



Your Personal Exams Guide



NDA



CDS



SSC CGL



CBSE UGC NET



IAS



SSC CHSL



CTET



MPSC



AFCAT



CSIR UDC NET



IBPS PO



UP POLICE



SSC MTS



SBI PO



BPSC



UP TET



IBPS RRB



IBPS CLERK



IES



UPSC CAPF



SSC Stenogr..



RRB NTPC



SSC GD



RBI GRADE B



RBI Assistant



DSSSB

SSC CGL 2018 (Tier-II: Quant) Previous Year Paper (12-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.

Your Personal Exams Guide

Quantitative Aptitude

1. When an article is sold at its marked price, it gives a profit of 25% If a discount of 9.6% is allowed on the marked price, then the profit percent will be: (+2, -0.5)
 - a. 16.6
 - b. 15
 - c. 13
 - d. 15.4

2. The bisector of $\angle B$ in $\triangle ABC$ meets AC at D. If AB = 10 cm, BC = 11 cm and AC = 14 cm, then the length of AD is: (+2, -0.5)
 - a. $20/3$ cm
 - b. $22/3$ cm
 - c. 6 cm
 - d. 7 cm

3. If the curved surface area of a solid cylinder is one-third of its total surface area, then what is the ratio of its diameter to its height? (+2, -0.5)
 - a. 1:1
 - b. 2:1
 - c. 5:2
 - d. 4:1

4. The ratio of the incomes of A and B last year was 4 : 3, respectively. The ratios of their individual incomes of the last year and the present year are 3 : 4 and 5 : 6, respectively. If their total income for the present year is Rs. 8.04 lakh, then the income of B last year was: (+2, -0.5)

- a. Rs. 2.4 lakh
- b. Rs. 3.6 lakh
- c. Rs. 2.8 lakh
- d. Rs. 2.7 lakh

5. The speed of a boat in still water is 18 km/h and the speed of the current is 6 km/h. In how much time (in hours) will the boat travel a distance of 90 km upstream and the same distance downstream? (+2, -0.5)

- a. $9\frac{1}{2}$
- b. $11\frac{1}{4}$
- c. 10
- d. 12

6. A person sells an article at 16% below its cost price. Had he sold it for Rs. 33 more, he would have gained 14%. To gain 25%, he should sell the article for: (+2, -0.5)

- a. Rs. 135
- b. Rs. 128
- c. Rs. 137.5

d. Rs. 130.5

7. The average weight of a certain number of students in a group is 72 kg. If 10 students having an average weight of 78kg. leave and 4 students having an average weight of 80 kg join the group, the average weight of the students in the group decreases by 0.7 kg. The number of students initially in the group is: (+2, -0.5)

a. 44

b. 56

c. 54

d. 46

8. In a class, $83\frac{1}{3}\%$ of the number of students are girls and the rest are boys. If 60% of the number of boys and 80% of the number of girls are present, then what percentage of the total number of students in the class is absent? (+2, -0.5)

a. $23\frac{1}{3}\%$

b. $12\frac{1}{2}\%$

c. $22\frac{2}{3}\%$

d. $26\frac{2}{3}\%$

9. A sum lent out at simple interest amounts to Rs. 6076 in 1 year and Rs. 7504 in 3 years. The sum and the rate of interest (approx) p.a are respectively: (+2, -0.5)

a. Rs. 5,362 and 13.32%

b. Rs. 5,400 and 10%

c. Rs. 5,400 and 9%

d. Rs. 5,600 and 9%

10. A sum of Rs. x is divided among A, B and C such that the ratio of the shares of A and B is 6 : 7 and that of B and C is 3 : 2. If the difference between the shares of A and C is Rs. 540, then the value of x is: (+2, -0.5)

a. 7290

b. 7425

c. 7020

d. 7155

11. A, B and C invested their capitals in the ratio of 2 : 3 : 5. The ratio of months for which A, B and C invested is 4 : 2 : 3. If C gets a share of profit which is Rs. 1,47,000 more than that of A, then B's share of profit is: (+2, -0.5)

a. Rs. 1,05,000

b. Rs. 1,26,000

c. Rs. 1,89,000

d. Rs. 1,68,000

12. The value of $9 \times 6 \div 24 + 8 \div 2$ of $5 - 30 \div 4$ of $4 + 27 \times 5 \div 9$ is: (+2, -0.5)

a. $243/8$

b. $647/40$

c. $259/8$

d. $493/8$

13. A circle is inscribed in quadrilateral ABCD touching AB, BC, CD and AD at the points P, Q, R and S, respectively, and $\angle B = 90^\circ$. If $AD = 24$ cm, $AB = 27$ cm and $DR = 6$ cm, then what is the circumference of the circle? (+2, -0.5)

a. 12π

b. 20π

c. 18π

d. 15π

14. $\triangle ABC$ and $\triangle DBC$ are on the same base BC but on opposite sides of it. AD and BC intersect each other perpendicularly at O. If $AO = a$ cm, $DO = b$ cm and the area of $\triangle ABC = x$ cm², then what is the area (in cm²) of $\triangle DBC$? (+2, -0.5)

a. $\frac{ab}{2}x$

b. $\frac{bx}{a}$

c. $\frac{a+b}{2}x$

d. $\frac{a}{b}x$

15. Three fractions, x , y , and z , are such that $x > y > z$. When the smallest of them is divided by the greatest, the result is $9/16$, which exceeds y by 0.0625 . If $x + y + z = 1\frac{13}{24}$, then the value of $x + z$ is: (+2, -0.5)

If $x + y + z = 1\frac{13}{24}$, then the value of $x + z$ is:

- a. $7/8$
- b. $25/24$
- c. 1
- d. $7/6$

16. If $x = \frac{\sqrt{5}-\sqrt{3}}{\sqrt{5}+\sqrt{3}}$ and y is the reciprocal of x, then what is the value of $(x^3 + y^3)$? (+2, -0.5)

- a. 476
- b. 504
- c. 488
- d. 472

17. If $8x^3 - 27y^3 = (Ax + By)(Cx^2 - Dy^2 + 6xy)$, then what is the value of $(A + B + C - D)$? (+2, -0.5)

- a. 9
- b. 15
- c. -12
- d. 12

18. What is the ratio of the third proportional to 0.4 and 0.8, to the mean proportional between 13.5 and 0.24? (+2, -0.5)

- a. 5 : 4

b. 8 : 9

c. 7 : 8

d. 9 : 10

19. A, B and C start a business. A invests $33\frac{1}{3}\%$ of the total capital, B invests 25% of the remaining and C invests the rest. If the total profit at the end of a year is Rs. 1,62,000 then A's share in profit is: (+2, -0.5)

a. Rs. 81,000

b. Rs. 90,000

c. Rs. 54,000

d. Rs. 60,000

20. The point of intersection of the graphs of the equation $3x - 5y = 19$ and $3y - 7x + 1 = 0$ is $P(\alpha, \beta)$. What is the value of $(3\alpha - \beta)$? (+2, -0.5)

a. 0

b. 1

c. -1

d. -2

21. If $x^4 - 83x^2 + 1 = 0$, then a value of $x^3 - x^{-3}$ can be: (+2, -0.5)

a. 739

b. 758

c. 756

d. 737

22. If the 11-digit number $5678x43267y$ is divisible by 72, then the value of $\sqrt{(5x + 8y)}$ is (+2, -0.5)

a. 6

b. 8

c. 7

d. 4

23. A hemispherical bowl of internal diameter 36 cm is full of a liquid. This liquid is to be filled into cylindrical bottles each of radius 3 cm and height 12 cm. How many such bottles are required to empty the bowl? (+2, -0.5)

a. 27

b. 36

c. 54

d. 72

24. In a circle with centre O, AC and BD are two chords. AC and BD meet at E when produced. If AB is the diameter and $\angle AEB = 68^\circ$, then the measure of $\angle DOC$ is: (+2, -0.5)

a. 30°

b. 22°

c. 32°

d. 44°

25. Let x be the least number which when divided by 15, 18, 20 and 27, the remainder in each case is 10 and x is a multiple of 31. What least number should be added to x to make it a perfect square? (+2, -0.5)

a. 37

b. 43

c. 36

d. 39

26. To do a certain work, the ratio of the efficiencies of X and Y is 5 : 4. Working together, they can complete the same work in 10 days. Y alone starts work and leaves after 5 days. The remaining work completed by X alone in (+2, -0.5)

a. 12 days

b. 15 days

c. 14 days

d. 10 days

27. If $x = (164)^{169} + (333)^{337} - (727)^{726}$, then what is the units digit of x ? (+2, -0.5)

a. 8

b. 9

c. 7

d. 5

-
28. Pipes A and B can fill a tank in 16 hours and 24 hours, respectively, and pipe C alone can empty the full tank in x hours. All the pipes were opened together at 10:30 AM, but C was closed at 2:30 PM. If the tank was full at 8:30 PM on the same day, then what is the value of x ? (+2, -0.5)

a. 48

b. 96

c. 45

d. 64

-
29. If the price of petrol increases by 19% and Sunitha intends to spend only an additional 12% on petrol, by what percent should she reduce the quantity of petrol purchased (nearest to an integer)? (+2, -0.5)

a. 7

b. 6

c. 5

d. 8

-
30. When a two-digit number is multiplied by the sum of its digits, the product is 424. When the number obtained by interchanging its digits is multiplied by the sum of the digits, the result is 280. The sum of the digits of the given number is: (+2, -0.5)

- a. 7
 - b. 8
 - c. 9
 - d. 6
-

31. If the volume of a sphere is 4851 cm^3 , then its surface area (in cm^2) is: (+2, -0.5)

(Take $\pi = 22/7$)

- a. 1337
 - b. 1386
 - c. 2772
 - d. 1323
-

32. If $\sqrt{10 - 2\sqrt{21}} + \sqrt{8 + 2\sqrt{15}} = \sqrt{a} + \sqrt{b}$, where a and b are positive integers, then the value of $\sqrt{ab}$ is closet to: (+2, -0.5)

- a. 7.2
 - b. 6.8
 - c. 4.6
 - d. 5.9
-

33. Sujata marks an article 36% above the cost price and allows a 40% discount on the marked price. The loss percentage is: (+2, -0.5)

- a. 4
- b. 16.8
- c. 1.5
- d. 18.4

34. Two-third of the number of employees of a company are males and the rest are females. If $\frac{3}{8}$ of the male employees and $\frac{2}{5}$ of the female employees are temporary employees and the total number of permanent employees is 740, then $\frac{7}{15}$ of the total number of employees exceeds the number of temporary female employees by: (+2, -0.5)

- a. 320
- b. 308
- c. 340
- d. 400

35. If $x + \frac{1}{16x} = 3$, then the value of $16x^3 + \frac{1}{256x^3}$ is: (+2, -0.5)

- a. 441
- b. 423
- c. 414
- d. 432

36. What is the compound interest on a sum Rs. 7200 for $2\frac{2}{5}$ years at 20% p.a interest compounded yearly (nearest to an integer)? (+2, -0.5)

- a. Rs. 4,290
 - b. Rs. 4,205
 - c. Rs. 3,960
 - d. Rs. 3,997
-

37. If $x + y + z = 2$, $xy + yz + zx = -11$ and $xyz = -12$, then what is the value of $\sqrt{x^3 + y^3 + z^3 - 2}$? (+2, -0.5)

- a. 12
 - b. 9
 - c. 6
 - d. 8
-

38. The average of 33 numbers is 74. The average of the first 17 numbers is 72.8 and that of the last 17 numbers is 77.2. If the 17th number is excluded, then what will be the average of the remaining numbers (correct to one decimal place)? (+2, -0.5)

- a. 73.4
 - b. 70.8
 - c. 71.6
 - d. 72.9
-

39. The base of a right pyramid is an equilateral triangle with side 8 cm, and the height of the pyramid is $24\sqrt{3}$ cm. The volume (in cm^3) of the pyramid is: (+2, -0.5)

- a. 480
- b. 384
- c. 1152
- d. 576

40. By selling two articles for Rs. 800, a person gains the cost price of three articles. The profit percent is: (+2, -0.5)

- a. 120
- b. 125
- c. 150
- d. 140

41. A man sells his goods at a certain price at 20% profit. If the price at which he buys the goods increases by 10% and he sells them at an 8% higher price, then what will be his profit percent (correct to one decimal place)? (+2, -0.5)

- a. 17.8
- b. 23.4
- c. 22.7
- d. 21.4

42. The value of $(\tan 29^\circ \cot 61^\circ - \operatorname{cosec}^2 61^\circ) + \cot^2 54^\circ - \sec^2 36^\circ + (\sin^2 1^\circ + \sin^2 3^\circ + \sin^2 5^\circ + \dots + \sin^2 89^\circ)$ is: (+2, -0.5)

- a. 21
- b. $22\frac{1}{2}$
- c. 22
- d. $20\frac{1}{2}$

43. The graphs of the equations $2x + 3y = 11$ and $x - 2y + 12 = 0$ intersect at $P(x_1, y_1)$ and the graph of the equation $x - 2y + 12 = 0$ intersects the x-axis at $Q(x_2, y_2)$. What is the value of $(x_1 - x_2 + y_1 + y_2)$? (+2, -0.5)

- a. 15
- b. 13
- c. -11
- d. -9

44. Places A and B are 396 km apart. Train X leaves from A for B and train Y leaves from B for A at the same time on the same day on parallel tracks. Both trains meet after $5\frac{1}{2}$ hours. The speed of Y is 10 km/h more than that of X. What is the speed (in km/h) of Y? (+2, -0.5)

- a. 31
- b. 41
- c. 56

d. 54

45. Train A which was travelling at 50 km/h crosses train B travelling in opposite direction in 15 seconds. If the length of train B is three times the length of A and the speed of train B was 58 km/h, then the length of train A(in m) is: (+2, -0.5)

a. 210

b. 150

c. 112.5

d. 124.5

46. The value of $\tan^2\phi + \cot^2\phi - \sec^2\phi \operatorname{cosec}^2\phi$ is equal to: (+2, -0.5)

a. -1

b. 1

c. -2

d. 0

47. A can do 40% of a work in 12 days, whereas B can do 60% of the same work in 15 days. Both works together for 10 days. C completes the remaining work alone in 4 days. A, B and C together will complete 28% of the same work in: (+2, -0.5)

a. $2\frac{1}{2}$ days

b. 2 days

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

d. 3 days

48. The expression $\sqrt{10 + 2(\sqrt{6} - \sqrt{10} - \sqrt{15})}$ is equal to: (+2, -0.5)

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

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

c. $\sqrt{3} - \sqrt{2} - \sqrt{5}$

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

49. The sides of a triangle are 56 cm, 90 cm and 106 cm. The circumference of its circumcircle is: (+2, -0.5)

a. 112π

b. 108π

c. 106π

d. 109π

50. The number of factors of 3600 is: (+2, -0.5)

a. 45

b. 44

c. 43

d. 42

51. If $\frac{1 + \sin \phi}{1 - \sin \phi} = \frac{p^2}{q^2}$, then $\sec \phi$ is equal to: (+2, -0.5)

- a. $\frac{p^2 q^2}{p^2 + q^2}$
- b. $\frac{1}{2} \left(\frac{q}{p} + \frac{p}{q} \right)$
- c. $\frac{1}{p^2} + \frac{1}{q^2}$
- d. $\frac{2p^2 q^2}{p^2 + q^2}$

52. In $\triangle ABC$, the medians AD, BE and CF meet at O. What is the ratio of the area of $\triangle ABD$ to the area of $\triangle AOE$? (+2, -0.5)

- a. 2 : 1
- b. 5 : 2
- c. 3 : 2
- d. 3 : 1

53. If 60% of a number is 120 more than 20% of the number, then 28% of the number is less than $33\frac{1}{3}\%$ of the number by: (+2, -0.5)

- a. 16
- b. 15
- c. 14
- d. 12

54. The value of $\frac{\sin(78^\circ + \theta) - \cos(12^\circ - \theta) + (\tan^2 70^\circ - \operatorname{cosec}^2 20^\circ)}{\sin 25^\circ \cos 65^\circ + \cos 25^\circ \sin 65^\circ}$ is: (+2, -0.5)

- a. -2
- b. 2
- c. -1
- d. 0

55. The base of a right prism is a triangle with sides 20 cm, 21 cm and 29 cm. If its volume is 7560 cm^3 , then its lateral surface area (in cm^2) is: (+2, -0.5)

- a. 2556
- b. 2520
- c. 2484
- d. 2448

56. The sides PQ and PR of ΔPQR are produced to point S and T, respectively. The bisectors of $\angle SQR$ and $\angle TRQ$ meet at U. If $\angle QUR = 79^\circ$ then the measure of $\angle P$ is: (+2, -0.5)

- a. 22°
- b. 49°
- c. 23°
- d. 41°

57. If $(5x + 1)^3 + (x - 3)^3 + 8(3x - 4)^3 = 6(5x + 1)(x - 3)(3x - 4)$, then x is equal to: (+2, -0.5)

- a. $2/3$
- b. $1/3$
- c. $5/6$
- d. $3/4$

58. The HCF of the two numbers is 21 and their LCM is 221 times the HCF. If one of the numbers lies between 200 and 300, then the sum of the digits of the other number is: (+2, -0.5)

- a. 15
- b. 14
- c. 17
- d. 18

59. If $3(\cot^2 \phi - \cos^2 \phi) = \cos^2 \phi$, $0^\circ < \phi < 90^\circ$, then the value of $(\tan^2 \phi + \operatorname{cosec}^2 \phi + \sin^2 \phi)$ is: (+2, -0.5)

- a. $13/3$
- b. $25/12$
- c. $61/12$
- d. $15/4$

60. In $\triangle ABC$, the perpendiculars are drawn from A, B and C to meet the opposite sides at D, E and F, respectively AD, BE and CF intersect at point p. If $\angle EPD = 116^\circ$ and the bisectors of $\angle A$ and $\angle B$ meet at Q, then the measure of $\angle AQB$ is: (+2, -0.5)

- a. 64°
- b. 96°
- c. 122°
- d. 124°

61. In $\triangle PQR$, I is the in-centre of the triangle. If $\angle QIR = 107^\circ$, then what is the measure of $\angle P$? (+2, -0.5)

- a. 73°
- b. 43°
- c. 34°
- d. 37°

62. The sum of the interior angles of a regular polygon is 1260° . What is the difference between an exterior angle and an interior angle of the polygon? (+2, -0.5)

