4 Simplification

IMPORTANT FACTS AND FORMULAE

I. 'BODMAS' Rule: This rule depicts the correct sequence in which the operations are to be executed, so as to find out the value of a given expression.

Here, '*B*' stands for 'Bracket', '*O*' for 'of', '*D*' for 'Division', '*M*' for 'Multiplication', '*A*' for 'Addition' and '*S*' for 'Subtraction'.

Thus, in simplifying an expression, first of all the brackets must be removed, strictly in the order ( ), { } and [ ].

After removing the brackets, we must use the following operations strictly in the order:

(*i*) of (*ii*) Division (*iii*) Multiplication (*iv*) Addition (*v*) Subtraction

II. Modulus of a Real Number: Modulus of a real number a is defined as

$$|a| = \begin{cases} a, & \text{if } a > 0 \\ -a, & \text{if } a < 0 \end{cases}$$

Thus, $|5| = 5$ and $|-5| = -(-5) = 5$.

III. Virnaculum (or Bar): When an expression contains Virnaculum, before applying the 'BODMAS' rule, we simplify the expression under the Virnaculum.

IV. Some Important Formulae:

(*i*) $(a+b)^2 = (a^2 + b^2 + 2ab)$ (*ii*) $(a-b)^2 = (a^2 + b^2 - 2ab)$

(*iii*) $(a+b)^2 + (a-b)^2 = 2(a^2 + b^2)$ (*iv*) $(a+b)^2 - (a-b)^2 = 4ab$

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

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

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

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

(*xi*) $a^3 + b^3 + c^3 - 3abc = (a+b+c)(a^2 + b^2 + c^2 - ab - bc - ca)$

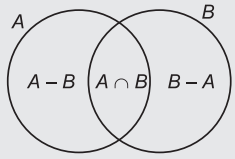
V. For any two sets *A* and *B*, we have:

(*i*) $n(A - B) + n(A \cap B) = n(A)$

(*ii*) $n(B - A) + n(A \cap B) = n(B)$

(*iii*) $n(A \cup B) = n(A - B) + n(A \cap B) + n(B - A)$

(*iv*) $n(A \cup B) = n(A) + n(B) - n(A \cap B)$.



SOLVED EXAMPLES

Ex. 1. ***4368 + 2158 – 596 –? = 3421 + 1262*** **(Bank P.O., 2009)**

Sol. Let $4368 + 2158 - 596 - x = 3421 + 1262$

$\Rightarrow x + 596 = (4368 + 2158) - (3421 + 1262)$

$\Rightarrow x + 596 = 6526 - 4683 = 1843$

$\Rightarrow x = 1843 - 596 = 1247$.

Hence, required number = 1247.

Ex. 2. ***3456 ÷ 12 ÷ 8 =?*** **(Bank Recruitment, 2008)**

Sol. Given expression $= \dfrac{3456}{12} \div 8 = 288 \div 8 = 36$.

Ex. 3. ***13 × 252 ÷ 42 + 170 =? + 47*** **(Bank P.O., 2010)**

Sol. Let $13 \times 252 \div 42 + 170 = x + 47$. Then,

$$13 \times \frac{252}{42} + 170 = x + 47 \Rightarrow 13 \times 6 + 170 = x + 47 \Rightarrow x + 47 = 78 + 170 = 248$$

$$\Rightarrow x = 248 - 47 = 201.$$

Hence, required number = 201.

Ex. 4. ***Simplify: (a) 460 × 15 – 5 × 20*** **(Bank P.O., 2010)**

(b) 1 ÷ [1 + 1 ÷ {1 + 1 ÷ 1(1 + 1 ÷ 2)}] + 1 **(A.A.O., 2009)**

Sol. (*a*) Given expression = 6900 – 100 = 6800.

(*b*) Given expression $= 1 \div \left[1 + 1 \div \left\{1 + 1 \div 1\left(1 + \frac{1}{2}\right)\right\}\right] + 1$

$$= 1 \div \left[1 + 1 \div \left\{1 + 1 \div \frac{3}{2}\right\}\right] + 1 = 1 \div \left[1 + 1 \div \left\{1 + 1 \times \frac{2}{3}\right\}\right] + 1$$

$$= 1 \div \left[1 + 1 \div \left\{1 + \frac{2}{3}\right\}\right] + 1 = 1 \div \left[1 + 1 \div \frac{5}{3}\right] + 1$$

$$= 1 \div \left[1 + 1 \times \frac{3}{5}\right] + 1 = 1 \div \left[1 + \frac{3}{5}\right] + 1 = 1 \div \frac{8}{5} + 1 = 1 \times \frac{5}{8} + 1 = \frac{5}{8} + 1 = \frac{13}{8}.$$

Ex. 5. ***Find the missing numeral:***

(a) (? – 2763) ÷ 86 × 13 = 208 **(L.I.C.A.D.O., 2007)**

(b) 3565 ÷ 23 + 4675 ÷? = 430 **(Bank Recruitment, 2008)**

Sol. (*a*) Let $(x - 2763) \div 86 \times 13 = 208$.

Then, $\frac{(x - 2763)}{86} \times 13 = 208 \Rightarrow \frac{(x - 2763)}{86} = \frac{208}{13} = 16$

$$\Rightarrow (x - 2763) = 16 \times 86 = 1376$$

$$\Rightarrow x = 1376 + 2763 = 4139.$$

(*b*) Let $3565 \div 23 + 4675 \div x = 430$.

Then, $\frac{3565}{23} + \frac{4675}{x} = 430 \Rightarrow 155 + \frac{4675}{x} = 430$

$$\Rightarrow \frac{4675}{x} = 430 - 155 = 275 \Rightarrow x = \frac{4675}{275} = 17.$$

Ex. 6. ***Simplify: (a)*** $\frac{(6 + 6 + 6 + 6) \div 6}{4 + 4 + 4 + 4 \div 4}$ ***(b)*** $\frac{(2 + 3) \times 5 + 3 \div \frac{1}{2}}{6 + 5 \times 4 \div \frac{4}{5}}$ **(R.R.B., 2006)**

Sol. (*a*) Given expression $= \frac{24 \div 6}{4 + 4 + 4 + 1} = \frac{4}{13}$.

(*b*) Given expression $= \frac{5 \times 5 + 3 \times 2}{6 + 5 \times 4 \times \frac{5}{4}} = \frac{25 + 6}{6 + 25} = \frac{31}{31} = 1.$

Ex. 7. ***What should come in place of both the question marks in the following equation?***

$$\frac{128 \div 16 \times ? - 7 \times 2}{7^2 - 8 \times 6 + ?^2} = 1$$

Sol. Let $\frac{128 \div 16 \times x - 7 \times 2}{7^2 - 8 \times 6 + x^2} = 1.$

Then, $8x - 7 \times 2 = 49 - 48 + x^2 \Leftrightarrow 8x - 14 = 1 + x^2 \Leftrightarrow x^2 - 8x + 15 = 0$

$\Leftrightarrow x^2 - 3x - 5x + 15 = 0 \Leftrightarrow x(x - 3) - 5(x - 3) = 0$

$\Leftrightarrow (x - 3)(x - 5) = 0 \Leftrightarrow x = 3$ or $x = 5$.

Hence, missing number is 3 or 5.

Ex. 8. *Simplify: (a)* $108 \div 36 \text{ of } \frac{1}{4} + \frac{2}{5} \times 3\frac{1}{4}$

(b) $\frac{2}{3} \times \frac{5}{6} + \frac{4}{9} - \frac{3}{4} + \frac{2}{9} \times \frac{5}{9} \div \frac{2}{9}$ (P.C.S., 2009)

Sol. (*a*) Given expression $= 108 \div 9 + \frac{2}{5} \times \frac{13}{4} = \frac{108}{9} + \frac{13}{10} = \left(12 + \frac{13}{10}\right) = \frac{133}{10} = 13\frac{3}{10}.$

(*b*) Given expression $= \frac{2}{3} \times \frac{5}{6} + \frac{4}{9} - \frac{3}{4} + \frac{2}{9} \times \frac{5}{9} \times \frac{9}{2}$

$= \frac{5}{9} + \frac{4}{9} - \frac{3}{4} + \frac{5}{9} = \frac{14}{9} - \frac{3}{4} = \frac{56 - 27}{36} = \frac{29}{36}.$

Ex. 9. *What value will replace the question mark in the following equation?*

$4\frac{1}{2} + 3\frac{1}{6} + ? + 2\frac{1}{3} = 13\frac{2}{5}.$

Sol. Let $\frac{9}{2} + \frac{19}{6} + x + \frac{7}{3} = \frac{67}{5}.$

Then, $x = \frac{67}{5} - \left(\frac{9}{2} + \frac{19}{6} + \frac{7}{3}\right) \Leftrightarrow x = \frac{67}{5} - \left(\frac{27 + 19 + 14}{6}\right) = \left(\frac{67}{5} - \frac{60}{6}\right)$

$\Leftrightarrow x = \left(\frac{67}{5} - 10\right) = \frac{17}{5} = 3\frac{2}{5}.$

Hence, missing fraction $= 3\frac{2}{5}.$

Ex. 10. *Simplify:* $\left[3\frac{1}{4} \div \left\{1\frac{1}{4} - \frac{1}{2}\left(2\frac{1}{2} - \overline{\frac{1}{4} - \frac{1}{6}}\right)\right\}\right].$

Sol. Given exp. $= \left[\frac{13}{4} \div \left\{\frac{5}{4} - \frac{1}{2}\left(\frac{5}{2} - \frac{3-2}{12}\right)\right\}\right] = \left[\frac{13}{4} \div \left\{\frac{5}{4} - \frac{1}{2}\left(\frac{5}{2} - \frac{1}{12}\right)\right\}\right]$

$= \left[\frac{13}{4} \div \left\{\frac{5}{4} - \frac{1}{2}\left(\frac{30-1}{12}\right)\right\}\right] = \left[\frac{13}{4} \div \left\{\frac{5}{4} - \frac{29}{24}\right\}\right]$

$= \left[\frac{13}{4} \div \left\{\frac{30-29}{24}\right\}\right] = \left[\frac{13}{4} \div \frac{1}{24}\right] = \left[\frac{13}{4} \times 24\right] = 78.$

Ex. 11. *Simplify:* $\frac{\frac{7}{2} \div \frac{5}{2} \times \frac{3}{2}}{\frac{7}{2} \div \frac{5}{2} \text{ of } \frac{3}{2}} \div 5.25$

