

ELEMENTARY MATHEMATICS

- In an examination 70% candidates passed in English and 65% in Mathematics. If 27% candidate fail in both the subject and 248 passed the examination. The total number of candidates was :
 (a) 400 (b) 348
 (c) 420 (d) 484
- A car runs x km at an average speed v_1 km/hr and y km at an average speeds of v_2 km/hr. What is the average speed of the car for the entire journey ?
 (a) $\frac{v_1 v_2 (x + y)}{xv_2 + yv_1}$ km/hr
 (b) $\frac{xv_2 + yv_1}{v_1 v_2 (x + y)}$ km/hr
 (c) $\frac{xy(v_1 + v_2)}{xv_1 + yv_2}$ km/hr
 (d) $\frac{xv_1 + yv_2}{xy(v_1 + v_2)}$ km/hr
- Average age of A and B is 20 years. If C were to replace A . The average would be 19 and if C were to replace B , the average would be 21. What are the ages of A , B and C (in years)?
 (a) 22, 18, 20 (b) 18, 22, 20
 (c) 22, 20, 18 (d) 18, 20, 22
- One year ago the ratio between Samer's and Ashok's age was 4 : 3. One year hence the ratio of their ages will be 5 : 4. The sum of their present ages :
 (a) 20 (b) 16
 (c) 18 (d) 15
- Subhash purchase a tape recorder at $\frac{9}{10}$ th of its selling price and sold it at 8% more than its selling price. His gain is
 (a) 9% (b) 10% (c) 18% (d) 20%
- Tarun bought a TV with 20% discount on the labelled price. Had he bought it with 25% discount, he would have saved Rs. 500. At what price did he buy the T.V?
 (a) Rs. 1500 (b) Rs. 10000
 (c) Rs. 12000 (d) Rs. 8000
- A reduction of 20% in the price of mangoes enables a person to purchase 12 more for Rs. 15. The price of 16 mangoes before reduction was :
 (a) Rs. 5 (b) Rs. 6
 (c) Rs. 7 (d) Rs. 9
- Annual payment will discharge a debt of Rs. 770 due in 5 years, the rate of interest being 5% per annum is :
 (a) Rs. 190 (b) Rs. 150
 (c) Rs. 140 (d) Rs. 100
- Divide Rs. 3903 between A and B , so that A 's share at end of 7 years, may equal to B 's share at end of 9 years, compound interest being at 4 percent
 (a) Rs. 2028, Rs. 1875 (b) Rs. 2018, Rs. 1885
 (c) Rs. 2008, Rs. 1895 (d) Rs. 2038, Rs. 1865
- Vijay obtains a loan of Rs. 64000 against his fix deposit. If the rate of interest be 2.5 paise per rupee per annum, calculate the compound interest payable after 3 years :
 (a) Rs. 4921 (b) Rs. 5020
 (c) Rs. 4821 (d) Rs. 4920
- A television is marked at Rs. 3575 cash of Rs. 1500 as cash down payment and Rs. 420 a month for 5 months. The rate of interest for this installment plan :
 (a) 4% (b) 5%
 (c) 4.86% (d) 3%
- A pocket transistor is sold for Rs. 125 cash or for Rs. 26 as cash down load payment followed by 4 equal monthly installments. If the rate of interest charged is 25% per annum the monthly installment will be :
 (a) Rs. 26 (b) Rs. 27
 (c) Rs. 23 (d) Rs. 24

½ Solved Paper

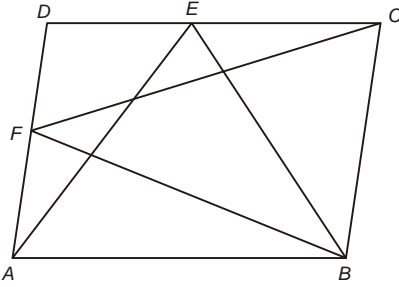
13. A sum of Rs. 7500 is to be paid back in 3 annual installment. How much is each installment, if the interest is compound annually on the balance at 4% and is to be included in each installment ?
(a) Rs. 2800, Rs. 2700, Rs. 2600
(b) Rs. 2600, Rs. 2700, Rs. 2800
(c) Rs. 2800, Rs. 2600, Rs. 2700
(d) Rs. 2700, Rs. 2800, Rs. 2600
14. In what proportion must rice at Rs. 3.10 per kg be mixed with rice at Rs. 3.60 per kg so that the mixture be worth Rs. 3.25 a kg ?
(a) 3 : 7 (b) 7 : 3
(c) 5 : 3 (d) 3 : 5
15. In what proportion must water be mixed with milk to gain $16\frac{2}{3}\%$ by selling it at cost price ?
(a) 1 : 6 (b) 6 : 1
(c) 1 : 5 (d) 5 : 1
16. In a zoo, there are rabbits and pigeons. If heads are counted these are 200 and if legs are counted there are 580. How many pigeons are there ?
(a) 90 (b) 80
(c) 110 (d) 100
17. A and B can do a piece of work in 10 days and B and C can do in 15 days and C and A in 20 days, they all work it for 6 days and then A leaves and B and C go on together for 4 days more. If B then leaves, how long will C takes to complete the work ?
(a) 20 days (b) 25 days
(c) 10 days (d) 15 days
18. To do a certain work B would take three times as long as A and C together and C twice as long as A and B together. The three men together complete the work in 10 days. Then how long would each take separately? (in days)
(a) 24, 40, 30
(b) 30, 40, 24
(c) 4, 0, 30, 24 (d) 24, 30, 40
19. A piece of work was to be completed in 40 days, a number of men employed on it did only half the work in 24 days, 16 more men were then set on and the work completed in the specified time. How many men were employed at first ?
(a) 16 (b) 32
(c) 24 (d) 48
20. Wages for 45 women amount to Rs. 15525 in 48 days. How many men must work 16 days to receive Rs. 5750, the daily wages of a man being double those of a woman ?
(a) 23 (b) 24
(c) 25 (d) 26
21. A, B and C together earn Rs. 1350 in 9 days. A and C together earn Rs. 470 in 5 days. B and C together earn Rs. 760 in 10 days. Daily earning of C is :
(a) Rs. 20 (b) Rs. 21
(c) Rs. 19 (d) Rs. 30
22. Two pipes P and Q would fill a cistern in 24 hours and 32 hours respectively. If both pipes are opened together, find when the first pipe must be turned off so that the cistern may be just filled in 16 hours
(a) 12 hours (b) 10 hours
(c) 13 hours (d) 11 hours
23. A man is walking at a speed of 12 km/hour after every km he takes rest for 12 minutes. How much time will be take to cover a distance of 36 km ?
(a) 8 hours (b) 10 hours
(c) 7 hours (d) 6 hours
24. A boy goes to school at a speed of 3 km/hour and returns to village at a speed of 2 km/hour. If he takes 5 hours in all, the distance between the village and the school is:
(a) 3 km (b) 4 km
(c) 5 km (d) 6 km
25. The distance between two station Delhi and Amritsar, is 1450 km. A train starts at 3.10 pm from Delhi and moves towards Amritsar at an average speed of 20 km/hour. Another train starts from Amritsar at 4 pm and moves

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- towards Delhi at an average speed of 60 km/hour. How far will the two trains meet ?
- (a) 115 km (b) 120 km
(c) 125 km (d) 200 km
26. Two guns fire from the same place at an interval of 13 minutes but a person in a train approaching the place hears the speed report 12 minutes 30 seconds after the first. The speed of train, supposing after that sound travel at 330 m/sec, is
- (a) $47\frac{13}{25}$ km/hr (b) $\frac{13}{25}$ km/hr
(c) 47 km/hr (d) $\frac{13}{25}$ km/hr
27. A train with 90 km/hour crosses a bridge in 36 seconds. Another train 100 m shorter crosses the same bridges at 45 km/hour. Find the time taken by the second train to cross the bridge
- (a) 64 sec. (b) 60 sec.
(c) 72 sec. (d) 1 hour
28. A man can row 30 km upstream and 44 km down stream in 10 hours. Also, he can row 40 km upstream and 55 km down stream in 13 hour. The rate of the current is
- (a) 5 km/hour (b) 3 km/hour
(c) 4 km/hour (d) $\frac{2}{3}$ km/hour
29. If the area and perimeter of a rectangle are 240 cm^2 and 68 cm respectively. Then its breadth is :
- (a) 24 cm (b) 10 cm
(c) 8 cm (d) 9 cm
30. There is a rectangular field of area 60 square cm. Sum of its diagonal and length is 5 times of its breadth. The breadth of rectangular field is :
- (a) 3 cm (b) 4 cm
(c) 5 cm (d) 15 cm
31. If the three sides of a right angled triangle are produced on either side then which of the following statement relating to the figure so obtained is correct ?
1. Of the twelve angle formed at the three vertices by adjoining lines, four are acute, four obtuse and four right angles.
2. The mean measure of the above twelve angles 90°
3. The measure and of the above twelve angles will generally have three or five distinct values.
- Select the correct answer using the codes given below codes
- (a) 1, 2, 3 and 4 (b) 1 and 2
(c) 1 and 3 (d) 2 and 3
32. From a point P in the base BC of an isosceles triangle ABC , a straight line is drawn perpendicular to the base cutting AB in Q and CA produced in R , then :
- (a) $\triangle AQR$ is equilateral
(b) $\triangle AQR$ is isosceles
(c) Q is the mid point of AB
(d) A is the mid point of CR
33. Which of the following statements relating to triangles ABC and DEF are not correct ?
- (a) If $AB = DE$, $BC = EF$ and the areas of the two triangles are equal, then they are congruent.
(b) If $\angle ACD = \angle DEF = 90^\circ$, $AB = DE$, $AC = DF$ then the triangles are congruent.
(c) If $\angle ABC = \angle DEF$, $\angle ACB = \angle DFE$ and the areas of the triangles are equal then they are congruent.
(d) If $\angle ABC = \angle DEF$, $\angle ACB = \angle DEF$ and $\angle BAC = \angle EDF$, then the triangles are congruent.
34. If PL , QM and RN are altitudes of $\triangle PQR$ whose ortho centre O , then Q is the orthocentre of :
- (a) $\triangle PRO$
(b) $\triangle PRN$
(c) $\triangle PRL$ (d) $\triangle QRO$
35. $ABCD$ is a parallelogram. If E and F are any two points lying on the sides DC and AD