- a. 105°
- b. 90°
- c. 100°
- d. 120°

63. In a circle, AB and DC are two chords. When AB and DC are produced, they meet at P. If PC = 5.6 cm, PB = 6.3 cm and AB = 7.7 cm, then the length of CD is: (+2, -0.5)

- a. 9 cm
- b. 9.25 cm
- c. 10.15 cm
- d. 8.35 cm

64. If $\frac{\sin^2 \phi - 3 \sin \phi + 2}{\cos^2 \phi} = 1$, where $0^\circ < \phi < 90^\circ$, then what is the value of $(\cos 2\phi + \sin 3\phi + \operatorname{cosec} 2\phi)$? (+2, -0.5)

- a. $\frac{3+4\sqrt{3}}{6}$
- b. $\frac{2+\sqrt{3}}{3}$
- c. $\frac{3+2\sqrt{3}}{3}$
- d. $\frac{9+4\sqrt{3}}{6}$

65. The value of $\sqrt{\frac{\operatorname{cosec} \phi - \cot \phi}{\operatorname{cosec} \phi + \cot \phi}} \div \frac{\sin \phi}{1 + \cos \phi}$ is equal to: (+2, -0.5)

- a. $\sec \phi$
- b. $1/2$
- c. 1
- d. $\operatorname{cosec} \phi$

66. A field roller, in the shape of a cylinder, has a diameter of 1 m and length of $1\frac{1}{4}$ m. (+2, -0.5)

If the speed at which the roller rolls is 14 revolutions per minute, then the maximum area (in m^2) that it can roll in 1 hour is: (Take $\pi = 22/7$)

- a. 3300
- b. 3600
- c. 3960
- d. 3560

67. A solid metallic sphere of radius 8 cm is melted and drawn into a wire of uniform cross-section. If the length of the wire is 24 m, then its radius (in mm) is: (+2, -0.5)

- a. $6\frac{2}{3}$
- b. 6
- c. $5\frac{1}{3}$
- d. 5

68. From a point exactly midway between the foot of two towers P and Q, the angles of elevation of their tops are 30° and 60° , respectively. The ratio of the height of P to that of Q is: (+2, -0.5)

- a. 1:2
- b. $1:2\sqrt{3}$

c. 1 : 3

d. $2 : 3\sqrt{3}$

69. The value of $\left(1\frac{1}{3} \div 2\frac{6}{7} \text{ of } 5\frac{3}{5}\right) \div \left(6\frac{2}{5} \div 4\frac{1}{2} \text{ of } 5\frac{1}{3}\right) \times \left(\frac{3}{4} \times 2\frac{2}{3} \div \frac{5}{9} \text{ of } 1\frac{1}{5}\right) = 1 + k$, where k lies between: (+2, -0.5)

a. - 0.08 and - 0.07

b. - 0.07 and - 0.06

c. - 0.05 and - 0.04

d. - 0.06 and - 0.05

70. In $\triangle ABC$, $AB = AC$ and D is a point on BC. If $BD = 5$ cm, $AB = 12$ cm and $AD = 8$ cm, then the length of CD is: (+2, -0.5)

a. 14 cm

b. 16.2 cm

c. 16 cm

d. 14.8 cm

71. A cylindrical vessel of radius 3.5 m is full of water. If 15400 litres of water is taken out from it, then the drop in the water level in the vessel will be: (+2, -0.5)

a. 40 cm

b. 60 cm

c. 72 cm

d. 35 cm

72. A man starts from his house and travelling at 30 km/h, he reaches his office (+2, -0.5)
late by 10 minutes, and travelling at 24 km/h, he reaches his office late by
18 minutes. The distance (in km) from his house to his office is:

a. 18

b. 20

c. 12

d. 16

73. If the diameter of the base of a right circular cylinder is reduced by $33\frac{1}{3}\%$ (+2, -0.5)
and its height is doubled, then the volume of the cylinder will:

a. remain unchanged

b. increase by $1\frac{1}{9}\%$

c. decrease by $11\frac{1}{9}\%$

d. increase by $11\frac{1}{9}\%$

74. A sum amounts to Rs. 14,395.20 at 9.25% p.a. simple interest in 5.4 years. (+2, -0.5)
What will be the simple interest on the same sum at 8.6% p.a. in 4.5 years?

a. Rs. 3,715.20

b. Rs. 3,627

c. Rs. 3,672

d. Rs. 3,797.76

75. A solid cube is cut into three cuboids of same volumes. What is the ratio of the surface area of the cube to the sum of the surface areas of any two of the cuboids so formed? (+2, -0.5)

a. 27 : 16

b. 9 : 10

c. 27 : 10

d. 9 : 8

76. 40 litres of 60% concentration of an acid solution is added to 35 litres of 80% concentration of the acid solution. What is the concentration of acid in the new solution? (+2, -0.5)

a. 69%

b. $69\frac{1}{3}\%$

c. 66%

d. $66\frac{2}{3}\%$

77. The value of $0.5\overline{6} - 0.7\overline{23} + 0.3\overline{9} \times 0.\overline{7}$ is: (+2, -0.5)

a. $0.\overline{154}$

b. $0.1\overline{58}$

c. $0.\overline{158}$

d. $0.1\overline{54}$

78. The area of the base of a right circular cone is 400π and its height is 15 cm. (+2, -0.5)

The curved surface area of the cone (in cm^2) is:

a. 500π

b. 480π

c. 560π

d. 450π

79. The value of $\frac{\sec\phi(1-\sin\phi)(\sin\phi+\cos\phi)(\sec\phi+\tan\phi)}{\sin\phi(1+\tan\phi)+\cos\phi(1+\cot\phi)}$ is equal to: (+2, -0.5)

a. $2\cos\phi$

b. $2\sin\phi$

c. $\sin\phi\cos\phi$

d. $\operatorname{cosec}\phi\sec\phi$

80. A right circular solid cone of radius 3.2 cm and height 7.2 cm is melted and (+2, -0.5)

recast into a right circular cylinder of height 9.6 cm. What is the diameter of the base of the cylinder?

a. 4.2 cm

b. 4.5 cm

c. 3.2 cm

d. 3.5 cm

81. 4 men and 5 women can complete a work in 15 days, whereas 9 men and 6 women can do it in 10 days. To complete the same work in 7 days, how many women should assist 4 men? (+2, -0.5)

- a. 13
- b. 14
- c. 11
- d. 12

82. $(\sec \phi - \tan \phi)^2 (1 + \sin \phi)^2 \div \sin^2 \phi = ?$ (+2, -0.5)

- a. $\cos^2 \phi$
- b. $\sec \phi$
- c. $\cos \phi$
- d. $\cot^2 \phi$

83. The value of $\left(\frac{\sin A}{1 - \cos A} + \frac{1 - \cos A}{\sin A} \right) \div \left(\frac{\cot^2 A}{1 + \operatorname{cosec} A} + 1 \right)$ is: (+2, -0.5)

- a. 2
- b. $1/2$
- c. $3/2$
- d. 1

84. Alloy A contains copper and zinc in the ratio of 4 : 3 and alloy B contains copper and zinc in the ratio 5 : 2. A and B are taken in the ratio of 5 : 6 and melted to form a new alloy. The percentage of zinc in the new alloy is closest to: (+2, -0.5)

- a. 54
- b. 36.8
- c. 34.2
- d. 35

85. The perimeters of two similar triangles ABC and PQR 78 cm and 46.8 cm. respectively. If PQ = 11.7 then the length of AB is: (+2, -0.5)

- a. 19.5 cm
- b. 20 cm
- c. 23.4 cm
- d. 24 cm

86. 5 years ago, the ratio of the age of A to that of B was 4 : 5. Five years hence, the ratio of the age of A to that of B will be 6 : 7. If, at present, C is 10 years younger than B, then what will be the ratio of the present age of A to that of C? (+2, -0.5)

- a. 4 : 3
- b. 5 : 4
- c. 5 : 3

d. 3 : 2

87. In a quadrilateral ABCD, the bisectors of $\angle C$ and $\angle D$ meet at E. If $\angle CED = 56^\circ$ (+2, -0.5) and $\angle A = 49^\circ$, then the measure of $\angle B$ is:

a. 54°

b. 67°

c. 71°

d. 63°

88. An article is sold at a certain price. If it is sold at 80% of this price, then there will be a loss of 10%. What is the percent profit when the article is sold at the original selling price? (+2, -0.5)

a. $12\frac{1}{2}$

b. $15\frac{1}{2}$

c. 12

d. 15

89. A spends 65% of his income. His income is increased by 20.1% and his expenditure is increased by 25%. His saving: (+2, -0.5)

a. Increase by 5%

b. Decrease by 11%

c. Increase by 11%

d. Decrease by 5%

90. A loan has to be returned in two equal yearly instalments each of Rs. 44,100. (+2, -0.5)
If the rate of interest is 5% p.a compounded annually, the total interest paid is:

a. Rs. 5,840

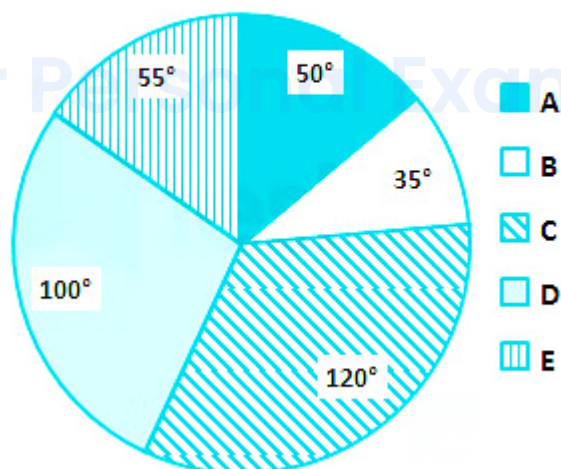
b. Rs. 6,280

c. Rs. 6,200

d. Rs. 6,000

91. **Directions:** The given pie chart shows the quantity-wise sales distribution of (+2, -0.5)
five products (A, B, C, D and E) of a company in 2016.

Quantity wise sales distribution of
five products (A, B, C, D and E)



If 320 units of product A were sold by the company, then how many units of products B and E together were sold by the company?

a. 576

b. 567

c. 640

d. 512

92. The value of $\frac{(0.545)(0.081)(0.51)(5.2)}{(0.324)^3 + (0.221)^3 - (0.545)^3}$ is: (+2, -0.5)

a. 3

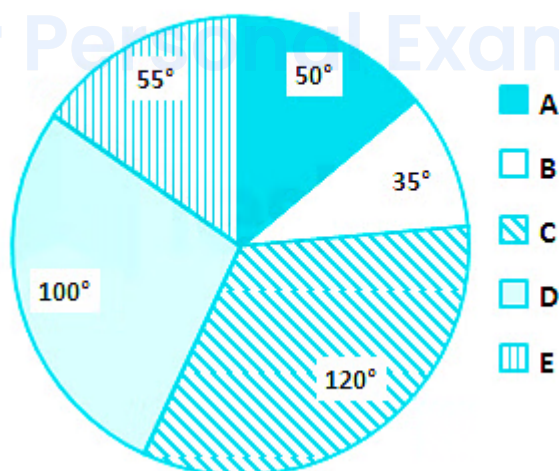
b. -3

c. 1

d. -1

93. **Directions:** The given pie chart shows the quantity-wise sales distribution of five products (A, B, C, D and E) of a company in 2016. (+2, -0.5)

Quantity wise sales distribution of five products (A, B, C, D and E)



If 1500 units of product D were sold in 2016 and the total number of units sold by the company in 2017 was 18% more than that sold in 2016, then the total units sold by the company in 2017 are:

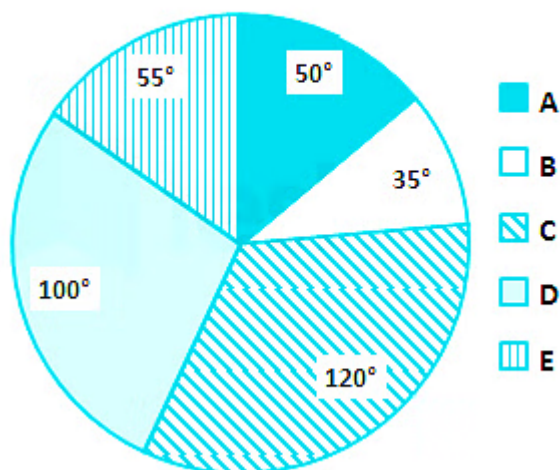
- a. 6354
- b. 6372
- c. 6390
- d. 6336

94. A is 25% more than B and B is 40% less than C. If C is 30% more than D, then by what percent is A less than D? (+2, -0.5)

- a. 1.5
- b. 4
- c. 5
- d. 2.5

95. **Directions:** The given pie chart shows the quantity-wise sales distribution of five products (A, B, C, D and E) of a company in 2016. (+2, -0.5)

Quantity wise sales distribution of five products (A, B, C, D and E)



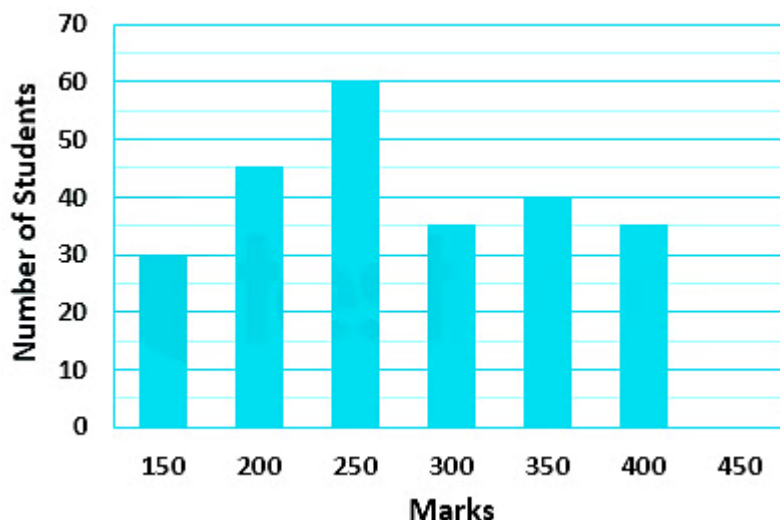
In 2016, if a total of 14616 units were sold, then the number of units of products D sold was:

- a. 4060
- b. 4096
- c. 4872
- d. 4263

96. The marked price of an article is Rs. 800 and it is sold at a discount of 19%. If there is a gain of 8%, then by what percent above the cost price was the article marked? (+2, -0.5)

- a. $33\frac{1}{3}$
- b. $36\frac{2}{3}$
- c. 27
- d. 35

97. The given bar graph shows the marks obtained by students in an examination. (+2, -0.5)

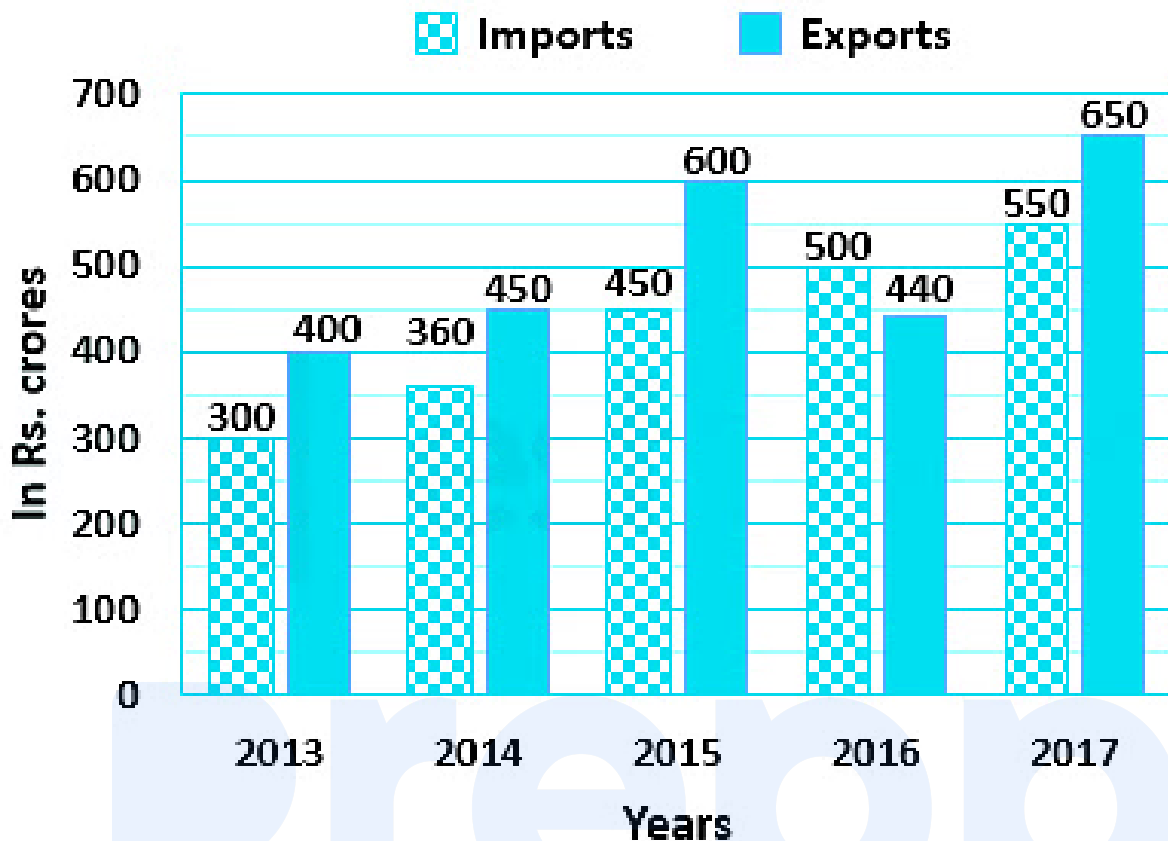


The number of students who obtained less than 300 marks is what percent more than the number of students who obtained 350 or more marks?

- a. 44.4%
- b. 80%
- c. 28%
- d. 22.7%

98. **Directions:** The given bar graph shows the imports and exports (in Rs. crores) of steel by a country from 2013 to 2017.

