QUESTION PAPER CODE 30/4/3
EXPECTED ANSWER/VALUE POINTS
SECTION A

Question numers 1 to 20 carry 1 mark each.

Question numbers 1 to 10 are multiple choice questions. Choose the correct option.

1. The mean and median of a distribution are 14 and 15 respectively. The value of mode is

(A) 16 (B) 17 (C) 18 (D) 13

Sol. (B) 17 1

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2. The quadratic equation $x^2 - 4x + k = 0$ has distinct real roots if

(A) k = 4 (B) k > 4 (C) k =16 (D) k < 4

Sol. (D) K < 4 1

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3. The first term of an A.P. is 5 and the last term is 45. If the sum of all the terms is 400, the number of terms is

(A) 20 (B) 8 (C) 10 (D) 16

Sol. (D) 16 1

OR

The 9th term of the A.P. – 15, –11, –7, ..., 49 is

(A) 32 (B) 0 (C) 17 (D) 13

Sol. (C) 17 1

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4. Point $P\left(\frac{a}{8}, 4\right)$ is the mid-point of the line segment joining the points A(– 5, 2) and B(4, 6). The value of 'a' is

(A) –4 (B) 4 (C) –8 (D) –2

Sol. (A) –4 1

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5. The number of zeroes for a polynomial p(x) whose graph is given in Figure-1, is

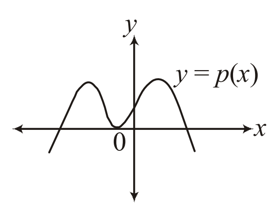

Fig. 1

(A) 4 (B) 3 (C) 5 (D) 1

Sol. (B) 3 1

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6. It is being given that the points A(l, 2), B(0, 0) and C(a, b) are collinear. Which of the following relations between a and b is true?

(A) a = 2b **(B) 2a = b** **(C) a + b = 0** **(D) a – b = 0**

Sol. (B) 2a = b 1

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7. The value of θ for which sin (44° + θ) = cos 30°, is

(A) 46° **(B) 60°** **(C) 16°** **(D) 90°**

Sol. (C) 16° 1

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8. The pair of linear equations y = 0 and y = –6 has

(A) a unique solution **(B) no solution**

(C) infinetly many solutions **(D) only solution (0, 0)**

Sol. (B) No solution 1

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9. A bag contains 3 red, 5 black and 7 white balls. A ball is drawn from the bag at random. The probability that the drawn is not black, is

(A) $\frac{1}{3}$ **(B)** $\frac{9}{15}$ **(C)** $\frac{5}{10}$ **(D)** $\frac{2}{3}$

Sol. (D) 2/3 1

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10. In Figure-2, TP and TQ are tangents drawn to the circle with centre at O. If ∠POQ = 115° then ∠PTQ is

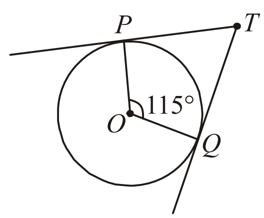

Fig. 2

(A) 115° **(B) 57.5°** **(C) 55°** **(D) 65°**

Sol. (D) 65° 1

OR

From an external point Q, the length of the tangent to a circle is 5 cm and the distance of Q from the centre is 8 cm. The radius of the circle is

(A) 39 cm **(B) 3 cm** **(C)** $\sqrt{39}$ **cm** **(D) 7 cm**

Sol. (C) $\sqrt{39}$ cm 1

Fill in the blanks in question numbers 11 to 15.

11. The distance between the points (a, b) and (– a, – b) is _______.

Sol. $2\sqrt{a^2+b^2}$ 1

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12. A spherical metal ball of radius 8 cm is melted to make 8 smaller identical balls. The radius of each new ball is _______ cm.

Sol. 4 1

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13. $\left(\frac{2+\sqrt{5}}{3}\right)$ **is _______ number.**

Sol. irrational 1

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14. Let ΔABC ~ ΔDEF and their areas be respectively 81 cm^2 and 144 cm^2. If EF = 24 cm, then length of side BC is _______ cm.

Sol. 18 1

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15. If tan A = 1, then 2 sin A cos A = _______.