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respectively, then relation between the areas. Δ_1 and Δ_2 of ΔAEB and ΔBFC respectively, then :



- (a) $\Delta_1 = \Delta_2$ (b) $\Delta_1 = 2 \Delta_2$
 (c) $2 \Delta_1 = \Delta_2$ (d) $2 \Delta_1 = 3 \Delta_2$

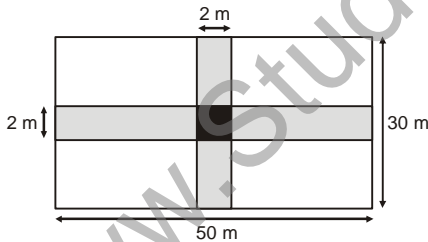
36. ABCD is a cyclic quadrilateral. The tangents to the circle drawn at A and C meet at P. If $\angle ABC = 110^\circ$, then $\angle APC$ is equal to :

- (a) 20° (b) 40°
 (c) 60° (d) 70°

37. If in a circle a chord of length 16 cm is at a distance 15 cm from the centre of the circle, then the radius of the circle is

- (a) 16 cm (b) 15 cm
 (c) 8 cm (d) 17 cm

38. The area of shaded region on the given below figure is :

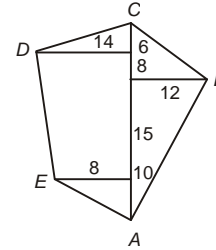


- (a) 150 m^2 (b) 156 m^2
 (c) 160 m^2 (d) 180 m^2

39. While calculating the area of a field the surveyer recorded the following observation in this field book.

Area of the field is :

- (a) 567 sq. m (b) 569 sq. m
 (c) 592 sq. m (d) 6055 sq. m



40. Edge of cube is decreased by 20% the percentage of decrease in the surface area is:

- (a) 44% (b) 36%
 (c) 20% (d) 60%

41. A hemispherical basin 150 cm in diameter holds water one hundred and twenty times as much as a cylindrical tub. If the height of the tub is 15 cm, then diameter of the tub (in cm) is :

- (a) 23 cm (b) 24 cm
 (c) 25 cm (d) 26 cm

42. If the volume of a right circular cylinder with its height equal to twice of the radius is

$169 \frac{5}{7} \text{ cm}^3$, then its diameter is equal to

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

43. If $p \sin A = q$ and A is acute angle, then the

value of $\sqrt{p^2 - q^2} \tan A$ is :

- (a) p (b) q (c) pq (d) $\frac{p}{q}$

44. If $2 \sin^2 \theta + \cos^2 45 = \tan 45^\circ$ and $0 \leq \theta \leq 90^\circ$ then $\sin \theta$ is :

- (a) 1 (b) $\sqrt{3}$ (c) $\frac{1}{\sqrt{3}}$ (d) $\frac{1}{2}$

45. Which of the following is not correctly matched ?

- | | |
|-------------------------|---------------------------------------------|
| If | Then |
| (a) $\theta = 75^\circ$ | $\sin \theta < \cos \theta$ |
| (b) $\theta = 35^\circ$ | $\operatorname{cosec} \theta < \sec \theta$ |
| (c) $\theta = 42^\circ$ | $\tan \theta < \cot \theta$ |
| (d) $\theta = 18^\circ$ | $\tan \theta < \sec \theta$ |

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46. Eliminating t from the equations $x = \cos t$, $y = 2 \sin t \cdot \cos t$, we get

- (a) $y^2 = 4x^2 + 4x^4$ (b) $y^2 = 4x^2 - 4x^4$
 (c) $y^2 = 2x^2 + 4x^4$ (d) $y^2 = 2x^2 - 4x^4$

47. The value of $\cos^2 \theta (1 + \tan^2 \theta) + \sin^2 \theta (1 + \cot^2 \theta)$ is :

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

48. If a person standing on the bank of river finds that the angle of elevation of the top of a tower on the other bank directly opposite to him is 45° , then :

- (a) the height of the tower is half the breadth of the river
 (b) the height of the tower is twice the breadth of the river.
 (c) the height of the tower is the same as the breadth of the river.
 (d) the height of the tower is thrice the breadth of the river.

49. AB is a vertical pole the end A is on the ground, C is the middle point AB , P is a point on the level ground the position BC subtends an angle a at P . If $AP = n \cdot AB$, then $\tan a$ is :

- (a) $\frac{n}{2n^2 + 1}$ (b) $\frac{n}{n^2 - 1}$
 (c) $\frac{n}{n^2 + 1}$ (d) $\frac{n^2 - 1}{n^2 + 1}$

50. The following table shows the distribution of weekly salary (in Rs.) of 1000 workers.

Weekly salary (in Rs.)	Frequency
less than 50	40
50-75	120
75-100	200
100-125	300
125-150	150
150-175	100
175-200	55
200 and above	35

The percentage of workers with weekly salary less than Rs. 125 and weekly salary more than Rs. 150 are respectively :

- (a) (81, 19) (b) (66, 34)
 (c) (66, 19) (d) (81, 34).

51. The last class-interval in a frequency distribution has an open end. Which one of the following in the most suitable diagram for graphical representations ?

- (a) absolute frequency curve
 (b) relative frequency curve
 (c) percentage frequency curve
 (d) cumulative frequency curve

52. $10^3 = 1000$ is same as :

- (a) $\log_3 1000 = 10$
 (b) $\log_{10} 1000 = 3$
 (c) $\log_{1000} 3 = 10$ (d) $\log_3 10 = 1000$

53. Which of the following is correct ?

- factors of $x^3 + 1$ are $(x + 1)$, $(x^2 + x + 1)$
- factors of $x^3 + 1$ are $(x + 1)$, $(x^2 - x + 1)$
- factors of $x^3 - 1$ are $(x - 1)$, $(x^2 - x - 1)$
- factors of $x^3 - 1$ are $(x - 1)$, $(x^2 + x + 1)$

Codes:

- (a) 1 and 3 are correct
 (b) 1 and 4 are correct
 (c) 2 and 4 are correct
 (d) 2, 3 and 4 are correct

54. If $x - 5$ and $x - k$ are distinct factors of $x^2 - 3x - 10$, then value of k is :

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

55. The sum of the digit of a two digit is 8. The number obtained by reversing the digit is 18 less than the original number. The original number :

- (a) 62 (b) 17
 (c) 53 (d) 35

56. What is the value of

$$\frac{\sin 2^\circ \sin 4^\circ \sin 6^\circ \dots \sin 88^\circ}{\cos 88^\circ \cos 86^\circ \cos 84^\circ \dots \cos 2^\circ} ?$$

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

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57. A man borrowed Rs. 40,0000 at 8% simple interest per year. At the end of second year he paid back certain amount and at the end of fifth year he paid back Rs. 35,960 and cleared the debt. What is the amount did he pay back after the second year?
 (a) Rs. 16,200 (b) Rs. 17,400
 (c) Rs. 18,600 (d) None of these
58. Value of $\left[(x^I)^{I-1} \right] \frac{1}{I-1}$
 (a) x (b) 1
 (c) x^{-1} (d) x^{-1}
59. If $x^a \times x^b \times x^c = 1$ then $a^3 + b^3 + c^3$ is equal to :
 (a) a (b) abc
 (c) $a + b + c$ (d) $3abc$
60. A dishonest dealer professes to sell his goods at cost price by using a false weight and thus gains $11\frac{1}{9}\%$.
 For weighing a kilogram he uses a weight of:
 (a) 960 gm (b) 940 gm
 (c) 920 gm (d) 900 gm
61. The length of a pendulum is 60 cm. The angle through which its swing when its tip describes an arc of length 16.5 cm is :
 (a) $15^\circ 30'$ (b) $15^\circ 45'$
 (c) $16^\circ 15'$ (d) none of these
62. If A and B are subsets of X then :
 (a) $A \cup B = X \Rightarrow A' = B$
 (b) $A \cup B = X \Rightarrow B' = A$
 (c) $A \cup B = X \Rightarrow A \cap B = \Phi$
 (d) $A \cup B = X$ and $A' = B \Rightarrow A \cap B = \Phi$
63. Let A be the set of square of natural numbers and let $x \in A, y \in A$, then :
 (a) $x + y \in A$
 (b) $x - y \in A$
 (c) $\frac{x}{y} \in A$
 (d) $xy \in A$
64. The polynomial $x^2 - x + 1$ has :
 (a) one proper linear factors
 (b) two proper linear factors
 (c) no proper linear factor
 (d) none of the above
65. Which of the following quadratic polynomial can be factorised into a product of real linear factors ?
 (a) $2x^2 - 5x + 9$ (b) $2x^2 + 4x - 5$
 (c) $2x^2 + 4x + 9$ (d) $5x^2 - 3x + 2$
66. If $\log_{10} 2 = 0.3010$, then the value of $\log_{10} 25$ is :
 (a) 1.462 (b) 1.398
 (c) 1.268 (d) none of these
67. $\log_2 7$ is :
 (a) an integer
 (b) a prime number
 (c) a rational number
 (d) an irrational number
68. The points $A (2a, 4a), B (2a, 6a)$ and $C ((2 + \sqrt{3})a, \sqrt{a})$ are vertices of :
 (a) a scalene triangle
 (b) an isosceles triangle
 (c) an equilateral triangle
 (d) none of these
69. The vertices of ΔABC are $(2, 1), (5, 2)$ and $(3, 4)$ respectively. The circumcentre is :
 (a) $\left(\frac{8}{3}, 3\right)$
 (b) $\left(\frac{13}{4}, \frac{9}{4}\right)$
 (c) $\left(\frac{10}{3}, \frac{7}{3}\right)$ (d) none of these
70. The distance between the parallel lines $y = mx + c$ and $y = mx + d$ is :
 (a) $|c - d|$ (b) $\frac{1}{2}|c - d|$
 (c) $\frac{|c - d|}{\sqrt{1 + m^2}}$ (d) none of these

