

SOLUTION

**Q.1. (A) For every sub-question 4 alternative answers are given.
Choose the correct answer and write the alphabet of it.** [4]

- (1) In the format of GSTIN there are _____ alpha-numerals.
(a) 15 (b) 10 (c) 16 (d) 9
- (2) From the following equations, which one is the quadratic equation?
(a) $\frac{5}{x} - 3 = x^2$ (b) $x(x + 5) = 4$
(c) $n - 1 = 2n$ (d) $\frac{1}{x^2}(x + 2) = x$
- (3) For simultaneous equations in variables x and y , if $D_x = 49$, $D_y = -63$, $D = 7$, then what is the value of x ?
(a) 7 (b) -7 (c) $\frac{1}{7}$ (d) $-\frac{1}{7}$
- (4) If $n(A) = 2$, $P(A) = \frac{1}{5}$, then $n(S) = ?$
(a) $\frac{2}{5}$ (b) $\frac{5}{2}$ (c) 10 (d) $\frac{1}{3}$

Ans. (1) – (a), (2) – (b), (3) – (a), (4) – (c)

Q.1. (B) Solve the following sub-questions. [4]

- (1) Find second and third term of an A.P. whose first term is -2 and common difference is -2 .**

Solution:

$$a = -2, d = -2$$

$$t_7 = a + d = -2 + (-2) = -2 - 2 = -4$$

$$t_3 = t_2 + d = -4 + (-2) = -4 - 2 = -6$$

Ans. The second and third terms of the A.P. are -4 and -6 respectively.

- (2) 'Pawan Medicals' supplies medicines. On some medicines the rate of GST is 12%, then what is the rate of CGST and SGST?

Solution:

$$\text{GST} = 12\%$$

$$\begin{aligned}\text{CGST} = \text{SGST} &= \frac{1}{2}\text{GST} \\ &= \frac{1}{2} \times 12 \\ &= 6\%\end{aligned}$$

Ans. CGST = 6% and SGST = 6%

(3) Find the values of a and b from the quadratic equation $2x^2 - 5x + 7 = 0$.

Solution:

$$2x^2 - 5x + 7 = 0$$

Comparing with $ax^2 + bx + c = 0$,

Ans. $a = 2$, $b = -5$

(4) If $15x + 17y = 21$ and $17x + 15y = 11$, then find the value of $x + y$.

Solution:

$$\begin{array}{ll} 15x + 17y = 21 & \dots(i) \\ + \quad 17x + 15y = 11 & \dots(ii) \\ \hline 32x + 32y = 32 & \dots(\text{Adding equations (i) and (ii)}) \\ \therefore x + y = 1 & \dots(\text{Dividing by 32}) \end{array}$$

Q.2. (A) Complete and write activities from the following. (Any two) [4]

(1) Complete the following table to draw the graph of $2x - 6y = 3$.

x	-5	
y		0
(x, y)		

Solution:

x	-5	$\frac{3}{2}$
y	$-\frac{13}{6}$	0
(x, y)	$\left(-5, -\frac{13}{6}\right)$	$\left(\frac{3}{2}, 0\right)$

- (2) First term and common difference of an A.P. are 6 and 3 respectively. Find S_{27} .

Solution:

First term = $a = 6$, common difference = $d = 3$, $S_{27} = ?$

$$S_n = \frac{n}{2} \left[\boxed{} + (n-1)d \right] \text{ formula}$$

$$S_{27} = \frac{27}{2} \left[12 + (27-1) \boxed{} \right]$$

$$= \frac{27}{2} \times \boxed{}$$

$$= 27 \times 45$$

$$\therefore S_{27} = \boxed{}$$

Solution:

First term = $a = 6$, common difference = $d = 3$, $S_{27} = ?$

$$S_n = \frac{n}{2} \left[\boxed{2a} + (n-1)d \right] \text{ formula}$$

$$\therefore S_{27} = \frac{27}{2} \left[12 + (27-1) \boxed{3} \right]$$

$$= \frac{27}{2} \times \boxed{90}$$

$$= 27 \times 45$$

$$\therefore S_{27} = \boxed{1215}$$

- (3) A card is drawn from a well shuffled pack of 52 playing cards. Find the probability of the event, the card drawn is a red card.