Sol. 1 1

Answer the following question numbers 16 to 20.

16. After how many decimal places will the decimal representation of the rational number $\frac{229}{2^2 \times 5^7}$ **terminate?**

Sol. After 7 decimal place 1

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17. In Figure-4, AB and CD are common tangents to circle which touch each other at D. If AB = 8 cm, then find the length of CD.

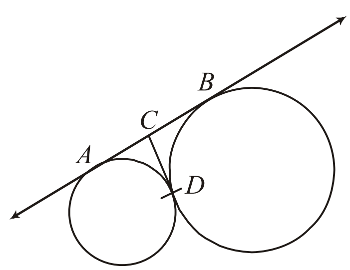

Fig. 4

Sol. AC = CD = BC $\frac{1}{2}$

CD = 4 cm $\frac{1}{2}$

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18. Given that HCF (135, 225) = 45, find the LCM (135, 225).

Sol. LCM $= \dfrac{135 \times 225}{45}$ $\frac{1}{2}$

$= 675$ $\frac{1}{2}$

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19. In Figure-3, a tightly stretched rope of length 20 m is tied from the top of a vertical pole to the ground. Find the height of the pole if the angle made by the rope with the ground is 30°.

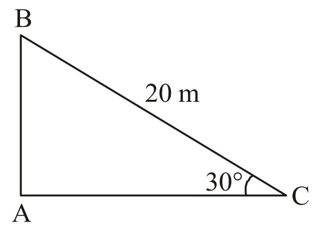

Fig. 3

Sol. $\sin 30° = \dfrac{AB}{20}$ $\frac{1}{2}$

$AB = 10$ m $\frac{1}{2}$

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20. Two dice are thrown similtaneously. What is the probability that the product of the numbers appearing on the top is 1?

Sol. Total outcomes = 36 $\frac{1}{2}$

Number of favourable outcomes = 1

Required probability $= \dfrac{1}{36}$ $\frac{1}{2}$

SECTION B

Question numbers 21 to 26 carry 2 marks each.

21. Find the mode of the following distribution:

Classes:	**10 – 20**	**20 – 40**	**40 – 60**	**60 – 80**	**80 – 100**
Frequency:	**10**	**8**	**12**	**16**	**4**

Sol. Modal class = 60 – 80 $\frac{1}{2}$

Mode $= l + \left(\dfrac{f_1 - f_0}{2f_1 - f_0 - f_2}\right) \times h = 60 + \left(\dfrac{16 - 12}{32 - 12 - 4}\right) \times 20$ 1

$= 65$ $\frac{1}{2}$

From the following distribution, find the median:

Classes:	**500 – 600**	**600 – 700**	**700 – 800**	**800 –900**	**900 – 1000**
Frequency:	**36**	**32**	**32**	**20**	**30**

Median class: 700 – 800 $\frac{1}{2}$

Median = $l + \frac{\left(\frac{N}{2} - cf\right)}{f} \times h$

$= 700 + \frac{75-68}{32} \times 100$ 1

$= 721.88$ $\frac{1}{2}$

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22. **In Figure-6, a tent is in the shape of a cylinder surmounted by a conical top. The cylindrical part is 2.1 m high and conical part has slant height 2.8 m. Both the parts have same radius 2 m. Find the area of the canvas used to make the tent. (Use $\pi = \frac{22}{7}$)**

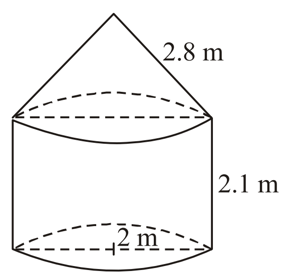

Fig. 6

Sol. Area of canvas = $\pi r(2h + l)$

$= \frac{22}{7} \times 2\,(2 \times 2.1 + 2.8)$ 1

$= 44\ m^2$ 1

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23. **Sovle for x:**

$\mathbf{14x^2 + 17x - 6 = 0}$

Sol. $14x^2 + 21x - 4x - 6 = 0$ 1

$\Rightarrow\ (2x + 3)\,(7x - 2) = 0$ $\frac{1}{2}$

$\Rightarrow\ x = \frac{-3}{2}, x = \frac{2}{7}$ $\frac{1}{2}$

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24. **The perimeters of two similar triangles are 30 cm and 20 cm respectively. If one side of the first triangle is 9 cm long, find the length of the corresponding side of the second triangle.**