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71. The point of intersection of the diagonals of a rectangle whose sides are $x = a$, $x = a'$, $y = b$, $y = b'$

(a) $\left(\frac{a+a'}{2}, \frac{b+b'}{2}\right)$ (b) $\left(\frac{a+b}{2}, \frac{a'+b'}{2}\right)$

(c) $\left(\frac{a+b'}{2}, \frac{a'+b}{2}\right)$ (d) none of these

72. How are the points (3, 4) and (2, -6) situated with respect to line $3x - 4y - 8 = 0$?

- (a) both lie on the line
 (b) they lie on same side of the line
 (c) they lie on opposite sides of the line
 (d) none of the above

73. The radius of the circle $16(x^2 + y^2) + 24x + 32y + 9 = 0$ is :

- (a) 3 (b) $\frac{1}{3}$ (c) 2 (d) 1

74. Pie diagrams used to represent statistical data are

- (a) one dimensional (b) three dimensional
 (c) two-dimensional (d) none of these

75. If $\log_7 \log_5 (\sqrt{x} + 5 + \sqrt{x}) = 0$ the value of x is:

- (a) 1 (b) 0
 (c) 2 (d) none of these

76. The value of $\frac{(55)^3 + (45)^3}{(55)^2 - 55 \times 45 + (45)^2}$:

- (a) 100 (b) 105
 (c) 125 (d) none of these

77. Which of the following values of x do not satisfy the inequality $(x^2 - 3x + 2 > 0)$ at all :

- (a) $1 \leq x \leq 2$ (b) $-1 \geq x \geq -2$
 (c) $0 \leq x \leq 2$ (d) $0 \geq x \geq -2$

78. Let x, y be two positive such that $x + y = 1$, then the minimum value of

$\left(x + \frac{1}{x}\right)^2 + \left(y + \frac{1}{y}\right)^2$ is:

- (a) 12 (b) 20 (c) 12.5 (d) 15.3

79. Let p and q be the roots of quadratic equation $x^2 - (\alpha - 2)x - \alpha - 1 = 0$ the minimum possible value of $p^2 + q^2$?

- (a) 0 (b) 3
 (c) 4 (d) 5

80. $y = \frac{1}{2 + \frac{1}{3 + \frac{1}{2 + \frac{1}{3 + \dots}}}}$ the value of y is :

- (a) $\frac{\sqrt{15} + 3}{2}$ (b) $\frac{\sqrt{15} - 3}{2}$

- (c) $\frac{\sqrt{13} + 13}{2}$ (d) none of these

Directions: These questions consist of two statements each printed as 'Assertion (A)' and 'Reason (R)'. While answering these questions you are required to choose any one of the following four responses.

- (A) both A and R are true and R is the correct explanation of A
 (B) both A and R are true but R is not the correct explanation of A
 (C) A is true but R is false
 (D) A is false but R is true

81. Assertion (A) : The number 63215988 is divisible by 11.

Reason (R) : The number formed by the last two digits is divisible by 11.

- (a) A (b) B
 (c) C (d) D

82. Assertion (A) : Period of $\cos(3x + 4)$ is $\frac{2\pi}{3}$.

Reason (R) : If the period of $f(x)$ is λ then the period of $f(ax + b)$ is λ .

- (a) A (b) B
 (c) C (d) D

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83. Assertion (A) : Median is not useful in those cases where large weights are to be given to the extreme items.
Reason (R) : Median ignores the importance of extreme items.
(a) A (b) B
(c) C (d) D
84. Assertion (A) : The area of a quadrilateral whose one diagonal is 10 m and lengths of the perpendicular drawn from the other vertices to this diagonal are 4 m and 6 m is 50 m^2 .
Reason (R) : The quadrilateral can be split into two triangles whose altitudes are equal to the lengths of the given perpendiculars.
(a) A (b) B
(c) C (d) D
85. Assertion (A) : No polynomial of degree one or higher has a multiplicative inverse which is a polynomial.
Reason (R) : The coefficients of the terms in a polynomial are all real numbers.
(a) A (b) B
(c) C (d) D
86. Assertion (A) : A bar chart is a two dimensional figure.
Reason (R) : In a bar chart, the height of each bar is of significance and not its width.
(a) A (b) B
(c) C (d) D
87. Assertion (A) : Mode is not a good measure of central tendency.
Reason (R) : Mode lays too much emphasis only on the modal group and does not consider other variates at all.
(a) A (b) B
(c) C (d) D
88. Assertion (A) : If p is a prime number and it divides ab , where a, b are positive integers, then p must divide either a or b .
Reason (R) : This true if p is any positive integer.
(a) A (b) B
(c) C (d) D
89. Assertion (A) : The sum of $\frac{1}{\sqrt{5} + \sqrt{6}}$ and $\frac{1}{\sqrt{6} + \sqrt{7}}$ is irrational.
Reason (R) : The sum of two irrational numbers is always irrational.
(a) A (b) B
(c) C (d) D
90. Assertion (A) : If O is the orthocenter of the triangle ABC , then $\angle BOC$ and $\angle BAC$ are supplementary.
Reason (R) : Both the triangles BOC and BAC have a common base.
(a) A (b) B
(c) C (d) D
91. The number in the unit place in $(623)^{38}$ is:
(a) 0 (b) 1
(c) 9 (d) 8
92. The product of two numbers is 192 and the sum of these two numbers is 28. The smaller number of these two numbers is :
(a) 12 (b) 9
(c) 11 (d) 10
93. Sum of two numbers is 1215 and their HCF is 81. How many pair of such number can be formed ?
(a) 1 (b) 2
(c) 3 (d) 4
94. Sum and difference of the LCM and HCF of two numbers are 592 and 518 respectively. If the sum of two numbers be 296. Then numbers are :
(a) 111, 105 (b) 37, 259
(c) 36, 332 (d) none of these
95. A can do a piece of work in 12 days. B is 60% more efficient than A. Then number of days it takes B to do the same work is
(a) 7 (b) $7\frac{1}{2}$
(c) $7\frac{3}{2}$ (d) 6

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96. A bag contains 1 rupee, fifty paise, twenty five paise and ten paise coins in the ratio 1 : 3 : 5 : 7. If the total amount is Rs. 22.25, then number of twenty five paise coins is
(a) 25 (b) 5
(c) 15 (d) 35
97. A bag contains 1 rupee, 50 paise and 25 paise coins in the ratio 5 : 6 : 7. If the total amount is Rs. 390, then number of 25 paise coin is
(a) 280 (b) 200
(c) 240 (d) 260
98. A, B and C go into business as partners and collect a profit of Rs. 1000. If A's capital : B's capital = 2 : 3 and B's capital : C's capital = 2 : 5, the share of profit which goes to C is
(a) Rs. 160 (b) Rs. 240
(c) Rs. 500 (d) Rs. 600
99. Ram's monthly income is 15% more than that of Shyam. Shyam's monthly income is 10% less than that of Sohan. If the difference between the monthly income of Ram and Sohan is Rs. 350, the monthly income of Shyam is
(a) Rs. 7000 (b) Rs. 8000
(c) Rs. 9000 (d) Rs. 6000
100. If base of the triangle is increased by 10% and the area is unchanged then the corresponding altitude must be decreased by:
(a) $11\frac{1}{9}\%$ (b) $9\frac{1}{11}\%$
(c) 11% (d) 10%