Sol. Given exp. $= \frac{\frac{7}{2} \times \frac{2}{5} \times \frac{3}{2}}{\frac{7}{2} \div \frac{15}{4}} \div 5.25 = \frac{\frac{21}{10}}{\frac{7}{2} \times \frac{4}{15}} \div \frac{525}{100} = \frac{21}{10} \times \frac{15}{14} \times \frac{100}{525} = \frac{6}{14} = \frac{3}{7}.$

Ex. 12. *Simplify:* $b - [b - (a + b) - \{b - (b - \overline{a - b})\} + 2a].$

Sol. Given exp. $= b - [b - (a + b) - \{b - (b - a + b)\} + 2a]$

$= b - [b - a - b - \{b - (2b - a)\} + 2a]$

$= b - [- a - \{b - 2b + a\} + 2a]$

$= b - [- a - \{- b + a\} + 2a]$

$= b - [- a + b - a + 2a] = b - b = 0.$

Ex. 13. *If $x + y = 23$ and $xy = 126$, what is the value of $x^2 + y^2$?* (Bank Recruitment, 2010)

Sol. $(x + y) = 23 \Rightarrow (x + y)^2 = (23)^2 = 529 \Rightarrow x^2 + y^2 + 2xy = 529$

$\Rightarrow x^2 + y^2 + 2 \times 126 = 529 \Rightarrow x^2 + y^2 = 529 - 252 = 277.$

Ex. 14. *If $\frac{a}{b} = \frac{4}{5}$ and $\frac{b}{c} = \frac{15}{16}$, find the value of $\frac{c^2 - a^2}{c^2 + a^2}$.* (M.B.A., 2007)

Sol. $\frac{a}{b} = \frac{4}{5}$ and $\frac{b}{c} = \frac{15}{16} \Rightarrow \frac{a}{b} \times \frac{b}{c} = \frac{4}{5} \times \frac{15}{16} = \frac{3}{4} \Rightarrow \frac{a}{c} = \frac{3}{4} \Rightarrow \frac{c}{a} = \frac{4}{3}.$

$$\therefore \frac{c^2 - a^2}{c^2 + a^2} = \frac{\frac{c^2}{a^2} - 1}{\frac{c^2}{a^2} + 1} = \frac{\left(\frac{c}{a}\right)^2 - 1}{\left(\frac{c}{a}\right)^2 + 1} = \frac{\left(\frac{4}{3}\right)^2 - 1}{\left(\frac{4}{3}\right)^2 + 1} = \frac{\left(\frac{16}{9} - 1\right)}{\left(\frac{16}{9} + 1\right)} = \frac{7}{9} \times \frac{9}{25} = \frac{7}{25}.$$

Ex. 15. *If $a = \frac{4xy}{x + y}$, find the value of $\frac{a + 2x}{a - 2x} + \frac{a + 2y}{a - 2y}$.* (M.C.A., 2007)

Sol. $$\frac{a + 2x}{a - 2x} + \frac{a + 2y}{a - 2y} = \frac{\frac{4xy}{x + y} + 2x}{\frac{4xy}{x + y} - 2x} + \frac{\frac{4xy}{x + y} + 2y}{\frac{4xy}{x + y} - 2y} = \frac{4xy + 2x(x + y)}{4xy - 2x(x + y)} + \frac{4xy + 2y(x + y)}{4xy - 2y(x + y)}$$

$$= \frac{2x(2y + x + y)}{2x(2y - x - y)} + \frac{2y(2x + x + y)}{2y(2x - x - y)} = \frac{(3y + x)}{(y - x)} + \frac{(3x + y)}{(x - y)}$$

$$= \frac{(3x + y)}{(x - y)} - \frac{(3y + x)}{(x - y)} = \frac{(3x + y) - (3y + x)}{(x - y)} = \frac{2x - 2y}{x - y} = 2.$$

Ex. 16. *Find the value of $4 - \cfrac{5}{1 + \cfrac{1}{3 + \cfrac{1}{2 + \frac{1}{4}}}}$.*

Sol. Given exp. $= 4 - \cfrac{5}{1 + \cfrac{1}{3 + \cfrac{1}{(9/4)}}} = 4 - \cfrac{5}{1 + \cfrac{1}{3 + \frac{4}{9}}} = 4 - \cfrac{5}{1 + \cfrac{1}{(31/9)}}$

$$= 4 - \frac{5}{1 + \frac{9}{31}} = 4 - \frac{5}{(40/31)} = 4 - \frac{5 \times 31}{40} = 4 - \frac{31}{8} = \frac{1}{8}.$$

Ex. 17. *If $\cfrac{2x}{1 + \cfrac{1}{1 + \cfrac{x}{1 - x}}} = 1$, then find the value of x.*

Sol. We have : $\cfrac{2x}{1 + \cfrac{1}{\cfrac{(1 - x) + x}{1 - x}}} = 1 \Leftrightarrow \cfrac{2x}{1 + \cfrac{1}{[1/(1 - x)]}} = 1 \Leftrightarrow \cfrac{2x}{1 + (1 - x)} = 1$

$$\Leftrightarrow 2x = 2 - x \Leftrightarrow 3x = 2 \Leftrightarrow x = \frac{2}{3}.$$

Ex. 18. *(i) If $4x + 5y = 83$ and $\frac{3x}{2y} = \frac{21}{22}$, then what is the value of $y - x$?* (Bank P.O., 2008)

(ii) If $\frac{x}{4} - \frac{x - 3}{6} = 1$, then find the value of x.

Sol. (*i*) $\frac{3x}{2y}=\frac{21}{22}\Rightarrow\frac{x}{y}=\frac{21}{22}\times\frac{2}{3}=\frac{7}{11}\Rightarrow x=\frac{7}{11}y.$

$4x+5y=83\Rightarrow 4\times\frac{7}{11}y+5y=83\Rightarrow\frac{28}{11}y+5y=83$

$\Rightarrow\frac{83}{11}y=83\Rightarrow y=83\times\frac{11}{83}=11.$

$\therefore\quad x=\left(\frac{7}{11}\times 11\right)=7.$ So, $y-x=11-7=4.$

(*ii*) $\frac{x}{4}-\frac{x-3}{6}=1\Leftrightarrow\frac{3x-2(x-3)}{12}=1\Leftrightarrow 3x-2x+6=12\Leftrightarrow x=6.$

Ex. 19. ***If $2x+3y=34$ and $\frac{x+y}{y}=\frac{13}{8}$, then find the value of $5y+7x$.***

Sol. The given equations are:

$2x+3y=34$ ...(*i*) and, $\frac{x+y}{y}=\frac{13}{8}\Rightarrow 8x+8y=13y\Rightarrow 8x-5y=0$ ...(*ii*)

Multiplying (*i*) by 5, (*ii*) by 3 and adding, we get: $34x=170$ or $x=5$.

Putting $x=5$ in (*i*), we get: $y=8$.

$\therefore\ 5y+7x=(5\times 8+7\times 5)=40+35=75.$

Ex. 20. ***The cost of 4 bags and 3 boxes is ₹ 555 and the cost of 3 bags and 4 boxes is ₹ 460. What is the cost of one bag?*** **(Bank P.O., 2009)**

Sol. Let the cost of 1 bag be ₹ x and that of 1 box be ₹ y.

Then, $4x+3y=555$ ...(*i*) and $3x+4y=460°$ ...(*ii*)

Adding (*i*) and (*ii*), we get: $7x+7y=1015$ or $x+y=145$ ...(*iii*)

Subtracting (*ii*) from (*i*), we get: $x-y=95$ ...(*iv*)

Adding (*iii*) and (*iv*), we get: $2x=240$ or $x=120$.

Hence, cost of 1 bag = ₹ 120.

Ex. 21. ***If $2x+3y+z=55$, $x+z-y=4$ and $y-x+z=12$, then what are the values of x, y and z?***

Sol. The given equations are:

$2x+3y+z=55$ ...(*i*); $x+z-y=4$ ...(*ii*); $y-x+z=12$ ...(*iii*)

Subtracting (*ii*) from (*i*), we get: $x+4y=51$ ...(*iv*)

Subtracting (*iii*) from (*i*), we get: $3x+2y=43$ ...(*v*)

Multiplying (*v*) by 2 and subtracting (*iv*) from it, we get: $5x=35$ or $x=7$.

Putting $x=7$ in (*iv*), we get: $4y=44$ or $y=11$.

Putting $x=7$, $y=11$ in (*i*), we get: $z=8$.

Ex. 22. ***If $x^2-7x=-12$, what is the value of x?*** **(M.B.A., 2006)**

Sol. $x^2-7x=-12\Leftrightarrow x^2-7x+12=0\Leftrightarrow x^2-3x-4x+12=0$

$\Leftrightarrow x(x-3)-4(x-3)=0\Leftrightarrow(x-3)(x-4)=0\Leftrightarrow x=3$ or $x=4.$

Ex. 23. ***Find the value of $\left(1-\frac{1}{3}\right)\left(1-\frac{1}{4}\right)\left(1-\frac{1}{5}\right).....\left(1-\frac{1}{100}\right)$.***

Sol. Given expression $=\frac{2}{3}\times\frac{3}{4}\times\frac{4}{5}\times.....\times\frac{99}{100}=\frac{2}{100}=\frac{1}{50}.$

Ex. 24. ***Find the value of $\frac{1}{2\times 3}+\frac{1}{3\times 4}+\frac{1}{4\times 5}+\frac{1}{5\times 6}+.....+\frac{1}{9\times 10}$.***

Sol. Given expression $=\left(\frac{1}{2}-\frac{1}{3}\right)+\left(\frac{1}{3}-\frac{1}{4}\right)+\left(\frac{1}{4}-\frac{1}{5}\right)+\left(\frac{1}{5}-\frac{1}{6}\right)+.....+\left(\frac{1}{9}-\frac{1}{10}\right)$

$=\left(\frac{1}{2}-\frac{1}{10}\right)=\frac{4}{10}=\frac{2}{5}.$

Ex. 25. ***Simplify :*** $99\frac{48}{49}\times 245$.

Sol. Given expression $=\left(100-\frac{1}{49}\right)\times 245=\frac{4899}{49}\times 245=4899\times 5=24495.$

Ex. 26. ***Find the value of:*** $\frac{1}{30}+\frac{1}{42}+\frac{1}{56}+\frac{1}{72}+\frac{1}{90}+\frac{1}{110}$. **(A.A.O. Exam, 2009)**

Sol. Given expression $=\left(\frac{1}{5}-\frac{1}{6}\right)+\left(\frac{1}{6}-\frac{1}{7}\right)+\left(\frac{1}{7}-\frac{1}{8}\right)+\left(\frac{1}{8}-\frac{1}{9}\right)+\left(\frac{1}{9}-\frac{1}{10}\right)+\left(\frac{1}{10}-\frac{1}{11}\right)$

$=\left(\frac{1}{5}-\frac{1}{11}\right)=\frac{6}{55}.$

Ex. 27. ***A board 7 ft. 9 inches long is divided into 3 equal parts. What is the length of each part?***

Sol. Length of board = 7 ft. 9 inches = (7 × 12 + 9) inches = 93 inches.

