



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 2016 Tier-II (Quant) Previous Year Paper (01-Dec-2016)

Total Time: 2 Hour

Total Marks: 200

Instructions

Sl No.	Section Name	No. of Question	Maximum Marks
1	Quantitative Aptitude	100	200

- 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. Let $0 < x < 1$. Then the correct inequality is: (+2, -0.5)
- a. $x < \sqrt{x} < x^2$
 - b. $\sqrt{x} < x < x^2$
 - c. $x^2 < x < \sqrt{x}$
 - d. $\sqrt{x} < x^2 < x$
-
2. Three bells ring at interval of 36 seconds, 40 seconds and 48 seconds respectively. They start ringing together at a particular time. They will ring together after every. (+2, -0.5)
- a. 6 minutes
 - b. 12 minutes
 - c. 18 minutes
 - d. 24 minutes
-
3. If the sum of the digits of a three-digit number is subtracted from that number, then it will always be divisible by: (+2, -0.5)
- a. 3 only
 - b. 9 only
 - c. both 3 and 9
 - d. all of 3, 6 and 9

4. Which of the following is correct?

(+2, -0.5)

- a. $\frac{2}{3} < \frac{3}{5} < \frac{11}{15}$
- b. $\frac{3}{5} < \frac{2}{3} < \frac{11}{15}$
- c. $\frac{11}{15} < \frac{3}{5} < \frac{2}{3}$
- d. $\frac{3}{5} < \frac{11}{15} < \frac{2}{3}$

5. The greater of the two numbers whose product is 900 and the sum exceeds their difference by 30 is:

(+2, -0.5)

- a. 60
- b. 75
- c. 90
- d. 100

6. The smallest fraction, which should be added to the sum of $2\frac{1}{2}$, $3\frac{1}{3}$, $4\frac{1}{4}$ and $5\frac{1}{5}$ to make the result a whole number is:

(+2, -0.5)

- a. $\frac{13}{60}$
- b. $\frac{1}{4}$
- c. $\frac{17}{60}$
- d. $\frac{43}{60}$

7. Find the cube root of (-13824)

(+2, -0.5)

OR Find the value of $\sqrt[3]{-13824}$

- a. 38
 - b. -38
 - c. 24
 - d. -24
-

8. The sum of three positive numbers is 18 and their product is 162. If the sum of two numbers is equal to the third then the sum of squares of the numbers is: (+2, -0.5)

- a. 120
 - b. 126
 - c. 132
 - d. 138
-

9. The sum of three consecutive even numbers is 28 more than the average of these three numbers. The smallest of these three number is: (+2, -0.5)

- a. 6
 - b. 12
 - c. 14
 - d. 16
-

10. In a division sum, the divisor 'd' is 10 times the quotient 'q' and 5 times the remainder 'r'. If $r = 46$, the dividend will be: (+2, -0.5)

- a. 5042
- b. 5328
- c. 5336
- d. 4276

11. A man can do a piece of work in 30 hours. If he works with his son then the same piece of work is finished in 20 hours. If the son works alone, he can do the work in: (+2, -0.5)

- a. 60 hours
- b. 50 hours
- c. 25 hours
- d. 10 hours

12. A water tap fills a tub in 'p' hours and a sink at the bottom empties it in 'q' hours. If $p < q$ and both tap and sink are open, the tank is filled in 'r' hours: (+2, -0.5)

- a. $\frac{1}{r} = \frac{1}{p} + \frac{1}{q}$
- b. $\frac{1}{r} = \frac{1}{p} - \frac{1}{q}$
- c. $r = p + q$
- d. $r = p - q$

13. John does $\frac{1}{2}$ piece of the work in 3 hours, Joe does $\frac{1}{4}$ of the remaining work in 1 hour and George finishes the remaining work in 5 hours. How long would it have taken the three working together to do the work? (+2, -0.5)

- a. $2\frac{1}{7}$ hours
- b. $3\frac{1}{7}$ hours
- c. $3\frac{8}{11}$ hours
- d. $2\frac{8}{11}$ hours

14. A does $\frac{2}{5}$ of a work in 9 days. Then B joined him and they together completed the remaining work in 6 days. B alone can finish the whole work in: (+2, -0.5)

- a. $6\frac{12}{13}$ days
- b. $8\frac{2}{11}$ days
- c. 10 days
- d. 18 days

15. The daily wages of A and B respectively are Rs.3.50 and 2.50. When A finishes a certain work, he gets a total wage of Rs. 63, When B does the same work, he gets a total wage Rs.75. If both of them do it together what is the cost of the work? (+2, -0.5)

- a. Rs. 67.50
- b. Rs. 27.50
- c. Rs. 60.50

d. Rs. 70.50

16. A man does double the work done by a boy in the same time. The number of days that 3 men and 4 boys will take to finish a work which can be done by 10 men in 8 days is: (+2, -0.5)

a. 4

b. 16

c. $7\frac{3}{11}$

d. $8\frac{4}{5}$

17. The marked price of an article is 30% higher than the cost price. If a trader sells the articles allowing 10% discount to the customer, then the gain percent will be: (+2, -0.5)

a. 17

b. 20

c. 19

d. 15

18. A merchant marked the price of an article by increasing its production cost by 40%. Now he allows a 20% discount and gets a profit of Rs. 48 after selling it. The production cost is: (+2, -0.5)

a. Rs. 320

b. Rs. 360

c. Rs. 400

d. Rs. 440

19. A watch dealer pays 10% customs duty on a watch which costs Rs. 500 abroad. He desires to make a profit of 20% after giving a discount of 25% to the buyer. The marked price should be: (+2, -0.5)

a. Rs. 950

b. Rs. 800

c. Rs. 880

d. Rs. 660

20. A shopkeeper allows 20% discount on his advertised price and made a profit of 25% on his outlay. What is the advertised price (in Rs.) on which he gains Rs. 6000? (+2, -0.5)

a. 36000

b. 37500

c. 39000

d. 42500

21. Rs. 2420 were divided among A, B, C so that $A : B = 5 : 4$ and $B : C = 9 : 10$ then C gets: (+2, -0.5)

a. 680

b. 800

c. 900

d. 950

22. 49 Kg of blended tea contains Assam and Darjeeling tea in the ratio 5 : 2. (+2, -0.5)
Then the quantity of Darjeeling tea is to be added to the mixture to make the ratio of Assam to Darjeeling tea 2 : 1 is:

a. 4.5 kg

b. 3.5 kg

c. 5 kg

d. 6 kg

23. Among 132 examinees of a certain school, the ratio of successful to (+2, -0.5)
unsuccessful students is 9 : 2. Had 4 more students passed, then the ratio of successful to unsuccessful students will be:

a. 14 : 3

b. 14 : 5

c. 28 : 3

d. 28 : 5

24. In a regiment, the ratio between the number of officers to soldiers was 3 : (+2, -0.5)
31 before the battle. In the battle, 6 officers and 22 soldiers were martyred, and the ratio became 1 : 13, the number of officers in the regiment before the battle was:

a. 31

b. 38

c. 21

d. 28

25. Three containers have their volumes in the ratio 3 : 4 : 5. They are full of mixtures of milk and water. The mixtures contain milk and water in the ratio of (4 : 1), (3 : 1) and (5 : 2) respectively. The contents of all these three containers are poured into a fourth container. The ratio of milk and water in the fourth container is (+2, -0.5)

a. 4 : 1

b. 151 : 48

c. 157 : 53

d. 5 : 2

26. In what proportion must a grocer mix sugar at Rs. 12 a kg and Rs. 7 a kg so as to make a mixture worth Rs. 8 a kg? (+2, -0.5)

a. 7 : 12

b. 1 : 4

c. 2 : 3

d. 12 : 7

27. Fifteen movie theatres average 600 customers per theatre per day. If six of the theatres close down but the total theatre attendance stays the same, (+2, -0.5)

then the average daily attendance per theatre among the remaining theatres is

- a. 900
 - b. 1000
 - c. 1100
 - d. 1200
-

28. The average weight of A, B and C is 45 kg. If the average weight of A and B be 40 kg and that of B and C be 43 kg, then the weight of B is: (+2, -0.5)

- a. 31 kg
 - b. 32 kg
 - c. 29.5 kg
 - d. 35. kg
-

29. The batting average for 40 innings of a cricket player is 50 runs. His highest score exceeds his lowest score by 172 runs. If these two innings are excluded, the average of the remaining 38 innings is 48 runs. The highest score of the player is (+2, -0.5)

- a. 165
 - b. 170
 - c. 172
 - d. 174
-

30. The average of 7 consecutive numbers is 20. The largest of these numbers is (+2, -0.5)

- a. 20
- b. 23
- c. 24
- d. 26

31. Mukesh has twice as much money as Soham. Soham has 50% more money than Pankaj. If the average money with them is Rs. 110, then Mukesh has (+2, -0.5)

- a. 155
- b. 160
- c. 180
- d. 175

32. The average daily income of 7 men, 11 women and 2 boys is Rs. 257.50. If the average daily income of the men is Rs. 10 more than that of women and the average daily income of the women is Rs. 10 more than that of boys, the average daily income of a man is (+2, -0.5)

- a. Rs. 277.5
- b. Rs. 250
- c. Rs. 265

d. Rs. 257

33. If the profit on selling an article for Rs. 425 is the same as the loss on selling it for Rs. 355, then the cost price of the article is (+2, -0.5)

a. Rs. 410

b. Rs. 380

c. Rs. 400

d. Rs. 390

34. A & B jointly made a profit of Rs. 1650 and they decided to share it such that $\frac{1}{3}$ of A's profit is equal to $\frac{2}{5}$ of B's profit. Then the profit of B is (+2, -0.5)

a. Rs. 700

b. Rs. 750

c. Rs. 850

d. Rs. 800

35. 4% of the selling price of an article is equal to 5% of its cost price. Again 20% of the selling price is Rs.120 more than 22% of its cost price. The ratio of cost price & selling price is (+2, -0.5)

a. 2 : 3

b. 4 : 2

c. 4 : 5

d. 5 : 4

36. Due to 25% fall in the rate of eggs, one can buy 2 dozen eggs more than before by investing Rs. 162. Then the original rate per dozen of the eggs is (+2, -0.5)

a. Rs. 22

b. Rs. 24

c. Rs. 27

d. Rs. 30

37. Last year Mr. A bought two paintings. This year he sold them for Rs. 20,000 each. On one, he made a 25% profit and on the other, he had a 25% loss. Then his net profit or loss is (+2, -0.5)

a. He lost more than Rs. 2000

b. He lost less than Rs. 2000

c. He earned more than Rs. 2000

d. He earned less than Rs. 2000

38. A shopkeeper sells rice at 10% profit and uses weight 30% less than the actual measure. His gain percent is (+2, -0.5)

a. $57\frac{2}{3}\%$

b. $57\frac{1}{7}\%$

c. $57\frac{2}{5}\%$

d. $57\frac{3}{7}\%$

39. What % of a day is 30 minutes?

(+2, -0.5)

- a. 2.83
 - b. 2.083
 - c. 2.09
 - d. 2.075
-

40. A businessman's earnings increase by 25% in one year but decreases by 4% in the next. Going by this pattern, after 5 years, his total earnings would be Rs. 72000. What is his present earning?

(+2, -0.5)

- a. Rs. 10000
 - b. Rs. 80000
 - c. Rs. 40000
 - d. Rs. 54000
-

41. In an examination 73% of the candidates passed in quantitative aptitude test, 70% passed in General awareness and 64% passed in both. If 6300 failed in both subjects the total number of examinees were

(+2, -0.5)

- a. 60000
- b. 50000
- c. 30000

d. 25000

42. A man spends 75% of his income. His income increases by 20% and his expenditure also increases by 10%. Find the percentage increase in his savings. (+2, -0.5)

a. 25%

b. 50%

c. 15%

d. 10%

43. On a river, Q is the mid-point between two points P and R on the same bank of the river. A boat can go from P to Q and back in 12 hours, and from P to R in 16 hours 40 min. How long would it take to go from R to P? (+2, -0.5)

a. $3\frac{1}{3}$ hr

b. 5 hr

c. $6\frac{2}{3}$ hr

d. $7\frac{1}{3}$ hr

44. A car can finish a certain journey in 10 hours at a speed of 42 kmph. In order to cover the same distance in 7 hours, the speed of the car (km/h) must be increased by: (+2, -0.5)

a. 12

b. 15

c. 18

d. 24

45. A man travels 450 km to his home partly by train and partly by car. He takes 8 hrs 40 mins if he travels 240 km by train and rest by car. He takes 20 mins more if he travels 180 km by train and the rest by car. The speed of the car in km/hr is (+2, -0.5)

a. 45

b. 50

c. 60

d. 48

46. A train 'B' speeding with 100 kmph crosses another train C, running in the same direction, in 2 mins. If the length of the train B and C be 150m and 250m respectively, what is the speed of the train C (in kmph)? (+2, -0.5)

a. 75

b. 88

c. 95

d. 110

47. The compound interest on Rs. 30,000 at 7% per annum for n years is Rs. 4347. The value of n is (+2, -0.5)

a. 3

b. 2

c. 4

d. 5

48. If A borrowed Rs. P at x% and B borrowed Rs. Q(>P) at y% per annum at simple interest at the same time, then the amount of their debts will be equal after (+2, -0.5)

a. $100 \left(\frac{Q-P}{Px-Qy} \right) \text{ years}$

b. $100 \left(\frac{Px-Qy}{Q-P} \right) \text{ years}$

c. $100 \left(\frac{Px-Qy}{P-Q} \right) \text{ years}$

d. $100 \left(\frac{P-Q}{Px-Qy} \right) \text{ years}$

49. A man invested a sum of money at compound interest. It amounted to Rs. 2420 in 2 years and to Rs. 2662 in 3 years. Find the sum (+2, -0.5)

a. Rs. 1000

b. Rs. 2000

c. Rs. 5082

d. Rs. 3000

50. If a sum of money becomes 4000 in 2 yrs and 5500 in 4 yrs 6 months at the same rate of simple interest per annum. Then the rate of simple interest is (+2, -0.5)

- a. $21\frac{3}{7}\%$
- b. $21\frac{2}{7}\%$
- c. $21\frac{1}{7}\%$
- d. $21\frac{5}{7}\%$

51. A hollow cylindrical tube 20 cm long is made of iron and its external and internal diameters are 8 cm and 6 cm respectively. The volume (in cubic cm) of iron used in making the tube is (Take $\pi = \frac{22}{7}$) (+2, -0.5)

- a. 1760
- b. 440
- c. 220
- d. 880

52. If the areas of three adjacent faces of a rectangular box which meet in a corner are 12 cm^2 , 15 cm^2 and 20 cm^2 respectively. Then the volume of the box is (+2, -0.5)

- a. 3600 cm^3
- b. 300 cm^3
- c. 60 cm^3
- d. 180 cm^3

53. The ratio between the length and the breadth of a rectangular park is 3 : 2. (+2, -0.5)
If a man cycling along the boundary of the park at the speed of 12 km/hour completes one round in 8 minutes, then the area of the park is