ANSWERS

1. (a)	2. (a)	3. (a)	4. (b)	5. (d)	6. (d)	7. (a)	8. (c)	9. (a)	10. (a)
11. (c)	12. (a)	13. (a)	14. (b)	15. (a)	16. (c)	17. (c)	18. (a)	19. (b)	20. (c)
21. (a)	22. (a)	23. (b)	24. (d)	25. (c)	26. (a)	27. (a)	28. (b)	29. (b)	30. (c)
31. (b)	32. (b)	33. (d)	34. (a)	35. (a)	36. (b)	37. (d)	38. (b)	39. (b)	40. (b)
41. (c)	42. (a)	43. (b)	44. (d)	45. (b)	46. (b)	47. (b)	48. (c)	49. (a)	50. (c)
51. (d)	52. (a)	53. (c)	54. (b)	55. (c)	56. (b)	57. (d)	58. (a)	59. (d)	60. (d)
61. (b)	62. (d)	63. (d)	64. (c)	65. (b)	66. (b)	67. (d)	68. (c)	69. (b)	70. (c)
71. (a)	72. (c)	73. (d)	74. (a)	75. (b)	76. (a)	77. (a)	78. (c)	79. (d)	80. (b)
81. (c)	82. (c)	83. (a)	84. (a)	85. (d)	86. (b)	87. (a)	88. (c)	89. (c)	90. (d)
91. (c)	92. (a)	93. (d)	94. (d)	95. (b)	96. (a)	97. (a)	98. (d)	99. (c)	100. (b)

EXPLANATIONS

1. Failed in English only = $(30 - 27) = 3\%$

Failed in Mathematics only = $(35 - 27) = 8\%$

Failed in both subjects = 27%

Failed in both subjects = 27%

Failed in one or both of the subjects

= $(3 + 8 + 27) \% = 38\%$

∴ 62% of $x = 248$

⇒ $\frac{62}{100} \times x = 248$

∴ $x = \frac{248 \times 100}{62} = 400$

2. Time taken in Ist journey = $\frac{x}{v_1}$ hours

time taken in IInd journey = $\frac{y}{v_2}$ hours

total distance = $(x + y)$ km.

$$\text{total time} = \left(\frac{x}{v_1} + \frac{y}{v_2} \right) \text{hours}$$

$$\begin{aligned} \therefore \text{average speed} &= \frac{\text{distance}}{\text{time}} \\ &= \frac{x+y}{\frac{x}{v_1} + \frac{y}{v_2}} \\ &= \frac{v_1 v_2 (x+y)}{xv_2 + yv_1} \text{ km/hr.} \end{aligned}$$

3. Let a, b, c are the ages of A, B and C

$$\therefore a + b = 2 \times 20 = 40 \quad \dots(i)$$

$$b + c = 2 \times 19 = 38 \quad \dots(ii)$$

$$c + a = 2 \times 21 = 42 \quad \dots(iii)$$

$$2(a + b + c) = 120 \text{ (adding all 3 equations)}$$

$$a + b + c = 60$$

$$Q \quad b + c = 38$$

$$\therefore a = 22$$

$$a + b = 40$$

$$\therefore b = 18$$

$$\text{similarly } c = 20$$

$$\therefore \text{Age of A} = 22 \text{ years}$$

$$\text{Age of B} = 18 \text{ years}$$

$$\text{Age of C} = 20 \text{ years}$$

4. One year ago Samer's age was $\frac{4}{3}$ of Ashok's

age. One year hence Samer's age will be $\frac{5}{4}$ of

Ashok's age of son. t_2 year hence the age of the father becomes 4 times the age of his son, then present age of son in

$$\frac{t_2(y-1) + t_1(x-1)}{(x-y)} \text{ years}$$

hence from above formula.

Ashok's age

$$A = \frac{1\left(\frac{4}{3}-1\right) + 1\left(\frac{5}{4}-1\right)}{\left(\frac{4}{3}-\frac{5}{4}\right)}$$

$$= \frac{\left(\frac{1}{3} + \frac{1}{4}\right)}{\frac{1}{12}} = 7 \text{ years}$$

\therefore from the relation

$$\frac{(S-1)}{(7-1)} = \frac{4}{3}$$

$$\therefore S = 8 + 1 = 9$$

$$\therefore \text{total ages} = A + S = 9 + 7 = 16 \text{ years}$$

5. Let selling price be x

$$\text{then cost price paid by Subhash} = \text{Rs. } \frac{9}{10}x$$

Selling price received by Subhash

$$= (108\% \text{ of } x) = \text{Rs. } \frac{27}{25}x$$

$$\therefore \text{Gain} = \text{Rs. } \left(\frac{27}{25}x - \frac{9}{10}x \right) = \text{Rs. } \frac{9}{50}x$$

$$\text{hence gain \%} = \left(\frac{9x}{50} \times \frac{10}{9x} \times 100 \right) \% = 20\%$$

6. Let selling price of TV = Rs. 100

If selling price is Rs. 86, MP = Rs. 100

If selling price is Rs. 100, MP

$$= \text{Rs. } \left(\frac{100}{80} \times 100 \right) = \text{Rs. } 125$$

Now if discount is 25% then selling price

$$= 75\% \text{ of Rs. } 125 = \text{Rs. } \frac{375}{4}$$

Difference between two selling price

$$= \text{Rs. } \left(100 - \frac{375}{4} \right) = \text{Rs. } \frac{25}{4}$$

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If difference is Rs. $\frac{25}{4}$, selling price = Rs. 100

If difference is Rs. 500, selling price

$$= \text{Rs.} \left(100 \times \frac{4}{25} \times 500 \right)$$

$$= \text{Rs. 8000}$$

7. Suppose the price of 1 mango be x paise

$$\text{Number of mangoes for Rs. 15} = \frac{1500}{x}$$

new price of one mango

$$= 80\% \text{ of } x = \frac{4x}{5} \text{ paise}$$

$$\text{number of mangoes for Rs. 15} = \frac{1500 \times 5}{4x}$$

$$\therefore \frac{7500}{4x} - \frac{1500}{x} = 12$$

$$\text{or } x = 31.25$$

\therefore cost of mangoes before reduction

$$= \text{Rs.} \left(\frac{31.25 \times 16}{100} \right)$$

$$= \text{Rs. 5}$$

8. Let annual payment be p rupees.

The amount of Rs. p in 4 years at 5%

$$= \frac{100p + 4 \times 5p}{100} = \frac{120p}{100}$$

$$\text{The amount of Rs. } p \text{ in 3 years at 5\%} = \frac{115p}{100}$$

$$\text{The amount of Rs. } p \text{ in 2 years at 5\%} = \frac{110p}{100}$$

$$\text{The amount of Rs. } p \text{ in 1 year at 5\%} = \frac{105p}{100}$$

Therefore amounts together with last annual payment of Rs. p will discharge the debt of Rs. 770

$$\therefore \frac{120p}{100} + \frac{115p}{100} + \frac{110p}{100} + \frac{105p}{100} + p = 770$$

$$\therefore \frac{550p}{100} = 770$$

$$\therefore p = \frac{770 \times 100}{550} = 140$$

hence annual payment = Rs. 140

9. We have

$$(A's \text{ present share}) \cdot \left(1 + \frac{4}{100} \right)^7$$

$$= (B's \text{ present share}) \cdot \left(1 + \frac{4}{100} \right)^9$$

$$\therefore \frac{A's \text{ present share}}{B's \text{ present share}} = \left(1 + \frac{4}{100} \right)^2 = \left(\frac{26}{25} \right)^2$$

$$= \frac{676}{625}$$

Dividing Rs. 3903 in Ratio 676 : 625

$$\therefore A's \text{ present share} = \frac{676}{676 + 625} \text{ of Rs. 3903}$$

$$= \text{Rs. 2028}$$

$$\therefore B's \text{ share} = \text{Rs. 3903} - \text{Rs. 2028}$$

$$= \text{Rs. 1875}$$

10. $P = \text{Rs. 64000}$

$$r = 2.5 \text{ paise per rupee per annum}$$

$$= 0.25 \text{ rupee per rupee per annum}$$

$$= 0.25 \times 100 \text{ rupee per hundred rupee per annum.}$$

$$= 2.5 \text{ percent per annum}$$

$$t = 3 \text{ years}$$

$$\text{Cost price} = 64000 \left[\left(1 + \frac{0.025 \times 100}{100} \right)^3 - 1 \right]$$

$$= 64000 [(1 + 0.25)^3 - 1]$$

$$= \text{Rs. 4921}$$

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11. Cash price = Rs. 3575
 cash down payment = Rs. 1500
 amount paid in 5 monthly installments
 = Rs. 420 × 5 = Rs. 2100
 ∴ Total amount paid under installment plan.
 = Rs. 1500 + Rs. 2100 = Rs. 3600
 ∴ Charged = Rs. 3600 - Rs. 3575 = Rs. 25
 the principal for each month is as under
 principal for 1 month
 = Rs. 3575 - Rs. 1500
 = Rs. 2075
 principal for 2 month
 = Rs. 2075 - Rs. 420
 = Rs. 1655
 principal for 3 month
 = Rs. 1655 - Rs. 420
 = Rs. 1235
 principal for 4 month
 = Rs. 1235 - Rs. 420
 = Rs. 815
 principal for 5 month
 = Rs. 815 - Rs. 420
 = Rs. 395

Total principal = Rs. 6175
 the final (sixth) installment of Rs. 420 consist
 of amount of Rs. 395 and interest of Rs. 25
 (Rs. 395 + Rs. 25 = Rs. 420)

thus the interest on Rs. 6175 for 1 month or

$\frac{1}{12}$ year is Rs. 25

$$\therefore R = \frac{I \times 100}{P \times T}$$

$$= \frac{25 \times 100}{6175 \times \frac{1}{12}} = \frac{25 \times 100 \times 12}{6175 \times 1}$$

$$= \frac{1200}{247} = 4.86\%$$

12. Cash price of transistor = Rs. 125
 cash down payment = Rs. 26
 balance of price due = Rs. 125 - Rs. 26
 = Rs. 99
 rate of interest charge = 25% per annum
 Interest on Rs. 99 for 4 months

$$= \text{Rs.} \frac{99 \times \frac{4}{12} \times 25}{100} = \text{Rs.} \frac{33}{4} = \text{Rs.} 8.25$$

$$\therefore \text{Amount due} = \text{Rs.} 99 + \text{Rs.} 8.25 = \text{Rs.} 107.25 \quad \dots (i)$$