Solution:

Suppose 'S' is the sample space.

$$\therefore n(S) = 52$$

Event A: The card drawn is a red card.

$$\therefore \text{Total red cards} = \boxed{} \text{ hearts} + 13 \text{ diamonds}$$

$$\therefore n(A) = \boxed{}$$

$$\therefore p(A) = \frac{\boxed{}}{n(S)} \dots\dots \text{formula}$$

$$\therefore p(A) = \frac{26}{52}$$

$$\therefore p(A) = \boxed{}$$

Solution:

Suppose 'S' is the sample space.

$$\therefore n(S) = 52$$

Event A: The card drawn is a red card.

$$\therefore \text{Total red cards} = \boxed{13} \text{ hearts} + 13 \text{ diamonds}$$

$$\therefore n(A) = \boxed{26}$$

$$\therefore p(A) = \frac{\boxed{n(A)}}{n(S)} \dots\dots \text{formula}$$

$$\therefore p(A) = \frac{26}{52}$$

$$\therefore p(A) = \boxed{\frac{1}{2}}$$

Q.2. (B) Solve sub-questions from the following. (Any four) [8]

(1) Find the value of the determinant.

$$\begin{vmatrix} 7 & 5 \\ 3 & 3 \\ 3 & 1 \\ 2 & 2 \end{vmatrix}$$

Solution:

$$\begin{aligned}\left[\begin{array}{cc} \frac{7}{3} & \frac{5}{3} \\ \frac{3}{2} & \frac{1}{2} \end{array} \right] &= \frac{7}{3} \times \frac{1}{2} - \frac{5}{3} \times \frac{3}{2} \\ &= \frac{7}{6} - \frac{15}{6} \\ &= \frac{-8}{6} \\ &= \frac{-4}{3}\end{aligned}$$

$$\text{Ans. } \left[\begin{array}{cc} \frac{7}{3} & \frac{5}{3} \\ \frac{3}{2} & \frac{1}{2} \end{array} \right] = \frac{-4}{3}$$

(2) Solve the quadratic equation by factorisation method.

$$x^2 - 15x + 54 = 0.$$

Solution:

$$x^2 - 15x + 54 = 0$$

$$\therefore x^2 - 9x - 6x + 54 = 0$$

$$\therefore x(x - 9) - 6(x - 9) = 0$$

$$\therefore (x - 9)(x - 6) = 0$$

$$\therefore x - 9 = 0 \quad \text{or} \quad x - 6 = 0$$

$$\therefore x = 9 \quad \text{or} \quad x = 6$$

Ans. 9 and 6 are the roots of the given quadratic equation.

(3) Decide whether the following sequence is an A.P.; if so, find the 20th term of the progression.

$$-12, -5, 2, 9, 16, 23, 30, \dots$$

Solution:

$$-12, -5, 2, 9, 16, 23, 30, \dots$$

$$d = -5 - (-12) = -5 + 12 = 7,$$

$$d = 2 - (-5) = 2 + 5 = 7,$$

$$d = 9 - 2 = 7,$$

$$d = 16 - 9 = 7,$$

$$d = 23 - 16 = 7,$$

$$d = 30 - 23 = 7$$

Thus, the difference between any two consecutive terms of the given A.P. is constant, i.e. 7.

∴ It is an A.P.

Here, $a = -12$, $d = 7$, $n = 20$, $t_n = ?$

$$t_n = a + (n - 1)d \dots\dots\dots (\text{formula})$$

$$t_{20} = -12 + (20 - 1) \times 7$$

$$= -12 + 19 \times 7$$

$$= -12 + 133$$

$$\text{Ans. } t_{20} = 121$$

(4) A two digit number is formed with digits 2, 3, 5, 7, 9 without repetition. What is the probability that the number formed is an odd number?

Solution:

A two digit number formed with the digits 2, 3, 5, 7, 9 without repetition can be:

$$S = \{23, 25, 27, 29, 32, 35, 37, 39, 52, 53, 57, 59, 72, 73, 75, 79, 92, 93, 95, 97\}$$

$$\therefore n(S) = 20$$

Let A be the event that the number so formed is an odd number.

$$A = \{23, 25, 27, 29, 35, 37, 39, 53, 57, 59, 73, 75, 79, 93, 95, 97\}$$

$$\therefore n(A) = 16$$

$$\therefore P(A) = \frac{n(A)}{n(S)} = \frac{16}{20} = \frac{4}{5}$$

$$\text{Ans. } P(A) = \frac{4}{5}$$

(5) If $L = 10$, $f_1 = 70$, $f_0 = 58$, $f_2 = 42$, $h = 2$, then find the mode by using formula.