- a. 153650 m²
- b. 135600 m²
- c. 153600 m²
- d. 156300 m²

54. If the radius of a right circular cylinder open at both the ends, is decreased by 25% and the height of the cylinder is increased by 25%. Then the curved surface area of the cylinder thus formed (+2, -0.5)

- a. remains unaltered
- b. is increased by 25%
- c. is increased by 6.25%
- d. is decreased by 6.25%

55. A cylindrical pencil of diameter 1.2 cm has one of its end sharpened into a conical shape of height 1.4 cm. The volume of the material removed is (+2, -0.5)

- a. 1.056 cm³
- b. 4.224 cm³
- c. 10.56 cm³
- d. 42.24 cm³

56. A rectangular park 60 m long and 40 m wide has two concrete crossroads running in the middle of the park and rest of the park has been used as a lawn. If the area of the lawn is 2109 m² then the width of the road is (+2, -0.5)
- a. 3 m
 - b. 5 m
 - c. 6 m
 - d. 2 m
-
57. Four circles of equal radii are described about the four corners of a square so that each touches two of the other circles. If each side of the square is 140 cm then the area of the space enclosed between the circumference of the circle is (take $n = \frac{22}{7}$) (+2, -0.5)
- a. 4200 cm²
 - b. 2100 cm²
 - c. 7000 cm²
 - d. 2800 cm²
-
58. The amount of concrete required to build a concrete cylindrical pillar whose base has a perimeter 8.8 metre and curved surface area 17.6 sq. metre, is (Take $n = \frac{22}{7}$) (+2, -0.5)
- a. 8.325 m³
 - b. 9.725 m³

- c. 10.5 m^3
- d. 12.32 m^3

59. A hemispherical bowl of internal radius 9 cm, contains a liquid. This liquid is to be filled into small cylindrical bottles of diameter 3 cm and height 4 cm. Then the number of bottles necessary to empty the bowl is (+2, -0.5)

- a. 18
- b. 45
- c. 27
- d. 54

60. A rectangular water tank is $80 \text{ m} \times 40 \text{ m}$. Water flows into it through a pipe of 40 sq. cm at the opening at a speed of 10 km/hr . The water level will rise in the tank in half an hour is (+2, -0.5)

- a. $\frac{3}{2} \text{ cm}$
- b. $\frac{4}{9} \text{ cm}$
- c. $\frac{5}{9} \text{ cm}$
- d. $\frac{5}{8} \text{ cm}$

61. A square and a regular hexagon are drawn such that all the vertices of the square and the hexagon are on a circle of radius $r \text{ cm}$. The ratio of the area of the square and the hexagon is (+2, -0.5)

- a. 3 : 4

b. $4 : 3\sqrt{3}$

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

d. $1 : \sqrt{2}$

62. A solid cylinder has a total surface area of 231 sq. cm. If its curved surface area is $\frac{2}{3}$ of the total surface area, then the volume of the cylinder is (+2, -0.5)

a. 154 cu.cm

b. 308 cu.cm

c. 269.5 cu.cm

d. 370 cu.cm

63. The lateral surface area of a frustum of a right circular cone, if the area of its base is $16\pi \text{ cm}^2$ and the diameter of the circular upper surface is 4 cm and slant height 6 cm, will be (+2, -0.5)

a. $30\pi \text{ cm}^2$

b. $48\pi \text{ cm}^2$

c. $36\pi \text{ cm}^2$

d. $60\pi \text{ cm}^2$

64. The diameter of a sphere is twice the diameter of another sphere. The surface area of the first sphere is equal to the volume of the second sphere. The magnitude of the radius of the first sphere is (+2, -0.5)

- a. 12
- b. 24
- c. 16
- d. 48

65. A right circular cylinder having a diameter of 21 cm and a height of 38 cm is full of ice cream. The ice cream is to be filled in cones of height 12 cm and diameter 7 cm having a hemispherical shape on the top. The number of such cones to be filled with ice cream is (+2, -0.5)

- a. 54
- b. 44
- c. 36
- d. 24

66. The simplified value of $\left(1 - \frac{2xy}{x^2+y^2}\right) \div \left(\frac{x^3-y^3}{x-y} - 3xy\right)$ is (+2, -0.5)

- a. $\frac{1}{x^2-y^2}$
- b. $\frac{1}{x^2+y^2}$
- c. $\frac{1}{x-y}$
- d. $\frac{1}{x+y}$

67. If $a + b + c = 0$ then the value of $\frac{1}{(a+b)(b+c)} + \frac{1}{(b+c)(c+a)} + \frac{1}{(c+a)(a+b)}$ is (+2, -0.5)

- a. 0

b. 1

c. 3

d. 2

68. If $x^2 + y^2 + 2x + 1 = 0$, then the value of $x^{31} + y^{35}$ is (+2, -0.5)

a. -1

b. 0

c. 1

d. 2

69. If $x = \frac{\sqrt{5}+1}{\sqrt{5}-1}$ and $y = \frac{\sqrt{5}-1}{\sqrt{5}+1}$, the value of $\frac{x^2+xy+y^2}{x^2-xy+y^2}$ is (+2, -0.5)

a. $3/4$

b. $4/3$

c. $3/5$

d. $5/3$

70. If $(x - 1/x)^2 = 3$, then the value of $x^6 + 1/x^6$ equals (+2, -0.5)

a. 90

b. 100

c. 110

d. 120

71. If $x^4 + 2x^3 + ax^2 + bx + 9$ is a perfect square, where a and b are positive real numbers, then the value of a and b are (+2, -0.5)

a. $a = 5, b = 6$

b. $a = 6, b = 7$

c. $a = 7, b = 6$

d. $a = 7, b = 8$

72. If $a^2 + b^2 + c^2 = 16$, $x^2 + y^2 + z^2 = 25$ and $ax + by + cz = 20$, then the value of $\frac{a+b+c}{x+y+z}$ (+2, -0.5)

a. $3/5$

b. $5/3$

c. $4/5$

d. $5/4$

73. The value of x which satisfies the equation $\frac{x+a^2+2c^2}{b+c} + \frac{x+b^2+2a^2}{c+a} + \frac{x+c^2+2b^2}{a+b} = 0$ is (+2, -0.5)

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

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

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

d. $-(a^2 + b^2 + 2c^2)$

74. If $a^3 = 117 + b^3$ and $a = 3 + b$, then the value of $a + b$ is: (+2, -0.5)

- a. 7
- b. 49
- c. 13
- d. 0

75. If $a + 1/a = -2$ then the value of $a^{1000} + a^{-1000}$ is (+2, -0.5)

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

76. $\triangle ABC$ is similar to $\triangle DEF$. If the area of $\triangle ABC$ is 9 sq. cm, and area of $\triangle DEF$ is 16 sq.cm, and $BC = 2.1$ cm. then the length of EF will be (+2, -0.5)

- a. 5.6 cm
- b. 2.8 cm
- c. 3.7 cm
- d. 1.4 cm

77. A chord of a circle is equal to its radius. The angle subtended by this chord at a point on the circumference is (+2, -0.5)

- a. 80°
- b. 60°
- c. 30°
- d. 90°

78. Let two chords AB and AC of the larger circle touch the smaller circle having the same centre at X and Y, then $XY = ?$ (+2, -0.5)

- a. BC
- b. $BC/2$
- c. $BC/3$
- d. $BC/4$

79. Let G be the centroid of the equilateral triangle ABC of perimeter 24 cm. Then the length of AG is (+2, -0.5)

- a. $2\sqrt{3}$ cm
- b. $8/\sqrt{3}$ cm
- c. $8\sqrt{3}$ cm
- d. $4\sqrt{3}$ cm

80. A and B are the centres of two circles with radii 11 cm and 6 cm respectively. A common tangent touches these circles at P & Q respectively. If $AB = 13$ cm, then the length of PQ is (+2, -0.5)

- a. 13 cm
- b. 17 cm
- c. 8.5 cm
- d. 12 cm

81. ABC is an isosceles triangle inscribed in a circle. If $AB = AC = 12\sqrt{5}$ and $BC = 24$ cm then radius of circle is (+2, -0.5)

- a. 10 cm
- b. 15 cm
- c. 12 cm
- d. 14 cm

82. ABC is an isosceles triangle where $AB = AC$ which is circumscribed about a circle. If P is the point where the circle touches the side BC, then which of the following is true? (+2, -0.5)

- a. $BP = PC$
- b. $BP > PC$
- c. $BP < PC$
- d. $BP = PC/2$

83. If D and E are the midpoints of AB and AC respectively of $\triangle ABC$, then the ratio of the areas of ADE and BCED is: (+2, -0.5)

a. 1 : 2

b. 1 : 4

c. 2 : 3

d. 1 : 3

84. O is the circumcenter of the isosceles $\triangle ABC$. Given that $AB = AC = 5$ cm and $BC = 6$ cm. The radius of the circle is (+2, -0.5)

a. 3.015 cm

b. 3.205 cm

c. 3.025 cm

d. 3.125 cm

85. B_1 is a point on the side AC of $\triangle ABC$ and B_1B is joined. A line is drawn through A parallel to B_1B meeting BC at A_1 and another line is drawn through C parallel to B_1B meeting AB produced at C_1 . Then (+2, -0.5)

a. $\frac{1}{CC_1} - \frac{1}{AA_1} = \frac{1}{BB_1}$

b. $\frac{1}{CC_1} + \frac{1}{AA_1} = \frac{1}{BB_1}$

c. $\frac{1}{BB_1} - \frac{1}{AA_1} = \frac{2}{CC_1}$

d. $\frac{1}{AA_1} - \frac{1}{CC_1} = \frac{2}{BB_1}$

86. The value of the expression $(1 + \sec 22^\circ + \cot 68^\circ)(1 - \operatorname{cosec} 22^\circ + \tan 68^\circ)$ is (+2, -0.5)

a. 0

b. 1

c. -1

d. 2

87. If $x \sin^3 \theta + y \cos^3 \theta = \sin \theta \cos \theta$ and $x \sin \theta - y \cos \theta = 0$, then the value of $x^2 + y^2$ equals (+2, -0.5)

a. 1

b. $1/2$

c. $3/2$

d. 2

88. If $\sec \theta + \tan \theta = m$ (>1), then the value of $\sin \theta$ is ($0^\circ < \theta < 90^\circ$) (+2, -0.5)

a. $\frac{1-m^2}{1+m^2}$

b. $\frac{m^2-1}{m^2+1}$

c. $\frac{m^2+1}{m^2-1}$

d. $\frac{1+m^2}{1-m^2}$

89. If $(a^2 - b^2) \sin \theta + 2ab \cos \theta = a^2 + b^2$, then $\tan \theta = ?$ (+2, -0.5)

a. $\frac{2ab}{a^2-b^2}$

b. $\frac{a^2-b^2}{2ab}$

c. $\frac{ab}{a^2-b^2}$

d. $\frac{a^2 - b^2}{ab}$

90. A person from the top of a hill observes a vehicle moving towards him at a uniform speed. It takes 10 minutes for the angle of depression to change from 45° to 60° . After this the time required by the vehicle to reach the bottom of the hill is (+2, -0.5)

- a. 12 min 20 sec
- b. 13 min
- c. 13 min 40 sec
- d. 14 min 24 sec

91. If $2y \cos \theta = x \sin \theta$ and $2x \sec \theta - y \operatorname{cosec} \theta = 3$, then the value of $x^2 + 4y^2$ is (+2, -0.5)

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

92. From the top of a cliff 100-metre high, the angles of depression of the top and bottom of a tower are 45° and 60° respectively. The height of the tower is (+2, -0.5)

- a. $\frac{100}{3} (3 - \sqrt{3})$ metre
- b. $\frac{100}{3} (\sqrt{3} - 1)$ meter
- c. $\frac{100}{3} (2\sqrt{3} - 1)$ meter

d. $\frac{100}{3} (\sqrt{3} - \sqrt{2})$ meter

93. A vertical tower stands on a horizontal plane and is surmounted by a vertical flagstaff of height h . At a point on the plane, the angle of elevation of the bottom of the flagstaff is α and that of the top of the flagstaff is β . Then the height of the tower is (+2, -0.5)

a. $\frac{h \tan \alpha}{\tan \beta - \tan \alpha}$

b. $\frac{h \tan \alpha}{\tan \alpha - \tan \beta}$

c. $h \tan \alpha$

d. None of these

94. A man on the top of a tower, standing on the sea-shore, finds that a boat coming towards him takes 10 minutes for the angle of depression to change from 30° to 60° . How soon the boat reach the sea-shore? (+2, -0.5)

a. 5 minutes

b. 7 minutes

c. 10 minutes

d. 15 minutes

95. The expression of $\frac{\cot \theta + \operatorname{cosec} \theta - 1}{\cot \theta - \operatorname{cosec} \theta + 1}$ is equal to (+2, -0.5)

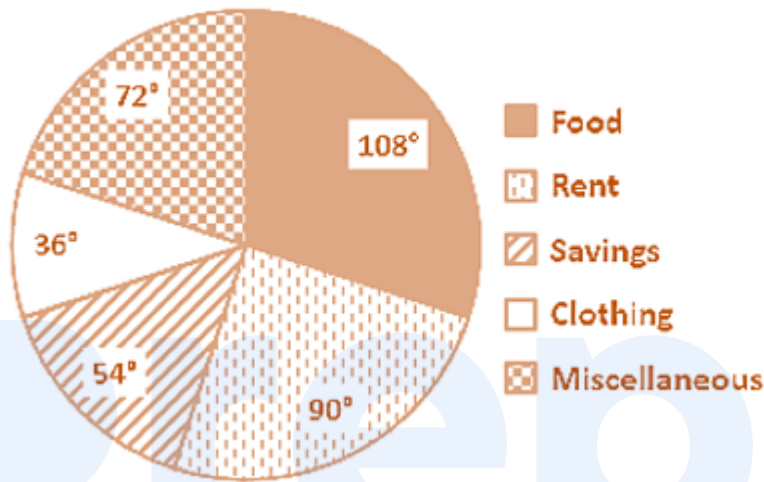
a. $\frac{1 + \cos \theta}{\sin \theta}$

b. $\frac{1 - \cos \theta}{\sin \theta}$

c. $\frac{\cot \theta + 1}{\operatorname{cosec} \theta}$

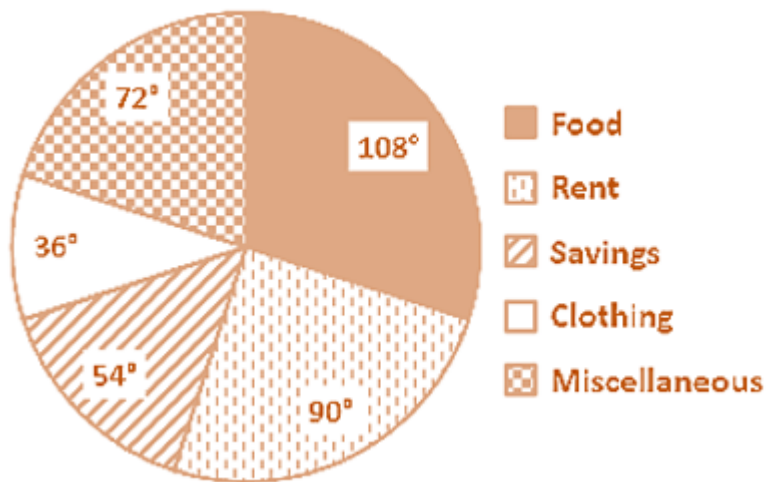
d. $\frac{\cot \theta - 1}{\operatorname{cosec} \theta}$

96. **Directions:** The following pie-chart shows the monthly expenditure of a family on various items. If the family spends Rs. 825 on clothing then answer the following questions. (+2, -0.5)



What is the total monthly income of the family?

