)

---

41. Answer: a

Explanation:



Given, AB = 12 cm, DC = 7.2 cm

Let E and F are midpoint of the diagonals

As we know

⇒ EF = 1/2(AB – CD)

⇒ EF = (1/2) × (12 – 7.2)

⇒ EF = (1/2) × 4.8 = 2.4

---

42. Answer: a

Explanation:

Total number of employees in all offices = 2400

Number of employees in office B = 2400 × (18/360) = 120

Number of employees in office A = 2400 × (126/360) = 840

40% of the number of employees in office A = 840 × (40/100) = 336

Number of employees who shifted to office B = 336/2 = 168

Number of employees in office B after sifting = 168 + 120 = 288

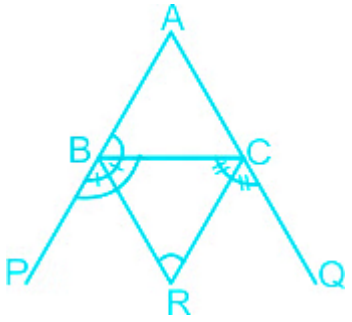
Number of employees in office C = 2400 × (54/360) = 360

Required difference between the number of employees in B and that in C = 360 – 288 = 72

---

43. Answer: a

Explanation:



Short Trick :

If the bisectors of ∠CBP and ∠BCQ meet at R, then

⇒ ∠BRC = 90° - ∠A/2

⇒ ∠BRC = 90° – 44°/2 = 90° – 22° = 68°

⇒ ∠BRC/2 = 68°/2 = 34°

Detailed Solution :

As we know,

⇒ ∠ABC + ∠CBP = 180°

⇒ ∠CBP = 180° – ∠ABC

⇒ ∠CBP/2 = 90° – ∠ABC/2

Similarly,

⇒ ∠BCR/2 = 90° – ∠ACB/2

In ΔBRC

⇒ ∠CBP/2 + ∠BCR/2 + ∠BRC = 180°

⇒ 90° – ∠ABC/2 + 90° – ∠ACB/2 + ∠BRC = 180°

⇒ 180° – ∠ABC/2 – ∠ACB/2 + ∠BRC = 180°

⇒ ∠BRC = 180° – 180° + (∠ABC + ∠ACB)/2

⇒ ∠BRC = (180° – ∠BAC)/2

⇒ ∠BRC = 90° – ∠BAC/2

⇒ ∠BRC = 90° – 44°/2

⇒ ∠BRC = 90° – 22 = 68

⇒ ∠BRC/2 = 68°/2 = 34°

---

44. Answer: b

Explanation:

Given:

Ratio of the volume of two cylinders = x : y

Ratio of radius of two cylinders = a : b

Formulae Used:

Volume of cylinder = $\pi r^2 h$

Calculation:

Let $V_1 = x$ and $V_2 = y$

$r_1 = a$ and $r_2 = b$

Let the height of two cylinders be h_1 and h_2.

According to the question

$\Rightarrow V_1/V_2 = [\pi (r_1)^2 \times h_1]/[\pi (r_2)^2 \times h_2]$

$\Rightarrow x/y = [a^2 \times h_1]/[b^2 \times h_2]$

$\Rightarrow h_1/h_2 = xb^2/ya^2$

$\Rightarrow h_1 : h_2 = xb^2 : ya^2$

---

45. Answer: a

Explanation:

Divisibility law of 8 ⇒ A number divisible by 8 if its last three digits are divisible by 8.

Divisibility law of 9 ⇒ A number is divisible by 9 if sum of its digit is divisible by 9.

Nine-digit number 389x6378y is divisible by 72, so number also divisible by 8 and 9 also.

78y divisible by 8 if y = 4 so number become 389x63784

Nine-digit number 389x63784 divisible by 9 if sum of its digit divisible by 9.

⇒ 3 + 8 + 9 + x + 6 + 3 + 7 + 8 + 4

⇒ 48 + x

If we put x = 6, the number become 54 which is divisible by 9.

So, x = 6 and y = 4

Now, $\sqrt{(6x + 7y)}$

$\Rightarrow \sqrt{(6 \times 6 + 7 \times 4)}$

$\Rightarrow \sqrt{(36 + 28)}$

$\Rightarrow \sqrt{64}$

⇒ 8

---

46. Answer: b

Explanation:

Given:

$2\sqrt{2}x^3 - 3\sqrt{3}y^3 = (\sqrt{2}x - \sqrt{3}y)(Ax^2 + By^2 + Cxy)$

Formula Used:

$(a^3 - b^3) = (a - b)(a^2 + b^2 + ab)$

Calculation:

$2\sqrt{2}x^3 - 3\sqrt{3}y^3 = (\sqrt{2}x - \sqrt{3}y)(Ax^2 + By^2 + Cxy)$

$\Rightarrow (\sqrt{2}x)^3 - (\sqrt{3}y)^3 = (\sqrt{2}x - \sqrt{3}y)(Ax^2 + By^2 + Cxy)$

$\Rightarrow (\sqrt{2}x - \sqrt{3}y)(2x^2 + 3y^2 + \sqrt{6}xy) = (\sqrt{2}x - \sqrt{3}y)(Ax^2 + By^2 + Cxy)$

$\Rightarrow (2x^2 + 3y^2 + \sqrt{6}xy) = (Ax^2 + By^2 + Cxy)$

On comparing

$A = 2, B = 3$ and $C = \sqrt{6}$

$(A^2 + B^2 - C^2) = 2^2 + 3^2 - (\sqrt{6})^2$

$\Rightarrow 4 + 9 - 6$

$\Rightarrow 7$

∴ The value of $A^2 + B^2 - C^2$ is 7.

---

47. Answer: b

Explanation:

$\Rightarrow \sqrt{86 - 60\sqrt{2}} = a - b\sqrt{2}$

⇒ $\sqrt{[6^2 + (5\sqrt{2})^2 - 2 \times 6 \times 5\sqrt{2}]} = a - b\sqrt{2}$

⇒ $\sqrt{(5\sqrt{2} - 6)^2} = a - b\sqrt{2}$

⇒ $5\sqrt{2} - 6 = a - b\sqrt{2}$

On comparing

a = -6 and b = -5

⇒ $\sqrt{(a^2 + b^2)}$

⇒ $\sqrt{(5^2 + 6^2)}$

⇒ $\sqrt{(25 + 36)}$

⇒ $\sqrt{61}$

⇒ 7.8

---

48. Answer: d

Explanation:

Efficiency ratio A to B = 3 : 7

Total work = $(3 + 7) \times 10\frac{1}{2} = 10 \times (21/2) = 105$

Work done by both in 8 days = $(3 + 7) \times 8 = 10 \times 8 = 80$

Remaining work = 105 – 80 = 25

60% of the remaining work = $25 \times (60/100) = 15$

60% of the remaining work A will complete in = 15/3 = 5 days

---

49. Answer: b

Explanation:

Let the speed of the boat be x km/hr and speed of the stream be y km/hr.