Sol. Let the side of other triangle be x cm

$\because$ Ratio of perimeters of two similar triangles is equal to ratio of their corresponding sides $\frac{1}{2}$

$\therefore \frac{9}{x} = \frac{30}{20}$ 1

x = 6 cm $\frac{1}{2}$

OR

In Figure-5, ΔPQR is right-angled at P. M is a point on QR such that PM is perpendicular to QR. Show that PQ^2 = QM × QR.

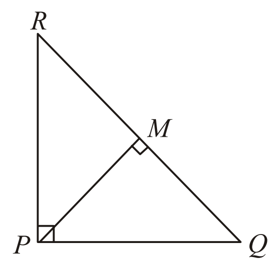

Fig. 5

ΔPQM ~ ΔRQP [By AA similarity] 1

$\therefore \frac{PQ}{RQ} = \frac{QM}{PQ}$

$\Rightarrow PQ^2 = QM \times QR$ 1

25. **Tree Plantation Drive**

A group Housing Society has 600 members, who have their houses in the campus and decided to hold a Tree Plantation Drive on the occasion of New Year. Each household was given he choice of planting a sampling of its choice. The number of different types of sampings planted were:

(i) Neem – 125

(ii) Peepal – 165

(iii) Creepers – 50

(iv) Fruit plants – 150

(v) Flowering plants – 110

On the opening ceremony, one of the plants is selected randomly for a prize. After reading the above passage, answer the following questions.

What is the probability that the selected plant is

(i) A fruit plant or a flowering plant?

(ii) Either a Neem plant or a Peepal plant?

Sol. Total outcomes = 600

(i) P(Fruit plant or a flowering plant) = $\frac{260}{600}$ or $\frac{13}{30}$ 1

(ii) P(either neem plant or a peepal plant) = $\frac{290}{600}$ or $\frac{29}{60}$ 1

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26. Evaluate:

$$\frac{2\sin 68°}{\cos 22°} - \frac{2\cot 15°}{\tan 75°} - 3\tan 40° \tan 45° \tan 50°$$

Sol. $\frac{2\sin(90° - 22°)}{\cos 22°} - \frac{2\cot(90° - 75°)}{\tan 75°} - 3\tan(90° - 50°) . \tan 50°$ $1\frac{1}{2}$

$= -3$ $\frac{1}{2}$

SECTION C

Question numbers 27 to 34 carry 3 marks each.

27. Solve the pair of equations:

$$\frac{2}{x} + \frac{3}{y} = 11, \quad \frac{5}{x} - \frac{4}{y} = -7$$

Hence, find the value of 5x – 3y.

Sol. $\frac{2}{x} + \frac{3}{y} = 11$ ...(i)

$\frac{5}{x} - \frac{4}{y} = -7$ ...(ii)

On solving equation (i) & (ii)

$x = 1$ 1+1

& $y = 1/3$

$\therefore$ $5x - 3y = 4$ 1

OR

Taxi charges in a city consist of fixed charges and the remainings charges depend upon the distance travelled. For a journey of 10 km, the charge paid is ₹ 75 and for a journey of 15 km, the charge paid is ₹ 110. Find the fixed charge and charges per km. Hence, find the charge of covering a distance of 35 km.

Let fixed charge be ₹ x and charges per km be ₹ y $\frac{1}{2}$

$x + 10y = 75$ ...(i)

$x + 15y = 110$ ...(ii) 1

Solve equation (i) & (ii)

$\left.\begin{array}{r} x = 5 \\ \& \; y = 7 \end{array}\right]$ $\frac{1}{2}+\frac{1}{2}$

$\therefore$ Total charge for 35 km = x + 35y = ₹ 250 $\frac{1}{2}$

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28. In Figure-7, AB is the diameter of a circle with centre O and AC is its chord such that $\angle BAC = 30°$. If the tangent drawn at C intersects extended AB at D, then show that BC = BD.