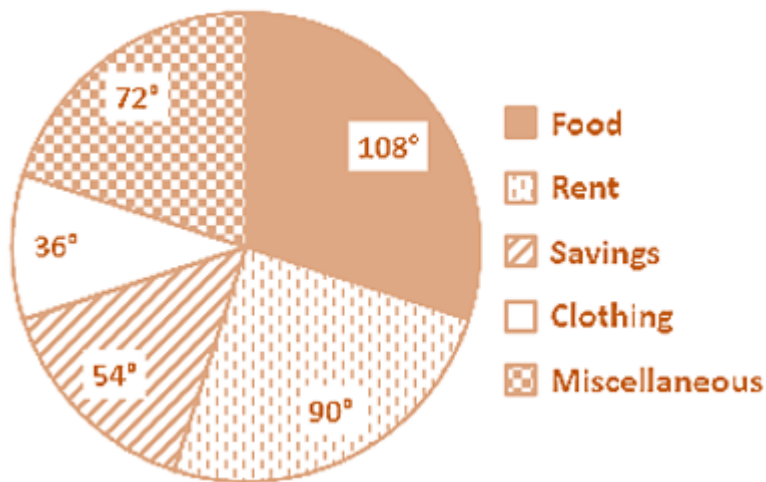
- a. Rs. 8025
- b. Rs. 8250
- c. Rs. 8520
- d. Rs. 8052
97. **Directions:** The following pie-chart shows the monthly expenditure of a family on various items. If the family spends Rs. 825 on clothing then answer the following questions. (+2, -0.5)



What percent of the total income does the family save?

- a. 15%
- b. 50%
- c. 20%
- d. 25%

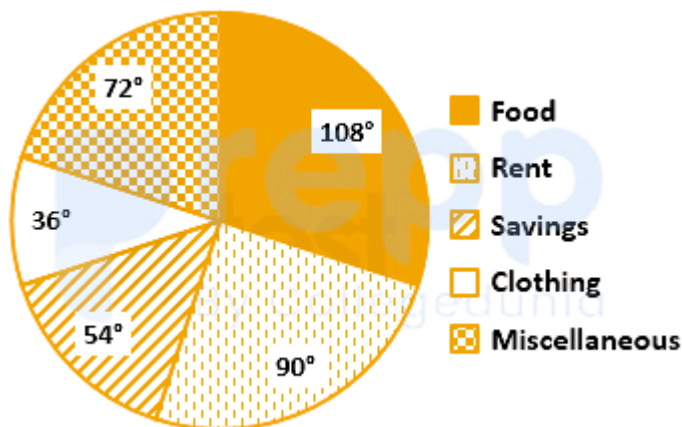
98. **Directions:** The following pie-chart shows the monthly expenditure of a family on various items. If the family spends Rs. 825 on clothing then answer the following questions. (+2, -0.5)



What is the ratio of expenses on food and miscellaneous?

- a. 3 : 4
- b. 2 : 3
- c. 3 : 2
- d. 2 : 5

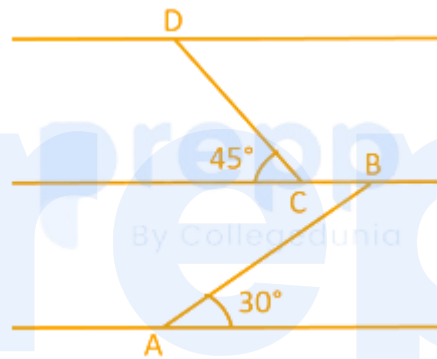
99. **Directions:** The following pie-chart shows the monthly expenditure of a family on various items. If the family spends Rs. 825 on clothing then answer the following questions. (+2, -0.5)



What is the average of expenses on clothing and rent?

- a. Rs. 1443.75
- b. Rs. 1344.57
- c. Rs. 1574.34
- d. Rs. 1734.45

100. Two ladders AB and CD are inclined on two floors of a building as shown below, such that $BC = \sqrt{2}$ m. If the height of a floor is $4\sqrt{2}$ m, how much minimum distance is to be covered to walk from point A to point D? (+2, -0.5)



- a. $(4 + 5\sqrt{2})$ m
- b. $(5 + 4\sqrt{2})$ m
- c. $(8 + 9\sqrt{2})$ m
- d. $(9 + 8\sqrt{2})$ m

Answers

1. Answer: c

Explanation:

$$0 < x < 1$$

Multiply by x

$$0 < x^2 < x$$

Again,

$$\Rightarrow x < 1$$

$$\Rightarrow \sqrt{x} < 1$$

Now we can say,

$$x^2 < x < \sqrt{x}$$

Other Method:

Let $x = 0.25$, then

$$\Rightarrow x^2 = 0.0625$$

$$\Rightarrow \sqrt{x} = \sqrt{0.25} = 0.5$$

Now, we can say

$$\Rightarrow 0.0625 < 0.25 < 0.5$$

$$\Rightarrow x^2 < x < \sqrt{x}$$

2. Answer: b

Explanation:

2	36, 40, 48
2	18, 20, 24
2	9, 10, 12
2	9, 5, 6
3	9, 5, 3
3	3, 5, 1
5	1, 5, 1
	1, 1, 1

LCM of 36, 40 and 48 is 720.

720 seconds = 12 min

They will ring together after every 12 min.

3. Answer: c

Explanation:

As we know,

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

Divisibility law of 3 $\Rightarrow$ A number is divisible by 3 if sum of its digit is divisible by 3.

Let any three digit number example 123

According to the question

$$\Rightarrow 123 - (1 + 2 + 3)$$

$$\Rightarrow 123 - 6$$

$$\Rightarrow 117$$

As we know,

$$\Rightarrow 1 + 1 + 7 = 9$$

So, 117 divisibly by 3 and 9 both, we can say number divisibly by 3 and 9 both.

4. Answer: b

Explanation:

The three fraction are $\frac{2}{3}$, $\frac{3}{5}$ and $\frac{11}{15}$

$$\frac{2}{3} = \frac{2}{3} \times \frac{5}{5} = \frac{10}{15}$$

$$\frac{3}{5} = \frac{3}{5} \times \frac{3}{3} = \frac{9}{15}$$

$$\Rightarrow \frac{11}{15}$$

$$\Rightarrow \frac{9}{15} < \frac{10}{15} < \frac{11}{15}$$

$$\Rightarrow \frac{3}{5} < \frac{2}{3} < \frac{11}{15}$$

5. Answer: a

Explanation:

Detailed Method:

Let two number are x and y . Where $x > y$

$$(x + y) - (x - y) = 30$$

$$\Rightarrow 2y = 30$$

$$\Rightarrow y = 15$$

$$\Rightarrow xy = 900$$

$$\Rightarrow x = 900/15$$

$$\Rightarrow x = 60$$

Other Method

Let the number be 60 (from the option), then

$$\text{Other number} = 900/60 = 15$$

$$\Rightarrow 60 + 15 = 60 - 15$$

$$\Rightarrow 75 = 45 \text{ (condition satisfied)}$$

6. Answer: d

Explanation:

$$2\frac{1}{2} + 3\frac{1}{3} + 4\frac{1}{4} + 5\frac{1}{5}$$

$$\Rightarrow 2 + 3 + 4 + 5 + \left(\frac{1}{2} + \frac{1}{3} + \frac{1}{4} + \frac{1}{5}\right)$$

$$\Rightarrow 14 + (30 + 20 + 15 + 12)/60$$

$$\Rightarrow 14 + 77/60$$

$$\Rightarrow 14 + 1 + 17/60$$

$$\Rightarrow 15 + 17/60$$

$$\text{Required ratio} = 1 - 17/60 = 43/60$$

7. Answer: d

Explanation:

$$\Rightarrow \sqrt[3]{-13824}$$

$$\Rightarrow \sqrt[3]{(-24) \times (-24) \times (-24)}$$

$$\Rightarrow (-24)$$

8. Answer: b

Explanation:

Let there are three numbers a, b and c.

$$\Rightarrow a + b + c = 18 \text{ and } a + b = c$$

$$\Rightarrow 2c = 18$$

$$\Rightarrow c = 9$$

$$\Rightarrow a + b = 9 \quad \text{---(1)}$$

$$\Rightarrow abc = 162$$

$$\Rightarrow ab \times 9 = 162$$

$$\Rightarrow ab = 18$$

As we know,

$$\Rightarrow (a + b)^2 - (a - b)^2 = 4ab$$

$$\Rightarrow 9^2 - (a - b)^2 = 4 \times 18$$

$$\Rightarrow (a - b)^2 = 81 - 72$$

$$\Rightarrow (a - b) = \sqrt{9}$$

$$\Rightarrow a - b = 3 \quad \text{---(2)}$$

Add equation (1) and equation (2)

$$\Rightarrow 2a = 12$$

$$\Rightarrow a = 6$$

$$\Rightarrow a + b + c = 18$$

$$\Rightarrow 6 + b + 9 = 18$$

$$\Rightarrow b = 18 - 15$$

$$\Rightarrow b = 3$$

Now,

$$a^2 + b^2 + c^2$$

$$\Rightarrow 6^2 + 3^2 + 9^2$$

$$\Rightarrow 36 + 9 + 81$$

$$\Rightarrow 126$$

Short trick:

$$a + b + c = 18 \text{ and } a + b = c$$

Put $a = 6$ and $b = 3$, then $c = 9$ (condition satisfied)

Now,

$$6^2 + 3^2 + 9^2$$

$$\Rightarrow 36 + 9 + 81$$

$$\Rightarrow 126$$

9. Answer: b

Explanation:

Given:

The sum of three consecutive even numbers is 28 more than the average of these three numbers

Concept used:

$$\text{Average} = (\text{Sum of observations}) / (\text{Number of observations})$$

Calculations:

Let the three consecutive even numbers be x , $(x + 2)$ and $(x + 4)$

$$\text{Sum of three consecutive numbers} = x + x + 2 + x + 4 = 3x + 6$$

$$\text{Average of the numbers} = (3x + 6) / 3 = x + 2$$

According to the question

$$\Rightarrow (3x + 6) - (x + 2) = 28$$

$$\Rightarrow 3x + 6 - x - 2 = 28$$

$$\Rightarrow 2x = 28 - 4$$

$$\Rightarrow x = 24 / 2$$

$$\Rightarrow x = 12$$

$\therefore$ The smallest number is 12.

10. Answer: c

Explanation:

$$\text{Remainder (r)} = 46$$

$$\text{Divisor} = 5 \times 46 = 230$$

$$\text{Quotient} = 230 / 10 = 23$$

As we know,

Dividend = Divisor $\times$ Quotient + remainder

$$\text{Dividend} = 230 \times 23 + 46 = 5336$$

11. Answer: a

Explanation:



Son = S and Father = F

Total work = 60

Efficiency of son = $3 - 2 = 1$

Son alone can complete the whole work in = $60/1 = 60$ hrs

Detailed Method:

Let son alone can complete the whole work in x days, then

According to the question

$$1/30 + 1/x = 1/20$$

$$\Rightarrow 1/x = 1/20 - 1/30$$

$$\Rightarrow 1/x = (3 - 2)/60$$

$$\Rightarrow 1/x = 1/60$$

Son alone can complete the whole work in 60 days.

12. Answer: b

Explanation:

Given, $p < q$

Work done by filling tap in 1 hr = $1/p$

Work done by a sink in 1 hr = $1/q$

According to the question

$$\Rightarrow 1/p - 1/q = 1/r$$

13. Answer: d**Explanation:****Calculation:**

John does $1/2$ piece of work in = 3 hrs

John complete the whole work in = $3 \times 2/1 = 6$ hrs

Joe does $1/4$ of the remaining work = $(1/4)(1 - 1/2) = 1/8$

Joe does $1/8$ of work in = 1 hr

Joe does the whole work = 8 hrs

George remaining work = $1 - (1/2 + 1/8)$

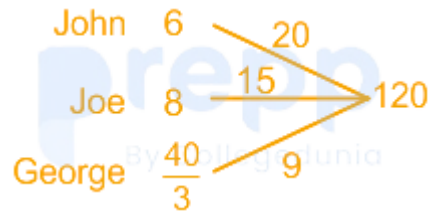
$$\Rightarrow 1 - 5/8$$

$$\Rightarrow 3/8$$

George does $3/8$ of work in = 5 hrs

$$\Rightarrow 5 \times 8/3 = 40/3$$

George does the whole work in = $40/3$



Total work = 120

The Efficiency of John, Joe, and George is 20, 15, and 9 units per day

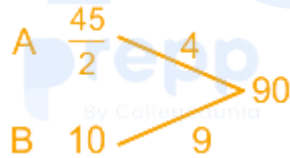
John, Joe, and George together complete the whole work in = $120 / (20 + 15 + 9)$

$\Rightarrow 120 / 44$

$\Rightarrow 2\frac{8}{11}$ days

14. Answer: d

Explanation:



A does $\frac{2}{5}$ of work in = 9 days

A complete 1 work in = $9 \times \frac{5}{2} = \frac{45}{2}$ days

A and B complete $\frac{3}{5}$ of work in = 6 days

A and B complete 1 work in = $6 \times \frac{5}{3} = 10$ days

Total work = 90

Efficiency of B = $9 - 4 = 5$

B alone complete the whole work in = $90 / 5 = 18$ days

15. Answer: a

Explanation:



A's one day wages = Rs. 3.5

B's one day wages = Rs. 2.5

A and B's one days wages = $3.5 + 2.5 = \text{Rs. } 6$

A complete the work in = $63/3.5 = 18$ days

B complete the work in = $75/2.5 = 30$ days

Total work = 90

A and B complete the work in = $90/(5 + 3) = 45/4$ days

Total wages of A and B = $45/4 \times 6 = \text{Rs. } 67.5$

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16. Answer: b

Explanation:

Let efficiency of 1 man and 1 boy be m and b respectively.

$$m = 2b$$

$$m : b = 2 : 1$$

Work done by 10 men in 8 days = $2 \times 10 \times 8 = 160$

Total efficiency of 3 men and 4 boys = $3 \times 2 + 4 \times 1 = 10$

Required days = $160/10 = 16$ days

17. Answer: a

Explanation:

Let Cost price of the article be Rs. 100

MP of the article = $\text{Rs. } 100 \times 130/100 = 130$

SP of the article = $130 \times (90/100) = 117$

Profit = $117 - 100 = 17$

Profit % = $17/100 \times 100 = 17\%$

Short Trick:

Required profit % = $30 - 10 - (30 \times 10)/100 = 20 - 3 = 17\%$

18. Answer: c

Explanation:

Let Cost price of the article be 100 unit

MP of the article = $100 \times 140/100 = 140$ unit

SP of the article = $140 \times (80/100) = 112$ unit

Profit = $112 - 100 = 12$ unit

$\Rightarrow 12 \text{ unit} = 48$

$\Rightarrow 1 \text{ unit} = 4$

$\Rightarrow 100 \text{ unit} = 400$

Cost price of the article Rs. 400

Short Trick:

$$\text{Required profit \%} = 40 - 20 - (40 \times 20)/100 = 20 - 8 = 12\%$$

$$\Rightarrow 12\% = 48$$

$$\Rightarrow 1\% = 4$$

$$\Rightarrow 100\% = 400$$

19. Answer: c

Explanation:

Cost price of the watch = Rs. 500

Cost price of the watch after adding 10% customs = $500 \times (110/100) = \text{Rs. } 550$

SP of the article, if he wants 20% profit = $550 \times (6/5) = \text{Rs. } 660$

MP of the article, if he gives 25% discount = $660 \times (4/3) = \text{Rs. } 880$

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20. Answer: b

Explanation:

Let the advertised price be 100 unit.