(+2, -0.5)

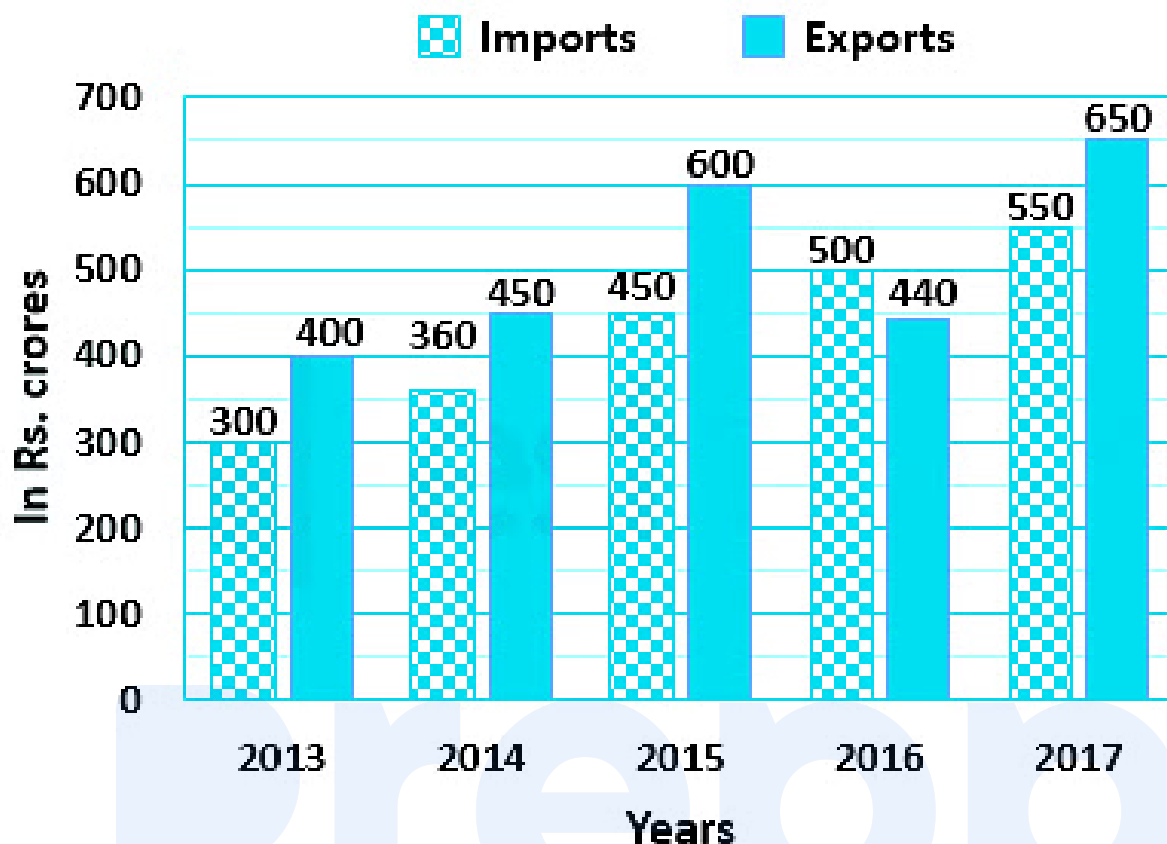


What is the ratio of the total imports in 2015 and 2017 to the total exports in 2013 and 2016?

- a. 9 : 8
- b. 25 : 21
- c. 11 : 4
- d. 9 : 11

99. **Directions:** The given bar graph shows the imports and exports (in Rs. crores) of steel by a country from 2013 to 2017.

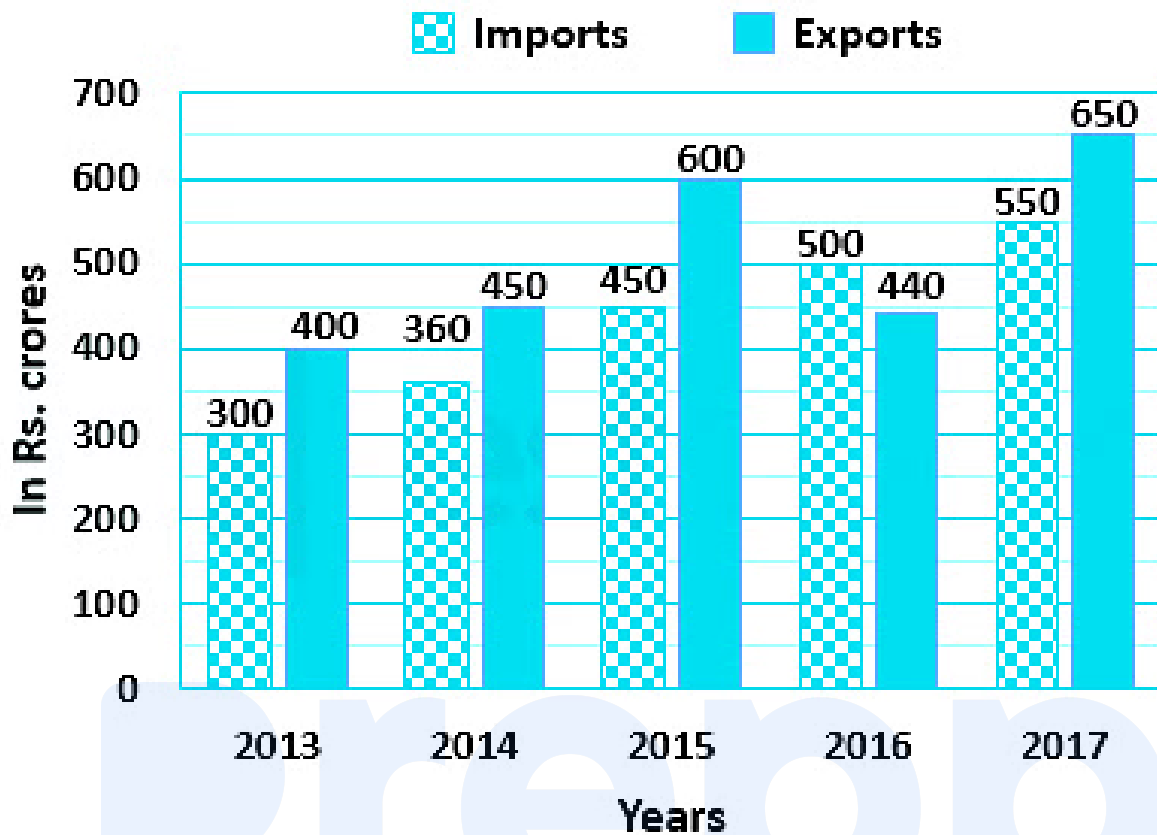
(+2, -0.5)



The total imports of steel in 2014, 2016 and 2017 is what percent less than the total exports in 2013, 2015 and 2017 (correct to one decimal place)?

- a. 14.5
- b. 16.2
- c. 15.8
- d. 13.4

100. **Directions:** The given bar graph shows the imports and exports (in Rs. crores) of steel by a country from 2013 to 2017. (+2, -0.5)



In how many years were the imports more than 80% of the average exports (per year) of the country during the given 5 years?

- a. 4
- b. 3
- c. 2
- d. 1

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Answers

1. Answer: c

Explanation:

Given:

Profit = 25%

Discount = 9.6%

Formulae Used:

Selling price = Marked price - discount on marked price

Selling price = cost price + profit on cost price

Calculations:

Let the CP of the article be x .

MP of the article = $x \times (125/100) = 1.25x$

SP of the article = $1.25 \times (100/90.4) = 1.13x$

Profit = $1.13x - x = 0.13x$

Profit percentage = $(0.13x/x) \times 100 = 13\%$

Short Trick:

Suppose the CP = 4 unit

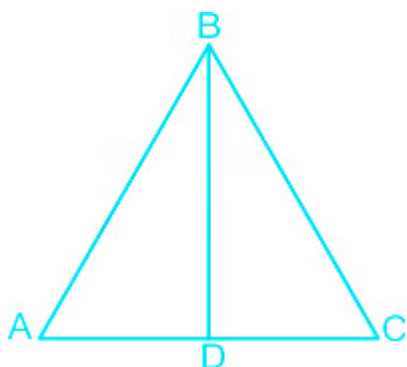
MP = 5

$\therefore$ SP = $5 \times (90.4/100) = 4.52$ unit

Profit percentage = $[(4.52 - 4)/4] \times 100 = 13\%$

2. Answer: a

Explanation:



Given, $AB = 10$ cm, $BC = 11$ cm and $AC = 14$ cm

In $\triangle ABC$, BD bisector of $\angle B$, then

$$AB/BC = AD/DC$$

$$\Rightarrow 10/11 = AD/DC$$

$$\Rightarrow AD : DC = 10x : 11x$$

$$\Rightarrow AC = AD + DC = 14 \text{ cm}$$

$$\Rightarrow 10x + 11x = 14$$

$$\Rightarrow 21x = 14$$

$$\Rightarrow x = 14/21$$

$$\Rightarrow x = 2/3$$

$$\Rightarrow AD = 10 \times (2/3)$$

$$\Rightarrow AD = 20/3 \text{ cm}$$

3. Answer: d

Explanation:

As we know,

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

Total surface area of cylinder = $2\pi r(h + r)$

According to the question

$$[2\pi rh / 2\pi r(h + r)] = 1/3$$

$$\Rightarrow 3h = h + r$$

$$\Rightarrow 3h - h = r$$

$$\Rightarrow 2h = r$$

$$\Rightarrow h/r = 1/2$$

$$\Rightarrow h/2r = 1/4$$

$$\Rightarrow 4/1 = 2r/h$$

So, ratio of diameter to height of cylinder = 4 : 1

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4. Answer: d

Explanation:

The ratio of the incomes of A and B last year was = $4x : 3x$ -----(1)

The ratio of income of A the last year to the present year is = $3x : 4x$ -----(2)

The ratio of income of B the last year to the present year is = $5x : 6x$ -----(3)

To equate last year income of A and B in the above equation we will multiply 15 in equation (1) and 20 in equation (2) and 9 in equation (3)

The ratio of the incomes of A and B last year was = $60x : 45x$ ----(4)

The ratio of income of A the last year to the present year is = $60x : 80x$ ----(5)

The ratio of income of B the last year to the present year is = $45x : 54x$ ----(6)

From equation (5) and equation (6)

The ratio of present income of A to the income of B = $80x : 54x$

According to the question

$$\Rightarrow 80x + 54x = 8.04 \text{ lakh}$$

$$\Rightarrow 134x = 8.04 \text{ lakh}$$

$$\Rightarrow x = 8.04/134$$

$$\Rightarrow x = 0.06$$

$$\text{Last year income of B was} = 45x = 45 \times 0.06 = 2.7 \text{ lakh}$$

5. Answer: b

Explanation:

Speed of boat = 18 km/h

Speed of current = 6 km/h

Speed of boat in downstream = $18 + 6 = 24$ km/hr

Speed of boat in upstream = $18 - 6 = 12$ km/hr

According to the question

$$\begin{aligned} \therefore \text{Total time to cover 90 km distance in upstream and 90 km distance in downstream} \\ = 90/24 + 90/12 = (90 + 180)/24 = 270/24 = 11\frac{1}{4} \text{ hr} \end{aligned}$$

6. Answer: c

Explanation:

Let the CP of the article be Rs. x

If article sold at 16% below its cost price, then SP of the article = $x \times (84/100) = 0.84x$

If article sold at 14% above its cost price, then SP of the article = $x \times (114/100) = 1.14x$

According to the question

$$\Rightarrow 1.14x - 0.84x = 33$$

$$\Rightarrow 0.3x = 33$$

$$\Rightarrow x = 33/0.3$$

$$\Rightarrow x = 110$$

To gain 25% on CP, then SP of the article = $110 \times (125/100) = 137.5$

Short Trick:

Let CP of the article be 100%, it should be sold at 125% to gain 25%

$$\Rightarrow 16\% + 14\% = 33$$

$$\Rightarrow 30\% = 33$$

$$\Rightarrow 125\% = (33/30) \times 125 = 137.5$$

Alternate solution:

Let CP = $100x$

According to question,

$$\Rightarrow 1.14x - 0.84x = 33$$

$$\Rightarrow 0.3x = 33$$

$$\Rightarrow x = 33/0.3$$

$$\Rightarrow x = 1.1$$

$$\therefore CP = 100x = 100 \times 1.1 = 110$$

Now,

$$125/100 \times 110 = 137.5 \text{ Rs.}$$

7. Answer: d

Explanation:

Given:

The average weight of a certain number of students in a group is 72 kg.

10 students having an average weight of 78kg. leave.

4 students having an average weight of 80 kg join the group.

The average weight of the students in the group decreases by 0.7 kg.

Formula:

Average weight = Total weight / Total number of people

Calculation:

Let the total number of students be x.

Average weight of total students = 72 kg

Sum of weight of 10 students whose average weight of 78 kg = $10 \times 78 = 780$ kg

Sum of weight of 4 students whose average weight of 80 kg = $4 \times 80 = 320$

According to the question

$$72x - 780 + 320 = (x - 10 + 4) (72 - 0.7)$$

$$\Rightarrow 72x - 460 = (x - 6) \times 71.3$$

$$\Rightarrow 72x - 460 = 71.3x - 427.8$$

$$\Rightarrow 72x - 71.3x = 460 - 427.8$$

$$\Rightarrow 0.7x = 32.2$$

$$\Rightarrow x = 32.2/0.7 = 46$$

$\therefore$ Number of students initially was 46.

Alternate Method

Average weight of some students be = 72 kg

Deviation of weight of 10 students who leave the class = $(78 - 72) \times 10 = 60$ kg

Deviation of weigh of 4 students who join the class = $(80 - 72) \times 4 = 32$ kg

Let the number of students after be x then,

$$\Rightarrow 0.7 \times x = 60 - 32$$

$$\Rightarrow x = 28/0.7 = 40$$

$\therefore$ Number of students was initially = $40 + 10 - 4 = 46$

8. Answer: a

Explanation:

Let total number of students in class be x

Number of girls = $x \times (5/6) = 5x/6$

Number of boys = $x \times (1/6) = x/6$

$$\text{Number of absent girls} = (5x/6) \times (20/100) = x/6$$

$$\text{Number of absent boys} = (x/6) \times (40/100) = x/15$$

$$\text{Total number of students who absent} = (x/6) + (x/15) = (5x + 2x)/30 = 7x/30$$

$$\text{Percentage of students who absent} = [(7x/30)/x] \times 100 = 70/3\% = 23\frac{1}{3}$$

Short Trick:

$$83\frac{1}{3}\% = 5/6$$

Let total number of students be 60

$$\text{Number of girls} = 60 \times (5/6) = 50$$

$$\text{Number of boys} = 60 - 50 = 10$$

$$\text{Number of absent Boys} = 10 \times (40/100) = 4$$

$$\text{Number of absent girls} = 50 \times (20/100) = 10$$

$$\text{Percentage of absent students} = [(4 + 10)/60] \times 100 = 23\frac{1}{3}$$

9. Answer: a

Explanation:

Given that,

Sum lent out at simple interest to 6076 in 1 year and 7504 in 3 years.

$$\text{SI of 2 years} = 7504 - 6076 = 1428$$

$$\text{SI of 1 year} = 1428/2 = 714$$

$$\text{Principal} = 6076 - 714 = 5362$$

$$\text{SI} = (P \times R \times T)/100$$

$$SI = (5362 \times r \times 1)/100$$

$$\Rightarrow 714 = (5362 \times r \times 1)/100$$

$$\Rightarrow r = 71400/5362 \approx 13.32\%$$

10. Answer: d

Explanation:

The ratio of shares of A to B = 6 : 7 -----(1)

The ratio of shares of B to C = 3 : 2 -----(2)

Multiply by 3 in equation (1) and multiply by 7 in equation (2)

The ratio of shares of A, B and C = 18 : 21 : 14

Let ratio of shares of A, B and C = 18k : 21k : 14k

According to the question

$$18k - 14k = 540$$

$$\Rightarrow 4k = 540$$

$$\Rightarrow k = 540/4 = 135$$

$$\text{Sum of shares of A, B and C} = 18k + 21k + 14k = 53k = 53 \times 135 = 7155$$

11. Answer: b

Explanation:

Ratio of capitals invested by A, B and C = 2 : 3 : 5

Ratio of time A, B and C = 4 : 2 : 3

As we know,

$$\text{Profit} = \text{Time} \times \text{Money}$$

$$\text{Ratio of profit A, B and C} = (2 \times 4) : (3 \times 2) : (5 \times 3) = 8 : 6 : 15$$

$$\text{Let the ratio of profit A, B and C} = 8k : 6k : 15K$$

According to the question

$$15k - 8k = 147000$$

$$\Rightarrow 7k = 147000$$

$$\Rightarrow k = 147000/7 = 21000$$

$$\therefore \text{Profit share of B} = 6k = 6 \times 21000 = 126000$$

Short trick:

	A	B	C
Money	2	3	5
Time	4	2	3
Profit	8	6	15

$$(15 - 8 = 7 \text{ unit}) = 147000$$

$$\Rightarrow 1 \text{ unit} = 14700/7 = 21000$$

$$\Rightarrow 6 \text{ unit} = 21000 \times 6 = 126000$$

$$\therefore \text{Profit share of B} = 126000$$

12. Answer: b

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.

$$9 \times 6 \div 24 + 8 \div 2 \text{ of } 5 - 30 \div 4 \text{ of } 4 + 27 \times 5 \div 9$$

$$\Rightarrow 9 \times (6/24) + 8 \div 10 - 30 \div 16 + 27 \times (5/9)$$

$$\Rightarrow (9/4) + (8/10) - (30/16) + 3 \times 5$$

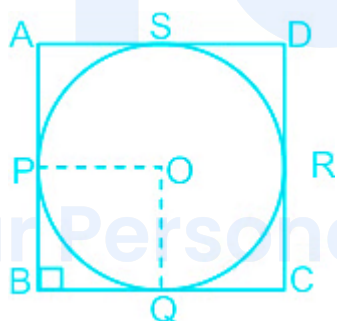
$$\Rightarrow (9/4) + (4/5) - (15/8) + 15$$

$$\Rightarrow (90 + 32 - 75 + 600)/40$$

$$\Rightarrow 647/40$$

13. Answer: c

Explanation:



Given, $AD = 24$, $AB = 27$ and $DR = 6$

In quadrilateral PBQO

$$\angle P = \angle Q = 90^\circ \text{ [tangents]}$$

$$\Rightarrow \angle B = 90^\circ \text{ [Given]}$$

$$\Rightarrow \angle P + \angle B + \angle Q + \angle O = 360^\circ$$

$$\Rightarrow 90^\circ + 90^\circ + 90^\circ + \angle O = 360^\circ$$

$$\Rightarrow \angle O = 360^\circ - 270^\circ = 90^\circ$$

Now, we can say PBQO is a square, so

$$PB = BQ = OQ = OP = 90^\circ$$

$$AD = AS + SD$$

$$AD = AS + DR \text{ [DR = SD (tangents)]}$$

$$\Rightarrow 24 = AS + 6$$

$$\Rightarrow AS = 24 - 6 = 18 \text{ cm}$$

$$AB = PB + AP$$

$$AB = PB + AS \text{ [tangents]}$$

$$\Rightarrow 27 = PB + 18$$

$$\Rightarrow PB = 27 - 18 = 9 \text{ cm}$$

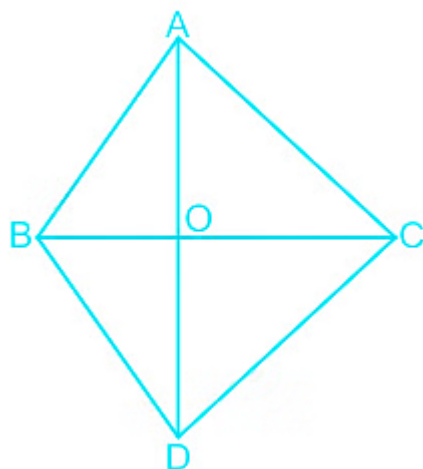
So, radius of circum-circle $r = 9 \text{ cm}$

$$\therefore \text{Circumference of the circle} = 2\pi r = 2 \times 9 \times \pi = 18\pi$$

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14. Answer: b

Explanation:



Given, $AO = a$, $OD = b$ and $\Delta ABC = x \text{ cm}^2$

As we know,

Area ratio of two triangle on same base = Ratio of corresponding sides (heights)

$$\text{ar } \Delta ABC / \text{ar } \Delta BDC = OA / OD$$

$$x / \text{ar } \Delta BDC = a / b$$

$$\text{ar } \Delta BDC = bx / a$$

15. Answer: b

Explanation:

$$\text{If } x > y > z$$

According to the question

$$z/x = 9/16$$

$$\Rightarrow y = 9/16 - 0.0625 = 9/16 - 1/16 = 1/2$$

$$\Rightarrow x + y + z = 1 \frac{13}{24} = \frac{37}{24}$$

$$\Rightarrow x + (1/2) + z = 37/24$$

$$\Rightarrow x + z = 37/24 - 1/2 = (37 - 12)/24 = 25/24$$

16. Answer: c

Explanation:

Given:

$$x = (\sqrt{5} - \sqrt{3})/(\sqrt{5} + \sqrt{3})$$

$$y = 1/x$$

Formula Used:

$$(x + y)^3 = x^3 + y^3 + 3 \times x \times y \times (x + y)$$

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

Calculation:

$$x = (\sqrt{5} - \sqrt{3})/(\sqrt{5} + \sqrt{3})$$

$$y = 1/x$$

$$\Rightarrow (\sqrt{5} + \sqrt{3})/(\sqrt{5} - \sqrt{3})$$

$$(x + y) = [\{(\sqrt{5} - \sqrt{3})/(\sqrt{5} + \sqrt{3})\} + \{(\sqrt{5} + \sqrt{3})/(\sqrt{5} - \sqrt{3})\}]$$

$$\Rightarrow (x + y) = [(\sqrt{5} - \sqrt{3})^2 + (\sqrt{5} + \sqrt{3})^2]/[(\sqrt{5} - \sqrt{3})(\sqrt{5} + \sqrt{3})]$$

$$\Rightarrow (x + y) = [5 + 3 - 2\sqrt{15} + 5 + 3 + 2\sqrt{15}]/[(\sqrt{5})^2 - (\sqrt{3})^2]$$

$$\Rightarrow (x + y) = 16/(5 - 3) = 16/2 = 8$$

$$(x + y)^3 = x^3 + y^3 + 3 \times x \times y \times (x + y)$$

$$\Rightarrow x^3 + y^3 = (x + y)^3 - 3 \times x \times (1/x) \times (x + y)$$

$$\Rightarrow 8^3 - 3 \times 8$$

$$\Rightarrow 512 - 24$$

$$\Rightarrow 488$$

$\therefore$ The value of $(x^3 + y^3)$ is 488.

17. Answer: d

Explanation:

Given:

$$8x^3 - 27y^3 = (Ax + By)(Cx^2 - Dy^2 + 6xy)$$

Formula Used:

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

Calculation:

$$8x^3 - 27y^3 = (Ax + By)(Cx^2 - Dy^2 + 6xy)$$

$$\Rightarrow (2x)^3 - (3y)^3 = (Ax + By)(Cx^2 - Dy^2 + 6xy)$$

$$\Rightarrow (2x - 3y)(4x^2 + 9y^2 + 6xy) = (Ax + By)(Cx^2 - Dy^2 + 6xy)$$

On comparing

$$A = 2, B = (-3), C = 4 \text{ and } D = (-9)$$

$$(A + B + C - D) = (2 - 3 + 4 + 9)$$

$$\Rightarrow 12$$

$\therefore$ The value of $(A + B + C - D)$ is 12.

18. Answer: b

Explanation:

Let A is the third proportional to 0.4 and 0.8, then

$$0.4 : 0.8 :: 0.8 : A$$

$$\Rightarrow 0.4/0.8 = 0.8/A$$

$$\Rightarrow A = (0.8 \times 0.8)/0.4$$

$$\Rightarrow A = 1.6$$

Let B is the mean proportional between 13.5 and 0.24, then

$$\Rightarrow 13.5 : A :: A : 0.24$$

$$\Rightarrow 13.5/A = A/0.24$$

$$\Rightarrow A^2 = 13.5 \times 0.24$$

$$\Rightarrow A = \sqrt{3.24}$$

$$\Rightarrow A = 1.8$$

$$\text{Required ratio } A : B = 1.6 : 1.8 = 8 : 9$$

19. Answer: c**Explanation:**

Let the total money be $6x$

$$\text{Money invested by A} = 6x \times (1/3) = 2x$$

$$\text{Money invested by B} = (6x - 2x) \times (1/4) = x$$

$$\text{Money invested by C} = 6x - 2x - x = 3x$$

Money ratio invested by A, B and C = $2x : x : 3x$

Profit ratio of A, B and C = $2x : x : 3x$

Total profit = 162000

$$2x + x + 3x = 162000$$

$$\Rightarrow 6x = 162000$$

$$\Rightarrow x = 162000/6 = 27000$$

$$\therefore \text{Profit share of A} = 2x = 2 \times 27000 = 54000$$

20. Answer: c

Explanation:

Given:

The point of intersection of the graphs of the equation $3x - 5y = 19$ and

$$3y - 7x + 1 = 0 \text{ is } P(\alpha, \beta)$$

Calculation:

$$3x - 5y = 19 \quad \text{-----(1)}$$

$$3y - 7x + 1 = 0$$

$$7x - 3y = 1 \quad \text{-----(2)}$$

Subtract equation (1) from equation (2) after multiply by 3 in equation (1) and multiply by 5 in equation (2)

$$\Rightarrow x = (-2)$$

Put $x = (-2)$ in equation (1)

$$\Rightarrow 3 \times (-2) - 5y = 19$$

$$\Rightarrow -6 - 5y = 19$$

$$\Rightarrow -5y = 19 + 6 = 25$$

$$\Rightarrow y = -25/5 = (-5)$$

$$\alpha = (-2) \text{ and } \beta = (-5)$$

$$\text{Now, } (3\alpha - \beta)$$

$$3 \times (-2) - (-5)$$

$$\Rightarrow (-6) + 5$$

$$\Rightarrow (-1)$$

Therefore the correct answer is -1.

21. Answer: c

Explanation:

$$x^4 - 83x^2 + 1 = 0$$

$$\text{Divided by } x^2$$

$$\Rightarrow x^2 - 83 + 1/x^2 = 0$$

$$\Rightarrow x^2 + 1/x^2 = 83$$

As we know,

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

$$\Rightarrow (x - 1/x)^2 = 83 - 2 = 81$$

$$\Rightarrow (x - 1/x) = \sqrt{81} = 9$$

Again, As we know,

$$(x - 1/x)^3 = x^3 - 1/x^3 - 3(x - 1/x)$$

$$\Rightarrow 9^3 = (x^3 - 1/x^3) - 3 \times 9$$

$$\Rightarrow (x^3 - 1/x^3) = 729 + 27 = 756$$

Short Trick:

As we know,

$$x^2 + 1/x^2 = a, \text{ then}$$

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

$$\text{If } (x - 1/x) = a, \text{ then}$$

$$(x^3 - 1/x^3) = a^3 + 3a$$

Now,

$$x^2 + 1/x^2 = 83, \text{ then}$$

$$(x - 1/x) = \sqrt{83 - 2} = \sqrt{81} = 9$$

$$\text{If } (x - 1/x) = 9, \text{ then}$$

$$\therefore (x^3 - 1/x^3) = 9^3 + 3 \times 9 = 729 + 27 = 756$$

22. Answer: a

Explanation:

11-digit number 5678x43267y is divisible by 72, so number divisible by 9 and 8 also

Divisibility law of 8 $\Rightarrow$ A number divisible by 8 if its last three-digit is divisible by 8.

Divisibility law of 9 $\Rightarrow$ A number is divisible by 9 if sum of its digit is divisible by 9.

11-digit number $5678x43267y$ is divisible by 8 if last three-digit $67y$ divisible by 8, last three-digit $67y$ divisible by 8 if $y = 2$

11-digit number $5678x432672$ is divisible by 9, if sum of its digit divisible by 9

$$5 + 6 + 7 + 8 + x + 4 + 3 + 2 + 6 + 7 + 2$$

$$\Rightarrow 50 + x$$

If we put $x = 4$ then number become 54 which is divisible by 9 so put $x = 4$.

$$\Rightarrow 50 + 4 = 54$$

$$\text{Now, } \sqrt{(5x + 8y)}$$

$$\sqrt{(5 \times 4 + 8 \times 2)}$$

$$\Rightarrow \sqrt{(20 + 16)}$$

$$\Rightarrow \sqrt{36}$$

$$\Rightarrow 6$$

23. Answer: b

Explanation:

As we know,

$$\text{Volume of hemisphere} = \left(\frac{2}{3}\right) \times \pi r^3$$

$$\text{Volume of cylinder} = \pi R^2 h$$

$$\text{Radius of hemispherical bowl } (r) = 36/2 = 18 \text{ cm}$$

$$\text{Radius of cylinder } (R) = 3 \text{ cm}$$

$$\text{Height of the cylinder } (h) = 12 \text{ cm}$$

Let the number of bottles required be n then

$$\pi R^2 h \times n = \left(\frac{2}{3}\right) \times \pi r^3$$

$$3 \times 3 \times 12 \times n = \left(\frac{2}{3}\right) \times 18 \times 18 \times 18$$

$$\Rightarrow n = (2 \times 18 \times 18 \times 18) / (3 \times 3 \times 3 \times 12)$$

$$\Rightarrow n = 36$$

So, the number of bottles required is 36.

24. Answer: d

Explanation:

Given:

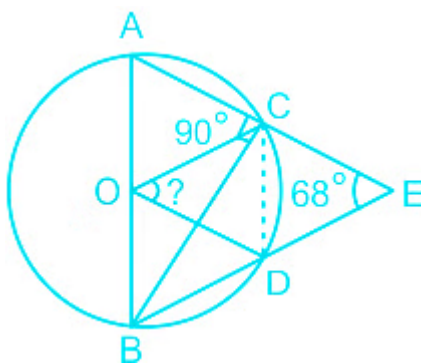
$$\angle AEB = 68^\circ$$

Concept:

The angle made in a semi circle is 90° .

The exterior angle of any triangle is equal to the sum of opposite angles of the triangle.

Calculation:



As AB is the diameter of the circle

$$\Rightarrow \angle ABC = 90^\circ$$

Now, $\angle ABC$ is the exterior angle of $\triangle BCE$

$$\Rightarrow \angle ACB = \angle BEC + \angle CBE$$

$$\Rightarrow 90^\circ = 68^\circ + \angle CBE$$

$$\Rightarrow \angle CBE = 22^\circ$$

Now, We know that

The angle made by an arc at the center is double of the angle made by the same arc at another point on the circumference in the major segment.

$$\text{So, } \angle COD = 2 \times \angle CBE$$

$$\Rightarrow \angle COD = 2 \times 22^\circ = 44^\circ$$

$\therefore$ The measurement of $\angle COD$ is 44° .

25. Answer: d

Explanation:

2	15, 18, 20, 27
2	15, 9, 10, 27
3	15, 9, 5, 27
3	5, 3, 5, 9
3	5, 1, 5, 3
5	5, 1, 5, 1
	1, 1, 1, 1

$$\begin{array}{r|l}
 & 47 \\
 \hline
 4 & 2170 \\
 +4 & 16 \\
 \hline
 87 & 570 \\
 & -609 \\
 \hline
 & -39
 \end{array}$$

LCM of 15, 18, 20 and 27 is 540

Number should be divisible by 31, let if we multiply k by in 540 and add 10 then number become divisible by 31

$$(540k + 10) / 31$$

$$(31 \times 17k) + (13k + 10) / 31$$

Put $k = 1, 2, 3, 4, \dots$ if we put $k = 4$, then number divisible by 31

$$\Rightarrow (13 \times 4 + 10) / 31$$

$$\Rightarrow 62 / 31$$

$$\Rightarrow 2$$

$$\text{So, } x = 540k + 10 = 540 \times 4 + 10 = 2160 + 10 = 2170$$

$\therefore$ If we add 39 in 2170, then number become 2209 which is square of 47.

26. Answer: c

Explanation:

Given:

Efficiencies ratio X to Y = 5 : 4

Formula used:

Total work = Total Efficiency $\times$ Total Time

Calculation

Total work = $(5 + 4) \times 10 = 90$ unit

Work done by Y in 5 days = $4 \times 5 = 20$ unit

Remaining work when Y leaves = $90 - 20 = 70$ unit

$\therefore$ Time taken to complete remaining work by X = Remaining work / Efficiency of X = $70/5 = 14$ days

27. Answer: a

Explanation:

Unit digit of $(164)^{169} + (333)^{337} - (727)^{726}$

To check unit place divide power by 4

$4^{169} + 3^{337} - 7^{726}$

$\Rightarrow 69/4 = \text{Reminder } 1$

$\Rightarrow 37/4 = \text{Reminder } 1$

$\Rightarrow 26/4 = \text{Reminder } 2$

$\Rightarrow 4^1 + 3^1 - 7^2$

$\Rightarrow 4 + 3 - 9$

$\Rightarrow 7 - 9$

or, $17 - 9$

$\Rightarrow 8$

So, the unit digit of number x is 8.

28. Answer: b

Explanation:

Pipes A and B can fill a tank in 16 hrs and 24 hrs respectively, and pipe C alone can empty the full tank in x hrs.

Pipe A and pipe B work for = 10 : 30 AM to 8 : 30 PM = 10 hrs

Pipe C work for = 10 : 30 to 2 : 30 PM = 4 hrs

According to the question

$$(10) \times (1/16 + 1/24) - (4/x) = 1$$

$$\Rightarrow (10) \times [(3 + 2)/48] - (4/x) = 1$$

$$\Rightarrow (10) \times (5/48) - (4/x) = 1$$

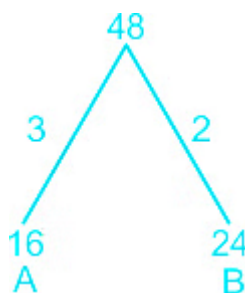
$$\Rightarrow (25/24) - (4/x) = 1$$

$$\Rightarrow 4/x = (25/24) - 1$$

$$\Rightarrow 4/x = 1/24$$

$$\Rightarrow x = 24 \times 4 = 96 \text{ hr}$$

Short trick:



Total work = 48

Efficiency ratio of A to B = 3 : 2

Let the efficiency of pipe C be k , then

Pipe A and pipe B work for = 10:30 AM to 8:30 PM = 10 hrs

Pipe C work for = 10:30 to 2:30 PM = 4 hrs

According to the question

$$10(3 + 2) - 4k = 48$$

$$\Rightarrow 10 \times 5 - 4k = 48$$

$$\Rightarrow 4k = 50 - 48$$

$$\Rightarrow k = 1/2$$

So, pipe C alone can empty the full tank in = $48 / (1/2) = 96$ hr

So, $x = 96$ hrs

29. Answer: b

Explanation:

Let the price of petrol be $100x$

After increment of 19% price of the petrol = $100x \times (119/100) = 119x$

The ratio of the price of petrol before and after increment = $100x : 119x$

If she intends to spend only an additional 12%, then price of petrol = $100x \times (112/100) = 112x$

As we know,

Consumption inversely proportional to price, so

The ratio of consumption of petrol before and after increment = $119x : 100x$

The ratio of consumption of petrol before and after intends to spend = $119x : 112x$

$$\text{Required percentage} = [(119x - 112x)/119x] \times 100 = 5.88\% \text{ or } 6\% (\text{approx})$$

30. Answer: b

Explanation:

Let the unit digit number be x and tens digit number be y , then number is $10y + x$

According to the question

$$(10y + x) \times (x + y) = 424 \quad \text{-----(1)}$$

$$(10x + y) \times (x + y) = 280 \quad \text{-----(2)}$$

Divide equation (1) by (2)

$$\Rightarrow (10y + x)/(10x + y) = 424/280$$

$$\Rightarrow (10y + x)/(10x + y) = 53/35$$

We can write

$$(10y + x)/(10x + y) = (50 + 3)/(30 + 5) \text{ (or we can find the value of } x \text{ and } y \text{ after solving in detail).}$$

$$\therefore x = 3 \text{ and } y = 5$$

Now we can say digit of the number are 5 and 3 so sum of digit = $5 + 3 = 8$

31. Answer: b

Explanation:

$$\text{Volume of sphere} = (4/3) \times \pi r^3$$

$$(4/3) \times (22/7) \times r^3 = 4851$$

$$\Rightarrow r^3 = (4851 \times 7 \times 3) / (4 \times 22) = (441 \times 3 \times 7) / 8 = (21 \times 21 \times 21) / (2 \times 2 \times 2)$$

$$\Rightarrow r = \sqrt[3]{(21 \times 21 \times 21) / (2 \times 2 \times 2)}$$

$$\Rightarrow r = 21/2$$

$$\text{Surface area of sphere} = 4 \pi r^2 = 4 \times (22/7) \times (21/2) \times (21/2) = 1386$$