According to the question

⇒ x + y = 50/2

⇒ x + y = 25 ---(1)

⇒ x – y = 28/4

⇒ x – y = 7 ---(2)

Adding equation (1) and equation (2), then

x = 16 km/hr and y = 9 km/hr

Speed of the boat in still water = 16 km/hr

Taken time to row 44.8 km distance in still water = 44.8/16 = 2.8 hr

---

50. Answer: b

Explanation:

⇒ If equation x – 7y = (-42) intersects the y-axis at P(α, β), then x = 0,

⇒ 0 – 7y = (-42)

⇒ y = 42/7 = 6

⇒ α = 0 and β = 6

If equation 6x + y – 15 = 0, interests x-axis at Q(γ, δ), then y = 0.

⇒ 6x + 0 = 15

⇒ x = 15/6 = 5/2

$\Rightarrow \gamma = 5/2$ and $\delta = 0$

Now, $(\alpha + \beta + \gamma + \delta)$

$\Rightarrow 0 + 6 + 5/2 + 0$

$\Rightarrow 17/2$

---

51. Answer: d

Explanation:

$(a + b) : (b + c) : (c + a) = 7k : 6k : 5k$

$\Rightarrow a + b + b + c + c + a = 7k + 6k + 5k$

$\Rightarrow 2(a + b + c) = 18k$

$\Rightarrow (a + b + c) = 9k$

$\Rightarrow c = 9k - 7k = 2k$

$\Rightarrow a = 9k - 6k = 3k$

$\Rightarrow b = 9k - 5k = 4k$

$\Rightarrow 1/a : 1/b : 1/c = 1/3k : 1/4k : 1/2k$

$\Rightarrow 12/3k : 12/4k : 12/2k$

$\Rightarrow 4 : 3 : 6$

---

52. Answer: c

Explanation:

Short Trick :

As we know,

$\Rightarrow (61)^2 = (60)^2 + (11)^2$

$\Rightarrow 3721 = 3600 + 121$

$\Rightarrow 3721 = 3721$

Now we can say triangle is a right angle triangle

As we know,

Radius of the circumscribing of right angled triangle = Hypotenuse/2 = 61/2 = 30.5

Detailed Solution :

As we know,

$s = (a + b + c)/2 = (11 + 60 + 61)/2 = 132/2 = 66$

Area of triangle $= \sqrt{[s (s - a) (s - b) (s - c)]} = \sqrt{[66 (66 - 11) (66 - 60) (66 - 61)]} = \sqrt{[66 \times 55 \times 6 \times 5]}$

$\Rightarrow \sqrt{[2 \times 3 \times 11 \times 5 \times 11 \times 2 \times 3 \times 5]}$

$\Rightarrow 2 \times 3 \times 5 \times 11$

$\Rightarrow 330$

Radius of circumscribing of triangle $R = abc/[4 \times (\text{Area of triangle})] = (11 \times 60 \times 61)/(4 \times 330) = 30.5$

---

53. Answer: d

Explanation:

Detailed Solution :

Let three years from now, the age ratio of A to B = 6x : 5x

According to the question

⇒ (6x – 4)/(5x – 4) = 4/3

⇒ 3(6x – 4) = 4(5x – 4)

⇒ 18x – 12 = 20x – 16

⇒ 20x – 18x = 16 – 12

⇒ 2x = 4

⇒ x = 2

Three years from now, age of A = 6x = 6 × 2 = 12 years

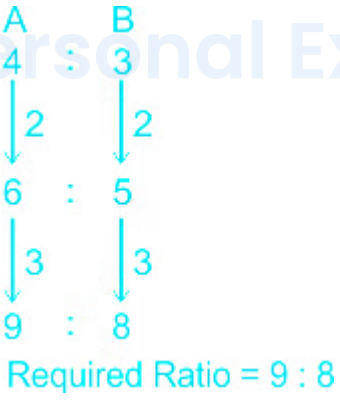
9 years from now age of A = 12 + 6 = 18

Three years from now, age of B = 5x = 5 × 2 = 10 years

9 years from now, age of B = 10 + 6 = 16

Ratio of respective ages of A and B, 9 years from now = 18 : 16 = 9 : 8

Short Trick :



⇒ 2 unit = 4 years

⇒ 1 unit = 2 years

⇒ 3 unit = 6 years

∴ Required ratio = 9 : 8

---

54. Answer: c

Explanation:

Total exports of cars of type A in 2014 to 2017 = 200 +150 + 275 + 175 = 800

Total exports of cars of type B in 2015 to 2018 = 250 + 200 + 275 + 325 = 1050

Required percentage = [(1050 - 800)/1050] × 100 = 23.8%

---

55. Answer: c

Explanation:

Detailed Solution :

Quantity of wheat bought by shopkeeper = 120

Let the price of the 120 quintals of wheat = Rs. 120

According to the question

$120 \times (1/5) \times (75/100) + 120 \times (4/5) \times (100 + x)/100 = 120 \times (125/100)$

$\Rightarrow 18 + (24/25) \times (100 + x) = 150$

$\Rightarrow (24/25)\ (100 + x) = 150 - 18 = 132$

$\Rightarrow 100 + x = 132 \times (25/24)$

$\Rightarrow 100 + x = 137.5$

$\Rightarrow x = 137.5 - 100$

$\Rightarrow x = 37.5\%$

Short trick :

Let the total quantity of wheat be 5.

⇒ 1 × (-25) + 4 × x = 5 × 25

⇒ -25 + 4x = 125

⇒ 4x = 125 + 25

⇒ 4x = 150

⇒ x = 150/4

⇒ x = 37.5%

---

56. Answer: d

Explanation:

Let the total time be 5 hours.

Speed of the person = 60km/h

Total distance = 5 × 60 = 300

He covers 60% of his journey in 2/5 th of the time

Remaining journey = 300 × (40/100) = 120 km

Remaining time = 5 × (3/5) = 3 hr

Required speed = 120/3 = 40 km/h

⭐ **Alternate Method**

The ratio of time is 2/5 : 3/5 = 2 : 3

The ratio of speed will be 3 : 2

60/x = 3/2

⇒ x = 40 km/hr.

---

57. Answer: a

Explanation:

Let 5000 divided into two parts x and y.