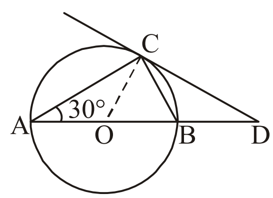

Fig. 7

Sol. OA = OC

$\Rightarrow \angle OCA = 30°$ $\frac{1}{2}$

$\angle OCB = \angle ACB - \angle ACO$

$= 90° - 30° = 60°$ 1

$\angle BCD = 90° - \angle OCB$

$= 90° - 60° = 30°$ ...(i) $\frac{1}{2}$

In ΔACD,

$\angle ACD + \angle CAD + \angle CDA = 180°$

$90° + 30° + 30° + \angle CDA = 180°$

$\angle CDA = 30°$ ...(ii) $\frac{1}{2}$

From (i) and (ii)

$\angle BCD = \angle CDA$

$\Rightarrow$ BC = BD (In ΔCBD) $\frac{1}{2}$

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29. **Prove that:**

$$\frac{\sin\theta - \cos\theta + 1}{\cos\theta + \sin\theta - 1} = \frac{1}{\sec\theta - \tan\theta}$$

Sol. L.H.S $= \dfrac{\sin\theta - \cos\theta + 1}{\cos\theta + \sin\theta - 1}$

Dividing N^r and D^r by $\cos\theta$

$$= \frac{\tan\theta - 1 + \sec\theta}{1 + \tan\theta - \sec\theta}$$ 1

$$= \frac{\tan\theta + \sec\theta - 1}{(\sec^2\theta - \tan^2\theta) + \tan\theta - \sec\theta}$$ 1

$$= \frac{\tan\theta + \sec\theta - 1}{(\sec\theta - \tan\theta)(\sec\theta + \tan\theta - 1)}$$

$$= \frac{1}{\sec\theta - \tan\theta} = \text{R.H.S}$$ 1

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30. **Construct a triangle with side 5 cm, 6 cm and 7 cm. Now construct another triangle whose side are $\frac{2}{3}$ times the corresponding sides of the first triangle.**

Sol. Correct construction of given triangle 1

Correct constriction of similar triangle with scale 2/3. 2

OR

Draw a pair of tangents to a circle of radius 3 cm which are inclined to each other at an angle of 60°.

Sol. Correct construction of circle with radius 3 cm. 1

Correct constrcution of two tangents. 2

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31. **Calculate the area of the shaded region common between two quadrants of circles of radius 7 cm each (as shown in Figure-8).**

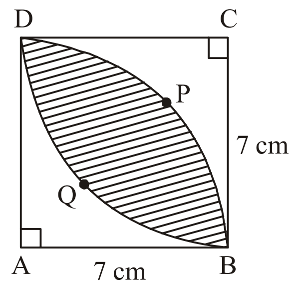

Fig. 8

Sol. Area of Shaded Region

= 2 (Area of one sector ABPD) – Area of square ABCD 1

$= 2\left(\frac{90° \times \pi \times 7^2}{360°}\right) - 7 \times 7$ $1\frac{1}{2}$

$= 28 \text{ cm}^2$ $\frac{1}{2}$

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32. **Prove that $\sqrt{5}$ is an irrational number.**

Sol. Let $\sqrt{5}$ be a rational number

$\sqrt{5} = \frac{a}{b} \quad b \neq 0 \quad \text{HCF } (a, b) = 1$ $\frac{1}{2}$

$\Rightarrow \; 5 = \frac{a^2}{b^2}, \; a^2 = 5b^2$

5 divides a 1

Put a = 5c (for some integer c)

$\Rightarrow \; 25c^2 = 5b^2 \Rightarrow b^2 = 5c^2$

then we get, 5 divides b $\frac{1}{2}$

Contradiction arises as HCF (a, b) = 1

∴ Our assumption is wrong

∴ $\sqrt{5}$ is irrational number 1

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33. If 6 times the 6th term of an A.P. is equal of 9 times the 9th term, show that its 15th term is zero.