32. Answer: d

Explanation:

$$\sqrt{10 - 2\sqrt{21}} + \sqrt{8 + 2\sqrt{15}} = \sqrt{a} + \sqrt{b},$$

$$\Rightarrow \sqrt{(\sqrt{7})^2 + (\sqrt{3})^2 - 2 \times \sqrt{7} \times \sqrt{3}} + \sqrt{(\sqrt{5})^2 + (\sqrt{3})^2 + 2 \times \sqrt{5} \times \sqrt{3}} = \sqrt{a} + \sqrt{b},$$

$$\Rightarrow \sqrt{[(\sqrt{7} - \sqrt{3})]^2} + \sqrt{[(\sqrt{5} + \sqrt{3})]^2} = \sqrt{a} + \sqrt{b}$$

$$\Rightarrow \sqrt{7} - \sqrt{3} + \sqrt{5} + \sqrt{3} = \sqrt{a} + \sqrt{b}$$

$$\Rightarrow \sqrt{7} + \sqrt{5} = \sqrt{a} + \sqrt{b}$$

On comparing

$$a = 7 \text{ and } b = 5$$

$$\Rightarrow \sqrt{ab}$$

$$\Rightarrow \sqrt{(7 \times 5)}$$

$$\Rightarrow \sqrt{35}$$

$$\Rightarrow 5.9 \text{ (approx)}$$

33. Answer: d

Explanation:

Let the CP of the article be Rs. x

$$\text{MP of the article} = x \times (136/100) = 1.36x$$

$$\text{SP of the article} = 1.36x \times (60/100) = 0.816x$$

$$\text{Loss} = x - 0.816x = 0.184x$$

$$\text{Loss percentage} = (0.184x/x) \times 100 = 18.4\%$$

Short Trick:

$$36 - 40 - (36 \times 40)/100$$

$$\Rightarrow -4 - 14.4$$

$$\Rightarrow -18.4\%$$

34. Answer: d

Explanation:

Calculation:

Let the total number of employees be 120 unit

$$\text{Number of males} = 120 \times (2/3) = 80 \text{ unit}$$

$$\text{Number of females} = 120 - 80 = 40$$

$$\text{Number of permanent males} = 80 \times (5/8) = 50 \text{ unit}$$

$$\text{Number of temporary females} = 40 \times (2/5) = 16 \text{ unit}$$

$$\text{Number of permanent females} = 40 - 16 = 24$$

$$\text{Total number of permanent employees} = 50 + 24 = 74$$

According to question,

$$74 \text{ unit} = 740$$

$$\Rightarrow 1 \text{ unit} = 10$$

$$\Rightarrow 120 \text{ unit} = 1200$$

The total number of employees = 1200

Number of temporary female employees = 16×10

$$\Rightarrow 160$$

$$7/15 \text{ of total no. of employees} = (7/15) \times 1200$$

$$\Rightarrow 560$$

$7/15$ of the total number of employees exceeds the number of temporary female employees = $560 - 160$

$$\Rightarrow 400$$

$\therefore 7/15$ of the total number of employees exceeds the number of temporary female employees = 400

★ Alternate Method

Let the total employees be x

$$\text{Number of males} = x \times (2/3) = 2x/3$$

$$\text{Number of females} = x \times (1/3) = x/3$$

$$\text{Number of permanent males} = (2x/3) \times (5/8) = 5x/12$$

$$\text{Number of permanent females} = (x/3) \times (3/5) = x/5$$

$$\text{Number of temporary females} = (x/3) \times (2/5) = 2x/15$$

According to the question

$$5x/12 + x/5 = 740$$

$$\Rightarrow (25x + 12x)/60 = 740$$

$$\Rightarrow 37x = 740 \times 60$$

$$\Rightarrow x = (740 \times 60)/37 = 1200$$

Total employees = 1200

$$7/15 \text{ of the total number} = 1200 \times (7/15) = 560$$

$$\text{Number of temporary females} = 2/15 \times 1200 = 160$$

$$\therefore \text{Required difference} = 560 - 160 = 400$$

35. Answer: b

Explanation:

$$x + 1/16x = 3$$

Multiply by 4

$$4x + 1/4x = 12$$

Taking cube on the both sides

$$(4x + 1/4x)^3 = 12^3$$

$$\Rightarrow 64x^3 + 1/64x^3 + 3(4x + 1/4x) = 1728$$

$$\Rightarrow 64x^3 + 1/64x^3 + 3 \times 12 = 1728$$

$$\Rightarrow 64x^3 + 1/64x^3 = 1728 - 36 = 1692$$

Divided by 4

$$16x^3 + 1/256x^3 = 423$$

36. Answer: d

Explanation:

As we know,

$$A = P \left(1 + \frac{r}{100}\right)^t$$

Given, $P = 7200$, $r = 20\%$ and $T = 2\frac{2}{5}$ or 2 years + $\frac{2}{5}$ year

Interest rate for 1st and 2nd year = 20%

Interest rate for $\left(\frac{2}{5}\right)$ year = $20 \times \left(\frac{2}{5}\right) = 8\%$

According to the question

$$A = 7200 \times \left(\frac{120}{100}\right) \times \left(\frac{120}{100}\right) \times \left(\frac{108}{100}\right)$$

$$A = 11,198$$

$$\text{Compound interest} = 11,198 - 7,200 = 3997$$

Short Trick:

$$20\% = \frac{1}{5} \text{ and } 8\% = \frac{2}{25}$$

$$\begin{array}{r} 5 \quad 6 \\ 5 \quad 6 \\ \hline 25 \quad 27 \\ \hline 625 \quad 972 \end{array}$$

$$\Rightarrow 625 \text{ unit} = 7200$$

$$\Rightarrow 1 \text{ unit} = 7200/625$$

$$\Rightarrow 972 - 625 = 347 \text{ unit} = (7200/625) \times 347 = 3997$$

37. Answer: c

Explanation:

As we know

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

$$\Rightarrow x^3 + y^3 + z^3 - 3 \times (-12) = 2[2^2 - 3 \times (-11)]$$

$$\Rightarrow x^3 + y^3 + z^3 + 36 = 2[4 + 33]$$

$$\Rightarrow x^3 + y^3 + z^3 + 36 = 2 \times 37$$

$$\Rightarrow x^3 + y^3 + z^3 = 74 - 36 = 38$$

$$\Rightarrow x^3 + y^3 + z^3 - 2 = 38 - 2 = 36$$

$$\therefore \sqrt{(x^3 + y^3 + z^3 - 2)} = \sqrt{36} = 6$$

38. Answer: d

Explanation:

Sum of 33 number whose average is 74 = $74 \times 33 = 2442$

Sum of first 17 numbers whose average is 72.8 = $72.8 \times 17 = 1237.6$

Sum of last 17 number whose average is 77.2 = $77.2 \times 17 = 1312.4$

17th number = $1312.4 + 1237.6 - 2442 = 108$

Sum of 32 numbers = $2442 - 108 = 2334$

Average of 32 numbers = $2334/32 = 72.9$

Short Trick:

Sum of 33 number whose average is 74 = $74 \times 33 = 2442$

Average of first 17 numbers = 72.8

Deviation on first 17 numbers = $74 - 72.8 = 1.2 \times 17 = 20.4$

Average of last 17 numbers = 77.2

Deviation on last 17 numbers = $(77.2 - 74) \times 17 = 3.2 \times 17 = 54.4$

17th number = $74 + 54.4 - 20.4 = 108$

Sum of 32 numbers = $2442 - 108 = 2334$

$\therefore$ Average of 32 numbers = $2334/32 = 72.9$

39. Answer: b

Explanation:

Given:

The base of a right pyramid is an equilateral triangle with side 8 cm, and the height of the pyramid is $24\sqrt{3}$ cm.

Formula used:

Volume of pyramid = $(1/3) \times \text{Area of base} \times \text{height}$

Calculation:

As we know,

The volume of any pyramid = $(1/3) \times \text{Area of base} \times \text{height}$

Volume of the pyramid whose base is an equilateral triangle = $(1/3) \times (\sqrt{3}/4) \times 8^2 \times 24\sqrt{3}$

$\Rightarrow (1/3) \times (\sqrt{3}/4) \times 8 \times 8 \times 24\sqrt{3}$

$\Rightarrow 384 \text{ cm}^3$

∴ The volume (in cm³) of the pyramid is 384.

40. Answer: c

Explanation:

Calculation:

After selling two articles a person gains the cost price of three articles.

Profit = Selling price - Cost Price

According to the question

$$\Rightarrow 2 \times SP - 2 \times CP = 3 \times CP$$

$$\Rightarrow 2 \times SP = 3CP + 2CP$$

$$\Rightarrow 2SP = 5CP$$

$$SP : CP = 5 : 2$$

Suppose CP = 2 unit

SP = 5 unit

$$\therefore \text{Profit percentage} = [(5 - 2)/2] \times 100 = 150\%$$

41. Answer: a

Explanation:

Let, initially, the cost price be Rs. 100

$$SP \text{ of the article} = 100 \times (120/100) = \text{Rs. } 120$$

$$\text{New CP of the article} = 100 \times (110/100) = \text{Rs. } 110$$

$$\text{New SP of the article} = 120 \times (108/100) = \text{Rs. } 129.6$$

$$\text{New Profit} = 129.6 - 110 = \text{Rs. } 19.6$$

$$\text{Profit percentage} = 19.6/110 \times 100 = 17.8\%$$

Note: In this question, discrepancy has been found from the side of SSC, the option has been changed accordingly to make this question correct.

42. Answer: d

Explanation:

$$\Rightarrow (\tan 29^\circ \cot 61^\circ - \operatorname{cosec}^2 61^\circ) + \cot^2 54^\circ - \sec^2 36^\circ + (\sin^2 1^\circ + \sin^2 3^\circ + \sin^2 5^\circ + \dots + \sin^2 89^\circ)$$

$$\Rightarrow [\cot(90^\circ - 29^\circ) \cot 61^\circ - \operatorname{cosec}^2 61^\circ] + \cot^2 54^\circ - \operatorname{cosec}^2(90^\circ - 36^\circ) + (\sin^2 1^\circ + \sin^2 3^\circ + \sin^2 5^\circ + \dots + \cos^2(90^\circ - 87^\circ) + \cos^2(90^\circ - 88^\circ) + \cos^2(90^\circ - 89^\circ)$$

$$\Rightarrow [\cot^2 61^\circ - \operatorname{cosec}^2 61^\circ] + [\cot^2 54^\circ - \operatorname{cosec}^2 54^\circ] + [\sin^2 1^\circ + \cos^2 1^\circ + \sin^2 2^\circ + \cos^2 2^\circ + \dots + \sin^2 43^\circ + \cos^2 43^\circ + \sin^2 45^\circ]$$

$$\Rightarrow -1 - 1 + 22 + (1/\sqrt{2})^2$$

$$\Rightarrow -2 + 22 + (1/2)$$

$$\Rightarrow 20\frac{1}{2}$$

Short Trick:

$$\Rightarrow (\sin^2 1^\circ + \sin^2 3^\circ + \sin^2 5^\circ + \dots + \sin^2 89^\circ)$$

In this type of question find how many terms are there, let the number of terms are n, then answer will be $n/2$

$$\text{As we know, in this series there are 45 terms so we can say the answer will be} = 45/2 = 22\frac{1}{2}$$

$$\Rightarrow [\cot^2 61^\circ - \operatorname{cosec}^2 61^\circ] + [\cot^2 54^\circ - \operatorname{cosec}^2 54^\circ] + [\sin^2 1^\circ + \cos^2 1^\circ + \sin^2 3^\circ + \cos^2 3^\circ + \dots + \sin^2 43^\circ + \cos^2 43^\circ + \sin^2 45^\circ]$$

$$\Rightarrow -1 - 1 + 22 + 1/2$$

$$\Rightarrow 20\frac{1}{2}$$

43. Answer: a

Explanation:

$$2x + 3y = 11 \quad \text{-----(1)}$$

$$x - 2y = (-12) \quad \text{-----(2)}$$

Multiply by 2 in equation (2) and after that subtract equation (2) from equation (1)

$$7y = 35$$

$$\Rightarrow y = 5$$

From equation (1)

$$2x + 3 \times 5 = 11$$

$$\Rightarrow 2x = 11 - 15$$

$$\Rightarrow 2x = (-4)$$

$$\Rightarrow x = (-2)$$

$$\text{So, } x_1 = (-2) \text{ and } y_1 = 5$$

If equation $x - 2y = (-12)$ intersects the x-axis at $P(x_2, y_2)$, then $y = 0$,

$$x - 0 = (-12)$$

$$\Rightarrow x = (-12)$$

$$\Rightarrow x_2 = (-12) \text{ and } y_2 = 0$$

$$\text{Now, } (x_1 - x_2 + y_1 + y_2)$$

$$\Rightarrow -2 - (-12) + 5 + 0$$

$$\Rightarrow -2 + 12 + 5$$

$\Rightarrow 15$

44. Answer: b

Explanation:

Let the speed of X be a km/hr and the speed of y is $(a + 10)$ km/hr.

As we know,

Time $\times$ speed = Distance

According to the question

$$5\frac{1}{2} \times (a + a + 10) = 396$$

$$\Rightarrow (11/2) (2a + 10) = 396$$

$$\Rightarrow 2a + 10 = 396 \times (2/11) = 72$$

$$\Rightarrow 2a = 72 - 10 = 62$$

$$\Rightarrow a = 62/2 = 31$$

$$\therefore \text{Speed of } y = 31 + 10 = 41 \text{ km/hr}$$

45. Answer: c

Explanation:

Let the length of the train A be x m

Length of the train B = $3x$

Speed of the train A = 50 km/hr

Speed of the train B = 58 km/hr

Effective speed of both train = $50 + 58 = 108 \text{ km/hr}$

As we know,

Speed = Distance/Time

$$108 \times (5/18) = (3x + x)/15$$

$$\Rightarrow 30 = 4x/15$$

$$\Rightarrow x = 450/4 = 112.5 \text{ m}$$

46. Answer: c

Explanation:

As we know,

$$\sec^2 \phi - \tan^2 \phi = 1 \text{ and } \operatorname{cosec}^2 \phi - \cot^2 \phi = 1 \text{ and } \tan \phi \cot \phi = 1$$

$$\Rightarrow \tan^2 \phi + \cot^2 \phi - \sec^2 \phi \operatorname{cosec}^2 \phi$$

$$\Rightarrow \tan^2 \phi + \operatorname{cosec}^2 \phi - 1 - \sec^2 \phi \operatorname{cosec}^2 \phi$$

$$\Rightarrow \tan^2 \phi - 1 + \operatorname{cosec}^2 \phi (1 - \sec^2 \phi)$$

$$\Rightarrow \tan^2 \phi - \operatorname{cosec}^2 \phi \tan^2 \phi - 1$$

$$\Rightarrow \tan^2 \phi (1 - \operatorname{cosec}^2 \phi) - 1$$

$$\Rightarrow \tan^2 \phi (-\cot^2 \phi) - 1$$

$$\Rightarrow (-1) - 1$$

$$\Rightarrow (-2)$$

★ Shortcut Trick

Put, $\phi = 45^\circ$

$$\tan^2 45^\circ + \cot^2 45^\circ - \sec^2 45^\circ \times \operatorname{cosec}^2 45^\circ$$

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

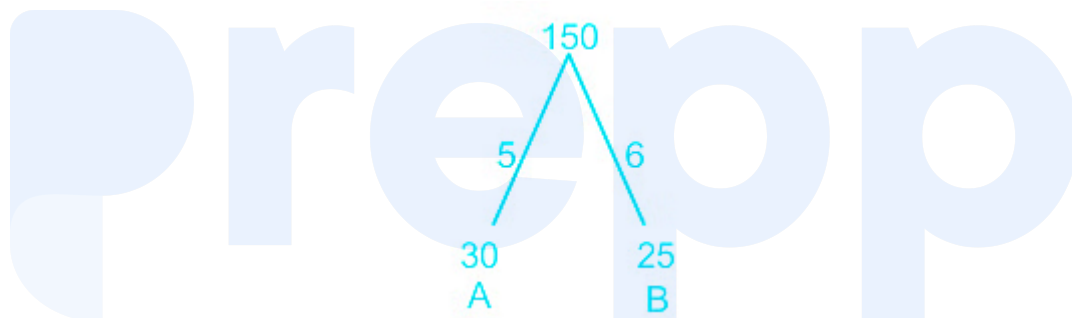
$$\Rightarrow 1 + 1 - 2 \times 2$$

$$\Rightarrow 2 - 4$$

$$\Rightarrow (-2)$$

47. Answer: b

Explanation:



A can do 40% of a work in = 12 days

A can do whole work (100%) of the work = $12 \times (100/40) = 30$ days

B can do 60% of a work in = 15 days

B can do whole work (100%) of the work = $15 \times (100/60) = 25$ days

Let total work = 150

Work done by A and B in 10 days = $(5 + 6) \times 10 = 110$

Remaining work = $150 - 110 = 40$

Let efficiency of C be x, then

$$4x = 40$$

$$\Rightarrow x = 40/4 = 10$$

Efficiency of C is 10

$$28\% \text{ of the total work} = 150 \times (28/100) = 42$$

$$28\% \text{ of the total work A, B and C will complete in} = 42/(5 + 6 + 10) = 42/21 = 2 \text{ days}$$

48. Answer: a

Explanation:

As we know,

$$(a + b - c)^2 = a^2 + b^2 + c^2 + 2(ab - bc - ca)$$

$$\sqrt{10 + 2(\sqrt{6} - \sqrt{15} - \sqrt{10})}$$

$$\Rightarrow \sqrt{(\sqrt{3})^2 + (\sqrt{2})^2 + (\sqrt{5})^2 + 2(\sqrt{3} \times \sqrt{2} - \sqrt{2} \times \sqrt{5} - \sqrt{5} \times \sqrt{3})}$$

$$\Rightarrow \sqrt{[\sqrt{3} + \sqrt{2} - \sqrt{5}]^2}$$

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

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49. Answer: c

Explanation:

As we know

Detailed Solution :

$$(\text{Hypotenuse})^2 = (\text{Base})^2 + (\text{Perpendicular})^2$$

$$\Rightarrow 106^2 = 56^2 + 90^2$$

$$\Rightarrow 11236 = 3136 + 8100$$

$$\Rightarrow 11236 = 11236$$

$$\text{Area of right-angled triangle} = (1/2) \times 90 \times 56 = 2520$$

$$\text{Radius of circumcircle} = abc / (4 \times \text{area of triangle}) = (106 \times 56 \times 90) / (4 \times 2520) = 53$$

$$\text{Circumference of circumcircle} = 2\pi r = 2 \times 53 \pi = 106\pi$$

Short trick :

Now we can say triangle is a right-angled triangle.

$$\text{Radius of circumcircle} = \text{Hypotenuse} / 2 = 106 / 2 = 53 \text{ cm}$$

$$\text{Circumference of circumcircle} = 2\pi r = 2 \times 53 \pi = 106\pi$$

50. Answer: a

Explanation:

2	3600
2	1800
2	900
2	450
3	225
3	75
5	25
5	5
	1

$$3600 = 2^4 \times 3^2 \times 5^2$$

$$\text{Total number of factors} = (4 + 1) \times (2 + 1) \times (2 + 1) = 5 \times 3 \times 3 = 45$$

51. Answer: b

Explanation:

$$\frac{1+\sin \phi}{1-\sin \phi} = \frac{p^2}{q^2}$$

Dividendo and Componendo

$$\Rightarrow \frac{1 + \sin \phi + 1 - \sin \phi}{1 + \sin \phi - 1 + \sin \phi} = \frac{p^2 + q^2}{p^2 - q^2}$$

$$\Rightarrow 1/(\sin \phi) = (p^2 + q^2)/(p^2 - q^2)$$

$$\Rightarrow \sin \phi = (p^2 - q^2)/(p^2 + q^2)$$

As we know,

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

$$\Rightarrow [(p^2 - q^2)/(p^2 + q^2)]^2 + \cos^2 \phi = 1$$

$$\Rightarrow \cos^2 \phi = 1 - [(p^2 - q^2)/(p^2 + q^2)]^2$$

$$\Rightarrow \cos^2 \phi = 1 - [(p^4 + q^4 - 2p^2q^2)/(p^4 + q^4 + 2p^2q^2)]$$

$$\Rightarrow \cos^2 \phi = [(p^4 + q^4 + 2p^2q^2) - (p^4 + q^4 - 2p^2q^2)]/(p^4 + q^4 + 2p^2q^2)$$

$$\Rightarrow \cos^2 \phi = 4p^2q^2/(p^2 + q^2)^2$$

$$\Rightarrow \cos \phi = \sqrt{4p^2q^2}/(p^2 + q^2)$$

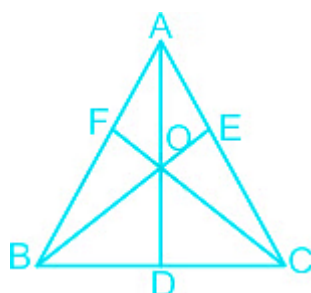
$$\Rightarrow \cos \phi = 2pq/(p^2 + q^2)$$

$$\Rightarrow \sec \phi = (p^2 + q^2)/2pq$$

$$\therefore \sec \phi = 1/2 (p/q + q/p)$$

52. Answer: d

Explanation:



As we know, median of the triangle divide the triangle in two equal area, so

$\text{ar } \triangle BOD = \text{ar } \triangle COD = \text{ar } \triangle EOC = \text{ar } \triangle AOE = \text{ar } \triangle AOF = \text{ar } \triangle FOB = 1 \text{ unit}$

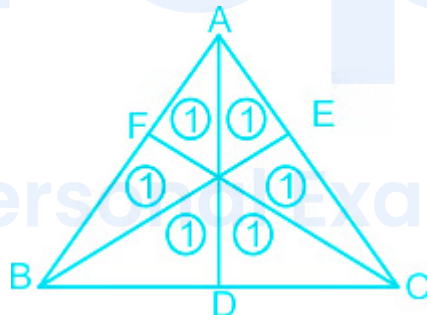
Area of $\triangle ABD = \text{ar } \triangle AOF + \text{ar } \triangle FOB + \text{ar } \triangle BOD$

Area of $\triangle ABD = 1 + 1 + 1 = 3 \text{ unit}$

Area of $\triangle AOE = 1 \text{ unit}$

Ratio of $\text{ar } \triangle ABD$ to $\text{ar } \triangle AOE = 3 : 1$

Short trick



From figure

$\text{ar } \triangle ABD : \text{ar } \triangle AOE = 3 : 1$

53. Answer: a

Explanation:

Let number be x , then

$$x \times (60/100) - x \times (20/100) = 120$$

$$\Rightarrow x \times (40/100) = 120$$

$$\Rightarrow x = 120 \times (100/40) = 300$$

$\therefore$ Number is 300

According to the question

28% of the number is less than 33.33% of the number = $(33.33/100) \times 300 - (28/100) \times 300$

$$\Rightarrow 99.99 - 84 = 16 \text{ approximately}$$

54. Answer: c

Explanation:

$$\Rightarrow \frac{\sin(78^\circ + \theta) - \cos(12^\circ - \theta) + (\tan^2 70^\circ - \operatorname{cosec}^2 20^\circ)}{\sin 25^\circ \cos 65^\circ + \cos 25^\circ \sin 65^\circ}$$

$$\Rightarrow \frac{\sin(78^\circ + \theta) - \sin[90 - (12^\circ - \theta)] + (\tan^2 70^\circ - \sec^2(90 - 20^\circ))}{\sin 25^\circ \sin(90 - 65^\circ) + \cos 25^\circ \cos(90 - 65^\circ)}$$

$$\Rightarrow \frac{\sin(78^\circ + \theta) - \sin(78^\circ + \theta) + (\tan^2 70^\circ - \sec^2 70^\circ)}{\sin^2 25^\circ + \cos^2 25^\circ}$$

$$\Rightarrow (-1)$$

As we know,

$$\Rightarrow \sin^2 \theta + \cos^2 \theta = 1 \text{ and } \tan^2 \theta - \sec^2 \theta = (-1)$$

55. Answer: b

Explanation:

As we know

$$(\text{Hypotenuse})^2 = (\text{Base})^2 + (\text{Perpendicular})^2$$

$$\Rightarrow 29^2 = 21^2 + 20^2$$

$$\Rightarrow 841 = 441 + 400$$

$$\Rightarrow 841 = 841$$

Now we can say triangle is a right-angled triangle.

As we know,

Volume of prism = Area of base $\times$ height

$$\Rightarrow \left(\frac{1}{2}\right) \times 20 \times 21 \times h = 7560$$

$$\Rightarrow h = (7560 \times 2) / (20 \times 21) = 36 \text{ cm}$$

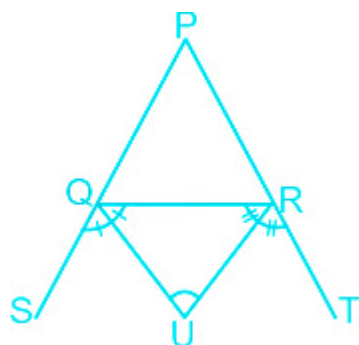
As we know

Lateral surface area of prism = Perimeter of base $\times$ Height

$$\text{Lateral surface area of prism} = (29 + 21 + 20) \times 36 = 2520 \text{ cm}^2$$

56. Answer: a

Explanation:



Short Trick:

Given, $\angle QUR = 79^\circ$

If the bisectors of $\angle SQR$ and $\angle TRQ$ meet at U, then

$$\angle QUR = 90^\circ - \angle P/2$$

$$79^\circ = 90^\circ - \angle P/2$$

$$\angle P/2 = 90 - 79 = 11^\circ$$

$$\angle P = 11^\circ \times 2 = 22^\circ$$

Detailed Solution:

As we know,

$$\angle PQR + \angle RQS = 180^\circ$$

$$\angle RQS = 180^\circ - \angle PQR$$

$$\angle RQS/2 = 90^\circ - \angle PQR/2$$

$$\angle RQU = 90^\circ - \angle PQR/2$$

Similarly,

$$\angle QRU = 90^\circ - \angle PRQ/2$$

In $\triangle QUR$

$$\angle RQU + \angle QRU + \angle QUR = 180^\circ$$

$$\angle QUR = 180^\circ - (\angle RQU + \angle QRU)$$

$$\angle QUR = 180^\circ - [180^\circ - (\angle PQR + \angle PRQ)/2]$$

$$\angle QUR = 180^\circ - [180 - (180^\circ - \angle QPR)/2]$$

$$79^\circ = 90^\circ - \angle QPR/2$$

$$\angle QPR/2 = 90^\circ - 79^\circ = 11^\circ$$

$$\angle QPR = 11^\circ \times 2 = 22^\circ$$

57. Answer: c

Explanation:

As we know,

If $a^3 + b^3 + c^3 - 3abc = 0$, then $(a + b + c) = 0$

$$(5x + 1)^3 + (x - 3)^3 + 8(3x - 4)^3 = 6(5x + 1)(x - 3)(3x - 4)$$

$$\Rightarrow (5x + 1)^3 + (x - 3)^3 + [2(3x - 4)]^3 - 3(5x + 1)(x - 3)[2(3x - 4)] = 0$$

So,

$$\Rightarrow (5x + 1) + (x - 3) + [2(3x - 4)] = 0$$

$$\Rightarrow 5x + 1 + x - 3 + 6x - 8 = 0$$

$$\Rightarrow 12x = 10$$

$$\therefore x = 10/12 = 5/6$$

58. Answer: a

Explanation:

HCF of two number = 21

LCM of two number = $21 \times 221 = 4641$

As we know,

First number $\times$ Second number = HCF $\times$ LCM

Let two number be $21a$ and $21b$ respectively, so

$$21a \times 21b = 21 \times 4641$$

$$\Rightarrow ab = 221$$

$$\Rightarrow ab = 13 \times 17$$

Suppose $a = 13$ and $b = 17$

$$\text{The first number} = 21a = 21 \times 13 = 273$$

$$\text{Second number} = 21b = 21 \times 17 = 357$$

$$\text{So, sum of digit of } 357 = 3 + 5 + 7 = 15.$$

59. Answer: c

Explanation:

Short trick :

$$3(\cot^2 \phi - \cos^2 \phi) = \cos^2 \phi$$

If $0^\circ < \phi < 90^\circ$, so put $\phi = 30, 45$ and 60

Put $\phi = 60$

$$\Rightarrow 3(\cot^2 60 - \cos^2 60) = \cos^2 60$$

$$\Rightarrow 3(1/3 - 1/4) = 1/4$$

$$\Rightarrow 3 \times (1/12) = 1/4$$

$$\Rightarrow 1/4 = 1/4 \text{ (satisfied)}$$

Now,

$$(\tan^2 \phi + \operatorname{cosec}^2 \phi + \sin^2 \phi)$$

$$\Rightarrow \tan^2 60 + \operatorname{cosec}^2 60 + \sin^2 60$$

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

$$\Rightarrow 3 + 4/3 + 3/4$$

$$\Rightarrow (36 + 16 + 9)/12$$

$$\Rightarrow 61/12$$

Detailed Solution :

$$3(\cot^2 \phi - \cos^2 \phi) = \cos^2 \phi$$

$$\Rightarrow 3 \cos^2 (1/\sin^2 \phi - 1) = \cos^2 \phi$$

$$\Rightarrow \operatorname{cosec}^2 \phi - 1 = 1/3$$

$$\Rightarrow \cot^2 \phi = 1/3$$

$$\Rightarrow \cot \phi = 1/\sqrt{3}$$

$$\Rightarrow \cot \phi = \cot 60$$

$$\Rightarrow \phi = 60$$

Now,

$$(\tan^2 \phi + \operatorname{cosec}^2 \phi + \sin^2 \phi)$$

$$\Rightarrow \tan^2 60 + \operatorname{cosec}^2 60 + \sin^2 60$$

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

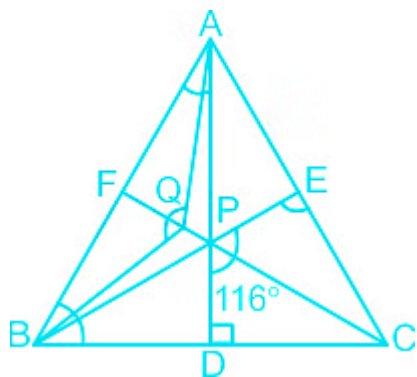
$$\Rightarrow 3 + 4/3 + 3/4$$

$$\Rightarrow (36 + 16 + 9)/12$$

$$\Rightarrow 61/12$$

60. **Answer: c**

Explanation:



Given, $\angle EPD = 116^\circ$

As we know,

$$\angle PEC = \angle PDC = 90^\circ$$

In quadrilateral PECD

$$\Rightarrow \angle PEC + \angle PDC + \angle EPD + \angle ECD = 360$$

$$\Rightarrow \angle ECD = 360^\circ - 116^\circ - 90^\circ - 90^\circ = 64$$

In $\triangle ABQ$

$$\angle A/2 + \angle B/2 + \angle Q = 180^\circ$$

$$\Rightarrow \angle Q = 180^\circ - (\angle B + \angle A)/2$$

$$\Rightarrow \angle Q = 180^\circ - [(180^\circ - \angle C)/2]$$

$$\Rightarrow \angle Q = 180^\circ - 90^\circ + \angle C/2$$

$$\Rightarrow \angle Q = 90^\circ + 64/2$$

$$\Rightarrow \angle Q = 90^\circ + 32^\circ = 122^\circ$$

Short trick

As we know,

$$\Rightarrow \angle C + \angle EPD = 180^\circ$$

$$\Rightarrow \angle C = 180^\circ - 116^\circ = 64^\circ$$

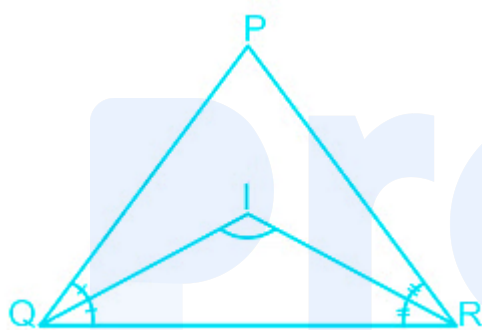
Again, As we know,

$$\Rightarrow \angle AQB = 90^\circ + \angle C/2$$

$$\Rightarrow \angle AQB = 90^\circ + 64^\circ/2 = 90^\circ + 32^\circ = 122^\circ$$

61. Answer: c

Explanation:



Short Trick :

As we know,

$$\angle QIR = 90^\circ + \angle P/2$$

$$\Rightarrow 107^\circ = 90^\circ + \angle P/2$$

$$\Rightarrow \angle P/2 = 107^\circ - 90^\circ = 17^\circ$$

$$\Rightarrow \angle P = 2 \times 17^\circ = 34^\circ$$

Detailed Solution :

In $\triangle QIR$

$$\angle Q/2 + \angle R/2 + \angle QIR = 180^\circ$$

$$\Rightarrow \angle QIR = 180^\circ - \angle Q/2 - \angle R/2$$

$$\Rightarrow \angle QIR = 180^\circ - (180^\circ - \angle P)/2$$

$$\Rightarrow \angle QIR = 180^\circ - 90^\circ + \angle P/2$$

$$\Rightarrow \angle QIR = 90^\circ + \angle P/2$$

$$\Rightarrow 107^\circ = 90^\circ + \angle P/2$$

$$\Rightarrow \angle P/2 = 107^\circ - 90^\circ = 17^\circ$$

$$\Rightarrow \angle P = 2 \times 17^\circ = 34^\circ$$

62. Answer: c

Explanation:

As we know,

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

Sum of interior angles of the polygon = $[(n - 2) \times 180]$

$$[(n - 2) \times 180] = 1260$$

$$\Rightarrow (n - 2) = 1260/180$$

$$\Rightarrow (n - 2) = 7$$

$$\Rightarrow n = 7 + 2 = 9$$

As we know,

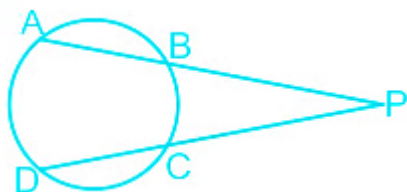
Each interior angles of the polygon = $1260/9 = 140^\circ$

Each exterior angles of the polygon = $180 - 140 = 40^\circ$

Required difference = $140^\circ - 40^\circ = 100^\circ$

63. Answer: c

Explanation:



Given, $PC = 5.6$, $PB = 6.3$, $AB = 7.7$

$$PA = PB + AB = 6.3 + 7.7 = 14$$

As we know,

$$PC \times PD = PB \times PA$$

$$\Rightarrow 5.6 \times PD = 6.3 \times 14$$

$$\Rightarrow PD = (6.3 \times 14) / 5.6$$

$$\Rightarrow PD = 15.75$$

$$\Rightarrow PD = PC + CD$$

$$\Rightarrow 15.75 = 5.6 + CD$$

$$\therefore CD = 15.75 - 5.6 = 10.15 \text{ cm}$$

64. Answer: d

Explanation:

If $0^\circ < \phi < 90^\circ$, then put any value between 0 and 90 so that equation satisfied.