SP of the advertised = $100 \times (125/100) = 125 \text{ unit}$

Profit = $125 - 100 = 25 \text{ unit}$

MP of the advertised = $125 \times (5/4) = 625/4 \text{ unit}$

25 unit = 6000

$$1 \text{ unit} = 240$$

$$\Rightarrow 625/4 \text{ unit} = 625/4 \times 240 = 37500$$

21. Answer: b

Explanation:

Given:

Rs. 2420 were divided among A, B, C

$$A : B = 5 : 4$$

$$B : C = 9 : 10$$

Concept Used:

Properties of ratio.

Calculation:

Total sum = Rs. 2420

$$A : B = 5 : 4 \quad \text{---} (1) \times 9$$

$$B : C = 9 : 10 \quad \text{---} (2) \times 4$$

$$A : B : C = 45 : 36 : 40$$

$$\Rightarrow 45 + 36 + 40 = 121 \text{ unit}$$

$$\Rightarrow 121 \text{ unit} = 2420$$

$$\Rightarrow 1 \text{ unit} = 2420/121$$

$$\Rightarrow 20$$

$$\Rightarrow 40 \text{ unit} = 20 \times 40$$

$$\Rightarrow 800$$

$\therefore$ Share of C is Rs. 800.

22. Answer: b

Explanation:

$$\text{Quantity of Assam tea} = \frac{5}{7} \times 49 = 35$$

$$\text{Quantity of Darjeeling tea} = 49 - 35 = 14$$

Let the quantity of Darjeeling tea added be x kg, then

According to the question

$$\Rightarrow \frac{35}{14 + x} = \frac{2}{1}$$

$$\Rightarrow 35 = 28 + 2x$$

$$\Rightarrow 2x = 35 - 28$$

$$\Rightarrow x = \frac{7}{2}$$

$$\Rightarrow x = 3.5 \text{ kg}$$

23. Answer: d

Explanation:

$$\text{Total number of examinees} = 132$$

$$\text{Number of pass students} = \frac{9}{11} \times 132 = 108$$

$$\text{Number of fail students} = 132 - 108 = 24$$

$$\text{If 4 more students pass, then number of pass students} = 108 + 4 = 112$$

If 4 more students pass, number of fail students = $24 - 4 = 20$

Ratio of pass students to fail students = $112 : 20 = 28 : 5$

24. Answer: c

Explanation:

Ratio between the number of officers to soldier = $3x : 31x$

According to the question

$$(3x - 6)/(31x - 22) = 1/13$$

$$\Rightarrow 39x - 78 = 31x - 22$$

$$\Rightarrow 39x - 31x = 78 - 22$$

$$\Rightarrow 8x = 56$$

$$\Rightarrow x = 7$$

$$\text{Number of officers} = 3 \times 7 = 21$$

25. Answer: c

Explanation:

Given:

Volume ratio of three containers = $3 : 4 : 5$

Ratio of milk to water in first container = $4 : 1$

Ratio of milk to water in second container = $3 : 1$

The ratio of milk to water in third container = $5 : 2$

Calculation:

Container	Milk	Water	Volume of container
I	4	1	5
II	3	1	4
III	5	2	7

Step (1): Make the volume of all containers are equal

Container	Milk	Water	Volume of container
I	$4 \times 28 = 112$	$1 \times 28 = 28$	$5 \times 28 = 140$
II	$3 \times 35 = 105$	$1 \times 35 = 35$	$4 \times 35 = 140$
III	$5 \times 20 = 100$	$2 \times 20 = 40$	$7 \times 20 = 140$

Step (2): Make the volume according to the given volume ratio

Container	Milk	Water	Volume of containers
I	$112 \times 3 = 336$	$28 \times 3 = 84$	$140 \times 3 = 420$
II	$105 \times 4 = 420$	$35 \times 4 = 140$	$140 \times 4 = 560$
III	$100 \times 5 = 500$	$40 \times 5 = 200$	$140 \times 5 = 700$
Total Quantity	$336 + 420 + 500 = 1256$	$84 + 140 + 200 = 424$	

The ratio of milk to water in the fourth container = $1256 : 424 = 157 : 53$

$\therefore$ The ratio of milk to water in the fourth container is $157 : 53$

★ Alternate Method

The volume ratio of three containers = $3 : 4 : 5$

Ratio of milk to water in first container = 4 : 1 ----(1) $(4 + 1 = 5) \times 21$

Ratio of milk to water in second container = 3 : 1 ----(2) $(3 + 1 = 4) \times 35$

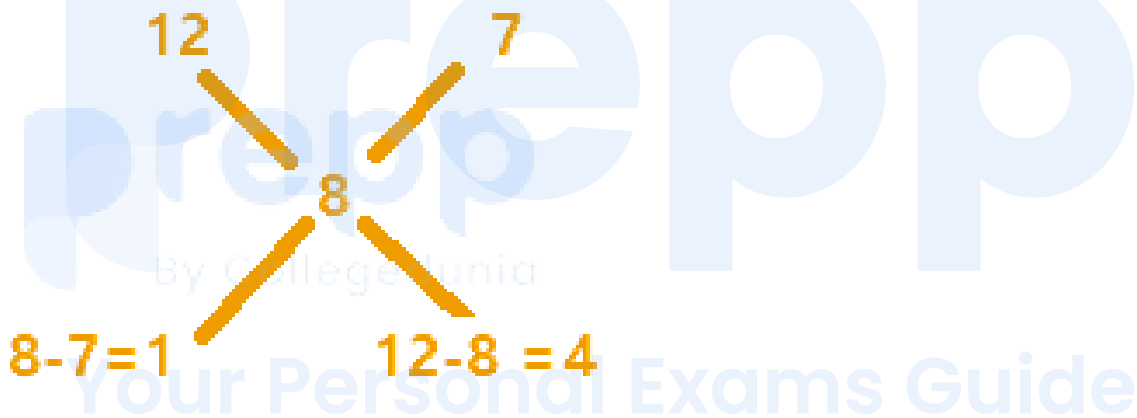
Ratio of milk to water in second container = 5 : 2 ----(3) $(5 + 2 = 7) \times 25$

Ratio of milk to water in fourth container = $(84 + 105 + 125) : (21 + 35 + 50) = 314 : 106$
 $= 157 : 53$

26. Answer: b

Explanation:

Using allegation method



Ratio of Rs. 12 per kg to Rs. 7 per kg = 1 : 4

27. Answer: b

Explanation:

Average customers of 15 movie theatres = 600

Sum of 15 movie theatres = $600 \times 15 = 9000$

Average of 9 movie theatres = $9000/9 = 1000$

28. Answer: a

Explanation:

Average weight of A, B and C = 45 kg

Sum of weight of A, B and C = $45 \times 3 = 135$ kg

Average weight of A and B = 40 kg

Sum of weight of A and B = $40 \times 2 = 80$ kg --- (1)

Average weight of B and C = $43 \times 2 = 86$ kg --- (2)

$\Rightarrow A + B + B + C = 80 + 86$

$\Rightarrow A + 2B + C = 166$ kg

$\Rightarrow B = 166 - 135 = 31$ kg

29. Answer: d

Explanation:

Given:

The batting average for 40 innings of a cricket player is 50 runs.

His highest score exceeds his lowest score by 172 runs.

If these two innings are excluded, the average of the remaining 38 innings is 48 runs.

Formula used:

Average run = $\frac{\text{Total run in total innings}}{\text{Total number of innings}}$

Calculation:

Average run for 40 inning of a cricket player = 50

Sum of run for 40 innings of a cricket player = $50 \times 40 = 2000$

Average run for 38 inning of a cricket player = 48

Sum of run for 38 innings of a cricket player = $38 \times 48 = 1824$

Sum of remaining 2 innings = $2000 - 1824 = 176$

Let the minimum score be x and maximum score be $x + 172$

According to the question

$$\Rightarrow x + x + 172 = 176$$

$$\Rightarrow 2x = 176 - 172$$

$$\Rightarrow 2x = 4$$

$$\Rightarrow x = 4/2$$

$$\Rightarrow x = 2$$

$$\therefore \text{Maximum score} = 2 + 172 = 174$$

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30. Answer: b

Explanation:

Average of 7 consecutive numbers = 20

According to the question

$$\Rightarrow x + x + 1 + x + 2 + x + 3 + x + 4 + x + 5 + x + 6 = 20 \times 7$$

$$\Rightarrow 7x + 21 = 140$$

$$\Rightarrow 7x = 140 - 21$$

$$\Rightarrow x = 119/7$$

$$\Rightarrow x = 17$$

$$\text{Largest number is} = 17 + 6 = 23$$



$$\text{Average of 7 consecutive numbers} = 20$$

$$4^{\text{th}} \text{ number is} = 20$$

$$7^{\text{th}} \text{ numbers} = 20 + 3 = 23$$

31. Answer: c

Explanation:

$$\text{Average of money of three persons} = 110$$

$$\text{Sum of money of three persons} = 110 \times 3 = 330$$

$$\text{Let the share of Pankaj be Rs. } 2x$$

$$\text{Share of Sohan} = 2x \times \frac{3}{2} = 3x$$

$$\text{Share of Mukesh} = 3x \times 2 = 6x$$

According to the question

$$\Rightarrow 2x + 3x + 6x = 330$$

$$\Rightarrow 11x = 330$$

$$\Rightarrow x = 30$$

$$\text{Share of Mukesh} = 6 \times 30 = \text{Rs. } 180$$

32. Answer: c

Explanation:

Average daily income of 7 men, 11 women and 2 boys (20 persons) = 257.50

Sum of income of 7 men, 11 women and 2 boys = $257.50 \times 20 = 5150$

Let daily income of one boy be Rs. x

Income of one woman = $x + 10$

Income of one man = $x + 20$

According to the question

$$\Rightarrow 7(x + 20) + 11(x + 10) + 2x = 5150$$

$$\Rightarrow 7x + 140 + 11x + 110 + 2x = 5150$$

$$\Rightarrow 20x + 250 = 5150$$

$$\Rightarrow 20x = 5150 - 250$$

$$\Rightarrow 20x = 4900$$

$$\Rightarrow x = 4900/20$$

$$\Rightarrow x = 245$$

Daily income of 1 man = $x + 20 = 245 + 20 = \text{Rs. } 265$

33. Answer: d

Explanation:

Let the cost price of the article be Rs. x

$$\Rightarrow 425 - x = x - 355$$

$$\Rightarrow x + x = 425 + 355$$

$$\Rightarrow 2x = 780$$

$$\Rightarrow x = 780/2$$

$$\Rightarrow x = 390$$

Short Trick:

$$\text{Cost price of article} = (425 + 355)/2 = 780/2 = 390$$

34. Answer: b

Explanation:

Total profit of A and B = Rs. 1650

According to the question

$$\Rightarrow A \times 1/3 = B \times 2/5$$

$$\Rightarrow A : B = 6 : 5$$

$$\Rightarrow 6 + 5 = 11 \text{ unit}$$

$$\Rightarrow 11 \text{ unit} = 1650$$

$$\Rightarrow 1 \text{ unit} = 150$$

$$\Rightarrow 5 \text{ unit} = 150 \times 5 = 750$$

Share of B = Rs. 750

35. Answer: c

Explanation:

According to the question

$$SP \times 4\% = CP \times 5\%$$

$$CP : SP = 4 : 5$$

36. Answer: c

Explanation:

Let the price of eggs one dozen be Rs. $4x$

$$\text{Price of eggs after fall in rate} = 4x \times \frac{3}{4} = 3x$$

$$\text{Price of eggs before to after} = 4x : 3x$$

$$\text{Consumption of eggs before to after} = 3x : 4x$$

As we know, consumption is inversely proportion to price.

$$\Rightarrow 4x - 3x = 2 \text{ dozens}$$

$$\Rightarrow x = 2 \text{ dozens}$$

$$\text{Consumption of eggs before} = 3 \times 2 = 6 \text{ dozens}$$

$$\text{Price of eggs per dozen} = 162/6 = \text{Rs. } 27$$

Detailed method:

Let the price of eggs one dozen be Rs. $4x$

$$\text{Price of eggs after fall in rate} = 4x \times \frac{3}{4} = 3x$$

According to question

$$\Rightarrow 162 \left[\frac{1}{3x} - \frac{1}{4x} \right] = 2$$

$$\Rightarrow 162 \left[\frac{(4 - 3)}{12x} \right] = 2$$

$$\Rightarrow 162 = 24x$$

$$\Rightarrow x = 162/24$$

$$\text{Price of eggs one dozen} = 4 \times 162/24 = \text{Rs. } 27$$

37. Answer: a

Explanation:

Short Trick:

$$\text{Total SP} = 20000 \times 2 = 40,000$$

$$\text{Loss \%} = (25 \times 25)/100 = 6.25\%$$

$$6.25\% = 1/16$$

Let total CP = 16 unit and total loss = 1 unit

$$\text{Total SP} = 16 - 1 = 15 \text{ unit}$$

$$15 \text{ unit} = 40,000$$

$$1 \text{ unit} = 40,000/15 = \text{Rs. } 2667$$

Loss is more than Rs.2000.