Solution:

$$L = 10, f_1 = 70, f_0 = 58, f_2 = 42, h = 2$$

$$\begin{aligned}
 \text{Mode} &= L + \left[\frac{f_1 - f_0}{2f_1 - f_0 - f_2} \right] \times h \\
 &= 10 + \left[\frac{70 - 58}{2 \times 70 - 58 - 42} \right] \times 2 \\
 &= 10 + \left[\frac{12}{140 - 100} \right] \times 2 \\
 &= 10 + \frac{12}{40} \times 2 \\
 &= 10 + 0.6 \\
 &= 10.6
 \end{aligned}$$

Ans. Mode = 10.6

Q.3. (A) Complete and write activity from the following. (Any one) [3]

(1)

Age group (in years)	No. of Persons	Measure of central angle
20 – 25	80	$\frac{\boxed{}}{200} \times 360 = \boxed{}$
25 – 30	60	$\frac{60}{200} \times 360 = \boxed{}$
30 – 35	35	$\frac{35}{200} \times \boxed{} = 63^\circ$
35 – 40	25	$\frac{25}{200} \times 360 = \boxed{}$
Total	200	$\boxed{}$

Solution:

Age group (in years)	No. of Persons	Measure of central angle
20 – 25	80	$\frac{\boxed{80}}{200} \times 360 = \boxed{144^\circ}$
25 – 30	60	$\frac{60}{200} \times 360 = \boxed{108^\circ}$

Age group (in years)	No. of Persons	Measure of central angle
30 – 35	35	$\frac{35}{200} \times 360 = 63^\circ$
35 – 40	25	$\frac{25}{200} \times 360 = 45^\circ$
Total	200	360°

- (2) Shri Shantilal has purchased 150 shares of FV ₹100, for MV of ₹120. The company has paid dividend at 7%, then to find the rate of return on his investment, complete the following activity.

Solution: FV = ₹100; Number of shares = 150

Market value = ₹120

- (i) Sum investment = MV × No. of Shares
 $= \boxed{} \times \boxed{}$
 $\therefore$ Sum investment = ₹18,000
- (ii) Dividend per share = FV × Rate of dividend
 $= \boxed{} \times \frac{\boxed{}}{100}$
 $= ₹7$
 $\therefore$ Total dividend received = 150×7
 $= \boxed{}$
- (iii) Rate of return = $\frac{\text{Dividend income}}{\text{Sum invested}} \times 100$
 $= \frac{1050}{18000} \times 100$
 $= \boxed{}$

Solution:

FV = ₹100; Number of shares = 150

Market value = ₹120

- (i) Sum investment = MV × No. of Shares
 $= \boxed{120} \times \boxed{150}$
 $\therefore$ Sum investment = ₹18,000

$$\begin{aligned}
 \text{(ii) Dividend per share} &= \text{FV} \times \text{Rate of dividend} \\
 &= \boxed{100} \times \frac{\boxed{7}}{100} \\
 &= ₹7
 \end{aligned}$$

$$\begin{aligned}
 \therefore \text{Total dividend received} &= 150 \times 7 \\
 &= \boxed{₹1050}
 \end{aligned}$$

$$\begin{aligned}
 \text{(iii) Rate of return} &= \frac{\text{Dividend income}}{\text{Sum invested}} \times 100 \\
 &= \frac{1050}{18000} \times 100 \\
 &= \boxed{5.83\%}
 \end{aligned}$$

Q.3. (B) Attempt sub-questions from the following. (Any two)
[6]

(1) A balloon vendor has 2 red, 3 blue and 4 green balloons. He wants to choose one of them at random to give it to Pranali. What is the probability of the event that Pranali gets:

(i) a red balloon (ii) a blue balloon

Solution:

2 red, 3 blue and 4 green balloons. If one is selected at random, then

$$S = \{R_1, R_2, B_1, B_2, B_3, G_1, G_2, G_3, G_4\}$$

$$\therefore n(S) = 9$$

(i) Let A be the event that the balloon is red.

$$\therefore A = \{R_1, R_2\}$$

$$\therefore n(A) = 2$$

$$\therefore P(A) = \frac{n(A)}{n(S)} = \frac{2}{9}$$

Ans. The probability of getting a red balloon is $\frac{2}{9}$.