$\therefore$ Length of each part $=\left(\frac{93}{3}\right)$ inches = 31 inches = 2 ft. 7 inches.

Ex. 28. ***Ram went to a shop to buy 50 kg of rice. He buys two varieties of rice which cost him ₹ 4.50 per kg and ₹ 5 per kg. He spends a total of ₹ 240. What was the quantity of rice bought which cost him ₹ 4.50 per kg?*** **(M.A.T., 2007)**

Sol. Let the quantity of rice bought at ₹ 4.50 per kg be x kg.

Then, quantity of rice bought at ₹ 5 per kg = $(50 - x)$ kg.

$\therefore$ $4.50x + 5(50 - x) = 240 \Rightarrow 250 - 0.5x = 240 \Rightarrow 0.5x = 10 \Rightarrow x = 20.$

Hence, quantity of rice bought at ₹ 4.50 per kg = 20 kg.

Ex. 29. ***A boy was asked to multiply a certain number by 53. He multiplied it by 35 and got his answer less than the correct one by 1206. Find the number to be multiplied.*** **(SNAP, 2005)**

Sol. Let the required number be x.

Then, $53x - 35x = 1206 \Leftrightarrow 18x = 1206 \Leftrightarrow x=\frac{1206}{18}=67.$

Hence, number to be multiplied = 67.

Ex. 30. $\frac{4}{15}$ ***of*** $\frac{5}{7}$ ***of a number is greater than*** $\frac{4}{9}$ ***of*** $\frac{2}{5}$ ***of the same number by 8. What is half of that number?***

Sol. Let the number be x.

Then, $\frac{4}{15}\text{ of }\frac{5}{7}\text{ of }x-\frac{4}{9}\text{ of }\frac{2}{5}\text{ of }x=8 \Leftrightarrow \frac{4}{21}x-\frac{8}{45}x=8$

$\Leftrightarrow \left(\frac{4}{21}-\frac{8}{45}\right)x=8 \Leftrightarrow \left(\frac{60-56}{315}\right)x=8 \Leftrightarrow \frac{4}{315}x=8$

$\Leftrightarrow x=\left(\frac{8\times 315}{4}\right)=630 \Leftrightarrow \frac{1}{2}x=315.$

Hence, required number = 315.

Ex. 31. ***A man owns*** $\frac{2}{3}$ ***of the market research bureau business and sells*** $\frac{3}{4}$ ***of his shares for ₹ 75000. What is the value of business?*** **(Campus Recruitment, 2010)**

Sol. Let the total value be ₹ x.

Then, $\frac{3}{4}$ of $\frac{2}{3}$ of $x = 75000 \Leftrightarrow \frac{x}{2} = 75000 \Leftrightarrow x = 150000.$

$\therefore$ Value of business = ₹ 150000.

Ex. 32. *A man spends $\frac{2}{5}$ of his salary on house rent, $\frac{3}{10}$ of his salary on food and $\frac{1}{8}$ of his salary on conveyance. If he has ₹ 1400 left with him, find his expenditure on food and conveyance.*

Sol. Part of the salary left = $1-\left(\frac{2}{5}+\frac{3}{10}+\frac{1}{8}\right)=1-\frac{33}{40}=\frac{7}{40}$.

Let the monthly salary be ₹ x.

Then, $\frac{7}{40}$ of $x=1400 \Leftrightarrow x=\left(\frac{1400\times 40}{7}\right)=8000$.

$\therefore$ Expenditure on food = ₹$\left(\frac{3}{10}\times 8000\right)$ = ₹ 2400.

Expenditure on conveyance = ₹$\left(\frac{1}{8}\times 8000\right)$ = ₹ 1000.

Ex. 33. *A third of Arun's marks in Mathematics exceeds a half of his marks in English by 30. If he got 240 marks in the two subjects together, how many marks did he get in English?*

Sol. Let Arun's marks in Mathematics and English be x and y respectively.

Then, $\frac{1}{3}x-\frac{1}{2}y=30 \Leftrightarrow 2x-3y=180$ ...(i) and $x+y=240$ ...(ii)

Solving (i) and (ii), we get: x = 180 and y = 60.

$\therefore$ Arun's marks in English = 60.

Ex. 34. *A tin of oil was $\frac{4}{5}$ full. When 6 bottles of oil were taken out and four bottles of oil were poured into it, it was $\frac{3}{4}$ full. How many bottles of oil can the tin contain?*

Sol. Suppose x bottles can fill the tin completely.

Then, $\frac{4}{5}x-\frac{3}{4}x=(6-4) \Leftrightarrow \frac{x}{20}=2 \Leftrightarrow x=40$.

$\therefore$ Required number of bottles = 40.

Ex. 35. *If $\frac{1}{8}$ of a pencil is black, $\frac{1}{2}$ of the remaining is white and the remaining $3\frac{1}{2}$ cm is blue, find the total length of the pencil.*

Sol. Let the total length of the pencil be x cm. Then,

Black part = $\left(\frac{x}{8}\right)$cm. Remaining part = $\left(x-\frac{x}{8}\right)$cm = $\left(\frac{7x}{8}\right)$cm.

White part = $\left(\frac{1}{2}\times\frac{7x}{8}\right)$cm = $\left(\frac{7x}{16}\right)$cm. Remaining part = $\left(\frac{7x}{8}-\frac{7x}{16}\right)$cm = $\frac{7x}{16}$ cm.

$\therefore$ $\frac{7x}{16}=\frac{7}{2}$ or $x=\frac{16}{2}=8$ cm.

Hence, total length of the pencil = 8 cm.

Ex. 36. *At a college football game, $\frac{4}{5}$ of the seats in the lower deck of the stadium were sold. If $\frac{1}{4}$ of all the seating in the stadium is located in the lower deck, and if $\frac{2}{3}$ of all the seats in the stadium were sold, what fraction of the unsold seats in the stadium was in the lower deck?*

Sol. Let the total number of seats in the stadium be x.

Then, number of seats in the lower deck = $\frac{x}{4}$.

Number of seats sold = $\frac{2x}{3}$. Number of seats unsold = $\left(x-\frac{2x}{3}\right)=\frac{x}{3}$.

Number of sold seats in lower deck = $\frac{4}{5}$ of $\frac{x}{4}=\frac{x}{5}$.

Number of unsold seats in lower deck = $\left(\frac{x}{4}-\frac{x}{5}\right)=\frac{x}{20}$.

$\therefore$ Required fraction = $\frac{x/20}{x/3}=\frac{3}{20}$.

Ex. 37. ***In a certain office, $\frac{1}{3}$ of the workers are women, $\frac{1}{2}$ of the women are married and $\frac{1}{3}$ of the married women have children. If $\frac{3}{4}$ of the men are married and $\frac{2}{3}$ of the married men have children, what part of workers are without children?***

Sol. Let the total number of workers be x. Then,

Number of women = $\frac{x}{3}$ and number of men = $\left(x-\frac{x}{3}\right)=\frac{2x}{3}$.

Number of women having children = $\frac{1}{3}$ of $\frac{1}{2}$ of $\frac{x}{3}=\frac{x}{18}$.

Number of men having children = $\frac{2}{3}$ of $\frac{3}{4}$ of $\frac{2x}{3}=\frac{x}{3}$.

Number of workers having children = $\left(\frac{x}{18}+\frac{x}{3}\right)=\frac{7x}{18}$.

$\therefore$ Workers having no children = $\left(x-\frac{7x}{18}\right)=\frac{11x}{18}=\frac{11}{18}$ of all workers.

Ex. 38. ***A crate of mangoes contains one bruised mango for every 30 mangoes in the crate. If 3 out of every 4 bruised mangoes are considered unsaleable, and there are 12 unsaleable mangoes in the crate, then how many mangoes are there in the crate?***

Sol. Let the total number of mangoes in the crate be x. Then,

Number of bruised mangoes = $\frac{1}{30}x$.

Number of unsaleable mangoes = $\left(\frac{3}{4}\times\frac{1}{30}x\right)=\frac{1}{40}x$.

$\therefore$ $\frac{1}{40}x=12$ or $x=(12\times 40)=480$.

Hence, total number of mangoes in the crate = 480.

Ex. 39. ***The cost of 4 rings and 2 bangles is ₹ 57200. What is the cost of 6 rings and 3 bangles?*** **(Bank Recruitment, 2009)**

Sol. We have: $4R+2B=57200\Rightarrow\frac{3}{2}(4R+2B)=\frac{3}{2}\times 57200 \Rightarrow 6R + 3B = 85800$.

Hence, cost of 6 rings and 3 bangles = ₹ 85800.

Ex. 40. ***The cost of 15 kg of sugar is ₹ 255, the cost of 17 kg of tea is ₹ 1615 and the cost of 22 kg of rice is ₹ 572. What is the total cost of 18 kg of sugar, 21 kg of tea and 27 kg of rice?*** **(Bank P.O., 2008)**

Sol. Cost of 1 kg sugar = ₹$\left(\frac{255}{15}\right)$=₹ 17; Cost of 1 kg tea = ₹$\left(\frac{1615}{17}\right)$=₹ 95;

Cost of 1 kg rice = ₹$\left(\frac{572}{22}\right)$=₹ 26.

$\therefore$ Required cost = ₹ (17 × 18 + 95 × 21 + 26 × 27) = ₹ (306 + 1995 + 702) = ₹ 3003.