So, put $\phi = 30^\circ$

$$\Rightarrow \frac{\sin^2 \phi - 3 \sin \phi + 2}{\cos^2 \phi} = 1$$

$$\Rightarrow \frac{\sin^2 30^\circ - 3 \sin 30^\circ + 2}{\cos^2 30^\circ} = 1$$

$$\Rightarrow \frac{\frac{1}{4} - \frac{3}{2} + 2}{\frac{3}{4}} = 1$$

$$\Rightarrow [(1 - 6 + 8)/4] / [3/4] = 1$$

$$\Rightarrow (3/4) \times (4/3) = 1$$

$$\Rightarrow 1 = 1 \text{ (satisfied)}$$

Now, $(\cos 2\phi + \sin 3\phi + \operatorname{cosec} 2\phi)$

$$\Rightarrow (\cos 60^\circ + \sin 90^\circ + \operatorname{cosec} 60^\circ)$$

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

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

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

Detailed Solution:

$$\Rightarrow \frac{\sin^2 \phi - 3 \sin \phi + 2}{\cos^2 \phi} = 1$$

$$\Rightarrow \sin^2 \phi - 3 \sin \phi + 2 = \cos^2 \phi$$

$$\Rightarrow \sin^2 \phi - 3 \sin \phi + 2 = 1 - \sin^2 \phi$$

$$\Rightarrow 2 \sin^2 \phi - 3 \sin \phi + 1 = 0$$

$$\Rightarrow 2 \sin^2 \phi - 2 \sin \phi - \sin \phi + 1 = 0$$

$$\Rightarrow 2 \sin \phi (\sin \phi - 1) - 1 (\sin \phi - 1) = 0$$

$$\Rightarrow (\sin \phi - 1) (2 \sin \phi - 1) = 0$$

So,

$$\Rightarrow \sin \phi = 1 \text{ and } \sin \phi = 1/2$$

Given, $0^\circ < \phi < 90^\circ$, so

Taking

$$\sin \phi = 1/2$$

$$\sin \phi = \sin 30^\circ$$

$$\phi = 30^\circ$$

Now, $(\cos 2\phi + \sin 3\phi + \operatorname{cosec} 2\phi)$

$$(\cos 60^\circ + \sin 90^\circ + \operatorname{cosec} 60^\circ)$$

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

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

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

65. Answer: c

Explanation:

Short trick :

$$\Rightarrow \sqrt{\frac{\operatorname{cosec} \phi - \cot \phi}{\operatorname{cosec} \phi + \cot \phi}} \div \frac{\sin \phi}{1 + \cos \phi}$$

Put $\phi = 45$

$$\Rightarrow \sqrt{[(\operatorname{cosec} 45 - \cot 45)/(\operatorname{cosec} 45 + \cot 45)]} \div [\sin 45/(1 + \cos 45)]$$

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

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

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

$$\Rightarrow 2 - 1$$

$$\Rightarrow 1$$

Detailed solution :

$$\sqrt{\frac{\operatorname{cosec} \phi - \cot \phi}{\operatorname{cosec} \phi + \cot \phi}} \div \frac{\sin \phi}{1 + \cos \phi}$$

$$\Rightarrow \sqrt{\frac{\operatorname{cosec} \phi - \cot \phi}{\operatorname{cosec} \phi + \cot \phi} \times \frac{\operatorname{cosec} \phi - \cot \phi}{\operatorname{cosec} \phi - \cot \phi}} \div \frac{\sin \phi}{1 + \cos \phi}$$

$$\Rightarrow \sqrt{(\operatorname{cosec} \phi - \cot \phi)^2 / (\operatorname{cosec}^2 \phi - \cot^2 \phi)} \div [\sin \phi / (1 + \cos \phi)]$$

$$\Rightarrow (\operatorname{cosec} \phi - \cot \phi) \div [\sin \phi / (1 + \cos \phi)]$$

$$\Rightarrow (1/\sin \phi - \cos \phi/\sin \phi) \div [\sin \phi / (1 + \cos \phi)]$$

$$\Rightarrow [(1 - \cos \phi) / \sin \phi] \div [\sin \phi / (1 + \cos \phi)]$$

$$\Rightarrow [(1 - \cos \phi) / \sin \phi] \times [(1 + \cos \phi) / \sin \phi]$$

$$\Rightarrow (1 - \cos^2 \phi) / \sin^2 \phi$$

$$\Rightarrow \sin^2 \phi / \sin^2 \phi$$

$$\Rightarrow 1$$

66. Answer: a

Explanation:

As we know,

Curved surface area of cylinder = $2 \pi r h$

Radius of roller (r) = $1/2$ m

Length of roller (h) = $1\frac{1}{4} = \frac{5}{4}$ m

Curved surface area of cylinder = $2 \pi r h = 2 \times (22/7) \times (1/2) \times (5/4) \text{ m}^2$

Total surface area covered in 1 hour = $2 \times (22/7) \times (1/2) \times (5/4) \times 14 \times 60 = 3300 \text{ m}^2$

67. Answer: c

Explanation:

As we know,

$$\text{Volume of sphere} = \left(\frac{4}{3}\right) \pi R^3$$

$$\text{Radius of sphere (R)} = 8 \text{ cm}$$

$$\text{Length of wire} = 24 \text{ m} = 2400 \text{ cm}$$

$$\text{Let radius of wire} = r \text{ cm}$$

According to the question

$$\pi r^2 \times 2400 = \left(\frac{4}{3}\right) \times \pi \times 8^3$$

$$\Rightarrow r^2 = (4 \times 8 \times 8 \times 8) / (3 \times 2400)$$

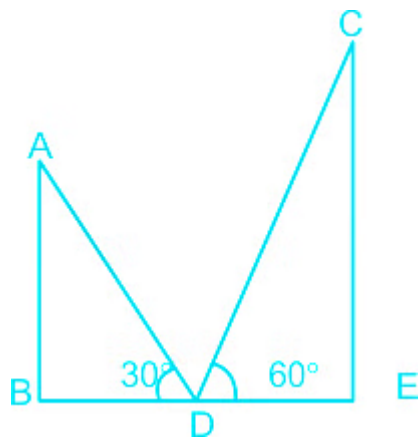
$$\Rightarrow r^2 = (8 \times 8) / (3 \times 3 \times 5 \times 5)$$

$$\Rightarrow r = \sqrt{(8 \times 8) / (3 \times 3 \times 5 \times 5)} = 8 / (3 \times 5) = 8/15 \text{ cm}$$

$$\Rightarrow r = (8/15) \times 10 = 16/3 \text{ mm} = 5 \frac{1}{3} \text{ mm}$$

68. Answer: c

Explanation:



Let the height of tower P and tower Q be AB and CE and D is the midpoint of BE.

$$BD = DE$$

In $\triangle ABD$

$$\tan 30^\circ = AB/BD$$

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

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

In $\triangle CDE$

$$\tan 60^\circ = CE/DE$$

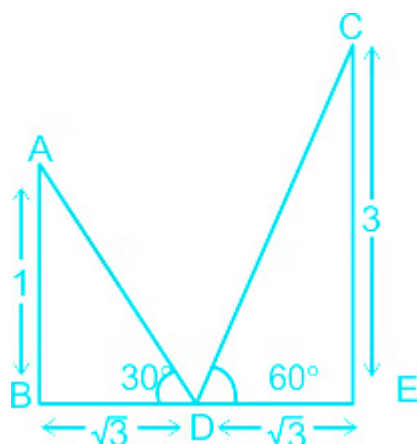
$$\Rightarrow \sqrt{3} = CE/DE$$

$$CE = \sqrt{3}DE$$

$$\text{Ratio of height of tower P and Q} = AB : CE = BD/\sqrt{3} : \sqrt{3}DE = DE/\sqrt{3} : \sqrt{3}DE = 1/\sqrt{3} : \sqrt{3}$$

$$\Rightarrow 1 : 3$$

Short trick



From the figure

$$AB : CE = 1 : 3$$

69. Answer: b

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.

$$\Rightarrow \left(\frac{4}{3} \div \frac{20}{7} \times \frac{28}{5} \right) \div \left(\frac{32}{5} \div \frac{9}{2} \times \frac{16}{3} \right) \times \left(\frac{3}{4} \times \frac{8}{3} \div \frac{5}{9} \times \frac{6}{5} \right) = 1 + k$$

$$\Rightarrow \left(\frac{4}{3} \div 16 \right) \div \left(\frac{32}{5} \div 24 \right) \times \left(\frac{3}{4} \times \frac{8}{3} \div \frac{2}{3} \right) = 1 + k$$

$$\Rightarrow \left(\frac{4}{3} \times \frac{1}{16} \right) \div \left(\frac{32}{5} \times \frac{1}{24} \right) \times \left(\frac{3}{4} \times \frac{8}{3} \times \frac{3}{2} \right) = 1 + k$$

$$\Rightarrow \frac{1}{12} \div \frac{4}{15} \times 3 = 1 + k$$

$$\Rightarrow (1/12) \times (15/4) \times 3 = 1 + k$$

$$\Rightarrow 15/16 = 1 + k$$

$$\Rightarrow k = 15/16 - 1$$

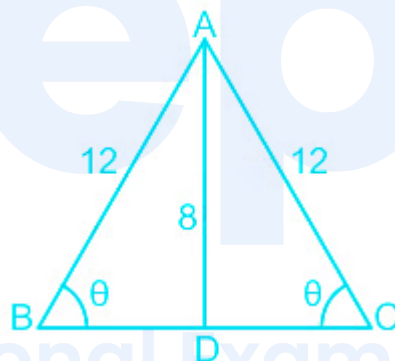
$$\Rightarrow k = -1/16$$

$$\Rightarrow k = -0.0625$$

So, number lies between $(-0.07 \text{ and } -0.06)$

70. Answer: c

Explanation:



If $AC = AB$, then $\angle ABC = \angle ACB$

Let $\angle ABC = \angle ACB = \theta$ and $DC = x$

In $\triangle ABD$

$$\cos \theta = (AB^2 + BD^2 - AD^2) / (2 \times AB \times BD)$$

$$\cos \theta = (12^2 + 5^2 - 8^2) / (2 \times 12 \times 5) \quad \text{-----(1)}$$

In $\triangle ADC$

$$\cos \theta = (AC^2 + DC^2 - AD^2) / (2 \times AC \times DC)$$

$$\cos \theta = (12^2 + x^2 - 8^2) / (2 \times 12 \times x) \quad \text{-----(2)}$$

From equation (1) and equation (2)

$$(12^2 + 5^2 - 8^2) / (2 \times 12 \times 5) = (12^2 + x^2 - 8^2) / (2 \times 12 \times x)$$

$$\Rightarrow (144 + 25 - 64) / 5 = (144 + x^2 - 64) / x$$

$$\Rightarrow 21x = 80 + x^2$$

$$\Rightarrow x^2 - 21x + 80 = 0$$

$$\Rightarrow x^2 - 16x - 5x + 80 = 0$$

$$\Rightarrow x(x - 16) - 5(x - 16) = 0$$

$$\Rightarrow (x - 16)(x - 5) = 0$$

So, $x = 16$ and 5

So, the value of $x = 16$

Length of CD = 16 cm

★ Confusion Points

SAS property of congruency cannot be applied over here because the angle should be adjacent to both sides to use SAS and in this figure that is not the case.

71. Answer: a

Explanation:

As we know,

$$\text{Volume of cylinder} = \pi r^2 h$$

Let h m water level drop after taking out 15400 litres of water in the vessel.

Radius of cylinder (r) = 3.5 m

According to the question

$$\pi r^2 h = 15400/1000$$

$$\Rightarrow (22/7) \times 3.5 \times 3.5 \times h = 15.4$$

$$\Rightarrow h = (15.4 \times 7) / (3.5 \times 3.5 \times 22) = 0.4 \text{ m}$$

$$\Rightarrow h = 0.4 \times 100 = 40 \text{ cm}$$

72. Answer: d

Explanation:

As we know,

Distance = Time $\times$ Speed

Let correct taking time to reach his office be x hr

$$30 \times (x + 10/60) = 24 \times (x + 18/60)$$

$$\Rightarrow 30x + 5 = 24x + 36/5$$

$$\Rightarrow 30x - 24x = 36/5 - 5$$

$$\Rightarrow 6x = 11/5$$

$$\Rightarrow x = 11/30 \text{ hr}$$

$$\text{Required distance} = 30 \times (11/30 + 10/60) = 30 \times (22 + 10)/60 = 16 \text{ km}$$

73. Answer: c

Explanation:

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

As we know,

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

If the radius of the cylinder decreased by $33\frac{1}{3}\%$, then new radius of the cylinder = $r \times (2/3) = 2r/3$

If the height of the cylinder increased by 100% then the new height of the cylinder = $h \times (200/100) = 2h$

$$\text{New volume of the cylinder} = \pi (2r/3)^2 \times 2h = 8\pi r^2 h/9$$

$$\text{Volume decreased by} = \pi r^2 h - 8\pi r^2 h/9 = \pi r^2 h/9$$

$$\text{Volume decreased by (in \%)} = [\pi r^2 h/9\pi r^2 h] \times 100 = 11\frac{1}{9}\%$$

Short Trick:

$$33\frac{1}{3}\% = 1/3$$

Let height be 1 unit after increment height will be 2 unit, then

$$\begin{array}{r} 3 \quad 2 \\ 3 \quad 2 \\ 1 \quad 2 \\ \hline 9 \quad 8 \end{array}$$

$$\therefore \text{Required percentage} = [(9 - 8)/9] \times 100 = 11\frac{1}{9}\% \text{ (decrease)}$$

74. Answer: a

Explanation:

As we know,

$$A = P + (Prt)/100$$

Given, $A = 14,395.20$, $r = 9.25\%$ and $t = 5.4\%$

$$\Rightarrow 14395.20 = P + (P \times 9.25 \times 5.4)/100$$

$$\Rightarrow 14395.20 = 149.95P/100$$

$$\Rightarrow P = 14395.20 \times (100/149.95)$$

$$\Rightarrow P = 9600$$

Again, $r = 8.6\%$ and $t = 4.5$ years

$$SI = Prt/100$$

$$\Rightarrow SI = (9600 \times 4.5 \times 8.6)/100$$

$$\therefore SI = 3715.2$$

75. Answer: b

Explanation:

Let side of the cube be 3 unit

Length of newly formed cuboid $l = 3$

Breadth of newly formed cuboid $b = 3$

Height of newly formed cuboid $h = 1$

$$\text{Total surface area of cube} = 6 \times a^2 = 6 \times 3 \times 3 = 54$$

$$\begin{aligned} \text{Total surface area of cuboid} &= 2(lb + bh + hl) = 2(3 \times 3 + 3 \times 1 + 1 \times 3) = 2 \times (9 + 3 + 3) \\ &= 2 \times 15 = 30 \end{aligned}$$

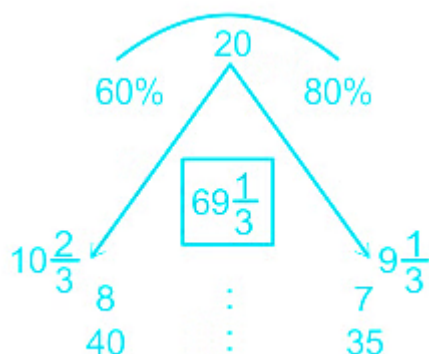
$$\text{Total surface area of two cuboid} = 2 \times 30 = 60$$

$$\therefore \text{Required ratio} = 54 : 60 = 9 : 10$$

76. Answer: b

Explanation:

Short Trick:



$$\Rightarrow 8 + 7 = 15 \text{ units} = 20$$

$$\Rightarrow 1 \text{ unit} = 20/15$$

$$\Rightarrow 8 \text{ unit} = (20 \times 8)/15 = 32/3 = 10\frac{2}{3}$$

$$\Rightarrow 7 \text{ units} = (20 \times 7)/15 = 28/3 = 9\frac{1}{3}$$

Detailed solution :

$$\text{Quantity of acid in 40 litres} = 40 \times (60/100) = 24 \text{ litres}$$

$$\text{Quantity of acid in 35 litres} = 35 \times (80/100) = 28 \text{ litres}$$

$$\text{Total quantity of acid in both solution} = 24 + 28 = 52 \text{ litres}$$

$$\text{Total quantity of both solution} = 40 + 35 = 75 \text{ litres}$$

$$\text{Percentage of acid in new solution} = (52/75) \times 100 = 69\frac{1}{3}\%$$

77. Answer: d

Explanation:

$$0.5\bar{6} - 0.7\bar{23} + 0.3\bar{9} \times 0.\bar{7}$$

$$\Rightarrow 0.5\bar{6} - 0.7\bar{23} + \frac{39-3}{90} \times \frac{7}{9}$$

$$\Rightarrow 0.5\bar{6} - 0.7\bar{23} + \frac{36}{90} \times \frac{7}{9}$$

$$\Rightarrow 0.5\bar{6} - 0.7\bar{23} + \frac{28}{90}$$

$$\Rightarrow 0.5\bar{6} - 0.7\bar{23} + 0.3\bar{1} \text{ (see figure)}$$

$$\begin{array}{r} 0.56666 \dots \infty \\ + 0.31111 \dots \infty \\ - 0.72323 \dots \infty \\ \hline 0.15454 \dots \infty \end{array}$$

$$\therefore 0.1\bar{54}$$

Or we can solve it with another method

$$\Rightarrow 0.5\bar{6} - 0.7\bar{23} + 0.3\bar{9} \times 0.\bar{7}$$

$$\Rightarrow \frac{56-5}{90} - \frac{723-7}{990} + \frac{39-3}{90} \times \frac{7}{9}$$

$$\Rightarrow \frac{51}{90} - \frac{716}{990} + \frac{36}{90} \times \frac{7}{9}$$

$$\Rightarrow \frac{51}{90} - \frac{716}{990} + \frac{28}{90}$$

$$\Rightarrow (561 - 716 + 308) / 990$$

$$\Rightarrow 153/990$$

$$\Rightarrow 0.1\bar{54}$$

78. Answer: a

Explanation:

Given, height of the cone $h = 15$ cm

As we know,

Curved surface area of cone $= \pi r l$

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

Base area of cone $= 400\pi$

$$\pi r^2 = 400\pi$$

$$\Rightarrow r^2 = 400$$

$$\Rightarrow r = \sqrt{400} = \sqrt{(20 \times 20)} = 20$$

As we know,

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

$$\Rightarrow l^2 = 20^2 + 15^2 = 400 + 225 = 625$$

$$\Rightarrow l = \sqrt{625} = \sqrt{(25 \times 25)} = 25$$

Curved surface area of cone $= \pi r l = 20 \times 25 \times \pi = 500\pi$

79. Answer: c

Explanation:

Short Trick:

$$\frac{\sec \phi (1 - \sin \phi) (\sin \phi + \cos \phi) (\sec \phi + \tan \phi)}{\sin \phi (1 + \tan \phi) + \cos \phi (1 + \cot \phi)}$$