Sol. Let a be the first term and d be the common difference

$6(a + 5d) = 9(a + 8d)$ $1\frac{1}{2}$

$a = -14d$ 1

$a + 14\ d = 0 \Rightarrow 15^{th}$ term $= 0$ $\frac{1}{2}$

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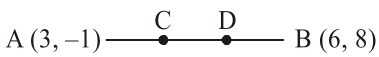
34. Find the co-ordinates of the points of trisection of the line segment joining the points (3, – 1) and (6,8).

Sol.



Case I: If C and D trisect AB

then C divides AB in the ratio 1 : 2 $\frac{1}{2}$

Co-ordinates of C: $x = \frac{1 \times 6 + 2 \times 3}{3} = 4$ $\frac{1}{2}$

and $y = \frac{1 \times 8 + 2\,(-1)}{3} = 2$ $\frac{1}{2}$

$\therefore$ Co-ordinates of C(4, 2)

Case II: Co-ordinates of D if D divides AB in the ratio 2 : 1 $\frac{1}{2}$

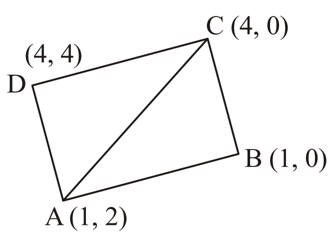
Co-ordinates of D: $x' = \frac{2 \times 6 + 1 \times 3}{3} = 5$ $\frac{1}{2}$

$y' = \frac{2 \times 8 + 1 \times (-1)}{3} = 5$ $\frac{1}{2}$

Co-ordinates of D = (5, 5)

OR

Find the area of a quadrilateral ABCD having vertices at A(l, 2), B(l, 0), C(4, 0) and D(4, 4).



$ar\,(\Delta ABC) = \frac{1}{2}[1(0-0) + 1(0-2) + 4(2-0)]$

$= 3$ sq. units $1\frac{1}{2}$

$$\text{ar}(\Delta ACD) = \frac{1}{2}[1(0-4)+4(4-2)+4(2-0)]$$

$= 6$ sq. units 1

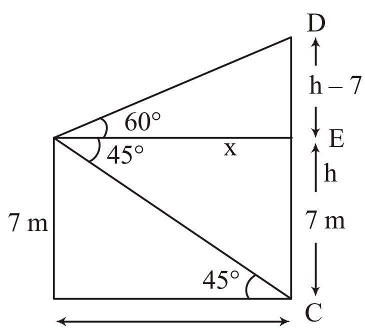
$\therefore$ Area of quadrialteral = 3 + 6 = 9 sq. units $\frac{1}{2}$

SECTION D

Question numbers 35 to 40 carry 4 marks each.

35. From the top of a 7 m building, the angle of elevation of the top of a cable tower is 60° and the angle of depression of its foot is 45°. Determine the height of the tower. (Use $\sqrt{3}$ = 1.73)

Sol.



For correct figure 1

$\tan 45° = \frac{7}{x} \Rightarrow x = 7$ 1

$\tan 60° = \frac{h-7}{x}$ 1

$7(\sqrt{3}+1) = h$ $\frac{1}{2}$

$h = 7 \times 2.73 = 19.11$ m $\frac{1}{2}$

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36. Obtain other zeroes of the polynomial

$f(x) = 2x^4 + 3x^3 - 5x^2 - 9x - 3$

if two of its zeroes are $\sqrt{3}$ and $-\sqrt{3}$

Sol. $f(x) = 2x^4 + 3x^3 - 5x^2 - 9x - 3$

$\because$ $\sqrt{3}$ and $-\sqrt{3}$ and zeroes of f(x)

$\therefore$ $(x-\sqrt{3})$ and $(x+\sqrt{3})$ are factors of f(x) $\frac{1}{2}$

$\therefore$ $x^2 - 3$ is a factor of f(x) $\frac{1}{2}$

$$q(x) = \frac{2x^4 + 3x^3 - 5x^2 - 9x - 3}{x^2 - 3}$$

$= 2x^2 + 3x + 1$ 2

For zeroes q(x) = 0

$\therefore$ $2x^2 + 3x + 1 = 0$

$(x + 1)(2x + 1) = 0$ $\frac{1}{2}$

$x = -1, -1/2$

$\therefore$ Remaining zeroes are -1 & $-1/2$ $\frac{1}{2}$

OR

Without actually calculating the zeroes, form a quadratic polynomial whose zeroes are reciprocals of the zeroes of the polynomial $5x^2 + 2x - 3$.