Let monthly installment be x rupees

∴ at the end of 4 month

1st installment of Rs. x will amount to

$$\text{Rs.} \left[x + \frac{x \times \frac{3}{12} \times 25}{100} \right] = \text{Rs.} \left(x + \frac{x}{16} \right)$$

$$= \text{Rs.} \frac{17x}{16}$$

$$Q \quad A = P + I = P + \frac{P \times T \times R}{100}$$

2nd installment of Rs. x will amount to

$$\text{Rs.} \left[x + \frac{x \times \frac{2}{12} \times 25}{100} \right] = \text{Rs.} \left(x + \frac{x}{24} \right)$$

$$= \text{Rs.} \frac{25}{24} x$$

3rd installment of Rs. x will amount to

$$\text{Rs.} \left[x + \frac{x \times \frac{1}{12} \times 25}{100} \right] = \text{Rs.} \left(x + \frac{x}{48} \right)$$

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$$= \text{Rs. } \frac{49}{48}x$$

4th installment of Rs. x will be

$$\text{Rs. } \left[x + \frac{x \times 0 \times 25}{100} \right] = \text{Rs. } x$$

∴ Total amount of 4 installment at the end of

$$\text{4th month} = \text{Rs. } \left[\frac{17x}{16} + \frac{25x}{24} + \frac{49x}{48} + x \right]$$

$$= \text{Rs. } \frac{51x + 50x + 49x + 48x}{48}$$

$$= \text{Rs. } \frac{198}{48}x = \text{Rs. } \frac{33}{8}x \quad \dots \text{(ii)}$$

from (i) and (ii) we get

$$\frac{33}{8}x = 107.25$$

$$\Rightarrow x = \frac{107.25 \times 8}{33} = \frac{858}{33} = 26$$

13. Loan to be paid in 3 installment

∴ each installment will of Rs. $(7500 \div 3)$
or Rs. 2500 together with the interest on
balance for 1 year.

Amount payable at end of 1st year
= Rs. 2500 + 4% of
Rs. 7500

$$= \text{Rs. } 2500 + \text{Rs. } \frac{4}{100} \times 7500$$

$$= \text{Rs. } 2500 + \text{Rs. } 300$$

$$= \text{Rs. } 2800$$

Balance at the end of 1st year

$$= \text{Rs. } 7500 - \text{Rs. } 2500$$

$$= \text{Rs. } 5000$$

∴ Amount payable at the end of 2nd year

$$= \text{Rs. } 2500 + 4\% \text{ of Rs. } 7500$$

$$= \text{Rs. } 2500 + \frac{4}{100} \text{ of Rs. } 5000$$

$$= \text{Rs. } 2500 + 200$$

$$= \text{Rs. } 2700$$

Balance at the end of 2nd year

$$= \text{Rs. } 5000 - \text{Rs. } 2500$$

$$= \text{Rs. } 2500$$

∴ Amount payable at end of 3rd year

$$= \text{Rs. } 2500 + 4\% \text{ of}$$

$$\text{Rs. } 2500$$

$$= \text{Rs. } 2500 + \frac{4}{100} \times$$

$$\text{Rs. } 2500$$

$$= \text{Rs. } 2500 + \text{Rs. } 100$$

$$= \text{Rs. } 2600$$

Hence the installments are

Rs. 2800,

Rs. 2700,

Rs. 2600 respectively

14. Let required ratio be $x : y$

As per question

$$310x + 360y = 325(x + y)$$

$$\text{or } 310x + 360y = 325x + 325y$$

$$\text{or } 325x - 310x = 360y - 325y$$

$$\text{or } 15x = 35y$$

$$\text{or } \frac{x}{y} = \frac{35}{15} = \frac{7}{3} = 7 : 3$$

15. Let required ratio be $a : b$

and cost price of milk be x per litre

As per question

selling price of mixture = Rs. x per litre

cost price of mixture

$$= x \times \frac{100}{100 + \frac{50}{3}} = \text{Rs. } \frac{6x}{7} \text{ per litre}$$

Now assume that cost price of water

= Rs. 0 per litre

$$\therefore (a \times 0 + b \times x) = (a + b) \frac{6x}{7}$$

or $bx = (a + b) \frac{6x}{7}$

or $b\left(1 - \frac{6}{7}\right) = \frac{6a}{7}$

or $\frac{b}{7} = \frac{6a}{7}$

or $\frac{a}{b} = \frac{1}{6}$

$a : b = 1 : 6$

16. Let number of Rabbits = R and pigeons = P

According to given condition

$R + P = 200$... (i)

$4R + 2P = 580$... (ii)

solving (i) and (ii)

$R = 90, P = 110$

∴ Pigeons are 110.

17. A, B and C together can do the work in

$$\frac{2 \times 10 \times 15 \times 20}{10 \times 15 + 20 \times 10 + 15 \times 20} = \frac{120}{30} \text{ days}$$

work done by all in 6 days = $\frac{13}{20}$

work done by B and C in 4 days = $\frac{4}{15}$

Remaining work = $1 - \left(\frac{13}{20} + \frac{4}{15}\right) = \frac{1}{12}$

which is to be done by C

now from question

C alone can do the whole work in $\frac{\frac{120}{13} \times 10}{10 - \frac{120}{13}}$

= 120

∴ $\frac{1}{12}$ of the work is done by C is $\frac{120}{12} = 10$ days

18. By the question

3 times B's daily work = (A + C)'s daily work
add B's daily work to both sides.

∴ 4 times B's daily work = (A + B + C)'s daily work = $\frac{1}{10}$

∴ B's daily work = $\frac{1}{40}$

Also, 2 times C's daily work = (A + B)'s work
3 times C's daily work = (A + B + C)'s daily

work = $\frac{1}{10}$

∴ C's daily work = $\frac{1}{30}$

Now A's daily work = $\frac{1}{10} - \left(\frac{1}{40} + \frac{1}{30}\right) = \frac{1}{24}$

∴ A, B and C can do work in 24, 40, 30 days respectively.

19. Let x men were employed 1st.

x men do $\frac{1}{2}$ of the work in 24 days.

∴ 1 man do the whole work in $24 \times 2 \times x = 48x$

Now, from the question

($x + 16$) men do the remaining work

$\left(1 - \frac{1}{2} = \frac{1}{2}\right)$ in $(40 - 24) = 16$ days

∴ 1 man do the work in $16 \times 2 (x + 16)$ days

or $48x = 32 (x + 16)$

∴ $x = 32$ men

20. Wage of a women for a day

= $\frac{15525}{45 \times 48} = \text{Rs. } \frac{115}{16}$

thus, wage of a man for a day

= $\frac{2 \times 115}{16} = \text{Rs. } \frac{115}{8}$

now, number of men

$$= \frac{\text{Total wage}}{\text{number of days} \times 1 \text{ man's 1 day's wages}}$$

$$= \frac{5750 \times 8}{16 \times 115} = 25 \text{ men}$$

21. Daily earning of

$$A + B + C = \text{Rs. } \frac{1350}{9} = \text{Rs. } 150 \quad \dots(i)$$

daily earning of

$$A + C = \text{Rs. } \frac{470}{5} = \text{Rs. } 94 \quad \dots(ii)$$

daily earning of

$$B + C = \text{Rs. } \frac{760}{10} = \text{Rs. } 76 \quad \dots(iii)$$

from (i) and (ii) daily earning of B

$$150 - 94 = \text{Rs. } 56 \quad \dots(iv)$$

from (iii) and (iv) daily earning of

$$C = 76 - 56 = \text{Rs. } 20$$

22. Suppose the first pipe was closed after x hours.

then first's x hours supply + second's 16 hours supply = 1

$$\text{or } \frac{x}{24} + \frac{16}{32} = 1$$

$$\therefore \frac{x}{24} = 1 - \frac{1}{2} = \frac{1}{2}$$

$$x = 12$$

23. Rest time = number of rest \times time of each rest

$$= 35 \times \frac{12}{60} = 7 \text{ hours}$$

Q to cover 36 km, the man has to take rest 35 times total time to cover 36 km

$$= \frac{36}{12} + 7 = 10 \text{ hours}$$

24. Let required distance be x km.

then, taken during the 1st journey = $\frac{x}{3}$ hours

and time taken during second journey

$$= \frac{x}{2} \text{ hours}$$

$$\therefore \frac{x}{3} + \frac{x}{2} = 5$$

$$\Rightarrow \frac{5x}{6} = 5$$

$$\text{or } x = 6$$

\therefore required distance = 6 km

25. Let trains meet at a distance of x km from Delhi. Let the trains from Delhi and Amritsar be A and B respectively.

Then, [time taken by A to cover x km] - [time taken by B to cover $(450 - x)$ km] = $\frac{50}{60}$

$$\frac{x}{20} - \frac{450 - x}{60} = \frac{50}{60}$$

$$3x - 450 + x = 50$$

$$4x = 500$$

$$\therefore x = \frac{500}{4} = 125 \text{ km}$$

Thus trains meet at a distance of 125 km from Delhi.