Ex. 41. *If * is an operation such that x * y = 3x + 2y, find the value of 2 * 3 + 3 * 4.*

Sol. $2 * 3 + 3 * 4 = (3 \times 2 + 2 \times 3) + (3 \times 3 + 2 \times 4) = (6 + 6) + (9 + 8)$
$= 12 + 17 = 29.$

Ex. 42. *If $a^2 + b^2 = 117$ and $ab = 54$, then find the value of $\frac{a+b}{a-b}$.*

Sol. $(a + b)^2 = a^2 + b^2 + 2ab = 117 + 2 \times 54 = 225 \Rightarrow a + b = 15.$
$(a - b)^2 = a^2 + b^2 - 2ab = 117 - 2 \times 54 = 9 \Rightarrow a - b = 3.$
$\therefore \quad \frac{a+b}{a-b} = \frac{15}{3} = 5.$

Ex. 43. *Find the value of $\left(\frac{75983 \times 75983 - 45983 \times 45983}{30000}\right)$.*

Sol. Given expression $= \frac{(75983)^2 - (45983)^2}{(75983 - 45983)} = \frac{(a^2 - b^2)}{(a - b)}$, where $a = 75983, b = 45983$

$= \frac{(a+b)(a-b)}{(a-b)} = (a + b) = (75983 + 45983) = 121966.$

Ex. 44. *Find the value of $\left(\frac{343 \times 343 \times 343 - 113 \times 113 \times 113}{343 \times 343 + 343 \times 113 + 113 \times 113}\right)$.* **(B.Ed. Entrance, 2010)**

Sol. Given expression $= \frac{(a^3 - b^3)}{(a^2 + ab + b^2)}$, where $a = 343, b = 113$

$= (a - b) = (343 - 113) = 230.$

Ex. 45. *If $(x - 4)^3 + (x - 9)^3 + (x - 8)^3 = 3(x - 4)(x - 9)(x - 8)$, find the value of x.*

Sol. If $a^3 + b^3 + c^3 = 3abc$, then $a + b + c = 0$.

So, we have: $(x - 4) + (x - 9) + (x - 8) = 0 \Rightarrow 3x - 21 = 0 \Rightarrow 3x = 21 \Rightarrow x = 7.$

Ex. 46. *There are certain number of benches in a classroom. If four students sit on each bench then three benches remain unoccupied. If, however, three students sit on each bench then three students remain standing in the class. Find the number of students in the class.* **(P.C.S., 2009)**

Sol. Let the total number of benches in the class be x.

Case I. When 4 students sit on each bench

In this case, total number of students $= 4(x - 3)$.

Case II. When 3 students sit on each bench

In this case, total number of students $= 3x + 3$.

$\therefore \quad 4(x - 3) = 3x + 3 \Leftrightarrow 4x - 12 = 3x + 3 \Leftrightarrow x = 15.$

Hence, number of students in the class $= 4(x - 3) = 4 \times 12 = 48.$

Ex. 47. *A man divides ₹ 8600 among 5 sons, 4 daughters and 2 nephews. If each daughter receives four times as much as each nephew, and each son receives five times as much as each nephew, how much does each daughter receive?*

Sol. Let the share of each nephew be ₹ x.

Then, share of each daughter = ₹ $(4x)$; share of each son = ₹ $(5x)$.

So, $5 \times 5x + 4 \times 4x + 2 \times x = 8600 \Leftrightarrow 25x + 16x + 2x = 8600$
$\Leftrightarrow 43x = 8600 \Leftrightarrow x = 200.$

$\therefore$ Share of each daughter = ₹ (4×200) = ₹ 800.

Ex. 48. *₹ 6500 were divided equally among a certain number of persons. Had there been 15 more persons, each would have got ₹ 30 less. Find the original number of persons.* **(M.A.T., 2005)**

Sol. Let the original number of persons be x.

Then, $\frac{6500}{x} - \frac{6500}{(x+15)} = 30 \Leftrightarrow 6500\left[\frac{x+15-x}{x(x+15)}\right] = 30 \Leftrightarrow 30x(x + 15) = 6500 \times 15$

$\Leftrightarrow x^2 + 15x = 3250 \Leftrightarrow x^2 + 15x - 3250 = 0$

$\Leftrightarrow x^2 + 65x - 50x - 3250 = 0$

$\Leftrightarrow x(x + 65) - 50(x + 65) = 0$

$\Leftrightarrow (x + 65)(x - 50) = 0 \Leftrightarrow x = 50.$

Hence, original number of persons = 50.

Ex. 49. ***Village X has a population of 68000, which is decreasing at the rate of 1200 per year. Village Y has a population of 42000, which is increasing at the rate of 800 per year. In how many years will the population of the two villages be equal?***

Sol. Let the population of villages X and Y be equal after p years.

Then, $68000 - 1200p = 42000 + 800p \Rightarrow 2000p = 26000 \Rightarrow p = 13.$

So, their population will be equal after 13 years.

Ex. 50. ***From a group of boys and girls, 15 girls leave. There are then left 2 boys for each girl. After this, 45 boys leave. There are then 5 girls for each boy. Find the number of girls in the beginning.***

Sol. Let at present there be x boys. Then, number of girls at present = $5x$.

Before the boys had left: Number of boys = $x + 45$ and number of girls = $5x$.

$\therefore \quad x + 45 = 2 \times 5x \Leftrightarrow 9x = 45 \Leftrightarrow x = 5.$

Hence, number of girls in the beginning = $5x + 15 = 25 + 15 = 40$.

Ex. 51. ***If x is an integer such that $x + \frac{1}{x} = \frac{17}{4}$, find the value of $x - \frac{1}{x}$.*** **(M.B.A., 2008)**

Sol. $x + \frac{1}{x} = \frac{17}{4} \Leftrightarrow \left(x + \frac{1}{x}\right)^2 = \left(\frac{17}{4}\right)^2 \Leftrightarrow x^2 + \frac{1}{x^2} + 2 \cdot x \cdot \frac{1}{x} = \frac{289}{16}$

$\Leftrightarrow x^2 + \frac{1}{x^2} = \frac{289}{16} - 2 = \frac{257}{16} \Leftrightarrow x^2 + \frac{1}{x^2} - 2 \cdot x \cdot \frac{1}{x} = \frac{257}{16} - 2$

$\Leftrightarrow \left(x - \frac{1}{x}\right)^2 = \frac{225}{16} = \left(\frac{15}{4}\right)^2 \Leftrightarrow x - \frac{1}{x} = \frac{15}{4}.$

Ex. 52. ***A zoo keeper counted the heads of the animals in a zoo and found it to be 80. When he counted the legs of the animals he found it to be 260. If the zoo had either pigeons or horses, how many horses were there in the zoo?*** **(R.R.B., 2009)**

Sol. Let the number of pigeons be x and the number of horses be y.

Then, total number of heads = $x + y$.

total number of legs = $2x + 4y$.

$\therefore \quad x + y = 80$ ...(i)

And, $2x + 4y = 260$ or $x + 2y = 130$ ...(ii)

Subtracting (i) from (ii), we get: $y = 50$.

Putting $y = 50$ in (i), we get: $x = 30$.

Hence, number of horses in the zoo = 50.

Ex. 53. ***In a caravan, in addition to 50 hens there are 45 goats and 8 camels with some keepers. If the total number of feet be 224 more than the number of heads, find the number of keepers.***

Sol. Let the number of keepers be x. Then,

Total number of heads = $(50 + 45 + 8 + x) = (103 + x)$.

Total number of feet = $(45 + 8) \times 4 + (50 + x) \times 2 = (312 + 2x)$.

$\therefore \quad (312 + 2x) - (103 + x) = 224 \Leftrightarrow x = 15.$

Hence, number of keepers = 15.

Ex. 54. ***When an amount was distributed among 14 boys, each of them got ₹ 80 more than the amount received by each boy when the same amount is distributed equally among 18 boys. What was the amount?***

Sol. Let the total amount be ₹ x. Then,

$$\frac{x}{14} - \frac{x}{18} = 80 \Leftrightarrow \frac{2x}{126} = 80 \Leftrightarrow \frac{x}{63} = 80 \Leftrightarrow x = 63 \times 80 = 5040.$$

Hence, total amount = ₹ 5040.

Ex. 55. ***Mr. Bhaskar is on tour and he has ₹ 360 for his expenses. If he exceeds his tour by 4 days, he must cut down his daily expenses by ₹ 3. For how many days is Mr. Bhaskar on tour?***

Sol. Suppose Mr. Bhaskar is on tour for x days. Then,

$$\frac{360}{x}-\frac{360}{x+4}=3 \Leftrightarrow \frac{1}{x}-\frac{1}{x+4}=\frac{1}{120} \Leftrightarrow x(x+4)=4\times 120=480$$

$$\Leftrightarrow x^2+4x-480=0 \Leftrightarrow (x+24)(x-20)=0 \Leftrightarrow x=20.$$

Hence, Mr. Bhaskar is on tour for 20 days.

Ex. 56. ***A railway half-ticket costs half the full fare. But the reservation charge on half-ticket is the same as that on full ticket. One reserved first-class ticket for a journey between two stations is ₹ 525 and the cost of one full and one half reserved first-class tickets is ₹ 850. What is the reservation charge?*** **(Bank P.O., 2008)**

Sol. Let the full fare be ₹ x and the reservation charge per ticket be ₹ y.

Then, $x + y = 525$ ...(i)

And, $\frac{3x}{2}+2y=850$ or $3x+4y=1700$ ...(ii)

Multiplying (i) by 3 and subtracting from (ii), we get: $y = 125$.

Hence, reservation charge = ₹ 125.

Ex. 57. ***Tom reads at an average rate of 30 pages per hour, while Jane reads at an average rate of 40 pages per hour. If Tom starts reading a novel at 4: 30 and Jane begins reading an identical copy of the same book at 5: 20, then at what time will they be reading the same page?*** **(M.A.T., 2007)**

Sol. Suppose they are reading the same page x hours after 5: 20.

Time from 4: 30 to 5: 20 = 50 min = $\frac{5}{6}$ hr.

Then, $30\left(x+\frac{5}{6}\right)=40x \Leftrightarrow 30x+25=40x \Leftrightarrow 10x = 25 \Leftrightarrow x = 2.5.$

Hence, Tom and Jane will be reading the same page $2\frac{1}{2}$ hrs i.e., 2 hr 30 min after 5: 20 i.e., at 7: 50.

Ex. 58. ***In an objective examination of 90 questions, 5 marks are allotted for every correct answer and 2 marks are deducted for every wrong answer. After attempting all the 90 questions a student got a total of 387 marks. Find the number of questions that he attempted wrong.*** **(M.A.T. 2007)**

Sol. Let the number of questions attempted correctly be x.

Then, number of questions attempted wrong = $(90 - x)$

$\therefore \quad 5x - 2(90 - x) = 387 \Leftrightarrow 7x = 387 + 180 = 567 \Leftrightarrow x = 81.$

Hence, number of questions attempted wrong = $(90 - 81) = 9$.

Ex. 59. ***Kiran had 85 currency notes in all, some of which were of ₹ 100 denomination and the remaining of ₹ 50 denomination. The total amount of all these currency notes was ₹ 5000. How much amount did she have in the denomination of ₹ 50?***

Sol. Let the number of 50-rupee notes be x.