Detailed Method:

$$\text{Total SP of both paintings} = 20,000 \times 2 = 40,000$$

$$\text{CP of first paintings} = 20,000 \times (4/5) = 16,000$$

$$\text{CP of second paintings} = 20,000 \times (4/3) = 26,667$$

$$\text{Total CP of both paintings} = 16,000 + 26,667 = 42,667$$

$$\text{Total loss} = 42,667 - 40,000 = 2,667$$

Now, we can say loss is more than Rs.2000.

38. Answer: b

Explanation:

Let the CP of 100 kg rice be Rs. 100

SP of 1 kg = $100 \times 110/100 = \text{Rs. } 110$

$\Rightarrow$ 30% of 100 kg

$\Rightarrow 100 \times 70/100$

$\Rightarrow 70 \text{ kg}$

Shopkeeper sold 70 kg instead of 100 kg.

CP of 70 kg = Rs. 70

SP of 70 kg = Rs. 110

Profit = $110 - 70 = 40$

Profit % = $40/70 \times 100 = 57\frac{1}{7}\%$

39. Answer: b

Explanation:

As we know,

$\Rightarrow 1 \text{ day} = 24 \text{ hr}$

$\Rightarrow 1 \text{ hr} = 60 \text{ min}$

$\Rightarrow 1 \text{ day} = 60 \times 24 = 1440 \text{ min}$

$$\text{Required percentage} = 30/1440 \times 100 = 2.083\%$$

40. Answer: c

Explanation:

Let the present income of businessman be Rs. x,

$$\Rightarrow x \times (5/4) \times (24/25) \times (5/4) \times (24/25) \times (5/4) = 72,000$$

$$\Rightarrow x \times 9/5 = 72,000$$

$$\Rightarrow x = 72,000 \times 5/9$$

$$\Rightarrow x = 40,000$$

Short Trick

$$\begin{array}{r} 4 \quad 5 \\ 25 \quad 24 \\ 4 \quad 5 \\ 25 \quad 24 \\ \times \quad 4 \quad 5 \\ \hline 5 \quad 9 \end{array}$$

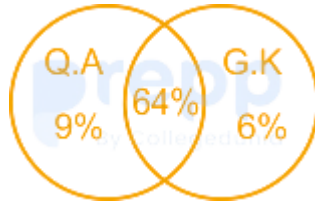
$$\Rightarrow 9 \text{ unit} = 72,000$$

$$\Rightarrow 1 \text{ unit} = 8,000$$

$$\Rightarrow 5 \text{ unit} = 40,000$$

41. Answer: c

Explanation:



Let the total number of students be x

Percentage of pass students in both subjects = $9 + 64 + 6 = 79\%$

Percentage of fail students = $100\% - 79\% = 21\%$

$$\Rightarrow x \times (21/100) = 6300$$

$$\Rightarrow x = 30,000$$

Total number of students is 30,000.

Short Trick:

Let total students be 100%

Percentage of pass students = $73\% + 70\% - 64\% = 79\%$

Percentage of fail students = $100\% - 79\% = 21\%$

$$21\% = 6300$$

$$\Rightarrow 1\% = 300$$

$$\Rightarrow 100\% = 30,000$$

42. Answer: b

Explanation:

Let the total income of man be Rs. 100

Expenditure of man = $100 \times 75/100 = \text{Rs. } 75$

Savings of income = $100 - 75 = \text{Rs. } 25$

New income of man = $100 \times (120/100) = \text{Rs. } 120$

New expenditure of man = $75 \times (110/100) = 82.5$

New savings of man = $120 - 82.5 = 37.5$

Savings increased by = $37.5 - 25 = 12.5$

Savings increased by (in %) = $12.5/25 \times 100 = 50\%$

43. Answer: d

Explanation:



Time taken to go from P to R by boat = 16 hrs + 40 min

Time taken to go from P to Q by boat = $(16 \text{ hr} + 40 \text{ min})/2 = 8 \text{ hrs} + 20 \text{ min}$

Time taken to go from P to Q and back by boat = 12 hrs

Time taken to come back from Q to P = $12 \text{ hrs} - (8 \text{ hrs} + 20 \text{ min}) = 3 \text{ hr} + 40 \text{ min}$

Time taken to come back from R to P = $2 (3 \text{ hr} + 40 \text{ min}) = 7 \text{ hr} + 20 \text{ min}$ or $7\frac{1}{3} \text{ hr}$

44. Answer: c

Explanation:

As we know, distance is same, then

Distance = Speed $\times$ Time

Let the speed of the car be $x \text{ km/hr}$, then

$$\Rightarrow x \times 7 = 42 \times 10$$

$$\Rightarrow x = 60 \text{ km/hr}$$

So, car increased its speed by $= 60 - 42 = 18 \text{ km/hr}$

45. Answer: a

Explanation:

Let the speed of train and car be $a \text{ km/hr}$ and $b \text{ km/hr}$.

According to the question

$$\Rightarrow 240/a + 210/b = 8 \text{ hr} + 40 \text{ min}$$

$$\Rightarrow 240/a + 210/b = 8\frac{2}{3}$$

$$\Rightarrow 240/a + 210/b = 26/3 \quad \text{---(1)}$$

$$\Rightarrow 180/a + 270/b = 9 \quad \text{---(2)}$$

Multiply by 3 in equation (1) and by 4 in equation (2)

$$\Rightarrow 450/b = 10$$

$$\Rightarrow b = 45 \text{ km/hr}$$

Speed of car is 45 km/hr

46. Answer: b

Explanation:

Given:

Speed of train B = 100 km/h

Length of B = 150 m

Length of C = 250 m

Time taken by B to cross C in same direction = 2 mins

Concept used:

Concept used:

1.) Relative speed is defined as the speed of a moving object with respect to another.

2.) When two objects are moving in the same direction, the relative speed is calculated as their difference.

Relative speed when moving in the same direction = $a - b$

3.) When two objects are moving in the opposite direction, the relative speed is computed by adding the two speeds.

Relative speed when moving in opposite direction = $a + b$

4.) Time taken to meet = Distance/Relative speed

Calculations:

Speed of train B = 100 kmph

Let the speed of train C be x km/hr

Length of train B and C are 150 m and 250 m respectively.

As we know,

Speed = Distance/Time

$$\Rightarrow (100 - x) \times 5/18 = (150 + 250)/(2 \times 60)$$

$$\Rightarrow (100 - x) = 400/120 \times 18/5$$

$$\Rightarrow 100 - x = 12$$

$$\Rightarrow x = 100 - 12$$

$$\Rightarrow x = 88$$

$\therefore$ Speed of the train C is 88 km/hr.

47. Answer: b

Explanation:

$$P = 30,000 \text{ and}$$

$$A = 30,000 + 4347 = 34,347 \text{ and } r = 7\%$$

As we know,

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

$$\Rightarrow 34,347 = 30,000 (1 + 7/100)^t$$

$$\Rightarrow (107/100)^t = 34347/30,000$$

$$\Rightarrow (107/100)^t = 11,449/10,000$$

$$\Rightarrow (107/100)^t = (107/100)^2$$

$$\Rightarrow t = 2 \text{ years}$$

$\therefore$ The value of n is 2.

48. Answer: a

Explanation:

As we know,

$$\text{Amount} = P + Prt/100$$

According to the question

$$Q + (Q \times y \times t) // 100 = P + (P \times x \times t) // 100$$

$$\Rightarrow 100Q + Qyt = 100P + Pxt$$

$$\Rightarrow Pxy - Qyt = 100Q - 100P$$

$$\Rightarrow t (Px - Qy) = 100 (Q - P)$$

$$\Rightarrow t = 100 \left(\frac{Q-P}{Px-Qy} \right) \text{ years}$$

49. Answer: b

Explanation:

$$R\% = \frac{2662-2420}{2420} \times 100$$

$$= \frac{242}{2420} \times 100 = 10$$

$$2 \text{ years CI \%} = 10 + 10 + \frac{10 \times 10}{100}$$

$$= 21\%$$

$$\text{So, } 121\% = 2420$$

$$100\% = 2000$$

50. Answer: a

Explanation:

A sum of money becomes 4000 in 2 years and 5500 in 4 years 6 months.

$$\text{SI for 2 years 6 month (5/2 years)} = 5500 - 4000 = 1500$$

$$\text{SI for 1 year} = 1500 \times 2/5 = 600$$

$$\text{SI for 2 years} = 2 \times 600 = 1200$$

$$\text{Principal} = 4000 - 1200 = 2800$$

As we know,

$$\text{SI} = \text{Prt}/100$$

$$\Rightarrow 1200 = (2800 \times r \times 2)/100$$

$$\Rightarrow r = 1200/56$$

$$\Rightarrow r = 21\frac{3}{7}\%$$

51. Answer: b

Explanation:

$$\text{External radius of the hollow cylinder } R = 8/2 = 4 \text{ cm}$$

$$\text{Internal radius of the hollow cylinder } r = 6/2 = 3 \text{ cm}$$

As we know,

$$\text{Volume of hollow cylinder} = \pi (R^2 - r^2) h$$

$$\Rightarrow 22/7 \times (4^2 - 3^2) \times 20$$

$$\Rightarrow 22/7 \times 7 \times 20$$

$$\Rightarrow 440 \text{ cm}^3$$

52. Answer: c

Explanation:

Given,

$$lb = 12 \text{ cm}^2, bh = 15 \text{ cm}^2 \text{ and } hl = 20 \text{ cm}^2$$

$$lb \times bh \times hl = 12 \times 15 \times 20$$

$$\Rightarrow (lbh)^2 = 3600$$

$$\Rightarrow \sqrt{(lbh)^2} = \sqrt{3600}$$

$$\Rightarrow lbh = 60 \text{ cm}^3$$

$$\Rightarrow \text{Volume of cuboid} = lbh = 60 \text{ cm}^3$$

Short Trick:

$$\text{Volume of cuboidal rectangle} = \sqrt{(12 \times 15 \times 20)} = \sqrt{3600} = 60 \text{ cm}^3$$

53. Answer: c

Explanation:

$$\text{Distance covered in 8 minutes, with the speed } 12 \text{ km/hr} = 12 \times \frac{5}{18} \times 8 \times 60 = 1600 \text{ m}$$

$$\text{Ratio of length to breadth of rectangular park} = 3x : 2x$$

$$\text{Perimeter of the park} = 2(3x + 2x)$$

$$\Rightarrow 2(3x + 2x) = 1600$$

$$\Rightarrow 5x = 1600/2$$

$$\Rightarrow x = 800/5$$

$$\Rightarrow x = 160$$

$$\text{Area of the park} = 3x \times 2x = 6x^2 = 6 \times 160 \times 160 = 153600 \text{ m}^2$$

54. Answer: d

Explanation:

★ Shortcut Trick

Curved surface area decreased by = $+25 - 25 - (25 \times 25)/100 = -6.25\%$

Detailed Method:

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

New radius of the cylinder = $r \times (75/100) = 0.75r$

New height of the cylinder = $h \times (125/100) = 1.25h$

Curved surface area of new cylinder = $2\pi \times 0.75r \times 1.25h$

Taking ratio of C.S.A before to after = $2\pi rh : 2\pi \times 0.75r \times 1.25h = 1 : 0.9375$

Let C.S.A before be 1 and after C.S.A be 0.9375

C.S.A decreased by = $1 - 0.9375 = 0.0625$

$\therefore$ C.S.A decreased by (in %) = $0.0625/1 \times 100 = 6.25\%$

55. Answer: a

Explanation:

As we know,

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

Volume of the cone = $(1/3) \pi r^2 h$

Radius of the cylinder $r = 1.2/2 = 0.6$ cm

Height of the cylinder $h = 1.4$ cm

Volume of the material removed = $\pi r^2 h - (1/3) \pi r^2 h = (2/3) \pi r^2 h$

$$\Rightarrow \left(\frac{2}{3}\right) \times \left(\frac{22}{7}\right) \times 0.6 \times 0.6 \times 1.4$$

$$\Rightarrow 1.056 \text{ cm}^3$$

56. Answer: a

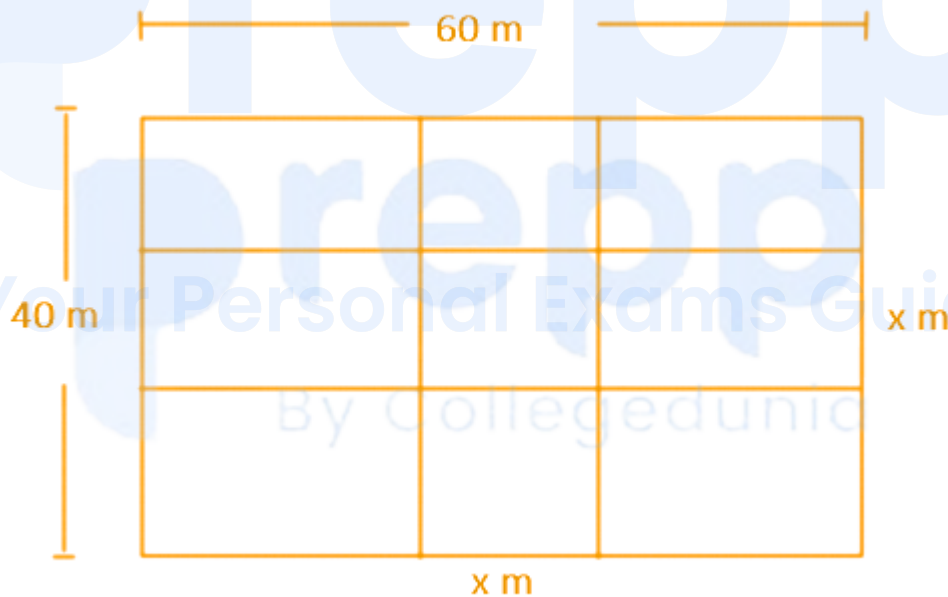
Explanation:

Given:

The length of the park is 60 m

The breadth of the park is 40 m

The area of the lawn is 2019 m²



Formula used:

Area of a Rectangle = length $\times$ breadth

Calculation:

Let the width of the park is x m

The area of the park is

$$\Rightarrow 60 \times 40 = 2400 \text{ m}^2$$

The area of the road is

$$\Rightarrow 60 \times x + 40 \times x - x^2 = 2400 - 2109$$

$$\Rightarrow 60x + 40x - x^2 = 291$$

$$\Rightarrow x^2 - 100x + 291 = 0$$

$$\Rightarrow x^2 - 97x - 3x + 291 = 0$$

$$\Rightarrow x(x - 97) - 3(x - 97) = 0$$

$$\Rightarrow (x - 3)(x - 97) = 0$$

$$\Rightarrow x = 3, 97$$

Since the width of the road cannot be larger than the length and the breadth

$\therefore$ The width of the road is 3 metre.