26. It is easy to see that the distance travelled by the train in 12 minutes, 30 seconds could be travelled by round in (13 minutes - 12 minutes 30 seconds) = 30 seconds

\therefore the train travels 330×30 meters in

$$12\frac{1}{2} \text{ minutes}$$

$$\text{the speed of train} = \frac{330 \times 30 \times 2 \times 60}{25 \times 1000}$$

$$= \frac{1188}{25} \text{ or } 47\frac{13}{25} \text{ km/hr.}$$

$$27. \text{ Speed of 1st train} = 90 \text{ km/hr.} = \frac{90 \times 5}{18}$$

$$= 25 \text{ m/sec.}$$

Let the length of the bridge be x m and that of

40 ½ Solved Paper

the train be y m.

$$\therefore x + y = 25 \times 36 = 900 \quad \dots(i)$$

Again speed of the second train = 45 km/hr.

$$= \frac{45 \times 5}{18} = \frac{25}{2} \text{ m/sec.}$$

\therefore train taken by the second train to cross the bridges

$$= \frac{(x-100) + y}{\frac{25}{2}} = \frac{(x+y-100)^2}{25}$$

28. Let up stream rate = x km/hr. and down stream rate = y km/hr.

$$\text{then, } \frac{30}{x} + \frac{44}{y} = 10 \text{ and } \frac{40}{x} + \frac{55}{y} = 13 \dots(i)$$

$$\text{or } 30u + 44v = 10 \quad \dots(ii)$$

$$40u + 55v = 13 \quad \dots(iii)$$

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

$$u = \frac{1}{5} \text{ and } v = \frac{1}{11}$$

$$\therefore x = 5 \text{ and } y = 11$$

$$\therefore \text{rate in still water} = \frac{5+11}{2} = 8 \text{ km/hr.}$$

$$\text{rate of current} = \frac{11-5}{2} = 3 \text{ km/hr.}$$

29. Area of rectangle = $xy = 240 \text{ cm}^2$

$$\text{perimeter of rectangle} = (x+y) \times 2 = 68 \text{ cm}$$

$$\text{or } x + y = 34 \text{ cm} \quad \dots(i)$$

$$\begin{aligned} (x-y)^2 &= (x+y)^2 - 4xy \\ &= (34)^2 - 4 \times 240 - 1156 \\ &\quad - 960 \\ &= 196 \end{aligned}$$

$$\text{or } (x-y) = \sqrt{196} = 14$$

On solving equation (i) and (ii), we have

$$x = 24 \text{ cm}$$

$$\text{and } y = 10 \text{ cm}$$

30. Let length = x and breadth = y

As per question

$$xy = 60 \text{ square cm} \quad \dots(i)$$

and

$$\sqrt{x^2 + y^2} + x = 5y$$

$$\text{or } x^2 + y^2 = (5y - x)^2$$

$$\text{or } x^2 + y^2 = 25y^2 + x^2 - 10xy$$

$$\text{or } 24y^2 = 10 \times 60$$

$$\text{or } y^2 = 5 \times 5$$

$$\therefore y = 5 \text{ cm and } x = \frac{60}{5} = 12 \text{ cm}$$

32. Since ABC is isosceles

$$\therefore AB = AC$$

$$\Rightarrow \angle B = \angle C$$

[angles opposite to equal side]

$$\text{Now } \angle AQR = \angle BQP$$

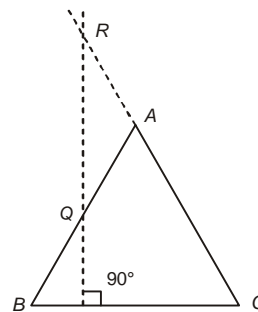
[vertically opposite angles]

$$= 90^\circ - B$$

and

$$\angle ARQ = 90^\circ - C = 90^\circ - B$$

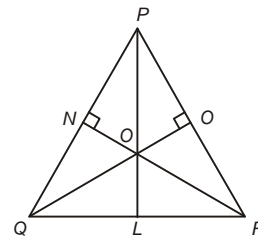
(since $\angle B = \angle C$)



$$\therefore \angle AQR = \angle ARQ$$

so $\triangle ARQ$ is isosceles

34. From Fig.



$\therefore QOM$ is perpendicular to PR

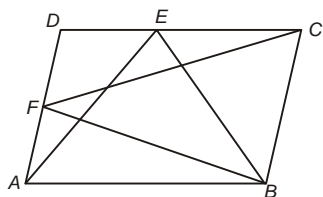
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QNP is perpendicular to OR
 QLR is perpendicular to PO
 $\therefore Q$ is the orthocentre of ΔPRO

35. Since, $ABCD$ is a parallelogram
 \therefore area of ΔAEB

$$= \frac{1}{2} \text{ area of } \parallel \text{ gm } ABCD \quad \dots(i)$$

[Since they are on the same base and between same parallel line]



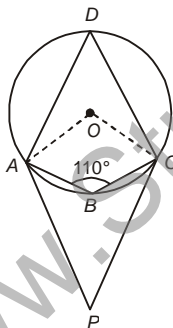
area of $DBFC$

$$= \frac{1}{2} \text{ area of } \parallel \text{ gm } ABCD \quad \dots(ii)$$

\therefore from (i) and (ii) $\Delta_1 = \Delta_2$

36. Q $ABCD$ is a cyclic quadrilateral

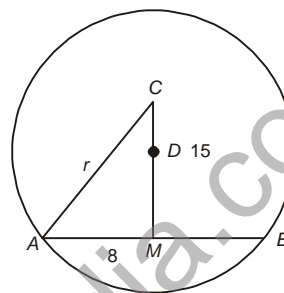
$$\begin{aligned} \therefore \angle D + \angle B &= 180^\circ \\ \therefore \angle D &= 180^\circ - \angle B \\ &= 180^\circ - 110^\circ = 70^\circ \end{aligned}$$



now $\angle AOC = 2\angle D$
 $\therefore \angle AOC = 140^\circ$
 [angle inscribed same arm at the centre is twice that of the exterior circle]

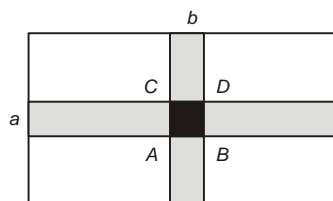
Now in quadrilateral $AOCB$
 $\angle AOC + \angle OCB + \angle CPA + \angle PAD = 360^\circ$
 or $140^\circ + 90^\circ + \angle CPA + 90^\circ = 360^\circ$
 or $\angle CPA = 40^\circ$

37. Here CM is perpendicular to AB
 $\therefore AM = BM = 8$
 [perpendicular drawn from the centre to chord, it divide chord in 2 equal parts]
 $AC = r$



$$\begin{aligned} \therefore r &= \sqrt{AM^2 + CM^2} \quad \text{[Pythagorus theorem]} \\ &= \sqrt{64 + 225} \\ &= 17 \text{ cm} \end{aligned}$$

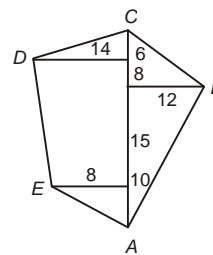
38. Required area =



area of strip (a) + area of strip (b) - area of $ABCD$

$$\begin{aligned} &= 50 \times 2 + 30 \times 2 - 2 \times 2 \\ &= 156 \text{ m}^2 \end{aligned}$$

39. area A is given by



$$A = \frac{1}{2} \times 25 \times 12 + \frac{1}{2} \times 14 \times 12 + \frac{1}{2} \times 6 \times 14$$

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$$\begin{aligned}
 & + \frac{1}{2}(8+14) \times 23 + \frac{1}{2} \times 8 \times 10 \\
 & = 150 + 84 + 42 + 253 + 40 \\
 & = 569 \text{ square m}
 \end{aligned}$$

40. Surface area of given cube = $6x^2$

$$\text{decrease in edge} = 20\% \text{ of } x = \frac{x}{5}$$

$$\text{Now edge becomes} = \frac{4x}{5}$$

$$\therefore \text{ new surface area} = 6 \cdot \left(\frac{4x}{5}\right)^2 = 6 \times \frac{16x^2}{25}$$

Decrease in surface area

$$= 6x^2 - \frac{16 \times 6}{25}x^2 = \frac{54x^2}{25}$$

$$\% \text{ decrease} = \frac{54x^2}{25} \times \frac{100}{6x^2} = 36\%$$

41. Here volume of hemispherical basin

$$= \frac{1}{2} \times \frac{4\pi}{3} (75)^3$$

Volume of cylindrical tub = $\pi r^2 \cdot 15$

\therefore according to given condition

$$120 \times 15\pi r^2 = \frac{2\pi}{3} \times (75)^3$$

$$\text{or } r^2 = \frac{(75)^2}{4} \text{ or } r = \frac{25}{2}$$

\therefore diameter = 25 cm

42. If r is the radius and h is height then $h = 2r$. then according to given question

$$\pi r^2 h = 169 \frac{5}{7}$$

$$\text{or } 2\pi r^3 = \frac{1188}{7}$$

$$\text{or } r^3 = \frac{1188 \times 7}{7 \times 2 \times 2} = 27 \text{ cm}$$

$\therefore r = 3$ and diameter = 6 cm

43. Here $p \sin A = q$

$$\therefore \sin A = \frac{q}{p}$$

$$\Rightarrow \tan A = \frac{q}{\sqrt{p^2 - q^2}}$$

\therefore value of $\sqrt{p^2 - q^2} \tan A$

$$= \sqrt{p^2 - q^2} \cdot \frac{q}{\sqrt{p^2 - q^2}}$$

$$= q$$

44. $2 \sin^2 \theta + \cos^2 45^\circ = \tan 45^\circ$

$$2 \sin^2 \theta + \frac{1}{2} = 1 \quad (\cos 45^\circ = \frac{1}{\sqrt{2}})$$

$$\text{or } 2 \sin^2 \theta = 1 - \frac{1}{2}$$

$$2 \sin^2 \theta = \frac{1}{2}$$

$$\text{or } \sin^2 \theta = \frac{1}{4} \text{ or } \sin \theta = \pm \frac{1}{2}$$

Since $0 \leq \theta \leq 90^\circ$

$$\therefore \sin \theta = \frac{1}{2}$$

45. If $\theta = 35^\circ$ then $\operatorname{cosec} \theta > \sec \theta$

\therefore (b) is not correctly matched.