Then, the number of 100-rupee notes = $(85 - x)$.

$\therefore \quad 50x + 100(85 - x) = 5000 \Leftrightarrow x + 2(85 - x) = 100 \Leftrightarrow x = 70.$

So, required amount = ₹ (50×70) = ₹ 3500.

Ex. 60. ***In a group of 70 people, 37 like coffee, 52 like tea and each person likes at least one of the two drinks. Find the number of people who like both coffee and tea.*** **(P.C.S., 2007)**

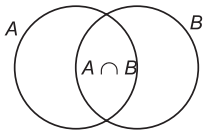
Sol. Let A and B represent the set of people who like coffee and tea respectively.

Then, $n(A) = 37$, $n(B) = 52$, $n(A \cup B) = 70$.

$\therefore \quad n(A \cap B) = n(A) + n(B) - n(A \cup B)$

$= 37 + 52 - 70 = 89 - 70 = 19.$

Hence, number of people who like both coffee and tea = 19.



Ex. 61. ***A train starts full of passengers. At the first station, it drops one-third of the passengers and takes 280 more. At the second station, it drops one-half of the new total and takes 12 more. On arriving at the third station, it is found to have 248 passengers. Find the number of passengers in the beginning.***

Sol. Let the number of passengers in the beginning be x.

After 1st station, number of passengers $= \left(x - \frac{x}{3}\right) + 280 = \left(\frac{2x}{3} + 280\right)$.

After 2nd station, number of passengers $= \frac{1}{2}\left(\frac{2x}{3} + 280\right) + 12$.

$\therefore \frac{1}{2}\left(\frac{2x}{3} + 280\right) + 12 = 248 \Leftrightarrow \frac{2x}{3} + 280 = 2 \times 236 \Leftrightarrow \frac{2x}{3} = 192$

$\Leftrightarrow x = \left(192 \times \frac{3}{2}\right) = 288.$

$\therefore$ Required number of passengers = 288.

Ex. 62. ***Arun and Sajal are friends. Each has some money. If Arun gives ₹ 30 to Sajal, then Sajal will have twice the money left with Arun. But, if Sajal gives ₹ 10 to Arun, then Arun will have thrice as much as is left with Sajal. How much money does each have?***

Sol. Suppose Arun has ₹ x and Sajal has ₹ y. Then,

$2(x - 30) = y + 30 \Rightarrow 2x - y = 90$ ...(i)

and $x + 10 = 3(y - 10) \Rightarrow x - 3y = -40$ ...(ii)

Solving (i) and (ii), we get: $x = 62$ and $y = 34$.

$\therefore$ Arun has ₹ 62 and Sajal has ₹ 34.

Ex. 63. ***An executive goes on a business trip. His daily schedule has a definite pattern. If he is busy with a meeting in the morning, he is free in the afternoon. When he returns, he realises that he attended 15 meetings altogether. There were 12 free mornings and 13 free afternoons. What was the duration of his trip?***

Sol. Let M and A represent the number of busy mornings and busy afternoons respectively.

Then, total number of mornings in the trip = $12 + M$.

And, total number of afternoons in the trip = $13 + A$.

Clearly, $12 + M = 13 + A$ or $M - A = 1$ ...(i)

Total number of meetings = $M + A$

So, $M + A = 15$ ...(ii)

Adding (i) and (ii), we get: $2M = 16$ or $M = 8$.

Hence, duration of the trip = $(12 + 8) = 20$ days.

Ex. 64. ***A man received a cheque. The rupees had been transposed for paise and vice- versa. After spending 5 rupees 42 paise, he discovered that he now had exactly six times the value of the correct cheque amount. What amount should he have received?*** **(M.A.T., 2005)**

Sol. Let the amount received be x rupees and y paise.

Then, amount written on cheque = $(100x + y)$ paise.

Actual amount to be received = $(100y + x)$ paise.

$\therefore (100x + y) - 542 = 6(100y + x)$

$\Leftrightarrow 100x + y - 542 = 600y + 6x \Leftrightarrow 94x - 599y = 542$

$\Leftrightarrow 94x = 542 + 599y$

$\Leftrightarrow x = \frac{542 + 599y}{94} = \frac{470 + 470y + 72 + 129y}{94} = 5(1 + y) + \frac{72 + 129y}{94}.$

For an integral value of x, $(72 + 129y)$ must be divisible by 94. This happens when $y = 6$.

$\therefore x = 5(1 + 6) + \frac{72 + 129 \times 6}{94} = 35 + 9 = 44.$

Hence, the man should have received ₹ 6.44.

EXERCISE

(OBJECTIVE TYPE QUESTIONS)

Directions: *Mark (✓) against the correct answer:*

1. What is 304 times 141? **(Bank Recruitment, 2009)**
(*a*) 39640 (*b*) 38760
(*c*) 42864 (*d*) 45942
(*e*) None of these

2. If $A + B = 96$ and A is half of B, then the value of A will be
(*a*) 22 (*b*) 32
(*c*) 48 (*d*) 64
(*e*) None of these

3. $1888 \div 32 \div 8 = ?$ **(Bank P.O., 2008)**
(*a*) 7.375 (*b*) 9.485
(*c*) 29.5 (*d*) 472
(*e*) None of these

4. $-76 \times 33 + 221 = ?$ **(NABARD, 2009)**
(*a*) − 2287 (*b*) 2287
(*c*) − 19304 (*d*) 19304
(*e*) None of these

5. $4848 \div 24 \times 11 - 222 = ?$ **(Bank P.O., 2010)**
(*a*) 200 (*b*) 2444
(*c*) 2000 (*d*) $115\frac{3}{8}$
(*e*) None of these

6. $(425 \times 4000) \div 16000 \times 12 = ?$ **(Bank Recruitment, 2009)**
(*a*) 8.85 (*b*) 925 (*c*) 1275
(*d*) 1700 (*e*) None of these

7. $[(84)^2 \div 28 \times 12] \div 24 = 7 \times ?$ **(Bank P.O., 2009)**
(*a*) 15 (*b*) 17
(*c*) 19 (*d*) 21
(*e*) None of these

8. (98764 + 89881 + 99763 + 66342) ÷ (1186 +? + 1040 + 1870) = 55 **(Bank Recruitment, 2008)**
(*a*) 2254 (*b*) 2354
(*c*) 2368 (*d*) 2404
(*e*) None of these

9. $1148 \div 28 \times 1408 \div 32 = ?$ **(S.B.I.P.O., 2008)**
(*a*) 1800 (*b*) 1804
(*c*) 1814 (*d*) 1822
(*e*) None of these

10. $-224 + (-314) \times (-9) = ?$
(*a*) − 547 (*b*) − 2602
(*c*) 547 (*d*) 2602
(*e*) None of these

11. $853 + ? \div 17 = 1000$
(*a*) 2482 (*b*) 2499
(*c*) 2516 (*d*) 16147
(*e*) None of these

12. $(? - 968) \div 79 \times 4 = 512$ **(Bank Recruitment, 2007)**
(*a*) 10185 (*b*) 10190
(*c*) 11075 (*d*) 11080
(*e*) None of these

13. $[(125)^2 \div 50 \times 20] \div 25 = ?$
(*a*) 11 (*b*) 100
(*c*) 150 (*d*) 250
(*e*) None of these

14. $999 \times 99 \times 9 \div 99 \div 9 \div 3 = ?$ **(Bank P.O., 2009)**
(*a*) 99 (*b*) 111
(*c*) 333 (*d*) 999
(*e*) None of these

15. If $a, b, c, \ldots\ldots, x, y, z$ are 26 natural numbers, then the value of
$(x - a)\ (x - b)\ (x - c)\ \ldots\ldots\ (x - y)\ (x - z)$ is
(*a*) 0 (*b*) 1
(*c*) 13 (*d*) 26

16. Simplify: $1 - [1 - \{1 - (1 - \overline{1 - 1})\}]$
(*a*) 0 (*b*) 1
(*c*) 2 (*d*) 3

17. What mathematical operation should come at the place of '?' in the equation:
2? 6 − 12 ÷ 4 + 2 = 11.
(*a*) + (*b*) −
(*c*) × (*d*) ÷

18. If $45 - [28 - \{37 - (15 - *)\}] = 58$, then * is equal to:
(*a*) − 29 (*b*) − 19
(*c*) 19 (*d*) 29

19. $\frac{343 \times 49}{216 \times 16 \times 81} = ?$ **(Bank P.O., 2010)**
(*a*) $\frac{7^5}{6^7}$ (*b*) $\frac{7^5}{6^8}$
(*c*) $\frac{7^4}{6^8}$ (*d*) $\frac{7^6}{6^7}$
(*e*) None of these

20. The value of x in the equation $\frac{113 \times 4 - x \times 2}{13 \times 9 - 5 \times 7} = 5$ is **(P.C.S., 2008)**
(*a*) 21 (*b*) 27
(*c*) 35 (*d*) 42

21. $\frac{18 \times 14 - 6 \times 8}{488 \div 4 - 20} = ?$ **(L.I.C.A.D.O., 2007)**
(*a*) $\frac{1}{2}$ (*b*) $\frac{3}{4}$
(*c*) 2 (*d*) 4
(*e*) None of these

22. $\frac{5+5+5}{7+7+7}-\frac{5+5}{7+7}+\frac{5}{7}=?$

(a) $\frac{1}{7}$ (b) $\frac{3}{7}$

(c) $\frac{5}{7}$ (d) $\frac{13}{14}$

23. $\frac{3+4\div2\times3}{4+3\times2\div3}=?$

(a) $\frac{7}{36}$ (b) $\frac{11}{18}$

(c) $\frac{3}{2}$ (d) $\frac{9}{4}$

24. $\frac{4+4\times18-6-8}{123\times6-146\times5}=?$

(a) 1 (b) 2

(c) 6.65 (d) 7.75

25. $\frac{180\times15-12\times20}{140\times8+2\times55}=?$

(a) $\frac{1}{7}$ (b) $\frac{4}{5}$

(c) 2 (d) 4

(e) None of these

26. Evaluate: $\frac{8-[5-(-3+2)]\div2}{|5-3|-|5-8|\div3}$

(a) 2 (b) 3

(c) 4 (d) 5

27. Given that $(1^2 + 2^2 + 3^2 + ... + 10^2) = 385$, the value of $(2^2 + 4^2 + 6^2 + ... + 20^2)$ is equal to **(M.B.A., 2006)**