According to the question

$x \times 4\frac{1}{5} \times 6\frac{2}{3} = 2 \times y \times 2\frac{3}{4} \times 4$

⇒ x × (21/5) × (20/3) = 2 × y × (11/4) × 4

⇒ x/y = 22/28

⇒ x/y = 11/14

Suppose the ratio of x : y = 11k : 14k

⇒ 11k + 14k = 5000

⇒ 25k = 5000

⇒ k = 200

The difference between x and y = 14k – 11k

⇒ 3k

⇒ 3 × 200

⇒ 600

---

58. Answer: c

Explanation:

⇒ $\text{cosec}(65^\circ + \theta) - \sec(25^\circ - \theta) + \tan^2 20^\circ - \text{cosec}^2 70^\circ$

⇒ $\text{cosec}(65 + \theta) - \text{cosec}[90 - (25 - \theta) + \tan^2 20 - \sec^2(90 - 70)$

⇒ $\text{cosec}\ (65 + \theta) - \text{cosec}(65 + \theta) + \tan^2 20 - \sec^2 20 = (-1)$

∴ $\tan^2\theta - \sec^2\theta = (-1)$

⭐ **Alternate Method**

For angles A and B

$(A + B) = 90^\circ$

⇒ cosec A = sec B ----(1)

According to question

⇒ $\text{cosec}(65^\circ + \theta) - \sec(25^\circ - \theta) + \tan 2\ 20^\circ - \text{cosec}\ 2\ \ 70^\circ$

⇒ $\text{cosec}(65^\circ + \theta) - \text{cosec}(90^\circ - (25^\circ - \theta) + \sec 2\ 20^\circ - 1 - \text{cosec}\ 2\ \ 70^\circ$

Using eqn (1)

⇒ $\text{cosec}(65^\circ + \theta) - \text{cosec}(65^\circ - \theta) + \sec 2\ 20^\circ - 1 - \text{cosec}\ 2\ \ 70^\circ$

⇒ -1

---

59. **Answer: a**

Explanation:

Given:

Lateral surface area of cylinder = 352 cm 2

Formulae used:

Lateral surface area of cylinder = $2\pi rh$

Volume of the cylinder = $\pi r^2 h$

Calculation:

$\Rightarrow 2\pi rh = 352$

$\Rightarrow 2 \times (22/7) \times r \times 7 = 352$

$\Rightarrow r = 352/22 \times 2$

$\Rightarrow r = 8$ cm

Volume of the cylinder = $\pi r^2 h = 22/7 \times 8 \times 8 \times 7 = 1408$ cm^3

---

60. **Answer: b**

Explanation:

Number of person in office C = $2400 \times 54/360 = 360$

Number of males in office C = $360 \times (20/100) = 72$

Number of the females in office C = $360 - 72 = 288$

Number of person in office E = $2400 \times (72/360) = 480$

Number of females in office E = $480 \times (40/100) = 192$

Required ratio = $288 : 192 = 3 : 2$

---

61. **Answer: d**

Explanation:

Total number of employees 2400

2400 employees represent = 360°

1 employee represent = 360/2400

350 employees represent = (360/2400) × 350 = 52.5°

650 employees represent = (360/2400) × 650 = 97.5°

Only three offices C, D and E have employees between 350 and 650.

---

62. **Answer: c**

Explanation:

The average of thirteen numbers is 47

Sum of the thirteen numbers is 47 × 13 = 611

The average of first three number = 39

Sum of the first three number = 39 × 3 = 117

The average of next seven number = 49

Sum of next seven number = 49 × 7 = 343

Sum of last the three number = 611 – 117 – 343 = 151

Let 12 th number be x

11 th number = 2x

13 th number = x + 3

According to the question

⇒ 2x + x + x + 3 = 151

⇒ 4x + 3 = 151

⇒ 4x = 151 – 3

⇒ 4x = 148

⇒ x = 37

11^{th} number = 2x = 2 × 37 = 74

13^{th} number = x + 3 = 37 + 3 = 40

Average of 11^{th} and 13^{th} number = (74 + 40)/2 = 114/2 = 57

Short Trick :

Average of 13 number = 47

Average of first three numbers = 39

Deviation of first three numbers = 3 × (47 – 39) = 3 × 8 = 24

Average of next 7 numbers = 49

Deviation of next 7 numbers = 7 × (47 – 49) = 7 × (-2) = (-14)

Sum of 11^{th}, 12^{th} and 13^{th} numbers = 47 × 3 + 24 – 14 = 141 + 10 = 151

Let 12^{th} number be x

11^{th} number = 2x

13^{th} number = x + 3

According to the question

⇒ 2x + x + x + 3 = 151

⇒ 4x + 3 = 151

⇒ 4x = 151 – 3

⇒ x = 37

11 th number is two times of x and 13 th number is 3 more than x so sum of extra number = 37 + 3 = 40

So, average number = 37 + 40/2 = 37 + 20 = 57

---

63. Answer: d

Explanation:

Detailed Solution :

Let the CP of the article be x

SP of the article = x × 105/100 = 1.05x

MP of the article = 1.05x × (100/70) = 1.5x

MP of the article more than the CP of the article by = 1.5x – x = 0.50x

Required percentage = (0.50x/x) × 100 = 50%

Short trick :

⇒ 5 = x – 30 – 30x/100

⇒ 5 + 30 = x – 3x/10

⇒ 35 = 7x/10

⇒ x = 35 × (10/7)

⇒ x = 50

---

64. Answer: a

Explanation:

As we know,

$(a^3 + b^3) = (a + b)(a^2 - ab + b^2)$

$\frac{(253)^3 + (247)^3}{25.3 \times 25.3 - 624.91 + 24.7 \times 24.7} = 50 \times 10^k$

$\frac{(253)^3 + (247)^3}{25.3 \times 25.3 - 624.91 + 24.7 \times 24.7} \times \frac{100}{100} = 50 \times 10^k$

$\frac{[(253)^3 + (247)^3] \times 100}{(253)^2 - 253 \times 247 + (247)^2} = 50 \times 10^k$

Let a = 253 and B = 247

$\Rightarrow \frac{(a^3 + b^3) \times 100}{(a^2 - ab + b^2)} = 50 \times 10^k$

$\Rightarrow \frac{[(a + b)(a^2 - ab + b^2)] \times 100}{(a^2 - ab + b^2)} = 50 \times 10^k$

$\Rightarrow (a + b) \times 100 = 50 \times 10^k$

$\Rightarrow (253 + 247) \times 100$

$\Rightarrow 500 \times 100 = 50 \times 10^k$

$\Rightarrow 50 \times 10^3 = 50 \times 10^k$

$\Rightarrow k = 3$

Note: The denominator is multiplied by 100 to remove the decimal, hence numerator is also multiplied by 100

---

65. Answer: c

Explanation:

$5\sin\theta - 4\cos\theta = 0$

$\Rightarrow 5\sin\theta = 4\cos\theta$

$\Rightarrow \tan\theta = 4/5$

⇒ (5sinθ – 2cosθ)/(5sinθ + 3cosθ)

Divided by cosθ

⇒ (5tanθ – 2)/(5tanθ + 3)

⇒ [(5 × 4/5) – 2/(5 × 4/5 + 3)]

⇒ (4 – 2)/(4 + 3)

⇒ 2/7

---

66. **Answer: b**

Explanation:

Ratio of investment by A to B = 14 : 15

Ratio of profit of A to B = 2 : 5

A invested the money for 3 month

Let B invested the money for x month

According to the question

⇒ (14 × 3)/(15 × x) = 2/5

⇒ x = 14 × 5/ 2 × 5

⇒ x = 7

Short trick :

Money Ratio	14	:	15
Time Ratio	3	:	7
Profit Ratio	42	:	105
	×21		×21
	2	:	5

B invest his money for 7 months.