46. Here

$$y = 2 \sin t \cos t$$

$$\Rightarrow y^2 = 4 \sin^2 t \cos^2 t$$

$$\Rightarrow y^2 = 4x^2 (1 - \cos^2 t)$$

$$\Rightarrow y^2 = 4x^2 (1 - x^2)$$

$$\Rightarrow y^2 = 4x^2 - 4x^4$$

47. $\cos^2 \theta (1 + \tan^2 \theta) + \sin^2 \theta (1 + \cot^2 \theta)$

$$= \cos^2 \theta \sec^2 \theta + \sin^2 \theta \operatorname{cosec}^2 \theta$$

$$= 1 + 1$$

$$= 2$$

48. from $\triangle ABC$

$$AB = BC$$

[sides opposite to equal angles since $\angle A = \angle C = 45^\circ$]

$$49. AC = \frac{1}{2} AB$$

[C is mid point of AB]

$$\begin{aligned} \tan \theta &= \frac{AC}{AP} \\ &= \frac{\frac{1}{2} AB}{\frac{1}{2} AP} = \frac{1}{n} \end{aligned}$$

$$\tan(\theta + \alpha) = \frac{AB}{AP} = \frac{1}{n}$$

$$\text{or } \frac{\tan \theta + \tan \alpha}{1 - \tan \theta \tan \alpha} = \frac{1}{n}$$

$$\left[\tan(A+B) = \frac{\tan A + \tan B}{1 - \tan A \tan B} \right]$$

$$\text{or } \frac{\frac{1}{2n} + \tan \alpha}{1 - \frac{1}{2n} \tan \alpha} = \frac{1}{n}$$

$$\text{or } \tan \alpha = \frac{n}{1 + 2n^2}$$

50. Cumulative frequency table

weekly salary	frequency	C.f
less than 50	40	40
50 - 75	120	160
75 - 100	200	360
100 - 125	300	660
125 - 150	150	810
150 - 175	100	910
175 - 200	55	965
20 and above	35	1000

∴ Workers with less than 125 = 660

$$\% \text{ of such workers} = \frac{660 \times 100}{1000} = 66\%$$

and workers with salary more than 150
= 1000 - 810 = 190

$$\% \text{ of such workers} = \frac{190 \times 100}{1000} = 19\%$$

51. The last class - interval in a frequency distribution has an open end the most suitable diagram for graphical representation is cumulative frequency curve.

52. $103 = 1000$

$$\Rightarrow \log_3 1000 = 10 [a^x = b, \Rightarrow \log_x b = a]$$

53. 2 and 4 are correct

54. Since $x - k$ is factor of $x^2 - 3x - 10$

$$\Rightarrow k^2 - 3k - 10 = 0$$

$$\Rightarrow k^2 - 5k + 2k - 10 = 0$$

$$\Rightarrow k(k - 5) + 2(k - 5) = 0$$

$$\Rightarrow (k + 2)(k - 5) = 0$$

$$\Rightarrow k = -2$$

55. Let the digits be x and y

$$\text{then } x + y = 8 \quad \dots(i)$$

∴ according to given conditions

$$(10x + y) - (10y + x) = 18$$

$$\text{or } x - y = 2 \quad \dots(ii)$$

solving (i) and (ii) we get

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

∴ number = 53

$$56. \text{ We have } \frac{\sin 2^\circ \sin 4^\circ \sin 6^\circ \dots \sin 88^\circ}{\cos 88^\circ \cos 86^\circ \cos 84^\circ \dots \cos 2^\circ}$$

$$\frac{\sin 2^\circ \sin 4^\circ \sin 6^\circ \dots \sin 88^\circ}{\cos(90^\circ - 2^\circ) \cos(90^\circ - 4^\circ) \cos(90^\circ - 6^\circ) \dots \cos(90^\circ - 88^\circ)}$$

$$= \frac{\sin 2^\circ \sin 4^\circ \sin 6^\circ \dots \sin 88^\circ}{\sin 2^\circ \sin 4^\circ \sin 6^\circ \dots \sin 88^\circ}$$

$$= 1 \times 1 \times 1 \dots \times 1$$

$$= 1$$

57. d is the graph of inequation $y \leq 2x + 8$

$$58. \left[(x^I)^{1-\frac{1}{I}} \right]^{\frac{I}{I-1}} = (x^I)^{\frac{I-1}{I} \cdot \frac{1}{I-1}} = (x^I)^{\frac{1}{I}} = x$$

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59. $x^a \times x^b \times x^c = 1$

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

or $a + b + c = 0$

$(a + b) = -c$

$(a + b)^3 = -c^3$

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

60. Let cost price pr kg be Rs. x

total gain = $11\frac{1}{9}\% = \frac{100}{9}\%$

\therefore gain of Rs. $x = \frac{100}{9} \times \frac{x}{100} = \text{Rs. } \frac{x}{9}$

Thus selling price per kg = $x + \frac{x}{9} = \text{Rs. } \frac{10}{9}x$

\therefore If we pay Rs. $\frac{10}{9}x$, then weight of the items ≤ 1000 gm

If we pay Rs. x , then weight of the item

$= 1000 \times \frac{9}{10} = 900$ gm

61. $r = 60$ cm, $s = 16.5$ cm

$\theta = \frac{s}{r} = \left(\frac{16.5}{60}\right)$

$= \left(\frac{16.5}{60} \times \frac{180}{\pi}\right) = \left(\frac{16.5}{60} \times \frac{180}{22} \times 7\right)$

$= 15^\circ 45'$

63. Let $m^2 = x$ and $n^2 = y$ then

$xy = m^2n^2 = (mn)^2$, when $mn \in N$

$\therefore xy \in A$

Note than $16 \in A$, $4 \in A$

But, $(16 + 4) \notin A$ and $\frac{4}{16} \notin A$

64. $b^2 - 4ac = 1 - 4 = -3 < 0$

\therefore given polynomial has no proper linear factor.

65. (a) $b^2 - 4ac = 25 - 72 = -47 < 0$

(b) $b^2 - 4ac = 16 + 40 = 56 < 0$

(c) $b^2 - 4ac = 16 - 72 = -56 < 0$

(d) $b^2 - 4ac = 9 - 40 = -31 < 0$

$\therefore (2x^2 + 4x - 5)$ can be factorized into a product of real linear factors.

66. $\log_{10} 25 = \log_{10} \frac{100}{4}$

$= \log_{10} 100 - \log_{10} 4$

$= 2 \log_{10} 10 - \log_{10} 4$

$= 2 - 2 \log 2$

$= 2 - 2 \times 0.3010 = 1.398$

67. If possible, let $\log_2 7$ be rational number

which in simplest form $\left(\frac{p}{q}\right)$

Then, $\log_2 7 = \frac{p}{q}$

$\frac{p}{2^q} = 7 \Rightarrow 2^p = 7^q$

which is wrong as LHS is even and RHS is odd.

$\therefore \log_2 7$ is irrational.

68. $AB = \sqrt{0^2 + (2a)^2} = 2a$

$BC = \sqrt{(\sqrt{3}a)^2 + (-a)^2} = 2a$

$CA = \sqrt{(\sqrt{3}a)^2 + (a)^2} = 2a$

$AB = BC = CA$

Hence, ΔABC is equilateral.

69. Let the circumcentre be $O(x, y)$

Then $OA^2 = OB^2 = OC^2$

$\Rightarrow (x - 2)^2 + (y - 1)^2 = (x - 5)^2 + (y - 2)^2$
 $= (x - 3)^2 + (y - 4)^2$

$\Rightarrow 3x + y = 12, x - y = 1$

$x = \frac{13}{4}, y = \frac{9}{4}$

∴ Circumcentre is $\left(\frac{13}{4}, \frac{9}{4}\right)$

70. Putting $x = 0$ in $y = mx + c$

we get $y = c$

∴ $(0, c)$ is a point of $y = mx + c$

Required distance

= Distance of $(0, c)$ from $y - mx - d = 0$

$$= \frac{|c - m \times 0 - d|}{\sqrt{1 + m^2}} = \frac{|c - d|}{\sqrt{1 + m^2}}$$

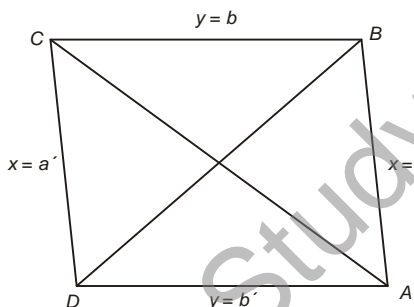
71. Let $ABCD$ be the rectangle and the equations of whose sides AB, BC, CD and DA respectively are $x = 1, y = b, x = a'$ and $y = b'$

Then, its vertices are

$A(a, b'), x + (a, b), C(a', b)$ and $D(a', b')$

equation of diagonal AC is

$$\frac{y - b}{x - a} = \frac{b - b'}{a' - a}$$



$$\Rightarrow (b - b')x + (a' - a)y = a'b - ab' \dots (ii)$$

solving (i) and (ii) we get

$$x = \frac{a + a'}{2}, y = \frac{b + b'}{2}$$

72. Value of $3x - 4y - 8$ at $(3, 4)$

$$= (3 \times 3 - 4 \times 4 - 8) = -15 < 0$$

value of $3x - 4y - 8$ at $(2, -6)$

$$= 3 \times 2 - 4 \times (-6) - 8 = 22 > 0$$

∴ $(3, 4)$ and $(2, -6)$ lie on opposite side of the line.