(a) 770 (b) 1155

(c) 1540 (d) $(385)^2$

28. $2\frac{1}{4}+1\frac{1}{3}-4\frac{1}{2}=?$ **(Bank Recruitment, 2010)**

(a) $-1\frac{1}{12}$ (b) $\frac{11}{12}$

(c) $-\frac{11}{12}$ (d) $1\frac{1}{12}$

(e) None of these

29. $4\frac{3}{7}-1\frac{3}{14}=?+2\frac{3}{28}$ **(Bank P.O., 2010)**

(a) $1\frac{3}{28}$ (b) $3\frac{1}{14}$

(c) $3\frac{3}{14}$ (d) $3\frac{1}{28}$

(e) None of these

30. $1\frac{3}{4}-1\frac{1}{5}+1\frac{5}{8}=?$ **(Bank Recruitment, 2010)**

(a) $2\frac{7}{40}$ (b) $3\frac{7}{40}$

(c) $9\frac{5}{8}$ (d) $10\frac{7}{8}$

(e) None of these

31. $12\frac{1}{3}+10\frac{5}{6}-7\frac{2}{3}-1\frac{4}{7}=?$ **(Bank P.O., 2008)**

(a) $11\frac{13}{14}$ (b) $13\frac{11}{14}$

(c) $13\frac{13}{14}$ (d) $14\frac{11}{13}$

(e) None of these

32. $6\frac{9}{13}-4\frac{4}{11}+2\frac{2}{5}=?$ **(Bank P.O., 2006)**

(a) $4\frac{596}{715}$ (b) $4\frac{521}{715}$

(c) $9\frac{324}{715}$ (d) $9\frac{386}{715}$

(e) None of these

33. $1+\frac{1}{2}+\frac{1}{4}+\frac{1}{7}+\frac{1}{14}+\frac{1}{28}$ is equal to

(a) 2 (b) 2.5

(c) 3 (d) 3.5

34. $\frac{1}{\left(2\frac{1}{3}\right)}+\frac{1}{\left(1\frac{3}{4}\right)}$ is equal to

(a) $\frac{7}{14}$ (b) $\frac{12}{49}$

(c) $4\frac{1}{12}$ (d) None of these

35. $5\frac{5}{6}-3\frac{8}{9}-?=1$

(a) $\frac{2}{3}$ (b) $\frac{3}{2}$

(c) $\frac{17}{18}$ (d) 3

36. If $\frac{1}{3}+\frac{1}{2}+\frac{1}{x}=4$, then $x=?$

(a) $\frac{5}{18}$ (b) $\frac{6}{19}$

(c) $\frac{18}{5}$ (d) $\frac{24}{11}$

37. $\frac{532}{648}\times\frac{432}{588}=?$ **(L.I.C.A.D.O., 2007)**

(*a*) $\frac{2}{21}$ (*b*) $\frac{38}{63}$

(*c*) $\frac{21}{64}$ (*d*) $\frac{19}{21}$

(*e*) None of these

38. $1\frac{10}{11}\times17\frac{2}{7}\times36\frac{1}{6}=?$

(*a*) $397\frac{5}{6}$ (*b*) $397\frac{1}{2}$

(*c*) $1193\frac{5}{6}$ (*d*) $1193\frac{1}{2}$

(*e*) None of these

39. $\frac{3}{7}$ of $455+\frac{5}{8}$ of $456=?$ **(Bank Recruitment, 2009)**

(*a*) 448 (*b*) 464

(*c*) 476 (*d*) 480

(*e*) None of these

40. $\frac{3}{5}$ of $\frac{4}{7}$ of $\frac{5}{9}$ of $\frac{21}{24}$ of $504=?$

(*a*) 63 (*b*) 69

(*c*) 96 (*d*) 109

(*e*) None of these

41. $6\frac{5}{6}\times5\frac{1}{3}+17\frac{2}{3}\times4\frac{1}{2}=?$

(*a*) $112\frac{1}{3}$ (*b*) $116\frac{2}{3}$

(*c*) 240 (*d*) 663

(*e*) None of these

42. $4\frac{4}{5}\div6\frac{2}{5}=?$ **(Bank Recruitment, 2009)**

(*a*) $\frac{3}{4}$ (*b*) $\frac{5}{7}$

(*c*) $\frac{5}{8}$ (*d*) $\frac{7}{11}$

(*e*) None of these

43. $1\frac{1}{4}+1\frac{5}{9}\times1\frac{5}{8}\div6\frac{1}{2}=?$ **(Bank P.O., 2009)**

(*a*) 17 (*b*) 27

(*c*) 18 (*d*) 42

(*e*) None of these

44. $\frac{225}{836}\times\frac{152}{245}\div1\frac{43}{77}=?$ **(Bank Recruitment, 2009)**

(*a*) $\frac{6}{49}$ (*b*) $\frac{6}{11}$

(*c*) $\frac{3}{28}$ (*d*) $\frac{1}{7}$

(*e*) None of these

45. $\left(16\frac{2}{5}-12\frac{1}{15}\right)\div3\frac{4}{81}=?$

(*a*) $1\frac{9}{19}$ (*b*) $1\frac{9}{13}$

(*c*) $2\frac{8}{13}$ (*d*) $3\frac{2}{19}$

(*e*) None of these

46. $18\frac{3}{4}\times?\div\frac{6}{37}=1480$

(*a*) $11\frac{7}{12}$ (*b*) $11\frac{4}{5}$

(*c*) $12\frac{5}{12}$ (*d*) $12\frac{4}{5}$

(*e*) None of these

47. $\frac{3}{2}\times\frac{11}{5}\div\left(\frac{25}{44}\times\frac{11}{5}\right)\div\frac{33}{15}=?$

(*a*) $\frac{1}{2}$ (*b*) $\frac{2}{3}$

(*c*) $\frac{126}{125}$ (*d*) $5\frac{101}{125}$

(*e*) None of these

48. If $3\frac{x}{7}\times2\frac{y}{5}=10$, then the values of x and y respectively, would be

(*a*) 3, 4 (*b*) 5, 7

(*c*) 4, 3 (*d*) 4, 4

49. $1+2\div\left\{1+2\div\left(1+\frac{1}{3}\right)\right\}$ is equal to

(*a*) $1\frac{4}{5}$ (*b*) $2\frac{1}{4}$

(*c*) $4\frac{1}{5}$ (*d*) $5\frac{1}{4}$

50. Simplify: $10\frac{1}{8}$ of $\frac{12}{15}\div\frac{35}{36}$ of $\frac{20}{49}$.

(*a*) $17\frac{5}{12}$ (*b*) $17\frac{8}{17}$

(*c*) $20\frac{3}{25}$ (*d*) $20\frac{103}{250}$

51. $\frac{-\frac{1}{2}-\frac{2}{3}+\frac{4}{5}-\frac{1}{3}+\frac{1}{5}+\frac{3}{4}}{\frac{1}{2}+\frac{2}{3}-\frac{4}{3}+\frac{1}{3}-\frac{1}{5}-\frac{4}{5}}$ is simplified to

(*a*) $-\frac{3}{10}$ (*b*) $-\frac{10}{3}$

(*c*) -2 (*d*) 1

52. When $\left(\frac{1}{2}-\frac{1}{4}+\frac{1}{5}-\frac{1}{6}\right)$ is divided by $\left(\frac{2}{5}-\frac{5}{9}+\frac{3}{5}-\frac{7}{18}\right)$, the result is

(*a*) $2\frac{1}{18}$ (*b*) $3\frac{1}{6}$

(*c*) $3\frac{3}{10}$ (*d*) $5\frac{1}{10}$

53. Which of the following can be used to compute $\left(34\times4\frac{1}{2}\right)$?

(*a*) $(30\times4)+\left(4\times4\frac{1}{2}\right)$

(*b*) $(34\times40)+\left(34\times\frac{1}{2}\right)$

(*c*) $\left(30\times4\frac{1}{2}\right)+(4\times4)$

(*d*) $\left(34\times\frac{1}{2}\right)+(30\times4)+(4\times4)$

54. $\frac{3}{8}$ of $168\times15\div5+?=549\div9+235$

(*a*) 107 (*b*) 174

(*c*) 189 (*d*) 296

(*e*) None of these

55. Find the value of * in the following

$1\frac{2}{3}\div\frac{2}{7}\times\frac{*}{7}=1\frac{1}{4}\times\frac{2}{3}\div\frac{1}{6}$ **(S.S.C., 2002)**

(*a*) 0.006 (*b*) $\frac{1}{6}$

(*c*) 0.6 (*d*) 6

56. $5\frac{2}{3}\div?\frac{5}{6}=2$

(*a*) 2 (*b*) 3

(*c*) 4 (*d*) None of these

57. Supply the two missing figures in order indicated by x and y in the given equation, the fractions being in their lowest terms. **(IGNOU, 2003)**

$5\frac{1}{x}\times y\frac{3}{4}=20$

(*a*) 3, 1 (*b*) 3, 3

(*c*) 4, 1 (*d*) 5, 3

58. The difference of $1\frac{3}{16}$ and its reciprocal is equal to **(M.A.T., 2002)**

(*a*) $1\frac{1}{8}$ (*b*) $\frac{4}{3}$

(*c*) $\frac{15}{16}$ (*d*) None of these

59. How many $\frac{1}{8}s$ are there in $37\frac{1}{2}$?

(*a*) 300 (*b*) 400

(*c*) 500 (*d*) Cannot be determined

60. Let $a = (4 \div 3) \div 3 \div 4$, $b = 4 \div (3 \div 3) \div 4$, $c = 4 \div 3 \div (3 \div 4)$. The maximum value among the above three is **(I.A.M., 2007)**

(*a*) a (*b*) b

(*c*) c (*d*) All equal

61. If I $= \frac{3}{4}\div\frac{5}{6}$, II $= 3 \div [(4 \div 5) \div 6]$, III $= [3 \div (4 \div 5)] \div 6$, IV $= 3 \div 4 \div (5 \div 6)$, then **(A.A.O., 2009)**