(ii) Let B be the event that the balloon is blue.

$$\therefore B = \{B_1, B_2, B_3\}$$

$$\therefore n(B) = 3$$

$$\therefore P(B) = \frac{n(B)}{n(S)} = \frac{3}{9} = \frac{1}{3}$$

Ans. The probability of getting a blue balloon is $\frac{1}{3}$.

(2) The denominator of a fraction is 4 more than twice its numerator. Denominator becomes 12 times the numerator, if both the numerator and the denominator are reduced by 6, find the fraction.

Solution:

Let the denominator of the fraction be x and numerator be y .

$\therefore$ the required fraction is $\frac{y}{x}$.

According to the first condition,

$$x = 2y + 4$$

$$\therefore x - 2y = 4 \quad \dots(i)$$

If denominator and numerator are reduced by 6, then the new denominator and numerator will be $(x - 6)$ and $(y - 6)$, respectively.

According to the second condition,

$$(x - 6) = 12(y - 6)$$

$$\therefore x - 6 = 12y - 72$$

$$\therefore x - 12y = -72 + 6$$

$$\therefore x - 12y = -66 \quad \dots(ii)$$

Subtracting equation (ii) from (i),

$$x - 2y = 4 \quad \dots(i)$$

$$- x - 12y = -66 \quad \dots(ii)$$

$$\begin{array}{r} - \quad + \quad + \\ \hline \end{array}$$

$$10y = 70$$

$$\therefore y = 7$$

Substituting $y = 7$ in equation (i),

$$x - 2 \times 7 = 4$$

$$\therefore x = 4 + 14$$

$$\therefore x = 18$$

Ans. The required fraction is $\frac{y}{x} = \frac{7}{18}$.

- (3) A milk centre sold milk to 50 customers. The table below gives the number of customers and the milk they purchased. Find the mean of the milk sold by direct method.

Milk Sold (litre)	No. of Customers
1 – 2	17
2 – 3	13
3 – 4	10
4 – 5	7
5 – 6	3

Solution:

Milk Sold (litre)	Class Mark (x_i)	No. of Customers (f_i)	$f_i x_i$
1 – 2	1.5	17	25.5
2 – 3	2.5	13	32.5
3 – 4	3.5	10	35.0
4 – 5	4.5	7	31.5
5 – 6	5.5	3	16.5
		$\sum f_i = 50$	$\sum f_i x_i = 141$

$$\begin{aligned}\text{Mean} &= \frac{\sum f_i x_i}{\sum f_i} \\ &= \frac{141}{50} \\ &= 2.82 \text{ litres}\end{aligned}$$

Ans. The average milk sold by the centre is 2.82 litres.

- (4) In an A.P. sum of three consecutive terms is 27 and their products is 504. Find the terms. (Assume that three consecutive terms in an A.P. are $a - d$, a , $a + d$.)

Solution:

Let the three consecutive terms of the A.P. are $a - d$, a , $a + d$.

Given: Sum of three consecutive terms is 27.

$$\therefore a - d + a + a + d = 27$$

$$\therefore 3a = 27$$

$$\therefore a = 9$$

Given: Product of three consecutive terms is 504.