---

67. Answer: d

Explanation:

Suppose the ratio of the income of A to B = 5x : 7x

Suppose the expenditure of B = 3y

Expenditure of A = 3y × 2/3 = 2y

According to the question

5x – 2y = 4000 ---- (1)

7x – 3y = 5000 ---- (2)

Multiply by 3 in equation (1) and multiply by 2 in equation (2)

15x – 6y = 12000 ---- (3)

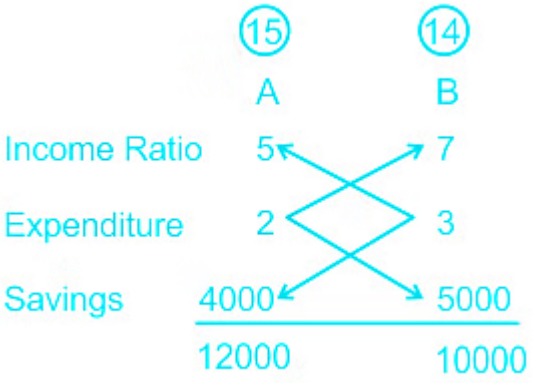
14x – 6y = 10000 ---- (4)

Subtract equation (4) from (3)

⇒ x = 2000

∴ Total income of A and B = 5x + 7x = 12x = 12 × 2000 = 24000

Short Trick :



⇒ 15 unit – 14 unit = 12000 – 10000

⇒ 1 unit = 2000

Income of A and B = (5 + 7) × 2000 = 12 × 2000 = 24000

---

68. **Answer: a**

Explanation:

Given:

Radius of Cone = 42/2 = 21 cm

Curved surface area of cone = 2310 cm^2

Formulae Used:

Curved surface area of cone = πrl

Volume of cone = (1/3) × πr 2 h

Calculations:

According to the question

⇒ πrl = 2310

⇒ (22/7) × 21 × l = 2310

⇒ l = 2310/22 × 3

⇒ l = 35

As we know,

$l^2 = r^2 + h^2$

⇒ $35^2 = 21^2 + h^2$

⇒ 1225 = 441 + h^2

⇒ $h^2 = 1225 - 441$

⇒ $h^2 = 784$

⇒ h = 28 cm

Volume of cone = (1/3) × $\pi r^2 h$

Volume of cone = (1/3) × (22/7) × 21 × 21 × 28

∴ **Volume of cone = 12936 cm^3**

69. **Answer: d**

Explanation:

Let the total quantity of goods be 100

Price of 100 goods = 100

According to the question,

Price of 35% of goods = 100 × (35/100) × (125/100) = 43.75

Price of 40% goods = 100 × (40/100) × (125/100) × (85/100) = 42.5

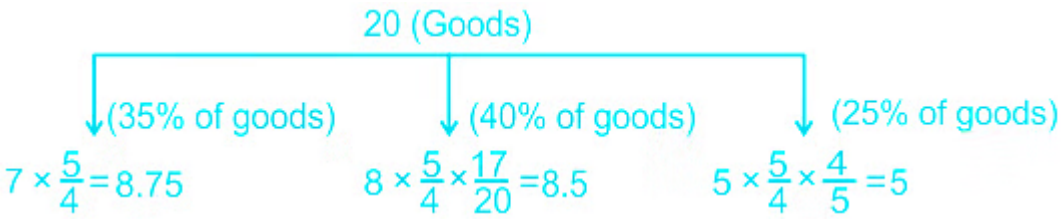
Price of 25% of goods = 100 × (25/100) × (125/100) × (80/100) = 25

Total price of 100 goods = 43.75 + 42.5 + 25 = 111.25

Profit = 111.25 – 100 = 11.25

Profit percentage = (11.25/100) × 100 = 11.25%

Short Trick :



Let the total goods 20 and cost price of 20 good be Rs. 20, then

Total selling price of 20 goods = 8.75 + 8.5 + 5 = 22.25

Total profit = 22.25 – 20 = 2.25

∴ Profit percentage = (2.25/20) × 100 = 11.25%

---

70. Answer: c

Explanation:

⇒ sin θ = √3 cos θ

⇒ sin θ/cos θ = √3

⇒ tan θ = √3

⇒ tan θ = 60°

⇒ $2\sin^2\theta + \sec^2\theta + \sin\theta\sec\theta + \text{cosec}\,\theta$

⇒ $2\sin^2 60° + \sec^2 60° + \sin 60 \sec 60 + \text{cosec}\,60$

$\Rightarrow 2 \times (\sqrt{3}/2)^2 + 2^2 + (\sqrt{3}/2) \times 2 + 2/\sqrt{3}$

$\Rightarrow 2 \times (3/4) + 4 + \sqrt{3} + 2/\sqrt{3}$

$\Rightarrow (3/2) + 4 + \sqrt{3} + (2/\sqrt{3})$

$\Rightarrow (9 + 24 + 6\sqrt{3} + 4\sqrt{3})/6$

$\Rightarrow (33 + 10\sqrt{3})/6$

---

71. Answer: b

Explanation:

$3x + y = 5$ ---- (1)

$2x - y = 5$ ---- (2)

Adding equation (1) and equation (2)

$5x = 10$

$x = 2$

From equation (1)

$\Rightarrow 3x + y = 5$

$\Rightarrow 3 \times 2 + y = 5$

$\Rightarrow 6 + y = 5$

$\Rightarrow y = 5 - 6$

$\Rightarrow y = (-1)$

So,

$\Rightarrow \alpha = 2$

⇒ β = (-1)

Now,

⇒ (3α + β)

⇒ 3 × 2 + (-1)

⇒ 6 – 1

⇒ 5

---

72. Answer: b

Explanation:

Let C complete the whole wok in x days

According to the question

1/6 + 1/8 + 1/x = 1/3

⇒ 1/x = 1/3 – 1/6 – 1/8

⇒ 1/x = (8 – 4 – 3)/24

⇒ 1/x = 1/24

So, C alone can complete the whole work in = 24 days

Efficiency ratio of A, B and C = 1/6 : 1/8 : 1/24 = 4 : 3 : 1

Let share ratio of A, B and C be 4k : 3k : k

According to the question

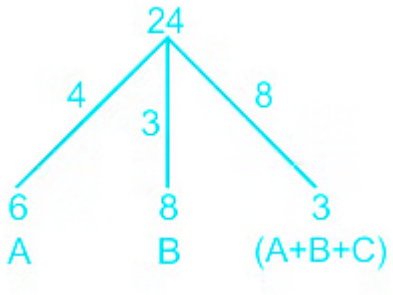
⇒ 4k + 3k + k = 1848

⇒ 8k = 1848

⇒ k = 1848/8 = 231

∴ Share of C = 231

Short Trick :



Efficiency of A = 4 unit

Efficiency of B = 3 unit

Efficiency of (A + B + C) = 8 unit

Efficiency of C = 8 – 4 – 3 = 1 unit

⇒ 8 unit = 1848

⇒ 1 unit = 231

Share of C = 231

---

73. Answer: d

Explanation:

As we know,

Area of equilateral triangle = $(\sqrt{3}/4) \times a^2$

Volume of pyramid = (1/3) × (Area of base) × height

Given, Side of equilateral triangle = 6

Volume of the pyramid whose base is an equilateral triangle = 45√3

⇒ (1/3) × (√3/4) × 6 × 6 × H = 45√3

⇒ H = (45√3 × 4 × 3)/(6 × 6 × √3)

⇒ H = 15 cm

---

74. Answer: d

Explanation:

Short Trick :

Put θ = 30,

$\sqrt{\frac{\cot\theta + \cos\theta}{\cot\theta - cos\theta}}$

$\Rightarrow \sqrt{\frac{\cot 30^\circ + \cos 30^\circ}{\cot 30^\circ - \cos 30^\circ}}$

$\Rightarrow \sqrt{\frac{\sqrt{3} + \frac{\sqrt{3}}{2}}{\sqrt{3} - \frac{\sqrt{3}}{2}}} = \sqrt{\frac{\frac{3\sqrt{3}}{2}}{\frac{\sqrt{3}}{2}}} = \sqrt{3}$

From option 4.

sec θ + tan θ

Put θ = 30,

sec 30 + tan 30

⇒ 2/√3 + 1/√3

⇒ 3/√3

⇒ √3

Detailed Solution :

$\sqrt{\frac{\cot\theta + \cos\theta}{\cot\theta - cos\ \theta}}$

Divided by cos θ

$\Rightarrow \sqrt{\frac{\text{cosec } \theta + 1}{\text{cosec}\theta - 1}} \times \sqrt{\frac{\text{cosec } \theta + 1}{\text{cosec}\theta + 1}}$

$\Rightarrow \sqrt{\frac{(\text{cosec } \theta + 1)^2}{(cosec^2\theta - 1^2)}}$

⇒ (cosec θ + 1)/{√(cosec ^{2}θ − 1)}

⇒ (cosec θ + 1)/(√cot ^{2}θ)

⇒ (cosec θ + 1)/cot θ

⇒ (cosec θ/cot θ) + (1/cot θ)

⇒ [(1/sin θ) / (cos θ/sin θ)] + tan θ

⇒ sec θ + tan θ

---

75. Answer: d

Explanation:

Solution :

Short Trick :

⇒ 16 + 14 + (16 × 14)/100

⇒ 30 + 2.24

⇒ 32.24%

⇒ 32.24 − 30 − (30 × 32.24)/100

⇒ 2.24 − (967.2/100)

⇒ 2.24 − 9.672

⇒ − 7.432%

⇒ 7% (approx)

Short Trick :

25	29
50	57
× 10	7
12500	11571

16% = 4/25, 14% = 7/50 and 30% = 3/10

Required percentage = [(12500 – 11571)/12500] × 100 = 7.432% or 7% (approx).

Detailed Solution :

Let the number be x.

Then the number after changing = x × (116/100) × (114/100) × (70/100) = 0.92568x

The number is more than after changing = x – 0.92568x = 0.07432x

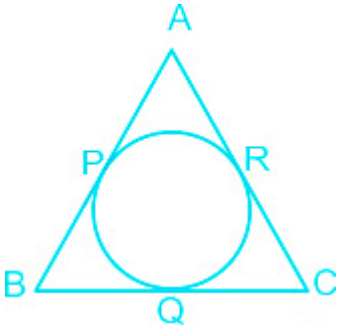
The number decreased by (in %) = (0.07432x/x) × 100 = 7.432% or 7% (approx)

---

76. **Answer: d**

Explanation:

Calculation:



AB - BC = 4 ---- (1)

AB - AC = 2 ---- (2)

Perimeter of ΔABC = 32

AB + BC + AC = 32 ----(3)

Adding equations (1), (2) and (3)

3 AB = 32 + 4 + 2

⇒ 3 AB = 38

⇒ AB = 38/3

As we know,

AR = AP [Tangents]

⇒ AB = PB + AR

⇒ AB = PB + AR = 38/3 cm

∴ The length of PB + AR is 38/3 cm.

---

77. Answer: d

Explanation:

As we know,

External radius of hollow hemisphere vessel (R) = 7 cm

Internal radius of hemisphere vessel (r) = 6 cm

Total surface area of hollow hemisphere = $2\pi R^2 + 2\pi r^2 + \pi(R^2 - r^2)$

Total surface area of hollow hemispherical vessel = $2\pi \times 7^2 + 2\pi \times 6^2 + \pi(7^2 - 6^2)$

⇒ $2 \times 49\pi + 2 \times 36\pi + 13\pi$

⇒ 98π + 72π + 13π

⇒ 183π

---

78. **Answer: d**

Explanation:

Total number of students = 75

Total number of boys = 75 × (1/3) = 25

Total number of girls = 75 - 25 = 50

Let average of score in mathematics of girls = 3x

Average score of boys in mathematics = 3x × (5/3) = 5x

The average score of all the students = 66

According to the question

5x × 25 + 3x × 50 = 75 × 66

⇒ 125x + 150x = 4950

⇒ x = 4950/275

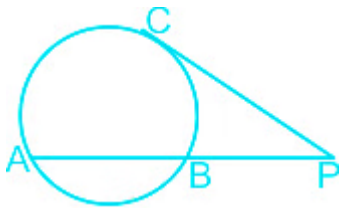
⇒ x = 18

Average score of girls in mathematics = 3x = 3 × 18 = 54

---

79. **Answer: c**

Explanation:



Given, PC = 18, BP = 15

As we know,

$PB \times PA = PC^2$

$PA \times 15 = 18^2$

$PA = (18 \times 18)/15$

$\Rightarrow PA = 21.6$

As we know,

$PA = PB + AB$

$\Rightarrow 21.6 = 15 + AB$

$\Rightarrow AB = 21.6 - 15$

$\Rightarrow AB = 6.6$

---

80. Answer: c

Explanation:

Given that,

$(\sqrt{2} + \sqrt{5} - \sqrt{3}) \times k = -12$

$$\Rightarrow k = \frac{-12}{[(\sqrt{2}+\sqrt{5})-\sqrt{3}]} \times \frac{(\sqrt{2}+\sqrt{5})+\sqrt{3}}{(\sqrt{2}+\sqrt{5})+\sqrt{3}} = \frac{-12(\sqrt{2}+\sqrt{5}+\sqrt{3})}{(\sqrt{2}+\sqrt{5})^2-(\sqrt{3})^2}$$

$$= \frac{-12(\sqrt{2}+\sqrt{5}+\sqrt{3})}{2+5+2\sqrt{10}-3} = \frac{-12(\sqrt{2}+\sqrt{5}+\sqrt{3})}{4+2\sqrt{10}}$$

$\Rightarrow k = \frac{-6(\sqrt{2}+\sqrt{5}-\sqrt{3})}{2+\sqrt{10}} \times \frac{2-\sqrt{10}}{2-\sqrt{10}}$

$\Rightarrow k = [-6(\sqrt{2} + \sqrt{5} + \sqrt{3})(2 - \sqrt{10})]/[2^2 - (\sqrt{10})^2]$

$\Rightarrow K = [-6(\sqrt{2} + \sqrt{5} + \sqrt{3})(2 - \sqrt{10})]/(4 - 10)$

$\Rightarrow k = [-6(\sqrt{2} + \sqrt{5} + \sqrt{3})(2 - \sqrt{10})]/(-6)$

$\Rightarrow k = (\sqrt{2} + \sqrt{5} + \sqrt{3})\ (2 - \sqrt{10})$

---

81. Answer: d

Explanation:

Let the radius of sphere be r cm.