★ Alternate Method

Let length of the road be x m

$$\text{Area of the rectangular park} = 60 \times 40 = 2400 \text{ m}^2$$

$$\text{Area of the road} = 2400 - 2109 \quad \text{--- (1)}$$

$$\text{Area of the road} = 40x + 60x - x^2 = 100x - x^2 \quad \text{--- (2)}$$

From equation (1) and equation (2)

$$100x - x^2 = 2400 - 2109$$

$$\Rightarrow x^2 - 100x + 291 = 0$$

$$\Rightarrow x^2 - 97x - 3x + 291 = 0$$

$$\Rightarrow x(x - 97) - 3(x - 97) = 0$$

$$\Rightarrow (x - 97)(x - 3) = 0$$

Taking, (as x can't be greater than sides of park)

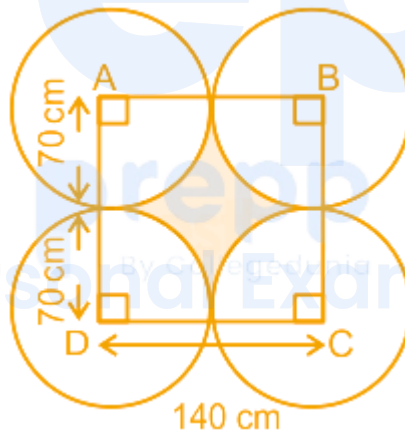
$$x - 3 = 0$$

$$\Rightarrow x = 3$$

Length of the road is 3 m.

57. Answer: a

Explanation:



Side of the square $a = 140$ cm

Radius of the circle $r = 140/2 = 70$ cm

Area of 4 quadrant = area of 1 circle

As we know,

Area of the square = a^2

Area of the circle = πr^2

Area of the space enclosed between the circumference of the circle = $a^2 - \pi r^2$

$$\Rightarrow 140 \times 140 - \left(\frac{22}{7}\right) \times 70 \times 70$$

$$\Rightarrow 19600 - 15400$$

$$\Rightarrow 4200 \text{ cm}^2$$

58. Answer: d

Explanation:

Base perimeter of cylindrical pillar = $2\pi r$

$$\Rightarrow 2 \times \frac{22}{7} \times r = 8.8$$

$$\Rightarrow r = 1.4 \text{ m}$$

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

$$\Rightarrow 2 \times \frac{22}{7} \times 1.4 \times h = 17.6$$

$$\Rightarrow h = 17.6 / (0.2 \times 22 \times 2)$$

$$\Rightarrow h = 2 \text{ m}$$

Volume of cylindrical pillar = $\pi r^2 h$

$$\Rightarrow \frac{22}{7} \times 1.4 \times 1.4 \times 2$$

$$\Rightarrow 12.32 \text{ m}^3$$

59. Answer: d

Explanation:

Internal radius of the hemispherical bowl $R = 9 \text{ cm}$

Radius of the cylindrical bottles $r = 3/2$ cm

Height of the cylindrical bottles $h = 4$ cm

Let number of cylindrical bottles be n , then

According to the question

$$\pi r^2 h \times n = (2/3) \times \pi R^3$$

$$\Rightarrow 3/2 \times 3/2 \times 2 \times n = 2/3 \times 9 \times 9 \times 9$$

$$\Rightarrow n = (2 \times 3 \times 9 \times 9) / (3 \times 3)$$

$$\Rightarrow n = 54$$

So, the number of bottles is 54.

60. Answer: d

Explanation:

Volume of water which drain out pipe in 1 hr = $40/10000 \times 10 \times 1000 = 40 \text{ m}^3$

Volume of water which drain out pipe in $1/2$ hr = $40/2 = 20 \text{ m}^3$

Let water level rise in the tank be h cm in $1/2$ hr

According to the question

$$80 \times 40 \times h = 20$$

$$\Rightarrow h = 20 / (80 \times 40) = 1/160 \text{ m}$$

$$\Rightarrow h = 100/160 = 5/8 \text{ cm}$$

61. Answer: b

Explanation:

As we know,

$$\text{Area of hexagon} = 3 \sqrt{3}/2 \times a^2$$

$$\text{Area of square} = (\text{diagonal})^2/2$$

$$\text{Diagonal of square} = 2r$$

$$\text{Area of the square} = (2r)^2/2 = 2r^2$$

$$\text{Side of the hexagon } a = r$$

$$\text{Area of the hexagon} = 3\sqrt{3}/2 \times r^2$$

$$\text{Ratio of area of square to that of hexagon} = 2r^2 : 3\sqrt{3}/2 \times r^2 = 4 : 3\sqrt{3}$$

62. Answer: c

Explanation:

$$\text{Total surface area of the cylinder} = 2\pi r(r + h)$$

$$\text{Curved surface area of the cylinder} = 2\pi rh$$

According to the question

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

$$\Rightarrow (r + h)/h = 3/2$$

$$\Rightarrow 2r + 2h = 3h$$

$$\Rightarrow 2r = 3h - 2h$$

$$\Rightarrow 2r = h$$

$$\Rightarrow r : h = x : 2x$$

According to the question

$$2 \pi r (r + h) = 231$$

$$\Rightarrow 2 \times \frac{22}{7} \times x (x + 2x) = 231$$

$$\Rightarrow 2 \times \frac{22}{7} \times x \times 3x = 231$$

$$\Rightarrow x^2 = \frac{(231 \times 7)}{(2 \times 22 \times 3)} = \frac{(7 \times 7)}{(2 \times 2)}$$

$$\Rightarrow x = \frac{7}{2}$$

$$\text{Radius} = \frac{7}{2} \text{ and Height} = \frac{7}{2} \times 2 = 7$$

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

$$\Rightarrow \frac{22}{7} \times \frac{7}{2} \times \frac{7}{2} \times 7$$

$$\Rightarrow 269.5 \text{ cm}^3$$

63. Answer: c

Explanation:

$$r = \frac{4}{2} = 2 \text{ cm}$$

$$\text{Also, } \pi R^2 = 16 \pi$$

$$\Rightarrow R^2 = 16$$

$$\Rightarrow R = 4$$

$$\text{Height of the frustum } h = 6 \text{ cm}$$

$$\text{Lateral surface area of the frustum} = \pi (R + r) \times l$$

$$\Rightarrow \pi (4 + 2) \times 6$$

$$\Rightarrow 6 \times 6 \times \pi$$

$$\Rightarrow 36 \pi$$

64. Answer: b

Explanation:

Formula used:

The surface is of sphere = $4\pi r^2$

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

Calculation:

Given that,

Ratio of diameter = Ratio of radius

Let, radius of first sphere be $2r$ cm

Radius of second sphere = r cm

According to the question

$$4\pi (2r)^2 = 4/3 \times \pi r^3$$

$$\Rightarrow 4r^2 = 1/3 \times r^3$$

$$\Rightarrow 4 = r/3$$

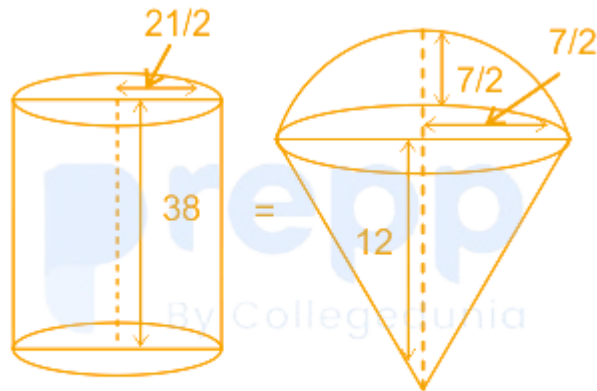
$$\Rightarrow r = 12$$

$$\therefore \text{Radius of first sphere} = 12 \times 2 = 24 \text{ cm}$$

65. Answer: a

Explanation:

Given:



Volume of cylinder =
sum of [volume of (cone + Hemisphere)]

Diameter of cylinder = 21 cm

Height of cylinder = 38 cm

The diameter of cone = 7 cm

The height of cone = 12 cm

The diameter of Hemisphere = 7 cm

Concept used:

Radius = Diameter/2

The volume of cylinder = $\pi R^2 H$

Volume of cone = $\frac{1}{3} \times r^2 h$

The volume of hemisphere = $\frac{2}{3} \times \pi r^3$

Where,

$R \rightarrow$ Radius of the cylinder

$r \rightarrow$ Radius of cone

$H \rightarrow$ Height of the cylinder

$h \rightarrow$ Height of cone

Calculations:

Let 'R' be the radius of Cylinder, 'r' be the radius of

Cone, 'H' be the height of Cylinder and 'h' be the height of Cone

$R = 21/2$ cm, $H = 38$ cm, $r = 7/2$ and $h = 12$ cm

Let number of cone be n, then

According to the question

<Diagram>

$$n \times \left[\frac{1}{3} \pi r^2 h + \frac{2}{3} \pi r^3 \right] = \pi R^2 H$$

$$\Rightarrow n \times \frac{1}{3} \times \pi \times r^2 (h + 2r) = \pi R^2 H$$

$$\Rightarrow n \times \frac{1}{3} \times \pi \times \frac{7}{2} \times \frac{7}{2} (12 + \frac{7}{2} \times 2) = \frac{21}{2} \times \frac{21}{2} \times 38$$

$$\Rightarrow n \times \frac{1}{3} \times \pi (12 + 7) = 3 \times 3 \times 38$$

$$\Rightarrow n = (3 \times 3 \times 38 \times 3) / 19$$

$$\Rightarrow n = 54$$

$\therefore$ The required number of icecream cone is 54

66. Answer: b

Explanation:

$$\Rightarrow \left(1 - \frac{2xy}{x^2+y^2} \right) \div \left(\frac{x^3-y^3}{x-y} - 3xy \right)$$

$$\Rightarrow \left(\frac{x^2+y^2-2xy}{x^2+y^2} \right) \div \left(\frac{x^3-y^3-3xy(x-y)}{x-y} \right)$$

$$\Rightarrow [(x-y)^2 / (x^2+y^2)] \times [(x-y) / (x-y)^3]$$

$$\Rightarrow 1/(x^2 + y^2)$$

Short Trick:

$$\left(1 - \frac{2xy}{x^2 + y^2}\right) \div \left(\frac{x^3 - y^3}{x - y} - 3xy\right)$$

Put $x = 2$ and $y = 1$

$$\Rightarrow (1 - 4/5) \div (7 - 6)$$

$$\Rightarrow 1/5$$

From option

$$\Rightarrow 1/(x^2 + y^2)$$

$$\Rightarrow 1/5 \text{ (satisfied)}$$

67. Answer: a

Explanation:

$$a + b + c = 0$$

$$\Rightarrow \frac{1}{(a+b)(b+c)} + \frac{1}{(b+c)(c+a)} + \frac{1}{(c+a)(a+b)}$$

$$\Rightarrow \frac{a+b+b+c+c+a}{(a+b)(b+c)(c+a)}$$

$$\Rightarrow \frac{2(a+b+c)}{(a+b)(b+c)(c+a)}$$

$$\Rightarrow \frac{2 \times 0}{(a+b)(b+c)(c+a)}$$

$$\Rightarrow 0$$

Short trick:

$$a + b + c = 0$$

Put $a = b = 1$ and $c = -2$

$$\Rightarrow \frac{1}{(a+b)(b+c)} + \frac{1}{(b+c)(c+a)} + \frac{1}{(c+a)(a+b)}$$

$$\Rightarrow \frac{1}{(1+1)(1-2)} + \frac{1}{(1-2)(-2+1)} + \frac{1}{(-2+1)(1+1)}$$

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

$$\Rightarrow 1 - 1$$

$$\Rightarrow 0$$

68. Answer: a

Explanation:

$$x^2 + y^2 + 2x + 1 = 0$$

$$\Rightarrow x^2 + 2x + 1 + y^2 = 0$$

$$\Rightarrow (x + 1)^2 + y^2 = 0$$

So,

$$(x + 1)^2 = 0$$

$$\Rightarrow x = -1$$

And

$$y^2 = 0$$

$$\Rightarrow y = 0$$

Now,

$$x^{31} + y^{35}$$

$$\Rightarrow (-1)^{31} + 0$$

$$\Rightarrow (-1)$$

69. Answer: b

Explanation:

$$x = \frac{\sqrt{5}+1}{\sqrt{5}-1} \text{ and } y = \frac{\sqrt{5}-1}{\sqrt{5}+1}$$

$$\Rightarrow x + y = \frac{\sqrt{5}+1}{\sqrt{5}-1} + \frac{\sqrt{5}-1}{\sqrt{5}+1}$$

$$\Rightarrow x + y = \frac{(\sqrt{5}+1)^2 + (\sqrt{5}-1)^2}{(\sqrt{5}-1)(\sqrt{5}+1)}$$

$$\Rightarrow x + y = (5 + 1 + 2\sqrt{5} + 5 + 1 - 2\sqrt{5})/(5 - 1)$$

$$\Rightarrow x + y = 12/4$$

$$\Rightarrow x + y = 3$$

$$\Rightarrow xy = \frac{\sqrt{5}+1}{\sqrt{5}-1} \times \frac{\sqrt{5}-1}{\sqrt{5}+1}$$

$$\Rightarrow xy = 1$$

Now,

$$\Rightarrow \frac{x^2 + xy + y^2}{x^2 - xy + y^2}$$

$$\Rightarrow \frac{(x+y)^2 - xy}{(x+y)^2 - 3xy}$$

$$\Rightarrow \frac{3^2 - 1}{3^2 - 3}$$

$$\Rightarrow (9 - 1)/(9 - 3)$$

$$\Rightarrow 8/6$$

$$\Rightarrow 4/3$$

70. Answer: c

Explanation:

Given:

$$(x - 1/x)^2 = 3$$

Formula used:

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

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

Calculation:

$$(x - 1/x)^2 = 3$$

$$\Rightarrow (x - 1/x) = \sqrt{3}$$

Squaring both sides

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

$$\Rightarrow x^2 + 1/x^2 - 2 = 3$$

$$\Rightarrow x^2 + 1/x^2 = 3 + 2$$

$$\Rightarrow (x^2 + 1/x^2) = 5$$

Cubing on both sides

$$(x^2 + 1/x^2)^3 = 5^3$$

$$\Rightarrow x^6 + 1/x^6 + 3(x^2 + 1/x^2) = 125$$

$$\Rightarrow x^6 + 1/x^6 = 125 - 3 \times 5$$

$$\Rightarrow x^6 + 1/x^6 = 110$$

$\therefore$ required value is 110.