$$\therefore (a - d) \times a \times (a + d) = 504$$

$$\therefore a(a^2 - d^2) = 504$$

$$\therefore 9(9^2 - d^2) = 504 \quad \dots(\text{Substituting } a = 9)$$

$$\therefore 81 - d^2 = 56$$

$$\therefore -d^2 = 56 - 81$$

$$\therefore -d^2 = -25$$

$$\therefore d^2 = 25$$

$$\therefore d = \pm 5 \quad \dots(\text{Taking square root})$$

Case i: If $d = 5$ and $a = 9$, then

$$a - d = 9 - 5 = 4$$

$$a = 9$$

$$a + d = 9 + 5 = 14$$

Case ii: If $d = -5$ and $a = 9$, then

$$a - d = 9 - (-5) = 9 + 5 = 14$$

$$a = 9$$

$$a + d = 9 + (-5) = 9 - 5 = 4$$

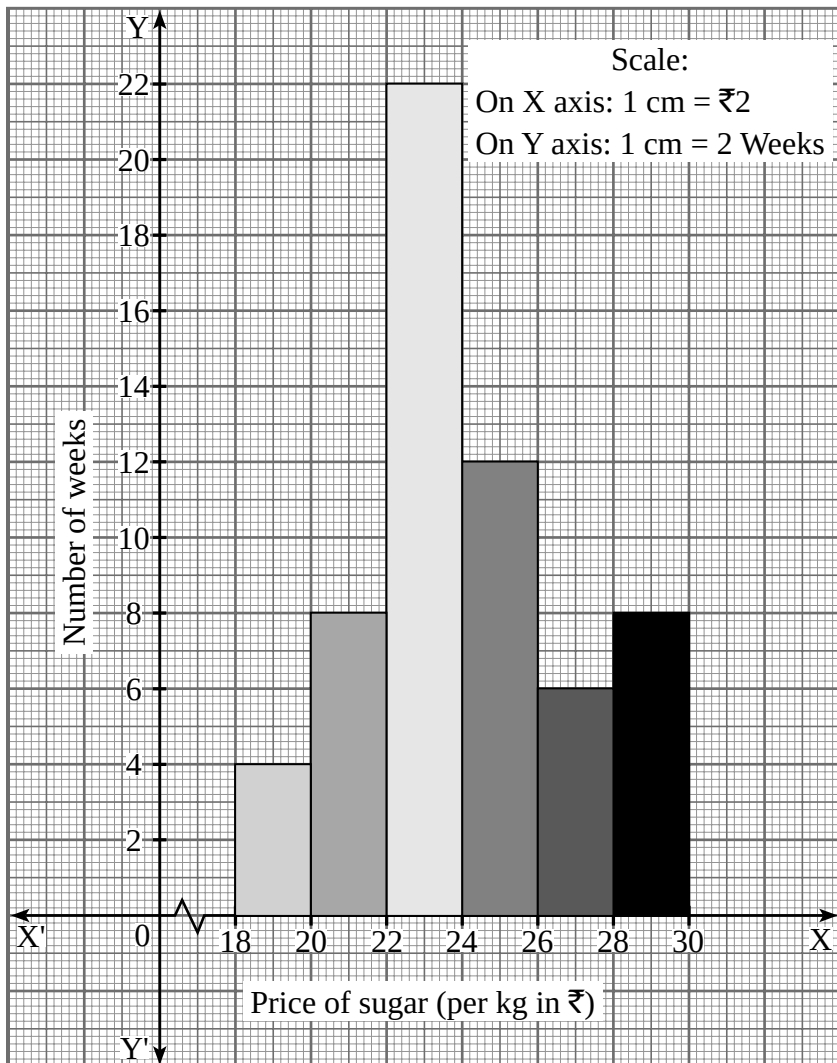
Ans. The three consecutive terms of the given A.P. are 4, 9 and 14 or 14, 9 and 4.

Q.4. Attempt sub-questions from the following. (Any two) [8]

(1) Represent the following data by histogram.

Price of Sugar (per kg in ₹)	Number of Weeks
18 – 20	4
20 – 22	8
22 – 24	22
24 – 26	12
26 – 28	6
28 – 30	8

Solution:



(2) One person borrows ₹4,000 and agrees to repay with a total interest of ₹500 in 10 instalments. Each instalment being less than the preceding instalments by ₹10. What should be the first and the last instalments?

Solution:

Principle amount = ₹4,000, interest = ₹500

Total amount payable = ₹4,500

Here, $S_n = 4500$, $n = 10$, $d = -10$

$$S_n = \frac{n}{2} [2a + (n-1)d]$$

$$\therefore S_{10} = \frac{10}{2} [2a + (10-1)(-10)]$$

$$\therefore 4500 = 5[2a - 90]$$

$$\therefore 2a - 90 = \frac{4500}{5}$$

$$\therefore 2a = 900 + 90$$

$$\therefore a = \frac{990}{2}$$

$$\therefore a = 495$$

$$t_n = a + (n-1)d$$

$$\begin{aligned}\therefore t_{10} &= 495 + (10-1) \times (-10) \\ &= 495 + 9 \times (-10) \\ &= 495 - 90 \\ &= 405\end{aligned}$$

Ans. First instalment = ₹495 and last instalment = ₹405.

(3) The sum of the areas of two squares is 400 sq.m. If the difference between their perimeters is 16 m, find the sides of two squares.