Volume of sphere = $(4/3)\pi r^3$

Total surface area of sphere = $4\pi r^2$

If the radius increased by 4 cm, then new radius = (r + 4) cm

New surface area of sphere = $4\pi(r + 4)^2$

According to the question

$4\pi(r + 4)^2 - 4\pi r^2 = 464\pi$

$\Rightarrow 4\pi[(r + 4)^2 - r^2] = 464\pi$

$\Rightarrow r^2 + 16 + 8r - r^2 = 464\pi/4\pi = 116$

$\Rightarrow 8r = 116 - 16 = 100$

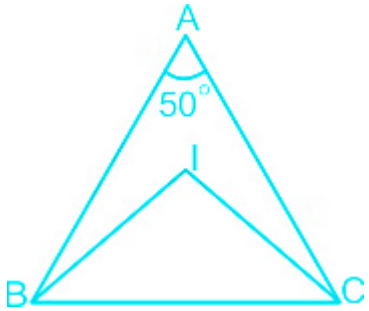
$\Rightarrow r = 100/8 = 25/2$

Volume of sphere = $(4/3)\pi r^3 = (4/3) \times (25/2)^3 \times \pi = (4/3) \times (15625/8) \times \pi = 15625\pi/6$

---

82. **Answer: b**

Explanation:



In ΔBIC

∠IBC + ∠ICB + ∠BIC = 180°

⇒ ∠ABC/2 + ∠ACB/2 + ∠BIC = 180°

⇒ ∠BIC = 180° - [(∠ABC + ∠ACB)/2]

⇒ ∠BIC = 180° - [(180° - ∠BAC)/2]

⇒ ∠BIC = 180° - 90° + ∠BAC/2

⇒ ∠BIC = 90° + 58/2

⇒ ∠BIC = 90° + 29°

⇒ ∠BIC = 119°

Short trick :

∠BIC = 90° + ∠A/2

⇒ ∠BIC = 90° + 58/2

⇒ ∠BIC = 90° + 29 = 119°

83. **Answer: c**

Explanation:

Let the CP of the article be Rs. x

SP of the article = x × (120/100) = 1.2x

His gain = Rs. 30.80

According to the question

SP - CP = Profit

⇒ 1.2x - x = 30.80

⇒ 0.2x = 30.80

⇒ x = 30.80/0.2

⇒ x = 154

CP of the article = Rs. 154

Short trick

Let the CP of the article be 5 unit

SP of the article = 6 unit

Profit = 6 - 5 = 1 unit

1 unit = 30.80

5 unit = 154

---

84. **Answer: c**

Explanation:

Pipes A, B and C can fill a tank in 30 h, 40 h and 60 h respectively.

Pipe A work for 3 hrs and pipe B work for 2 hrs alone and after that all three pipes work together and fill the tank in x hrs.

According to the question

$3/30 + 2/40 + x\,(1/30 + 1/40 + 1/60) = 1$

$\Rightarrow x[(4 + 3 + 2)/120] = 1 - 1/10 - 1/20$

$\Rightarrow 9x/120 = (20 - 2 - 1)/20$

$\Rightarrow 9x/120 = 17/20$

$\Rightarrow x = (17 \times 120) / (9 \times 20)$

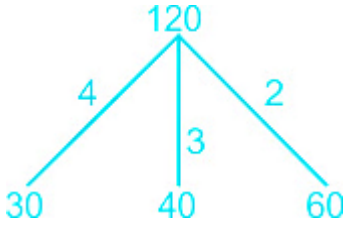
$\Rightarrow x = 34/3$

$\Rightarrow x = (11 + 1/3 \text{ hr})$

$\Rightarrow x = 11$ hours 20 min

Required Time = 10:00 am + (11 hrs 20 min) = 9:20 pm

Short trick



Pipe A work for 3 hours and pipe B work for 2 hrs, after that all three pipes work for x hrs to fill the remaining hrs, then

$4 \times 3 \times + 2 \times 3 + (4 + 3 + 2)x = 120$

$\Rightarrow 9x = 120 - 12 - 6$

$\Rightarrow x = 102/9 = 34/3$

⇒ x = (11 + 1/3) hr

⇒ x = 11 hr + 1/3 × 60 min

⇒ x = 11 hr 20 min

Required time = 10:00 am + (11 hr 20 min) = 9:20 pm

---

85. Answer: a

Explanation:

A started a business with a capital of = 54,000

Let the capital of B be x and capital of C be y. B invested his capital for 8 months and C invested his capital for 6 months, then

According to the question,

(54000 × 12)/(x × 8) = 1/4

⇒ x = (54000 × 12 × 4)/8

⇒ x = 54000 × 6

Similarly,

(54000 × 12) / (y × 6) = 1/5

⇒ y × 6 = (54000 × 12 × 5)/6

⇒ y = 54000 × 10

Difference of capital B and C = y - x = 54000 × 10 - 54000 × 6 = 54000 (10 - 6) = 216000

Short trick

		A	B	C
Money Ratio		x	y	z
Time Ratio	×	12	8	6
Profit Ratio		1	4	5

As we know,

12x = 1

⇒ x = 1/12

8y = 4

⇒ y = 4/8 = 1/2

6z = 5

⇒ z = 5/6

Money ratio of A, B and C = 1/12 : 1/2 : 5/6

Multiply by 12

12/12 : 12/2 : 60/6

⇒ 1 : 6 : 10

1 unit = 54000

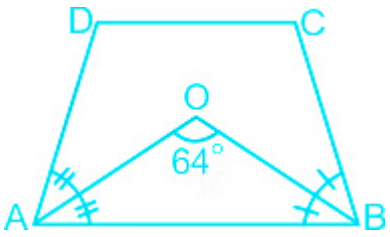
Difference of capital B and C.

⇒ 10 - 6 = 4 units = 4 × 54000 = 216000

---

86. Answer: a

Explanation:



As we know,

∠OAB + ∠OBA + ∠BOA = 180°

⇒ ∠DAB/2 + ∠CBA/2 + ∠BOA = 180°

⇒ ∠BOA = 180° - [(∠DAB + ∠CBA)/2]

⇒ ∠BOA = 180° - [(360 - ∠ADC - ∠BCD)/2]

⇒ 64° = 180° - 180° + [(∠ADC + ∠BCD)/2]

⇒ (∠ADC + ∠BCD)/2 = 64°

⇒ ∠ADC + ∠BCD = 64 × 2 = 128°

Short trick

⇒ 2∠BOA = ∠ADC + ∠BCD

⇒ 2 × 64° = ∠ADC + ∠BCD

⇒ ∠C + ∠D = 128°

---

87. Answer: a

Explanation:

Shortcut Trick

Let the CP of the article be 3x unit.