71. Answer: c

Explanation:

As we know,

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

Similarly

$$(x^2 + x + 3)^2$$

$$x^4 + x^2 + 9 + 2x^3 + 6x + 6x^2$$

$$\Rightarrow x^4 + 2x^3 + 7x^2 + 6x + 9$$

Comparing on $x^4 + 2x^3 + ax^2 + bx + 9$

$$\Rightarrow a = 7 \text{ and } b = 6$$

72. Answer: c

Explanation:

$$a^2 + b^2 + c^2 = 16$$

Put $b = c = 0$, then

$$a^2 = 16$$

$$\Rightarrow a = 4$$

Similarly,

$$x^2 + y^2 + z^2 = 25$$

Put $y = z = 0$

$$x^2 = 25$$

$$\Rightarrow x = 5$$

Now,

$$ax + by + zc = 20$$

$$\Rightarrow 4 \times 5 + 0 + 0 = 20$$

$$\Rightarrow 20 = 20 \text{ (satisfied)}$$

Now,

$$(a + b + c)/(x + y + z)$$

$$\Rightarrow 4/5$$

73. Answer: b

Explanation:

$$\frac{x+a^2+2c^2}{b+c} + \frac{x+b^2+2a^2}{c+a} + \frac{x+c^2+2b^2}{a+b} = 0$$

From the option

$$\text{Put } x = -(a^2 + b^2 + c^2)$$

$$\frac{-a^2-b^2-c^2+a^2+2c^2}{b+c} + \frac{-a^2-b^2-c^2+b^2+2a^2}{c+a} + \frac{-a^2-b^2-c^2+c^2+2b^2}{a+b} = 0$$

$$\frac{c^2-b^2}{b+c} + \frac{a^2-c^2}{c+a} + \frac{b^2-a^2}{a+b} = 0$$

$$\frac{(c-b)(c+b)}{b+c} + \frac{(a+c)(a-c)}{c+a} + \frac{(a+b)(b-a)}{a+b} = 0$$

$$c - b + a - c + b - a = 0$$

$$0 = 0 \text{ (satisfied)}$$

★ **Shortcut Trick**

$$\text{Put, } a = b = c = 1$$

Hence, $\frac{x+a^2+2c^2}{b+c} + \frac{x+b^2+2a^2}{c+a} + \frac{x+c^2+2b^2}{a+b} = 0$

$\Rightarrow x = -3$

Now, putting $a = b = c = 1$ in option 2 we get -3 .

Hence, option 2 is correct.

74. Answer: a

Explanation:

$a^3 - b^3 = 117$ and $a - b = 3$

Put $a = 5$ and $b = 2$, then all condition satisfied

$a + b$

$\Rightarrow 5 + 2$

$\Rightarrow 7$

Detailed Method:

$(a - b) = 3$ and $(a^3 - b^3) = 117$

As we know,

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

$\Rightarrow 3^3 = 117 - 3ab \times 3$

$\Rightarrow 9ab = 117 - 27$

$\Rightarrow ab = 90/9$

$\Rightarrow ab = 10$

As we know,

$$\Rightarrow (a + b)^2 - (a - b)^2 = 4ab$$

$$\Rightarrow (a + b)^2 - 3^2 = 4 \times 10$$

$$\Rightarrow (a + b)^2 = 40 + 9 = 49$$

$$\Rightarrow (a + b) = \sqrt{49} = 7$$

75. Answer: a

Explanation:

$$a + 1/a = -2$$

Put $a = -1$, then condition satisfied

Now,

$$a^{1000} + 1/a^{1000}$$

$$\Rightarrow (-1)^{1000} + 1/(-1)^{1000}$$

$$\Rightarrow 1 + 1$$

$$\Rightarrow 2$$

76. Answer: b

Explanation:

ΔABC is similar to ΔDEF , then

$$(\text{area of } \Delta ABC) / (\text{area of } \Delta DEF) = (BC/EF)^2$$

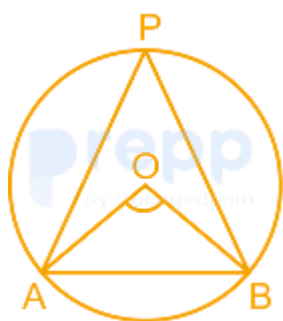
$$\Rightarrow \sqrt{9/16} = 2.1/EF$$

$$\Rightarrow EF = 2.1 \times 4/3$$

$$\Rightarrow EF = 2.8$$

77. Answer: c

Explanation:



AB is chord of circle, and point P is on the circumference.

$$OA = OB = AB$$

$\triangle OAB$ is equilateral triangle

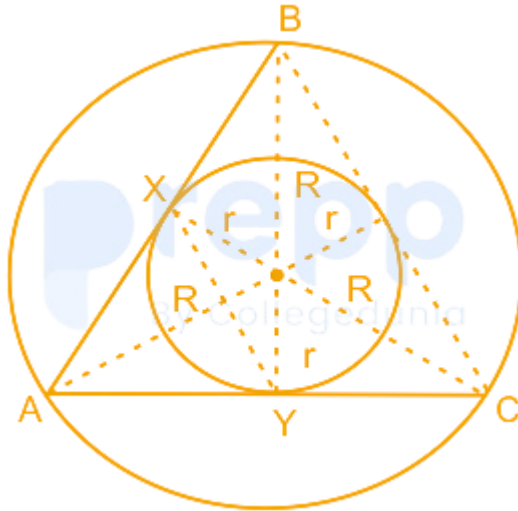
$$\text{So, } \angle AOB = \angle OBA = \angle OAB = 60^\circ$$

As we know,

$$\angle APB = \angle AOB / 2 = 60^\circ / 2 = 30^\circ$$

78. Answer: b

Explanation:



$$AX = AY \text{ [tangents]}$$

$$XB = R^2 - r^2 \dots(i)$$

$$YC = R^2 - r^2 \dots(ii)$$

similarly

$$AX = AY = R^2 - r^2 \dots(iii)$$

From above equations we get

$$AY = YC$$

$$AX = XB$$

Thus X and Y are midpoints of AB and AC respectively

Therefore, By midpoint theorem $XY \parallel BC$

$$XY = BC/2$$

79. Answer: b

Explanation:

$$\text{Side of the equilateral triangle } a = \text{Perimeter}/3 = 24/3 = 8 \text{ cm}$$

Circum-radius of the equilateral triangle = length of AG = $a/\sqrt{3} = 8/\sqrt{3}$ cm

80. Answer: d

Explanation:



$AP = 11 \text{ cm}$, $QB = 6 \text{ cm}$, $PR = 11 - 6 = 5 \text{ cm}$ and $AB = RQ = 13 \text{ cm}$

In right angled triangle PRQ

$$RQ^2 = PQ^2 + RP^2$$

$$\Rightarrow 13^2 = PQ^2 + 5^2$$

$$\Rightarrow PQ^2 = 169 - 25$$

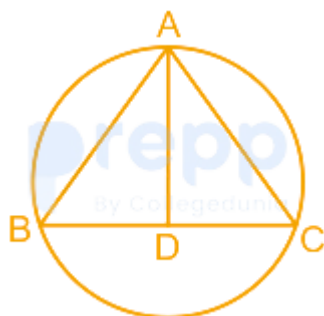
$$\Rightarrow PQ = \sqrt{144}$$

$$\Rightarrow PQ = 12 \text{ cm}$$

Note: Diagram is provided only for calculation purposes.

81. Answer: b

Explanation:



Radius of circum-circle = $\frac{abc}{4 \times \text{area of } \Delta}$

AD perpendicular to BC. $BD = BC/2 = 12 \text{ cm}$

In ΔABD

$$AB^2 = AD^2 + BD^2$$

$$\Rightarrow (12\sqrt{5})^2 = AD^2 + 12^2$$

$$\Rightarrow AD^2 = 144(5 - 1)$$

$$\Rightarrow AD = \sqrt{144 \times 4}$$

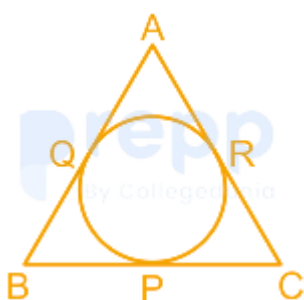
$$\Rightarrow AD = 12 \times 2 = 24$$

Now, Area of triangle = $\frac{1}{2} \times BC \times AD = \frac{1}{2} \times 24 \times 24 = 12 \times 24$

Circum-radius of the triangle = $\frac{(12\sqrt{5} \times 12\sqrt{5} \times 24)}{(4 \times 12 \times 24)} = 15 \text{ cm}$

82. Answer: a

Explanation:



As we know,

$$AQ = AR = a \text{ [tangents]}$$

$$BQ = BP = b \text{ [tangents]}$$

$$CP = CR = c \text{ [tangents]}$$

$$\text{Now, } AB = a + b \text{ and } AC = a + c$$

$$\text{Given, } AB = AC$$

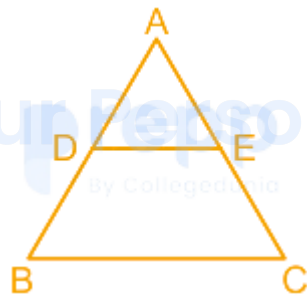
$$\Rightarrow a + b = b + c$$

$$\Rightarrow a = c$$

$$\text{Hence, } BP = CP$$

83. Answer: d

Explanation:



$$DE \parallel BC$$

$$DE = BC/2$$

$$\Rightarrow DE : BC = 1 : 2$$

$$\text{area of } \triangle ABC / \text{area of } \triangle ADE = (BC/DE)^2$$

$$\text{Area of } \triangle ABC / \text{Area of } \triangle ADE = (2/1)^2 = 4/1$$

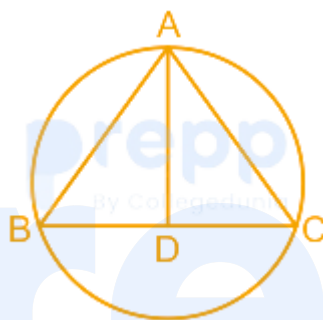
Let Area of $\triangle ABC = 4$ unit and Area of $\triangle ADE = 1$

Hence, area of BCED = $4 - 1 = 3$

Ratio of area of $\triangle ADE$ to area of BCED = $1 : 3$

84. Answer: d

Explanation:



Radius of circum-circle = $\frac{abc}{4 \text{ area of } \triangle}$

AD perpendicular to BC. $BD = BC/2 = 3$ cm

In $\triangle ABD$

$$AB^2 = AD^2 + BD^2$$

$$\Rightarrow 5^2 = AD^2 + 3^2$$

$$\Rightarrow AD^2 = 25 - 9$$

$$\Rightarrow AD = \sqrt{16}$$

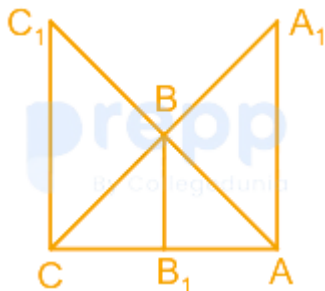
$$\Rightarrow AD = 4$$

$$\text{Area of triangle} = \frac{1}{2} \times BC \times AD = \frac{1}{2} \times 6 \times 4 = 12$$

$$\therefore \text{Circum-radius of the triangle} = \frac{(5 \times 5 \times 6)}{(4 \times 12)} = 3.125 \text{ cm}$$

85. Answer: b

Explanation:



In $\triangle AA_1C$ and $\triangle BB_1C$

$BB_1 \parallel AA_1$

$$BB_1/AA_1 = B_1C/AC \quad \text{--- (1)}$$

In $\triangle CC_1B$ and $\triangle ABB_1$

$BB_1 \parallel CC_1$

$$BB_1/CC_1 = AB_1/AC$$

$$\Rightarrow BB_1/CC_1 = (AC - B_1C)/AC$$

$$\Rightarrow BB_1/CC_1 = 1 - (B_1C/AC)$$

From equation (1)

$$BB_1/CC_1 = 1 - BB_1/AA_1$$

$$\Rightarrow BB_1[1/CC_1 + 1/AA_1] = 1$$

$$\Rightarrow 1/CC_1 + 1/AA_1 = 1/BB_1$$

86. Answer: d

Explanation:

$$\begin{aligned}
 & (1 + \sec 22^\circ + \cot 68^\circ)(1 - \operatorname{cosec} 22^\circ + \tan 68^\circ) \\
 & \Rightarrow (1 + \sec 22^\circ + \tan 22^\circ)(1 - \operatorname{cosec} 22^\circ + \cot 22^\circ) \\
 & \Rightarrow \left(1 + \frac{1}{\cos 22} + \frac{\sin 22}{\cos 22}\right) \left(1 - \frac{1}{\sin 22} + \frac{\cos 22}{\sin 22}\right) \\
 & \Rightarrow \left(\frac{\cos 22 + 1 + \sin 22}{\cos 22}\right) \left(\frac{\sin 22 - 1 + \cos 22}{\sin 22}\right) \\
 & x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} \\
 & \Rightarrow \frac{(\sin 22 + \cos 22)^2 - 1^2}{\sin 22 \cos 22} \\
 & \Rightarrow \frac{\sin^2 22 + \cos^2 22 + 2 \sin 22 \cos 22 - 1}{\sin 22 \cos 22} \\
 & \Rightarrow \frac{1 + 2 \sin 22 \cos 22 - 1}{\sin 22 \cos 22} \\
 & \Rightarrow \frac{2 \sin 22 \cos 22}{\sin 22 \cos 22} \\
 & \Rightarrow 2
 \end{aligned}$$

87. Answer: a

Explanation:

$$x \sin \theta - y \cos \theta = 0$$

$$x \sin \theta = y \cos \theta \quad \text{--- (1)}$$

$$\text{Now, } x \sin^3 \theta + y \cos^3 \theta = \sin \theta \cos \theta$$

$$\Rightarrow x \sin \theta \sin^2 \theta + y \cos^3 \theta = \sin \theta \cos \theta$$

$$\Rightarrow y \cos \theta [\sin^2 \theta + \cos^2 \theta] = \sin \theta \cos \theta$$

$$\Rightarrow y \cos \theta = \sin \theta \cos \theta$$

$$\Rightarrow y = \sin \theta \quad \text{--- (2)}$$

From equation (1) and equation (2)

$$x = \cos \theta$$

$$\text{Hence, } x^2 + y^2 = \cos^2 \theta + \sin^2 \theta = 1$$

88. Answer: b

Explanation:

$$\sec \theta + \tan \theta = m \quad \text{--- (1)}$$

$$\text{We, know, } \sec^2 \theta - \tan^2 \theta = 1$$

$$\Rightarrow (\sec \theta - \tan \theta) (\sec \theta + \tan \theta) = 1$$

$$\Rightarrow \sec \theta - \tan \theta = 1/m \quad \text{--- (2)}$$

Add equation (1) and equation (2)

$$2 \sec \theta = m + 1/m$$

$$\Rightarrow \sec \theta = (m^2 + 1)/2m$$

Subtract equation (2) equation from (1)

$$2 \tan \theta = m - 1/m$$

$$\Rightarrow \tan \theta = (m^2 - 1)/2m$$

$$\text{Now, } \sin \theta = \tan \theta \times 1/\sec \theta$$

$$\Rightarrow \sin \theta = [(m^2 - 1)/2m] \times [2m/(m^2 + 1)]$$

$$\therefore \sin \theta = (m^2 - 1)/(m^2 + 1)$$

Alternate method

$$\sec \theta + \tan \theta = m$$

Put $\theta = 45^\circ$

$$m = \sec 45^\circ + \tan 45^\circ$$

$$\Rightarrow m = (\sqrt{2} + 1)$$

$$\text{Now, } \sin \theta = \sin 45 = 1/\sqrt{2}$$

Now, from the option

$$\frac{m^2-1}{m^2+1}$$

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

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

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

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

$$\Rightarrow 1/\sqrt{2} \text{ (satisfied)}$$

89. Answer: b

Explanation:

$$(a^2 - b^2) \sin \theta + 2ab \cos \theta = a^2 + b^2$$

Divide by $\cos \theta$

$$(a^2 - b^2) \tan \theta + 2ab = (a^2 + b^2) \sec \theta$$

Squaring on both side

$$[(a^2 - b^2) \tan \theta + 2ab]^2 = [(a^2 + b^2) \sec \theta]^2$$

$$\Rightarrow (a^2 - b^2)^2 \tan^2 \theta + 4a^2 b^2 + 4ab(a^2 - b^2) \tan \theta = (a^2 + b^2)^2 \sec^2 \theta$$

$$\Rightarrow (a^2 - b^2)^2 \tan^2 \theta + 4a^2 b^2 + 4ab(a^2 - b^2) \tan \theta = (a^2 + b^2)^2 (1 + \tan^2 \theta)$$

$$\Rightarrow (a^2 - b^2)^2 \tan^2 \theta + 4a^2 b^2 + 4ab(a^2 - b^2) \tan \theta = (a^2 + b^2)^2 + (a^2 + b^2)^2 \tan^2 \theta$$

$$\Rightarrow 0 = (a^2 + b^2)^2 + (a^2 + b^2)^2 \tan^2 \theta - (a^2 - b^2)^2 \tan^2 \theta - 4a^2 b^2 + 4ab(a^2 - b^2) \tan \theta$$

$$\Rightarrow [(a^2 + b^2)^2 - (a^2 - b^2)^2] \tan^2 \theta + (a^2 + b^2)^2 - 4a^2 b^2 - 4ab(a^2 - b^2) \tan \theta = 0$$

$$\Rightarrow 4a^2 b^2 \tan^2 \theta + (a^2 - b^2)^2 - 4ab(a^2 - b^2) \tan \theta = 0$$