Solution:

Let the side of the greater square be x m and the side of smaller square be y m.

$$\therefore \text{Area of the greater square} = x^2$$

$$\text{Area of the smaller square} = y^2$$

$$\text{Perimeter of the greater square} = 4x$$

$$\text{Perimeter of the smaller square} = 4y$$

Difference of the perimeter of two squares is 16 m.

$$\therefore 4x - 4y = 16$$

$$\therefore x - y = 4 \quad \dots(\text{Dividing by } 4)$$

$$\therefore x = 4 + y \quad \dots(\text{i})$$

Sum of the areas of two squares is 400 m².

$$\therefore x^2 + y^2 = 400 \quad \dots(\text{ii})$$

Substituting $x = 4 + y$ from equation (i) to (ii),

$$\therefore (4 + y)^2 + y^2 = 400$$

$$\therefore 16 + 8y + y^2 + y^2 = 400$$

$$\therefore 2y^2 + 8y + 16 - 400 = 0$$

$$\therefore 2y^2 + 8y - 384 = 0$$

$$\therefore y^2 + 4y - 192 = 0 \quad \dots(\text{Dividing by } 2)$$

$$\therefore y^2 + 16y - 12y - 192 = 0$$

$$\therefore y(y + 16) - 12(y + 16) = 0$$

$$\therefore (y + 16)(y - 12) = 0$$

$$\therefore y + 16 = 0 \quad \text{or} \quad y - 12 = 0$$

$$\therefore y = -16 \quad \text{or} \quad y = 12$$

But, side of a square cannot be negative

$$\therefore y \neq -16 \quad \therefore y = 12$$

Substituting $y = 12$ in equation (i),

$$x = 4 + 12$$

$$\therefore x = 16$$

Ans. The side of the smaller square is 12 m and that of square is 16 m.

Q.5. Attempt sub-question from the following. (Any one) [3]

(1) Convert the following equations into simultaneous equations and solve.

$$\sqrt{\frac{x}{y}} = 4, \frac{1}{x} + \frac{1}{y} = \frac{1}{xy}$$

Solution:

$$\sqrt{\frac{x}{y}} = 4$$

$$\therefore \frac{x}{y} = 16 \quad \dots(\text{Squaring both the sides})$$

$$\therefore x = 16y$$

$$\therefore x - 16y = 0 \quad \dots(\text{i})$$

$$\frac{1}{x} + \frac{1}{y} = \frac{1}{xy}$$

$$\therefore y + x = 1 \quad \dots(\text{Multiplying by } xy)$$

$$\therefore x + y = 1 \quad \dots(ii)$$

Subtracting equation (ii) from (i),

$$\begin{array}{r} x - 16y = 0 \\ - \quad x + \quad y = 1 \\ \hline -17 = -1 \end{array}$$

$$\therefore y = \frac{1}{17}$$

Substituting $y = \frac{1}{17}$ in equation (i),

$$\therefore x - 16 \times \frac{1}{17} = 0$$

$$\therefore x - \frac{16}{17} = 0$$

$$\therefore x = \frac{16}{17}$$

Ans. $\left(\frac{16}{17}, \frac{1}{17}\right)$ is the solution of the given equations.

(2) A dealer sells a toy for ₹24 and gains as much percent as the cost price of the toy. Find the cost price of the toy.

Solution:

Let the cost price be ₹ x .

Since profit percent is same as cost price.

$$\therefore \text{Profit} = x\%$$

$$\begin{aligned} x\% \text{ profit on cost price} &= x \times \frac{x}{100} \\ &= \frac{x^2}{100} \end{aligned}$$

We know,

Selling price = Cost price + Profit

$$\therefore 24 = x + \frac{x^2}{100}$$

$$\therefore 2400 = 100x + x^2$$

$$\therefore x^2 + 100x - 2400 = 0$$

$$\therefore x^2 + 120x - 20x - 2400 = 0$$

$$\therefore x(x + 120) - 20(x + 120) = 0$$

$$\therefore (x + 120)(x - 20) = 0$$

$$\therefore x + 120 = 0 \quad \text{or} \quad x - 20 = 0$$

$$\therefore x = -120 \quad \text{or} \quad x = 20$$

But cost price cannot be negative.

$$\therefore x \neq -120$$

$$\therefore x = 20$$

Ans. The cost price of the toy is ₹20.

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