(*a*) I and II are equal (*b*) I and III are equal

(*c*) I and IV are equal (*d*) All are equal

62. The value of $\left(\frac{5}{7}\text{ of }1\frac{6}{13}\right)\div\left(2\frac{5}{7}\div3\frac{1}{4}\right)$ is

(*a*) $\frac{20}{169}$ (*b*) 1

(*c*) $\frac{5}{4}$ (*d*) $1\frac{119}{180}$

63. $2\frac{3}{4}\div2\frac{2}{3}\div1\frac{1}{12}=?$

(*a*) $\frac{39}{48}$ (*b*) $1\frac{1}{4}$

(*c*) $\frac{169}{144}$ (*d*) None of these

64. The value of $\frac{2}{3}\times\frac{3}{\frac{5}{6}\div\frac{2}{3}\text{ of }1\frac{1}{4}}$ is

(*a*) $\frac{1}{2}$ (*b*) $\frac{2}{3}$

(*c*) 1 (*d*) 2

65. $\frac{4335}{4(?)24}\div1\frac{7}{8}=\frac{289}{528}$

(*a*) 1 (*b*) 2

(*c*) 8 (*d*) None of these

66. $5\frac{1}{3}-3\frac{2}{3}\div1\frac{1}{3}\div?+3\frac{1}{5}\div1\frac{1}{5}=7$

(*a*) $1\frac{1}{2}$ (*b*) $2\frac{1}{3}$

(*c*) $3\frac{1}{4}$ (*d*) None of these

67. $9-1\frac{2}{9}\text{ of }3\frac{3}{11}\div5\frac{1}{7}\text{ of }\frac{7}{9}=?$ **(S.S.C., 2002)**

(*a*) $\frac{5}{4}$ (*b*) 8

(*c*) $8\frac{32}{81}$ (*d*) 9

68. $\frac{5}{6}\div\frac{6}{7}\times ?-\frac{8}{9}\div 1\frac{3}{5}+\frac{3}{4}\times 3\frac{1}{3}=2\frac{7}{9}$

(a) $\frac{7}{6}$ (b) $\frac{6}{7}$

(c) 1 (d) None of these

69. $\frac{3}{4}\div 2\frac{1}{4}\text{ of }\frac{2}{3}-\frac{\frac{1}{2}-\frac{1}{3}}{\frac{1}{2}+\frac{1}{3}}\times 3\frac{1}{3}+\frac{5}{6}=?$

(a) $\frac{7}{18}$ (b) $\frac{49}{54}$

(c) $\frac{2}{3}$ (d) $\frac{1}{6}$

70. A student was asked to solve the fraction $\frac{\frac{7}{3}+1\frac{1}{2}\text{ of }\frac{5}{3}}{2+1\frac{2}{3}}$ and his answer was $\frac{1}{4}$. By how much was his answer wrong?

(a) 1 (b) $\frac{1}{55}$

(c) $\frac{1}{220}$ (d) None of these

71. Simplify: $\frac{\frac{1}{3}+\frac{3}{4}\left(\frac{2}{5}-\frac{1}{3}\right)}{1\frac{2}{3}\text{ of }\frac{3}{4}-\frac{1}{4}\text{ of }\frac{4}{5}}$.

(a) $\frac{1}{63}$ (b) $\frac{23}{40}$

(c) $\frac{23}{55}$ (d) $\frac{23}{63}$

72. Find the value of $1-\left(\frac{1\frac{2}{3}}{3\frac{1}{2}}+\frac{1\frac{1}{6}}{3\frac{1}{2}}\right)$.

(a) $\frac{3}{20}$ (b) $\frac{4}{21}$

(c) $\frac{8}{21}$ (d) $\frac{13}{21}$

73. If the expression $2\frac{1}{2}\text{ of }\frac{3}{4}\times\frac{1}{2}\div\frac{3}{2}+\frac{1}{2}\div\frac{3}{2}\left[\frac{2}{3}-\frac{1}{2}\text{ of }\frac{2}{3}\right]$ is simplified, we get **(R.R.B., 2006)**

(a) $\frac{1}{2}$ (b) $\frac{7}{8}$

(c) $1\frac{5}{8}$ (d) $2\frac{3}{5}$

74. The value of $\frac{1\frac{1}{7}-\frac{2}{3}+\frac{\frac{2}{5}}{1-\frac{1}{25}}}{1-\frac{1}{7}\left[\frac{1}{3}+\frac{\frac{2}{5}}{1-\frac{2}{5}}\right]}$ is **(I.I.F.T., 2005)**

(a) $\frac{3}{4}$ (b) $\frac{24}{25}$

(c) 1 (d) $1\frac{1}{24}$

75. $\frac{6}{5-\frac{5}{3}}\div\frac{4-\frac{2}{4-\frac{1}{2}}}{5-\frac{3}{2}}-\frac{2}{5}\text{ of }\left\{\frac{6}{9}+\frac{2}{3}\text{ of }\frac{1}{2}\right\}=?$ **(M.C.A., 2005)**

(a) $1\frac{1}{3}$ (b) $2\frac{13}{49}$

(c) $1\frac{7}{16}$ (d) $2\frac{3}{5}$

76. The expression $\frac{5\frac{5}{8}}{6\frac{3}{7}}\text{ of }\frac{6\frac{7}{11}}{9\frac{1}{8}}\div\frac{8}{9}\left(2\frac{3}{11}+\frac{13}{22}\right)\text{ of }\frac{3}{5}$ equals

(a) 1 (b) $\frac{1}{2}$

(c) $\frac{7}{9}$ (d) $\frac{5}{12}$

77. The simplified value of $\frac{\frac{1}{3}\div\frac{1}{3}\times\frac{1}{3}}{\frac{1}{3}\div\frac{1}{3}\text{ of }\frac{1}{3}}-\frac{1}{9}$ is

(a) 0 (b) $\frac{1}{9}$

(c) $\frac{1}{3}$ (d) 1

78. The value of $\frac{\frac{1}{2}\div\frac{1}{2}\text{ of }\frac{1}{2}}{\frac{1}{2}+\frac{1}{2}\text{ of }\frac{1}{2}}$ is

(a) 1 (b) $1\frac{1}{3}$

(c) $2\frac{2}{3}$ (d) 3

79. $\frac{3\frac{1}{4}-\frac{4}{5}\text{ of }\frac{5}{6}}{4\frac{1}{3}\div\frac{1}{5}-\left(\frac{3}{10}+21\frac{1}{5}\right)}$ is equal to

(a) $\frac{1}{6}$ (b) $2\frac{7}{12}$

(c) $15\frac{1}{2}$ (d) $21\frac{1}{2}$

80. $\frac{7\frac{1}{2}-5\frac{3}{4}}{3\frac{1}{2}+?} \div \frac{\frac{1}{2}+1\frac{1}{4}}{1\frac{1}{5}+3\frac{1}{2}} = 0.6$

(a) $4\frac{1}{3}$ (b) $4\frac{1}{2}$

(c) $4\frac{2}{3}$ (d) None of these

81. Which of the following pairs of fractions adds up to a number greater than 5?

(a) $\frac{5}{3}, \frac{3}{4}$ (b) $\frac{7}{3}, \frac{11}{5}$

(c) $\frac{11}{4}, \frac{8}{3}$ (d) $\frac{13}{5}, \frac{11}{6}$

82. $5-\left[\frac{3}{4}+\left\{2\frac{1}{2}-\left(0.5+\overline{\frac{1}{6}-\frac{1}{7}}\right)\right\}\right]$ is equal to

(a) $1\frac{19}{84}$ (b) $2\frac{61}{84}$

(c) $2\frac{23}{84}$ (d) $2\frac{47}{84}$

83. If $[p]$ means the greatest integer less than or equal to p, then $\left[-\frac{1}{4}\right]+\left[4\frac{1}{4}\right]+[3]$ is equal to:

(a) 4 (b) 5

(c) 6 (d) 7

84. If $x = -3$, then $x^3 - x^2 - x$ will be equal to (U.P.G.I.C., 2009)

(a) – 33 (b) – 27

(c) 15 (d) 54

85. Let $R = gS - 4$, when $S = 8$ and $R = 16$. If $S = 10$, then R is equal to

(a) 11 (b) 14

(c) 20 (d) 21

86. If $x = 5$, $y = 3$ and $z = 2$, then $\frac{x(y-z)}{y(x+y+z)} = ?$

(a) $\frac{1}{6}$ (b) $\frac{1}{30}$

(c) 1 (d) 5

87. If $a = 7$, $b = 5$, then the value of $a^3 - b^3 + 3a^2b$ is

(a) 218 (b) 307

(c) 735 (d) 953

88. $-7m - [3n - \{8m - (4n - 10m)\}]$ simplifies to (R.R.B., 2006)

(a) $11m - 5n$ (b) $11m - 7n$

(c) $11n - 7m$ (d) $13n - 11m$

89. If $a + 2b = 6$ and $ab = 4$, then what is $\frac{2}{a}+\frac{1}{b}$? (M.B.A., 2006)

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

(c) $\frac{3}{2}$ (d) 2

(e) $\frac{5}{2}$

90. If $\frac{a}{3}=\frac{b}{4}=\frac{c}{7}$, the value of $(a + b + c) \div c$ is

(a) $\frac{1}{7}$ (b) $\frac{1}{2}$

(c) 2 (d) 7

91. The value of $2a^3 - [3a^3 + 4b^3 - \{2a^3 + (-7a^3)\} + 5a^3 - 7b^3]$ is (Teacher's Exam, 2007)

(a) $-11a^3 + 3b^3$ (b) $7b^3 + 3a^3$

(c) $11a^3 - 3b^3$ (d) $-(11a^3 + 3b^3)$

92. If $\frac{x}{y+z}=a; \frac{y}{z+x}=b$ and $\frac{z}{x+y}=c$, then $\frac{1}{1+a}+\frac{1}{1+b}+\frac{1}{1+c}$ is equal to

(a) 2 (b) 3

(c) 6 (d) $x + y + z$

93. If $y = (x + 3)^2$, then $(-2x - 6)^2$ is equal to

(a) $-4y^2$ (b) $-2y^2$

(c) $-4y$ (d) $2y$

(e) $4y$

94. Which among the following is the correct value of $(x + a)(x + b)$? (R.R.B., 2007)

(a) $x^2 + abx + ab$ (b) $x^2 - (a + b)x + ab$

(c) $x^2 + (a + b)x + ab$ (d) $x^2 + (a - b)x + ab$

95. The value of $\left[1+\frac{1}{x+1}\right]\left[1+\frac{1}{x+2}\right]\left[1+\frac{1}{x+3}\right]\left[1+\frac{1}{x+4}\right]$ is