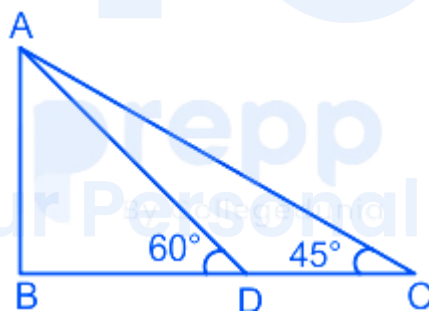
$$\Rightarrow [2ab \tan \theta - (a^2 - b^2)]^2 = 0$$

$$\Rightarrow 2ab \tan \theta - (a^2 - b^2) = 0$$

$$\therefore \tan \theta = (a^2 - b^2)/2ab$$

90. Answer: c

Explanation:



CD = 10 unit

In ΔABC

$$\tan 45 = AB/BC$$

$$BC = AB \quad \text{--- (1)}$$

In ΔABD

$$\tan 60 = AB/BD$$

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

$$\Rightarrow AB = \sqrt{3} BD$$

$$BC = \sqrt{3} BD \quad [\text{From equation (1)}]$$

$$BC = BD + CD$$

$$\Rightarrow \sqrt{3} BD - BD = CD$$

$$\Rightarrow BD (\sqrt{3} - 1) = 10$$

$$\Rightarrow BD = 10/(\sqrt{3} - 1) \times [(\sqrt{3} + 1)/(\sqrt{3} + 1)]$$

$$\Rightarrow BD = 10 (\sqrt{3} + 1)/2$$

$$\Rightarrow BD = 5 (1.732 + 1)$$

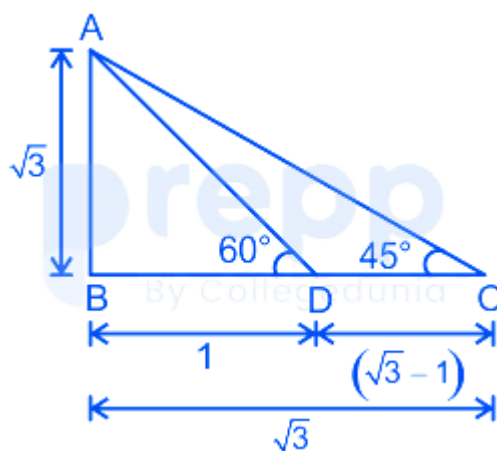
$$\Rightarrow BD = 5 \times 2.732$$

$$\Rightarrow BD = 13.66 \text{ unit}$$

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

$$\Rightarrow 13.66 \text{ unit} = 13 \text{ min } 40 \text{ sec}$$

Short Trick:



$$(\sqrt{3} - 1) \text{ unit} = 10 \text{ min}$$

$$1 \text{ unit} = 10/(\sqrt{3} - 1) \times [(\sqrt{3} + 1)/(\sqrt{3} + 1)]$$

$$\Rightarrow 1 \text{ unit} = 10 (\sqrt{3} + 1)/2 = 5 (1.732 + 1) = 5 \times 2.732 = 13.66$$

$$\Rightarrow 13.66 = 13 \text{ min } 40 \text{ sec}$$

91. Answer: d

Explanation:

$$2y \cos \theta = x \sin \theta \quad \text{--- (1)}$$

$$\Rightarrow x = 2y \cos \theta / \sin \theta$$

$$\text{Also, } 2x \sec \theta - y \operatorname{cosec} \theta = 3$$

$$\Rightarrow [2 \times 2y \cos \theta / \sin \theta] \sec \theta - y \operatorname{cosec} \theta = 3$$

$$\Rightarrow 4y \operatorname{cosec} \theta - y \operatorname{cosec} \theta = 3$$

$$\Rightarrow 3y \operatorname{cosec} \theta = 3$$

$$\Rightarrow y = 1 / \operatorname{cosec} \theta$$

$$\Rightarrow y = \sin \theta \quad \text{--- (2)}$$

From equation (1) and equation (2)

$$2 \sin \theta \cos \theta = x \sin \theta$$

$$\Rightarrow x = 2 \cos \theta$$

$$\Rightarrow x^2 + 4y^2$$

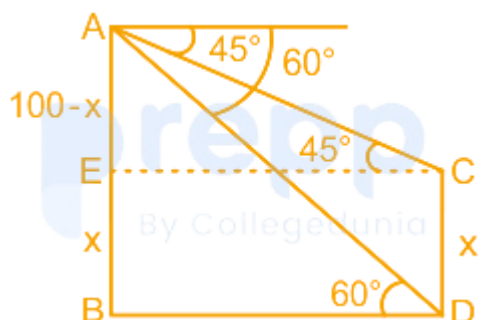
$$\Rightarrow 4 \cos^2 \theta + 4 \sin^2 \theta$$

$$\Rightarrow 4 (\cos^2 \theta + \sin^2 \theta)$$

$$\Rightarrow 4$$

92. Answer: a

Explanation:



Let, height of tower be x .

In $\triangle AEC$

$$\tan 45^\circ = \frac{AE}{CE}$$

$$\Rightarrow 1 = \frac{(100 - x)}{CE}$$

$$\Rightarrow CE = 100 - x \quad \text{----- (1)}$$

In $\triangle ABD$

$$\tan 60^\circ = \frac{AB}{BD}$$

$$\Rightarrow \sqrt{3} = \frac{100}{CE} \quad (CE = BD)$$

$$\Rightarrow (100 - x) \times \sqrt{3} = 100$$

$$\Rightarrow 100 - x = \frac{100}{\sqrt{3}}$$

$$\Rightarrow x = 100 - \frac{100}{\sqrt{3}}$$

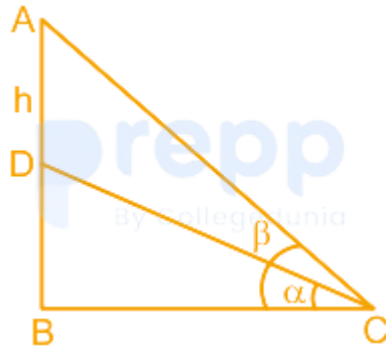
$$\Rightarrow x = 100 \left(1 - \frac{1}{\sqrt{3}}\right)$$

$$\Rightarrow x = \frac{100}{3} (3 - \sqrt{3})$$

$$\therefore \text{Height of tower} = \frac{100}{3} (3 - \sqrt{3}) \text{ m}$$

93. Answer: a

Explanation:



Let, height of tower be BD and height of vertical flagstaff be $h = AD$

In $\triangle ABC$

$$\tan \beta = AB/BC$$

$$\Rightarrow BC = AB/\tan \beta$$

$$\Rightarrow BC = (h + BD)/\tan \beta \quad \text{--- (1)}$$

In $\triangle BDC$

$$\tan \alpha = BD/BC$$

$$\Rightarrow BC = BD/\tan \alpha \quad \text{--- (2)}$$

From equation (1) and equation (2)

$$(h + BD)/\tan \beta = BD/\tan \alpha$$

$$\Rightarrow h/\tan \beta + BD/\tan \beta = BD/\tan \alpha$$

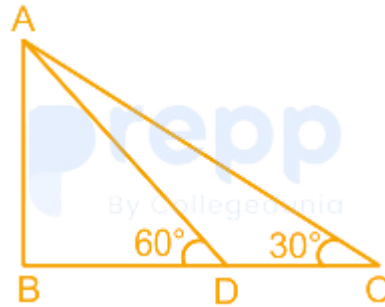
$$\Rightarrow BD/\tan \alpha - BD/\tan \beta = h/\tan \beta$$

$$\Rightarrow BD [(\tan \beta - \tan \alpha)/\tan \alpha \tan \beta] = h/\tan \beta$$

$$\therefore BD = h \tan \alpha / (\tan \beta - \tan \alpha)$$

94. Answer: a

Explanation:



CD = 10 min and BD = ?

In ΔABC

$$\tan 30^\circ = AB/BC$$

$$\Rightarrow 1/\sqrt{3} = AB/BC$$

$$\Rightarrow AB = BC/\sqrt{3} \quad \text{--- (1)}$$

In ΔABD

$$\tan 60^\circ = AB/BD$$

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

$$\Rightarrow AB = \sqrt{3} BD \quad \text{--- (2)}$$

From equation (1) equation (2)

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

$$\Rightarrow BC = 3 BD$$

As we know,

$$BC = BD + CD$$

$$\Rightarrow 3BD = BD + 10$$

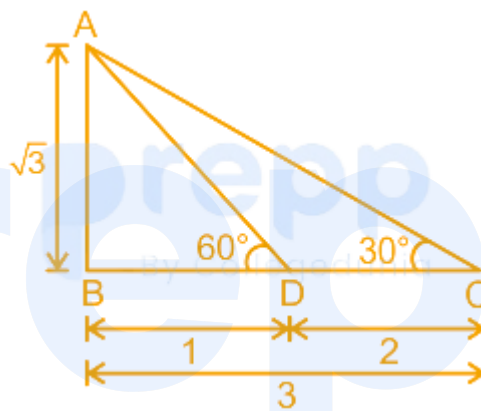
$$\Rightarrow 2BD = 10$$

$$\Rightarrow BD = 10/2$$

$$\Rightarrow BD = 5 \text{ min}$$

Concept used : As, speed is constant, hence distance is directly proportional to time.

Short Trick:



$$2 \text{ unit} = 10 \text{ min}$$

$$\text{Hence, } 1 \text{ unit} = 5 \text{ min}$$

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95. Answer: a

Explanation:

$$\frac{\cot \theta + \operatorname{cosec} \theta - 1}{\cot \theta - \operatorname{cosec} \theta + 1}$$

As we know,

$$\operatorname{cosec}^2 \theta - \cot^2 \theta = 1$$

$$\Rightarrow \frac{\cot \theta + \operatorname{cosec} \theta - (\operatorname{cosec}^2 \theta - \cot^2 \theta)}{\cot \theta + \operatorname{cosec} \theta + 1}$$

$$\Rightarrow \frac{(\cot \theta + \operatorname{cosec} \theta)(1 - \operatorname{cosec} \theta + \cot \theta)}{\cot \theta - \operatorname{cosec} \theta + 1}$$

$$\Rightarrow \cot \theta + \operatorname{cosec} \theta$$

$$\Rightarrow \cos \theta / \sin \theta + 1 / \sin \theta$$

$$\Rightarrow (\cos \theta + 1) / \sin \theta$$

96. Answer: b

Explanation:

Family spends on cloths = 36°

According to question, $36^\circ = 825$

Hence, $360^\circ = 8250$

$\therefore$ Total monthly income of the family = 8250

97. Answer: a

Explanation:

Total income = 360°

Savings of family = 54°

$\therefore$ Percentage of savings of the family = $(54^\circ / 360^\circ) \times 100 = 15\%$

98. Answer: c

Explanation:

Expenditure on food = 108°

Expenditure on miscellaneous = 72°

$\therefore$ Required ratio = $108^\circ : 72^\circ = 3 : 2$

99. Answer: a

Explanation:

Family spends on cloths = 36°

According to question, $36^\circ = 825$

Now, Average of expenses on clothing and rent = $(36^\circ + 90^\circ)/2 = 126^\circ/2 = 63^\circ$

$\Rightarrow 1^\circ = 825/36$

$\therefore 63^\circ = 825/36^\circ \times 63^\circ = 1443.75$

100. Answer: c

Explanation:

Given:

$BC = \sqrt{2} \text{ m}$

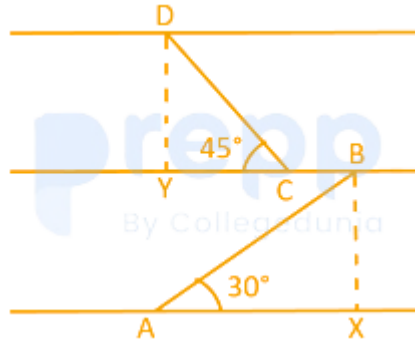
Height of floor = $4\sqrt{2} \text{ m}$

Formula Used:

$\sin \theta = \text{perpendicular/hypotenuse}$

Calculation:

$BX = DY = 4\sqrt{2} \text{ m}$



Considering $\triangle AXB$,

$$\Rightarrow \sin 30^\circ = \text{perpendicular/hypotenuse} = BX/AB$$

$$\Rightarrow \frac{1}{2} = \frac{4\sqrt{2}}{AB}$$

$$\Rightarrow AB = 8\sqrt{2} \text{ m}$$

Similarly,

Considering $\triangle CYD$,

$$\Rightarrow \sin 45^\circ = \text{perpendicular/hypotenuse} = DY/CD$$

$$\Rightarrow \frac{1}{\sqrt{2}} = \frac{4\sqrt{2}}{CD}$$

$$\Rightarrow CD = 8 \text{ m}$$

Now, minimum distance to be covered to walk from point A to point D = $AB + BC + CD$

$$\therefore \text{Required distance} = 8\sqrt{2} + \sqrt{2} + 8 = (8 + 9\sqrt{2}) \text{ m}$$