SP of the article = 3 × (2/3) = 2 unit

Original price of the article = 6 × (60/100) = 3.6 unit

Profit percentage = [(3.6 - 3)/3] × 100 = 20%

Detailed solution:

As 33.33% fraction value is 1/3 so, let's take the value of SP which is easily divisible:Let SP = 300 on which it is sold

It is sold at 1/3 of this price

∴ SP = 100 and still has loss of 33.33%

So after 66.66% loss, SP = Rs. 100

Which means CP = Rs. 150 (∵ 66.66% of 150 = 100)

Now SP = 300

It is sold at 60% of SP which is our MP = 60% of 300 = Rs. 180

So profit percentage = [(180 - 150)/150] × 100 = 20%

---

88. **Answer: d**

Explanation:

$x^8 - 1442x^4 + 1 = 0$

Divided by x^4

$\Rightarrow x^4 - 1442 + 1/x^4 = 0$

$\Rightarrow x^4 + 1/x^4 = 1442$

As we know,

$(x^2 + 1/x^2)^2 = x^4 + 1/x^4 + 2$

$\Rightarrow (x^2 + 1/x^2)^2 = 1442 + 2$

$\Rightarrow x^2 + 1/x^2 = \sqrt{1444} = 38$

Again, as we know

$\Rightarrow (x - 1/x)^2 = x^2 + 1/x^2 - 2$

$\Rightarrow (x - 1/x)^2 = 38 - 2 = 36$

$\Rightarrow x - 1/x = \sqrt{36} = 6$

Short trick

As we know,

If $x^2 + 1/x^2 = a$, then

$x - 1/x = \sqrt{(a - 2)}$

or, $x + 1/x = \sqrt{(a + 2)}$

If $x^4 + 1/x^4 = 1442$

$\Rightarrow x^2 + 1/x^2 = \sqrt{(1442 + 2)} = \sqrt{1444} = 38$

$\Rightarrow x - 1/x = \sqrt{(38 - 2)} = \sqrt{36} = 6$

---

89. Answer: b

Explanation:

$22.\bar{4} + 11.5\overline{67} - 33.5\bar{9}$

We can write

$\Rightarrow 22 + 0.\bar{4} + 11 + 0.5\overline{67} - 33 - 0.5\bar{9}$

$\Rightarrow 0.\bar{4} + 0.5\overline{67} - 0.5\bar{9}$

⇒ 4/9 + [(567 - 5)/990] - [(59 - 5)/90]

⇒ 4/9 + 562/990 - 54/90

⇒ 408/990

⇒ (412 - 4)/990

⇒ $0.4\overline{12}$

Short Trick :

$$\begin{array}{r} +\ 0.4444444 \\ +\ 0.5676767 \\ -\ 0.5999999 \\ \hline 0.4121212 \end{array}$$

$22 + 0.\bar{4} + 11 + 0.5\overline{67} - 33 - 0.5\bar{9}$

$\Rightarrow 0.\bar{4} + 0.5\overline{67} - 0.5\bar{9}$

We can write, 0.4121211.....

⇒ $0.4\overline{12}$

---

90. Answer: d

Explanation:

Calculation:

Let x is added to each of 2, 3, 30 and 35 to make numbers in proportion

(2 + x) / (3 + x) = (30 + x) / (35 + x)

Using dividend and componendo

(2 + x + 3 + x) / (2 + x - 3 - x) = (30 + x + 35 + x) / (30 + x - 35 - x)

⇒ (5 + 2x) / (-1) = (65 + 2x) / (-5)

⇒ 5(5 + 2x) = 65 + 2x

⇒ 25 + 10x = 65 + 2x

⇒ 10x - 2x = 65 - 25

⇒ 8x = 40

⇒ x = 40/8

⇒ x = 5

Mean proportional between (x + 7) and (x - 2)

√(x + 7)(x - 2) = √(5 + 7)(5 - 2) = √(12 × 3) = √36 = 6

Short trick

Mean proportional between (x + 7) and (x - 2) = √(x + 7)(x - 2)

Put the value of x = 1, 2, 3, 4, 5 ....., So that the number become a perfect square

So, put x = 5

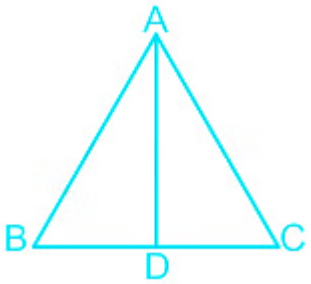
⇒ √(5 + 7)(5 - 2)

⇒ √(12 × 3) = √36 = 6

---

91. Answer: b

Explanation:



Given,

AB = 6 cm, AC = 8 cm and BC = 9 cm

Length of median AD = ?

BD = BC/2 = 9/2

As we know,

$AB^2 + AC^2 = 2(AD^2 + BD^2)$

$\Rightarrow 6^2 + 8^2 = 2[AD^2 + (9/2)^2]$

$\Rightarrow (36 + 64)/2 = AD^2 + 81/4$

$\Rightarrow 100/2 = AD^2 + 81/4$

$\Rightarrow AD^2 = 50 - 81/4 = (200 - 81)/4$

$\Rightarrow AD = \sqrt{(119/4)} = \sqrt{119}/2$

---

92. Answer: d

Explanation:

Short trick :

$\Rightarrow -25 + x - 25x/100 = 20$

$\Rightarrow x - x/4 = 20 + 25$

⇒ 3x/4 = 45

⇒ x= 45 × (4/3) = 60%

Detailed solution

Let the price of the item be x

According to the question,

⇒ x × (3/4) × (100 + x)/100 = x × (6/5)

⇒ (100 + x)/100 = (6x × 4) / (3x × 5)

⇒ (100 + x)/100 = 8/5

⇒ 100 + x = (8 × 100)/5 = 8 × 20 = 160

⇒ x = 160 - 100 = 60%

---

93. **Answer: d**

Explanation:

Short trick

$[(1 + \cos\theta)^2 + \sin^2\theta] / [(\operatorname{cosec}^2\theta - 1) \sin^2\theta]$

Put $\theta = 60°$

$\Rightarrow [(1 + 1/2)^2 + (\sqrt{3}/2)^2] / \{[(2/\sqrt{3})^2 - 1] \times (\sqrt{3}/2)^2\}$

$\Rightarrow [(3/2)^2 + 3/4] / [(4/3 - 1) \times 3/4]$

⇒ (9/4 + 3/4) / (1/3 × 3/4)

⇒ 3/(1/4)

⇒ 12

With the help of option 4

⇒ 2sec60 (1 + sec60)