Put $\phi = 45^\circ$

$$\frac{\sec 45 (1 - \sin 45) (\sin 45 + \cos 45) (\sec 45 + \tan 45)}{\sin 45 (1 + \tan 45) + \cos 45 (1 + \cot 45)}$$

$$\Rightarrow \frac{\sqrt{2}\left(1-\frac{1}{\sqrt{2}}\right) \times \frac{2}{\sqrt{2}} \times (\sqrt{2}+1)}{2 \times \frac{1}{\sqrt{2}} \times (1+1)} = \frac{(\sqrt{2}-1) \times \sqrt{2} \times (\sqrt{2}+1)}{2\sqrt{2}} = \frac{1}{2}$$

With the help of option 3

$$\Rightarrow \sin \phi \cos \phi$$

$$\Rightarrow \sin 45 \cos 45$$

$$\Rightarrow (1/\sqrt{2}) \times (1/\sqrt{2})$$

$$\Rightarrow 1/2 \text{ (satisfied)}$$

Detailed Solution:

$$\Rightarrow \frac{\sec \phi (1 - \sin \phi)(\sin \phi + \cos \phi)(\sec \phi + \tan \phi)}{\sin \phi (1 + \tan \phi) + \cos \phi (1 + \cot \phi)}$$

$$\Rightarrow \frac{(\sec \phi - \tan \phi)(\sin \phi + \cos \phi)(\sec \phi + \tan \phi)}{\sin \phi \left(1 + \frac{\sin \phi}{\cos \phi}\right) + \cos \phi \left(1 + \frac{\cos \phi}{\sin \phi}\right)}$$

$$\Rightarrow \frac{(\sec^2 \phi - \tan^2 \phi)(\sin \phi + \cos \phi)}{\frac{\sin \phi (\sin \phi + \cos \phi)}{\cos \phi} + \frac{\cos \phi (\sin \phi + \cos \phi)}{\sin \phi}} = \frac{(\sin \phi + \cos \phi)}{(\sin \phi + \cos \phi)(\tan \phi + \cot \phi)} = \frac{1}{\tan \phi + \cot \phi}$$

$$\Rightarrow 1/(\sin \phi / \cos \phi + \cos \phi / \sin \phi)$$

$$\Rightarrow 1/(\sin^2 \phi + \cos^2 \phi) / \sin \phi \cos \phi$$

$$\Rightarrow \sin \phi \cos \phi$$

As we know,

$$\Rightarrow \sin^2 \phi + \cos^2 \phi = 1 \text{ and } \sec^2 \phi - \tan^2 \phi = 1$$

80. Answer: c

Explanation:

As we know,

$$\text{Volume of cone} = (1/3) \pi r^2 h$$

$$\text{Volume of cylinder} = \pi R^2 H$$

$$\text{Radius of cone (r)} = 3.2 \text{ cm}$$

$$\text{Height of cone (h)} = 7.2 \text{ cm}$$

$$\text{Height of cylinder (H)} = 9.6 \text{ cm}$$

$$\text{Radius of cylinder} = R$$

According to the question

$$\pi R^2 H = \left(\frac{1}{3}\right) \pi r^2 h$$

$$\Rightarrow R^2 \times 9.6 = \left(\frac{1}{3}\right) \times 3.2 \times 3.2 \times 7.2$$

$$\Rightarrow R^2 = \frac{(3.2 \times 3.2 \times 7.2)}{(3 \times 9.6)} = \frac{(3.2 \times 3.2)}{4}$$

$$\Rightarrow R = \sqrt{(3.2 \times 3.2)/4} = 3.2/2 = 1.6$$

$$\text{Diameter of the cylinder} = 2 \times 1.6 = 3.2$$

81. Answer: a

Explanation:

According to the question

$$\text{Total work} = \text{Total work}$$

$$\Rightarrow (4m + 5w) \times 15 = (9m + 6w) \times 10$$

$$\Rightarrow (4m + 5w) \times 3 = (9m + 6w) \times 2$$

$$\Rightarrow 12m + 15w = 18m + 12w$$

$$\Rightarrow 15w - 12w = 18m - 12m$$

$$\Rightarrow 3w = 6m$$

$$\Rightarrow w : m = 2 : 1$$

$$\text{Total work} = (4m + 5w) \times 15 = (4 \times 1 + 5 \times 2) \times 10 = (4 + 10) \times 15 = 14 \times 15 = 210$$

Let x women assist 4 men to complete the work in 7 days, then

$$(4 \times 1 + x \times 2) \times 7 = 210$$

$$\Rightarrow 4 + 2x = 210/7 = 30$$

$$\Rightarrow 2x = 30 - 4 = 26$$

$$\Rightarrow x = 26/2 = 13$$

82. Answer: d

Explanation:

Detailed Solution :

$$(\sec \phi - \tan \phi)^2 (1 + \sin \phi)^2 \div \sin^2 \phi$$

$$\Rightarrow (1/\cos \phi - \sin \phi/\cos \phi)^2 (1 + \sin \phi)^2 \div \sin^2 \phi$$

$$\Rightarrow (1/\cos^2 \phi (1 - \sin \phi)^2 (1 + \sin \phi)^2 \div \sin^2 \phi$$

$$\Rightarrow 1/\cos^2 \phi (1 - \sin^2 \phi)^2 \div \sin^2 \phi$$

$$\Rightarrow 1/\cos^2 \phi (\cos^2 \phi)^2 \div \sin^2 \phi$$

$$\Rightarrow \cos^2 \phi / \sin^2 \phi$$

$$\Rightarrow \cot^2 \phi$$

Short Trick :

$$(\sec \phi - \tan \phi)^2 (1 + \sin \phi)^2 \div \sin^2 \phi$$

$$\text{Put } \phi = 45$$

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

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

$$\Rightarrow (2 - 1)^2 / 2 \times 2$$

$$\Rightarrow (1/2) \times 2$$

$$\Rightarrow 1$$

With the help of option 4

$$\cot \phi$$

$$\Rightarrow \cot 45$$

$$\Rightarrow 1 \text{ (satisfied)}$$

83. Answer: a

Explanation:

Detailed Solution:

$$\begin{aligned} & \left(\frac{\sin A}{1 - \cos A} + \frac{1 - \cos A}{\sin A} \right) \div \left(\frac{\cot^2 A}{1 + \operatorname{cosec} A} + 1 \right) \\ \Rightarrow & \left(\frac{\sin^2 A + (1 - \cos A)^2}{\sin A (1 - \cos A)} \right) \div \left(\frac{\operatorname{cosec}^2 A - 1}{1 + \operatorname{cosec} A} + 1 \right) \\ \Rightarrow & \left(\frac{\sin^2 A + 1 + \cos^2 A - 2 \cos A}{\sin A (1 - \cos A)} \right) \div (\operatorname{cosec} A - 1 + 1) \end{aligned}$$

$$\Rightarrow [(2 - 2 \cos A) / \sin A (1 - \cos A)] \div \operatorname{cosec} A$$

$$\Rightarrow [2(1 - \cos A) / \sin A (1 - \cos A)] \div \operatorname{cosec} A$$

$$\Rightarrow 2 \operatorname{cosec} A \div \operatorname{cosec} A$$

$$\Rightarrow 2$$

Short trick:

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

$$\begin{aligned} & \left(\frac{\sin 45^\circ}{1 - \cos 45^\circ} + \frac{1 - \cos 45^\circ}{\sin 45^\circ} \right) \div \left(\frac{\cot^2 45^\circ}{1 + \operatorname{cosec} 45^\circ} + 1 \right) \\ \Rightarrow & \left(\frac{\frac{1}{\sqrt{2}}}{1 - \frac{1}{\sqrt{2}}} + \frac{1 - \frac{1}{\sqrt{2}}}{\frac{1}{\sqrt{2}}} \right) \div \left(\frac{1}{1 + \sqrt{2}} + 1 \right) \\ \Rightarrow & \left(\frac{1}{\sqrt{2} - 1} + \sqrt{2} - 1 \right) \div (\sqrt{2} - 1 + 1) \\ \Rightarrow & (\sqrt{2} + 1 + \sqrt{2} - 1) \div \sqrt{2} \\ \Rightarrow & 2\sqrt{2} \div \sqrt{2} \\ \Rightarrow & 2 \end{aligned}$$

84. Answer: d

Explanation:

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

Ratio of copper to zinc in alloy B = $5x : 2x$ -----(2)

Multiply by 5 in equation (1) and multiply by 6 in equation (2)

Ratio of copper to zinc in alloy A = $20x : 15x$

Ratio of copper to zinc in alloy B = $30x : 12x$

Ratio of copper to zinc in new alloy = $(20x + 30x) : (15x + 12x) = 50x : 27x$

Percentage of zinc in new alloy = $[27 / (50 + 27)] \times 100 = 35\%$ (approx)

85. Answer: a

Explanation:

Given,

$\Delta ABC \sim \Delta PQR$

Perimeter of ΔABC / Perimeter of $\Delta PQR = AB / PQ$

$$\Rightarrow 78/46.8 = AB/11.7$$

$$\Rightarrow AB = (78/46.8) \times 11.7 = 19.5$$

86. Answer: b

Explanation:

Let 5 years ago age of A to B = $4x : 5x$

According to the question

$$\Rightarrow (4x + 10)/(5x + 10) = 6/7$$

$$\Rightarrow 7(4x + 10) = 6(5x + 10)$$

$$\Rightarrow 28x + 70 = 30x + 60$$

$$\Rightarrow 30x - 28x = 70 - 60$$

$$\Rightarrow 2x = 10$$

$$\Rightarrow x = 10/2 = 5$$

5 years ago, age of A = $4x = 4 \times 5 = 20$

Present age of A = $20 + 5 = 25$ years

5 years ago, age of B = $5x = 5 \times 5 = 25$

Present age of B = $25 + 5 = 30$

Present age of C = $30 - 10 = 20$

Ratio of present age of A to C = $25 : 20 = 5 : 4$

87. Answer: d

Explanation:

Short Trick :

As we know,

$$\angle A + \angle B = 2\angle CED$$

$$\Rightarrow 49^\circ + \angle B = 2 \times 56^\circ$$

$$\Rightarrow \angle B = 112^\circ - 49^\circ = 63^\circ$$

Detailed Solution :

In $\triangle CED$

$$\angle C/2 + \angle D/2 + \angle CED = 180^\circ$$

$$\Rightarrow \angle C/2 + \angle D/2 + 56^\circ = 180^\circ$$

$$\Rightarrow \angle C/2 + \angle D/2 = 180^\circ - 56^\circ = 124^\circ$$

$$\Rightarrow \angle C + \angle D = 124^\circ \times 2 = 248^\circ$$

As we know,

$$\angle A + \angle B + \angle C + \angle D = 360^\circ$$

$$\Rightarrow 49^\circ + \angle B + 248^\circ = 360^\circ$$

$$\Rightarrow \angle B = 360^\circ - 297^\circ = 63^\circ$$

88. Answer: a

Explanation:

Let the original price of the article be 100x.

$$\text{SP of the article} = 100x \times (80/100) = 80x$$

$$\text{CP of the article} = 80x \times (100/90) = 800x/9$$

If the article sold at original price, then

$$\text{profit} = 100x - 800x/9 = (900x - 800x)/9 = 100x/9$$

$$\text{Profit percentage} = [(100x/9)/(800x/9)] \times 100 = 12\frac{1}{2}\%$$

Short tick:

Let the original price of the article be 45

$$\text{SP of the article} = 45 \times (4/5) = 36$$

$$\text{CP of the article} = 36 \times (10/9) = 40$$

$$\text{Profit if article sold at original price} = 45 - 40 = 5$$

$$\text{Profit percentage} = (5/40) \times 100 = 12.5\%$$

89. Answer: c

Explanation:

Given :

A spends 65% of his income

His income is increased by 20.1% and his expenditure is increased by 25%.

Concept:

$$\text{Expenditure} = \text{Income} - \text{saving}$$

Solution :

Let income of A be $100x$

$$\text{Expenditure of A} = 100x \times (65/100) = 65x$$

$$\text{Savings of A} = 100x - 65x = 35x$$

Let his income increased by 20.1%

$$\text{His new income} = 100x \times (120.1/100) = 120.1x$$

$$\text{His new expenditure} = 65x \times (125/100) = 81.25x$$

$$\text{His new savings} = 120.1x - 81.25x = 38.85x$$

$$\text{His saving increased by} = [(38.85x - 35x)/35x] \times 100 = 11\%$$

$\therefore$ His saving increased by 11%.

90. Answer: c

Explanation:

As we know,

Formulae for installments in case of compound interest is

$$P = x/(1 + r/100) + x/(1 + r/100)^2 + \dots + x/(1 + r/100)^n$$

Given, (each installment) $x = 44,100$, $r = 5\%$, $n = 2$ and $P = ?$

$$\Rightarrow P = x/(1 + r/100) + x/(1 + r/100)^2$$

$$\Rightarrow P = 44,100/(1 + 5/100) + 44,100/(1 + 5/100)^2$$

$$\Rightarrow P = [44,100 \times (20/21)] + [44,100 \times (20/21) \times (20/21)]$$

$$\Rightarrow P = 42,000 + 40,000 = 82,000$$

$$\text{Total Rs. paid} = 44,100 \times 2 = 88,200$$

$$\text{Interest paid} = 88,200 - 82,000 = 6,200$$

Short Trick:

$$5\% = 1/20$$

$$\begin{array}{r} 20 : 21 \quad] \times 21 \\ 400 : 441 \quad] \times 1 \\ \hline 420 : 441 \\ 400 : 441 \\ \hline 820 \quad 882 \end{array}$$

$$\text{Total instalment} = 44,100 \times 2 = 88,200$$

$$882 \text{ unit} = 88200$$

$$\Rightarrow 1 \text{ unit} = 100$$

$$\Rightarrow (882 - 820 = 62 \text{ unit}) = 62 \times 100 = 6200$$

91. Answer: a

Explanation:

Let the total unit sold by all five products be x unit.

Number of units sold of product A = 320

$$x \times (50/360) = 320$$

$$x = 320 \times (360/50) = 2304$$

$$\text{Unit sold of products B and E together} = 2304 \times [(35^\circ + 55^\circ)/360^\circ] = 576^\circ$$

Short Trick :

50° represents = 320 unit

$$35^\circ + 55^\circ = 90^\circ \text{ will represent} = (320/50) \times 90 = 576 \text{ unit}$$

92. Answer: d

Explanation:

As we know,

If $a + b + c = 0$, then $a^3 + b^3 + c^3 = 3abc$

$$\Rightarrow \frac{(0.545)(0.081)(0.51)(5.2)}{(0.324)^3 + (0.221)^3 - (0.545)^3}$$

Suppose $a = 0.324$, $b = 0.221$ and $c = -0.545$

$$a + b - c = 0.324 + 0.221 - 0.545 = 0$$

Now, we can say, $a^3 + b^3 - c^3 = -3abc$, similarly

$$\Rightarrow (0.324)^3 + (0.221)^3 - (0.545)^3 = -3 \times 0.324 \times 0.221 \times 0.545$$

$$\Rightarrow \frac{(0.545)(0.081)(0.51)(5.2)}{-3 \times 0.324 \times 0.221 \times 0.545}$$

After solving

$$\Rightarrow (-1)$$

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93. Answer: b

Explanation:

Let total units of all five products be x

units of product D sold in 2016 = 1500

$$\Rightarrow x \times (100/360) = 1500$$

$$\Rightarrow x = 1500 \times (360/100) = 5400$$

Total units sold in 2016 = 5400

$$\text{Total units sold in 2017} = 5400 \times (118/100) = 6372$$

94. Answer: d

Explanation:

Let the value of D be $100x$

$$\text{value of C} = 100x \times (130/100) = 130x$$

$$\text{value of B} = 130x \times (60/100) = 78x$$

$$\text{value of A} = 78x \times (125/100) = 97.5x$$

$$\text{A is less than D by} = 100x - 97.5x = 2.5x$$

$$\text{A is less than D by (in \%)} = (2.5x/100x) \times 100 = 2.5\%$$

95. Answer: a

Explanation:

The total unit sold by all five products in 2016 = 14616

$$\text{Unit sold of product D in 2016 was} = 14616 \times (100/360) = 4060$$

96. Answer: a

Explanation:

MP of the article = 800

$$\text{SP of the article} = 800 \times (81/100) = 648$$

$$\text{CP of the article} = 648 \times (100/108) = 600$$

$$\text{MP more than CP by} = 800 - 600 = 200$$

$$\text{MP more than CP by (in \%)} = (200/600) \times 100 = 33.33\%$$

Short trick:

Let MP is $x\%$ more than CP, then

$$x - 19 - 19x/100 = 8$$

$$\Rightarrow 81x/100 = 19 + 8$$

$$\Rightarrow x = 27 \times (100/81) = 33.33\%$$

97. Answer: b

Explanation:

$$\text{Number of students who obtained less than 300 marks} = 30 + 45 + 60 = 135$$

$$\text{Number of students who obtained 350 or more marks} = 40 + 35 + 0 = 75$$

$$\therefore \text{Required percentage} = [(135 - 75)/75] \times 100 = 80\%$$

98. Answer: b

Explanation:

$$\text{Total imports in 2015 and 2017} = 450 + 550 = 1000$$

$$\text{Total imports in 2013 and 2016} = 400 + 440 = 840$$

$$\text{Required ratio} = 1000 : 840 = 25 : 21$$

Short trick :

$$\text{Total imports in 2015 and 2017} = 450 + 550 = 1000$$

See in the option which number divided the 1000 perfectly only 25 divide the 1000, so option 3 is right.

99. Answer: a

Explanation:

Total imports of steel in 2014, 2016 and 2017 = $360 + 500 + 550 = 1410$

Total exports of steel in 2013, 2015 and 2017 = $400 + 600 + 650 = 1650$

$\therefore$ Required percentage = $[(1650 - 1410)/1650] \times 100 = 14.5$

100. Answer: b

Explanation:

Total exports over the years = $400 + 450 + 600 + 440 + 650 = 2540$

Average exports over the years = $2540/5 = 508$

80% of 508 = $508 \times (80/100) = 406.4$ crores

So, in 2015, 2016 and 2017 imports are more than 80% of the average exports per year.

$\therefore$ The correct option is 2nd i.e in 3 years