Let zeroes of given quadratic polynomial be α and β

$$\left.\begin{aligned} \alpha + \beta &= \frac{-2}{5} \\ \alpha\beta &= \frac{-3}{5} \end{aligned}\right] \quad 1$$

Now,

$$\frac{1}{\alpha} + \frac{1}{\beta} = \frac{\beta + \alpha}{\alpha\beta} = \frac{\frac{-2}{5}}{\frac{-3}{5}} = \frac{2}{3} \quad 1$$

$$\frac{1}{\alpha\beta} = \frac{-5}{3} \quad 1$$

Required Polynomial is

$$x^2 - \frac{2}{3}x - \frac{5}{3} \quad 1$$

or

$3x^2 - 2x - 5$

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37. A bucket open at the top has top and bottom radii of circular ends as 40 cm and 20 cm respectively. Find the volume of the bucket if its depth is 21 cm. Also find the area of the tin sheet required for making the bucket. (Use $\pi = \frac{22}{7}$)

Sol. Volume $= \frac{\pi h}{3}[R^2 + r^2 + Rr]$

$= \frac{22}{7} \times \frac{21}{3}[40^2 + 20^2 + 40 \times 20]$ 1

$= 61600 \text{ cm}^3$ $\frac{1}{2}$

$l = \sqrt{h^2 + (R - r)^2} = 29\,\text{cm}$ 1

Area of tin = $\pi l(R + r) + \pi r^2$

$= \pi[29 \times 60 + 400]$ 1

$= 6725.7\ \text{cm}^2$ $\frac{1}{2}$

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38. In a flight of 600 km, the speed of the aircraft was slowed down due to bad weather. The average speed of the trip was decreased by 200 km/hr and thus the time of flight increased by 30 minutes. Find the average speed of the aircraft originally.

Sol. Let average speed of aircraft be x km/h

$\frac{600}{x - 200} - \frac{600}{x} = \frac{1}{2}$ 2

$x^2 - 200x - 240000 = 0$ 1

$(x - 600)(x + 400) = 0$

$x = 600$ km/h 1

$\therefore$ Original speed = 600 km/h

OR

₹ 9,000 were divided equally among a certain number of persons. Had there been 20 more persons, each would have got ₹ 160 less. Find the original number of persons.

Sol. Let original number of persons be x

$\frac{9000}{x} - \frac{9000}{x + 20} = 160$ 2

$x^2 + 20x - 1125 = 0$ 1

$(x + 45)(x - 25) = 0$

$x = 25$

$\therefore$ Number of persons = 25 1

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39. Change the following distribution into 'less than' type distribution and draw its ogive. Hence find the median of the distribution.

Marks	Number of Students
20 – 30	4
30 – 40	10
40 – 50	12
50 – 60	14
60 – 70	8
70 – 80	3
80 – 90	4
90 – 100	5

Sol. Less than type distribution table is:

Marks	fi	cf
Less than 30	4	4
Less than 40	10	14
Less than 50	12	26
Less than 60	14	40
Less than 70	8	48
Less than 80	3	51
Less than 90	4	55
Less than 100	5	60

Correct Table 2

For Drawing the correct Ogive $1\frac{1}{2}$

Getting correct median = 52.86 $\frac{1}{2}$

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40. If a line is drawn parallel to one side of a triangle to intersect the other two sides in distinct points, then prove that the other two sides are divided in the same ratio.

Sol. For correct given, To prove, Construction and figure $4\times\frac{1}{2}=2$

For correct proof 2

OR

In a right-angled triangle, prove that the square of the hypotenuse is equal to the sum of the squares of the other two sides.

Sol. For correct given, To prove, construction & figure $4\times\frac{1}{2}=2$

For correct proof 2