⇒ 2 × 2 (1 + 2)

⇒ 4 × 3 = 12

Detailed solution :

$[(1 + \cos\theta)^2 + \sin^2\theta] / [(\text{cosec}^2\theta - 1) \sin^2\theta]$

$\Rightarrow (1 + \cos^2\theta + 2\cos\theta + \sin^2\theta) / (\cot^2\theta \times \sin^2\theta)$

$\Rightarrow (2 + 2\cos\theta)/\cos^2\theta$ $[\cot\theta = \cos\theta/\sin\theta]$

$\Rightarrow 2[1 + (1/\sec\theta)]/\cos^2\theta$

$\Rightarrow 2\sec\theta (1 + \sec\theta)$

---

94. Answer: c

Explanation:

Total exports of cars of type A = 200 + 150 + 275 + 175 + 300 = 1100

Average exports of cars of type A = 1100/5 = 220

In the year 2014, exports of the car were 200

200 × 110/100 = 220

∴ in the year 2014 the export was 10% more than the average export over the years

Note: The question was incorrect in the official paper. However, we have changed it and update it accordingly.

---

95. **Answer: c**

Explanation:

Total exports of cars of type A in 2014 and 2018 = 200 + 300 = 500

Total exports of cars of type B in 2015 and 2016 = 250 + 200 = 450

Required ratio = 500 : 450 = 10 : 9

---

96. **Answer: a**

Explanation:

Let the value of B be x, then

the value of A = x × (128/100) = 1.28x

Value of C = (x + 1.28x) × (75/100) = 2.28x × (3/4) = 1.71x

C more than A by = 1.71x - 1.28x = 0.43x

C more than A by in (%) = (0.43x/1.28x) × 100 = 33.6%

Short trick :

Let B = 100

A = 100 × (128/100) = 128

C = (100 + 128) × (75/100) = 228 × (3/4) = 171

C is more than A by [(171 - 128)/128] × 100 = 33.6%

---

97. **Answer: c**

Explanation:

Let the total number of students in school be x.

Number of girls in school = x × (4/9) = 4x/9

Number of boys in school = x - (4x/9) = 5x/9

Number of boys below 12 years = (5x/9) × (3/5) = x/3

Number of girls 12 years or above = (4x/9) × (5/12) = 5x/27

Number of girls below 12 years = (4x/9) × (7/12) = 7x/27

Total number of students below age 12 years = 7x/27 + x/3 = (7x + 9x)/27

According to the question

16x /27 = 480

⇒ x = 480 × (27/16) = 810

5/18 of the total students = 810 × (5/18) = 225

Short trick

Let the total number of students be 540.

Number of girls = 540 × (4/9) = 240

Number of boys = 540 - 240 = 300

Number of boys below 12 years = 300 × (3/5) = 180

Number of girls below 12 years = 240 × (7/12) = 140

According to the question

(180 + 140) unit = 480

320 unit = 480

1 unit = 480/320 = 3/2

540 unit = (3/2) × 540 = 810

Total students = 810

5/18 of total students = 810 × (5/18) = 225

---

98. **Answer: b**

Explanation:

Short Trick :

[(2sinA)(1 + sinA)]/(1 + sinA + cosA)

Put θ = 90°

⇒ [(2sin90°)(1 + sin90°)/(1 + sin90° + cos90°)]

⇒ (2 × 1)(1 + 1)/1 + 1

⇒ (2 × 2)/2

⇒ 2

with the help of option (2)

1 + sinA - cosA

⇒ 1 + sin90 - cos90

⇒ 1 + 1 - 0

⇒ 2

Detailed Solution :

[(2sinA)(1 + sinA)] / (1 + sinA + cosA)

⇒ [{(2sinA)(1 + sinA)} / (1 + sinA + cosA)] × [(1 + sinA - cosA) / (1 + sinA - cosA)]

$\Rightarrow [(2\sin A + 2\sin^2 A)(1 + \sin A - \cos A)] / [(1 + \sin A)^2 - \cos^2 A]$

$\Rightarrow [(2\sin A + 2\sin^2 A)(1 + \sin A - \cos A)] / (1 + \sin^2 A + 2\sin A - \cos^2 A)$

$\Rightarrow [(2\sin A + 2\sin^2 A)(1 + \sin A - \cos A)] / (\sin^2 A + 2\sin A + \sin^2 A)$

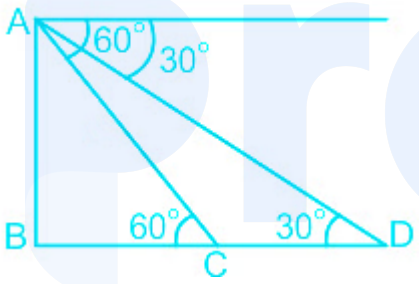
$\Rightarrow [(2\sin A + 2\sin^2 A)(1 + \sin A - \cos A)] / (2\sin^2 A + 2\sin A)$

$\Rightarrow (1 + \sin A - \cos A)$

---

99. Answer: c

Explanation:



$CD = 400\sqrt{3}$

In ΔABC

$\tan 60° = AB/BC$

$\sqrt{3} = AB/BC$

$AB = \sqrt{3}BC$ ---- (1)

In ΔABD

$\tan 30 = AB/BD$

$1/\sqrt{3} = AB/BD$

$AB = BD/\sqrt{3}$ ---- (2)

From equation (1) and equation (2)

$\sqrt{3}BC = BD/\sqrt{3}$

$BD = 3BC$

As we know,

$BD = BC + CD$

$3BC = BC + 400\sqrt{3}$

$3BC - BC = 400\sqrt{3}$

$2BC = 400\sqrt{3}$

$BC = 400\sqrt{3}/2 = 200\sqrt{3}$

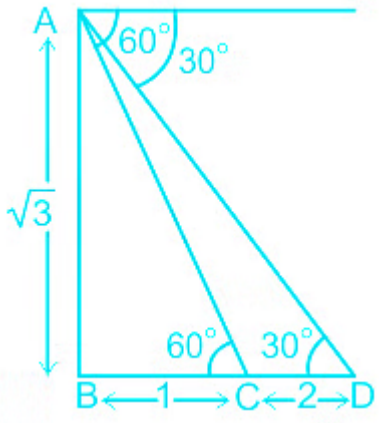
From equation (1)

$AB = \sqrt{3} \times 200\sqrt{3}$

$AB = 600$

Height of the tower = 600 m

Short trick



From the following

Ratio of AB : BC : CD = $\sqrt{3} : 1 : 2$

2 unit = $400\sqrt{3}$

1 unit = $200\sqrt{3}$

$\sqrt{3}$ unit = $200\sqrt{3} \times \sqrt{3} = 600$

Height of the tower 600 m

---

100. Answer: a

Explanation:

Number of workers whose daily wages are less than Rs.500 are = 45 + 30 = 75

Number of workers whose daily wages are more than Rs.600 are = 55 + 35 = 90

∴ Required ratio = 75 : 90 = 5 : 6