73. Given circle is

$$x^2 + y^2 + \frac{3}{2}x + 2y + \frac{9}{16} = 0$$

Here $2g = \frac{3}{2}, 2f = 2, c = \frac{9}{16}$

$$\Rightarrow g = \frac{3}{4}, f = 1, c = \frac{9}{16}$$

$$\therefore \text{Radius} = \sqrt{g^2 + f^2 - c} = \sqrt{\frac{9}{16} + 1 - \frac{9}{16}} = 1$$

75. $\log_7 \log_5 (\sqrt{x} + 5 + \sqrt{x}) = 0$

$$\log_5 (\sqrt{x} + 5 + \sqrt{x}) = 7^0 = 1$$

$$(\sqrt{x} + 5 + \sqrt{x}) = (5)^1 = 5$$

$$2\sqrt{x} = 0$$

$$\Rightarrow x = 0$$

76. We know that

$$\frac{a^3 + b^3}{a^2 - ab + b^2} = a + b$$

$$\therefore \frac{(55)^3 + (45)^3}{(55)^2 - 55 \times 45 + (45)^2} = 45 + 55 = 1000$$

77. $x^2 - 3x + 2 > 0$

$$x^2 - 2x - x + 2 > 0$$

$$x(x - 2) - 1(x - 2) > 0$$

$$(x - 2)(x - 1) > 0$$

This gives $(x > 2)$ as one range and $(x < 1)$ is the other. In between these two extremes, there is no value of x satisfies the given inequality.

78. Q $x + y = 1$

$$\therefore \left(x + \frac{1}{x}\right)^2 + \left(y + \frac{1}{y}\right)^2$$

$$x^2 + \frac{1}{x^2} + y^2 + \frac{1}{y^2} + 4$$

46 ½ Solved Paper

Minimum value of $x^2 + y^2$ occur when $x = y$
 [Q $x + y = 1$]

∴ Put $x = y = \frac{1}{2}$

Min. value of

$$\left(x + \frac{1}{x}\right)^2 + \left(y + \frac{1}{y}\right)^2 = \left(\frac{5}{2}\right)^2 + \left(\frac{5}{2}\right)^2$$

$$= \frac{25}{2} = 12.5$$

79. Sum of roots, $p + q = \alpha - 2$

product of root $pq = -\alpha - 1$

$$\begin{aligned} \text{now } p^2 + q^2 &= (p + q)^2 - 2pq \\ &= (\alpha - 2)^2 + 2(\alpha + 1) \\ &= \alpha^2 + 4 - 4\alpha + 2\alpha + 2 \\ &= (\alpha + 1)^2 + 5 \end{aligned}$$

∴ minimum value of $p^2 + q^2 = 5$

80.

$$y = \frac{1}{2 + \frac{1}{3 + \frac{1}{2 + \frac{1}{3 + \dots}}}}$$

$$y = \frac{1}{2 + \frac{1}{3 + y}}$$

$$y = \frac{3 + y}{6 + 2y + 1}$$

or $2y^2 + 7y = 3 + y$,

or $2y^2 + 6y - 3 = 0$

$$\therefore y = \frac{-6 \pm \sqrt{36 + 24}}{4} = \frac{-3 \pm \sqrt{15}}{2}$$

As the contained fraction = $y = \frac{\sqrt{15} - 3}{2}$

81. $(623)^{38} = (623)^{4 \times 9} \times (623)^2$ in the unit place
 = $(1) \times (9)$ in the unit place

= 9 in the unit place.

82. Let number be x and y

∴ $xy = 192, x + y = 28$ (i)

∴ $(x - y)^2 = (x + y)^2 - 4xy$
 = $784 - 768 = 16$

∴ $x - y = 4$... (ii)

On solving (i) and (ii), we get

$x = 16$ and $y = 12$

83. Let the two number be $81a$ and $81b$ where a and b are two number prime to each other

∴ $81a + 81b = 1215$

$$a + b = \frac{1215}{81} = 15$$

Now find two number whose sum is 15, the possible pairs are $(14, 1), (13, 2), (12, 3), (11, 4), (10, 5), (9, 6), (8, 7)$ of these only pair of numbers that are prime to each other are $(14, 1), (13, 2), (11, 4)$ and $(8, 7)$

hence the required number are

$(14 \times 81, 1 \times 81), (13 \times 81, 2 \times 81), (11 \times 81, 4 \times 81), (8 \times 81, 7 \times 81)$

or $(1134, 81), (1053, 162), (891, 324), (648, 567)$

Hence there are four such pairs.

84. Let LCM and HCF be h and k respectively

∴ $h + k = 592$ and $h - k = 518$

consequently $h = \frac{592 + 518}{2} = 555$

and $k = \frac{592 - 518}{2} = 37$

i.e. LCM = 555 and HCF = 37

let the number be $37a$ and $37b$, where a and b are co-primes.

∴ $37a + 37b = 296$ or $a + b = 8$

possible pair of co-primes whose sum is 8 are $(1, 7)$ and $(3, 5)$

∴ possible pair of numbers are $(37 \times 1, 37 \times 7)$ and $(37, 259)$ and $(37 \times 3, 37 \times 5)$ or $(111, 185)$

47 ½ Solved Paper

Now $HCF \times LCM = 555 \times 37 = 20535$

also $111 \times 185 = 20535$ while $37 \times 259 \neq 20535$

Hence the required numbers are 111 and 185

85. $A : B$
 Efficiency 100 : 160
 Days 160 : 100
 or 8 : 5

∴ the number of days taken by B

$$= \frac{12}{8} \times 5 = \frac{15}{2} = 7 \frac{1}{2}$$

86. Let number of coin be $x, 3x, 5x, 7x$ respectively as 1 rupees, fifty paise, twenty five paise and ten paise.

Since

value of Re. 1 coin in rupee = 1

value of 50 paise coin in rupee = $\frac{1}{2}$

value of 25 paise coin in rupee = $\frac{1}{4}$

value of 10 paise coin in rupee = $\frac{1}{10}$

$$\therefore \left[(x \times 1) + \left(3x \times \frac{1}{2} \right) + \left(5x \times \frac{1}{4} \right) + \left(7x \times \frac{1}{10} \right) \right]$$

$$= 22.25$$

or $\frac{89x}{20} = 22.25$ or $x = 5$

Number of 25 paise coins = $5x = 25$

87. Ratio of the values of coins

$$= \frac{5}{1} : \frac{6}{2} : \frac{7}{4} = 20 : 12 : 7$$

value of one rupee coin = $Rs. \left(390 \times \frac{20}{39} \right)$
 = Rs. 200

value of 50 paise coin = $Rs. \left(390 \times \frac{12}{39} \right)$
 = Rs. 120

value of 25 paise coin = $Rs. \left(390 \times \frac{7}{39} \right)$
 = Rs. 70

∴ number of 25 paise coin = $70 \times 4 = 280$

88. A's capital : B's capital = 2 : 3

also B's capital : C's capital = 2 : 5

$$= 1 : \frac{5}{2} = 3 : \frac{15}{2}$$

∴ A's capital : B's capital : C's capital

$$= 2 : 3 : \frac{15}{2}$$

$$= 4 : 6 : 15$$

since $4 + 6 + 15 = 25$

∴ C's share = $\frac{15}{25} \times 1000 = Rs. 600$

89. Ram's monthly income

= Shyam's income + 15% of Shyam's income

= 1.15 Shyam's income

Shyam's income

= Sohan's income - 10% of Sohan's income

= .9 Sohan's income

Ram's income = $1.15 \times .9$ Sohan's income

= 1.035 Sohan's income

Now Ram's income - Sohan's income

= 1.035 Sohan's income - Sohan's income

= Rs. 350

∴ Sohan's income = $\frac{350}{.035} = Rs. 10,000$

∴ Shyam's income = $.9 \times 10,000 = Rs. 9000$

90. Let length = 100 m and height = x metre

area = $100x$

48 ½ Solved Paper

New length = 110 m and let new height = $(x - y\%$ of $x)$

$$\text{then } 110 \times \left(x - \frac{y}{100} x \right) = 100 \times x$$

$$\text{or } 110 \times \left(1 - \frac{y}{100} \right) = 100$$

$$\text{or } 1 - \frac{y}{100} = \frac{100}{110}$$

$$\text{or } \frac{y}{100} = 1 - \frac{100}{110} = \frac{10}{110} = \frac{1}{11}$$

$$\therefore y = \frac{100}{11} = 9\frac{1}{11}\%$$

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