(a) $\frac{x+5}{x+1}$ (b) $\frac{x+1}{x+5}$

(c) $1+\frac{1}{x+5}$ (d) $\frac{1}{x+5}$

96. If $(a - b)$ is 6 more than $(c + d)$ and $(a + b)$ is 3 less than $(c - d)$, then $(a - c)$ is

(a) 0.5 (b) 1

(c) 1.5 (d) None of these

97. If $\frac{a}{b}=\frac{4}{3}$, then $\frac{3a+2b}{3a-2b}=?$ (M.B.A., 2007)

(a) – 1 (b) 3

(c) 5 (d) 6

98. If $\frac{x}{y}=\frac{6}{5}$, then the value of $\left(\frac{6}{7}-\frac{5x-y}{5x+y}\right)$ is equal to

(a) $\frac{1}{7}$ (b) $\frac{2}{7}$

(c) $\frac{3}{7}$ (d) $\frac{4}{7}$

99. If $\frac{x}{y}=\frac{1}{3}$, then $\frac{x^2+y^2}{x^2-y^2}=?$ (R.R.B., 2006)

(a) $-\frac{10}{9}$ (b) $\frac{5}{4}$

(c) $-\frac{5}{4}$ (d) $-\frac{5}{3}$

100. If $\frac{x}{2y}=\frac{6}{7}$, the value of $\frac{x-y}{x+y}+\frac{14}{19}$ is

(a) $\frac{13}{19}$ (b) $\frac{15}{19}$

(c) 1 (d) $1\frac{1}{19}$

101. If $\frac{a}{b}=\frac{4}{5}$ and $\frac{b}{c}=\frac{15}{16}$, then $\frac{c^2-a^2}{c^2+a^2}$ is (M.B.A., 2007)

(a) $\frac{1}{7}$ (b) $\frac{7}{25}$

(c) $\frac{3}{4}$ (d) None of these

102. If $x = 1 - q$ and $y = 2q + 1$, then for what value of q, x is equal to y?

(a) -1 (b) 0

(c) $\frac{1}{2}$ (d) 2

103. Find x if $\frac{x}{5}-\frac{x}{6}=4$.

(a) -120 (b) -100

(c) 100 (d) 120

104. If $4x+5y=83$ and $\frac{3x}{2y}=\frac{21}{22}$, then $y-x=?$

(a) 3 (b) 4

(c) 7 (d) 11

105. If $a=\frac{x}{x+y}$ and $b=\frac{y}{x-y}$, then $\frac{ab}{a+b}$ is equal to

(a) $\frac{xy}{x^2+y^2}$ (b) $\frac{x^2+y^2}{xy}$

(c) $\frac{x}{x+y}$ (d) $\left(\frac{y}{x+y}\right)^2$

106. If $\frac{a}{b}=\frac{1}{3}, \frac{b}{c}=2, \frac{c}{d}=\frac{1}{2}, \frac{d}{e}=3$ and $\frac{e}{f}=\frac{1}{4}$, then what is the value of $\frac{abc}{def}$? (C.A.T., 2006)

(a) $\frac{1}{4}$ (b) $\frac{3}{4}$

(c) $\frac{3}{8}$ (d) $\frac{27}{4}$

(e) $\frac{27}{8}$

107. If $\frac{m}{n}=\frac{4}{3}$ and $\frac{r}{t}=\frac{9}{14}$, the value of $\frac{3mr-nt}{4nt-7mr}$ is (M.B.A. 2011)

(a) $-5\frac{1}{2}$ (b) $-\frac{11}{14}$

(c) $-1\frac{1}{4}$ (d) $\frac{11}{14}$

108. If $a+\frac{1}{b}=1$ and $b+\frac{1}{c}=1$, then $c+\frac{1}{a}$ is equal to (S.S.C., 2007)

(a) 0 (b) $\frac{1}{2}$

(c) 1 (d) 2

109. If $y+\frac{1}{z}=1$ and $x+\frac{1}{y}=1$, then what is the value of xyz?

(a) -1 (b) 0

(c) $\frac{1}{2}$ (d) 1

110. If $\frac{x}{(2x+y+z)}=\frac{y}{(x+2y+z)}=\frac{z}{(x+y+2z)}=a$, then find a if $x + y + z \neq 0$. (M.A.T., 2005)

(a) $\frac{1}{3}$ (b) $\frac{1}{4}$

(c) $\frac{1}{2}$ (d) $\frac{1}{8}$

111. If $\frac{a}{b+c}=\frac{b}{c+a}=\frac{c}{a+b}=K$, then the value of K is

(a) $\pm\frac{1}{2}$ (b) $\frac{1}{2}$ or -1

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

112. If $a - 8 = b$, then determine the value of $|a - b| - |b - a|$.

(a) 0 (b) 2

(c) 4 (d) 16

113. If $x = \frac{a}{a-1}$ and $y = \frac{1}{a-1}$, then

(*a*) x is equal to y
(*b*) x is equal to y only if $a < 1$
(*c*) x is greater than y
(*d*) x is greater than y only if $a < 1$
(*e*) y is greater than x only if $a < 1$

114. If $0 < a < 1$, then the value of $a + \frac{1}{a}$ is

(*a*) less than 2 (*b*) greater than 2
(*c*) less than 4 (*d*) greater than 4

115. If $\frac{a}{x} + \frac{y}{b} = 1$ and $\frac{b}{y} + \frac{z}{c} = 1$, then $\frac{x}{a} + \frac{c}{z}$ will be equal to:

(*a*) 0 (*b*) $\frac{b}{y}$
(*c*) 1 (*d*) $\frac{y}{b}$

116. If a, b, c are integers; $a^2 + b^2 = 45$ and $b^2 + c^2 = 40$, then the values of a, b and c respectively are

(*a*) 2, 6, 3 (*b*) 3, 2, 6
(*c*) 5, 4, 3 (*d*) None of these

117. If $x + y = 15$ and $xy = 56$, then what is the value of $x^2 + y^2$? **(L.I.C.A.D.O., 2007)**

(*a*) 110 (*b*) 113
(*c*) 121 (*d*) Cannot be determined
(*e*) None of these

118. If $(a - b) = 4$ and $ab = 2$, then $(a^2 + b^2) = ?$

(*a*) 18 (*b*) 20
(*c*) 25 (*d*) None of these

119. If $a = bc$ and $c = a - b$, then the value of a is **(R.R.B., 2008)**

(*a*) $b^2 - 1$ (*b*) $\frac{b^2}{b-1}$
(*c*) $\frac{b}{b-1}$ (*d*) None of these

120. If $a + b + c = 0$, find the value of $\frac{a^2}{(a^2 - bc)} + \frac{b^2}{(b^2 - ca)} + \frac{c^2}{(c^2 - ab)}$. **(M.A.T., 2005)**

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

121. If $\frac{x}{y} = \frac{a+2}{a-2}$, then $\frac{x^2 - y^2}{x^2 + y^2}$ is equal to

(*a*) $\frac{8a}{a^2 + 4}$ (*b*) $\frac{4a}{a^2 - 4}$
(*c*) $\frac{4}{a^2}$ (*d*) $\frac{4a}{a^2 + 4}$

122. If $3x + 7 = x^2 + P = 7x + 5$, what is the value of P?

(*a*) $\frac{1}{2}$ (*b*) $8\frac{1}{4}$
(*c*) $8\frac{1}{2}$ (*d*) Cannot be determined

123. If $\frac{2a+b}{a+4b} = 3$, then find the value of $\frac{a+b}{a+2b}$.

(*a*) $\frac{2}{7}$ (*b*) $\frac{5}{9}$
(*c*) $\frac{10}{7}$ (*d*) $\frac{10}{9}$

124. If $(2a + 3b)(2c - 3d) = (2a - 3b)(2c + 3d)$, then

(*a*) $\frac{a}{b} = \frac{c}{d}$ (*b*) $\frac{a}{d} = \frac{c}{b}$
(*c*) $\frac{a}{b} = \frac{d}{c}$ (*d*) $\frac{b}{a} = \frac{c}{d}$

125. If $(a + b + 2c + 3d)(a - b - 2c + 3d) = (a - b + 2c - 3d)(a + b - 2c - 3d)$, then $2bc$ is equal to

(*a*) $\frac{3}{2}$ (*b*) $\frac{3a}{2d}$
(*c*) $3ad$ (*d*) a^2d^2

126. The expression $\frac{x+y}{x-y} \div \frac{(x+y)^2}{(x^2 - y^2)}$ is equal to

(*a*) -1 (*b*) $x - y$
(*c*) 1 (*d*) $x + y$

127. $\frac{a^2 - b^2 - 2bc - c^2}{a^2 + b^2 + 2ab - c^2}$ is equivalent to

(*a*) $\frac{a-b+c}{a+b+c}$ (*b*) $\frac{a-b-c}{a-b+c}$
(*c*) $\frac{a-b-c}{a+b-c}$ (*d*) $\frac{a+b+c}{a-b+c}$

128. If $x + y + z = 0$, then $x^2 + xy + y^2$ equals

(*a*) $y^2 + yz + z^2$ (*b*) $y^2 - yz + z^2$
(*c*) $z^2 - zx + x^2$ (*d*) $z^2 + zx + x^2$

129. If $a + b + c = 2s$, then the value of $(s - a)^2 + (s - b)^2 + (s - c)^2 + s^2$ will be

(*a*) $s^2 - a^2 - b^2 - c^2$ (*b*) $s^2 + a^2 + b^2 + c^2$
(*c*) $a^2 + b^2 + c^2$ (*d*) $4s^2 - a^2 - b^2 - c^2$

130. If $(x + y)^2 - z^2 = 4$, $(y + z)^2 - x^2 = 9$, $(z + x)^2 - y^2 = 36$, what is/are the value(s) of $x + y + z$?

(*a*) 0 (*b*) ± 1
(*c*) ± 3 (*d*) ± 7

131. If $a + b = 2c$, then the value of $\frac{a}{a-c}+\frac{b}{b-c}$ is

(*a*) $\frac{1}{2}$ (*b*) 1

(*c*) 2 (*d*) 3

132. $\frac{x}{x-1}+\frac{1}{x+1}+\frac{2x}{1-x^2}=?$

(*a*) 1 (*b*) 2

(*c*) 3 (*d*) 4

133. The value of $\frac{(a+b)^2}{(a^2-b^2)}$ is **(R.R.B., 2006)**

(*a*) $\frac{ab}{a+b}$ (*b*) $\frac{2ab}{a-b}$

(*c*) $\frac{a+b}{a-b}$ (*d*) None of these

134. If $ab + bc + ca = 0$, then what is the value of $\left(\frac{1}{a^2-bc}+\frac{1}{b^2-ca}+\frac{1}{c^2-ab}\right)$?

(*a*) 0 (*b*) 1

(*c*) 3 (*d*) $a + b + c$

135. How many boxes are required for filling 15 kg of sweet if each box is filled with 250 grams of sweet? **(Bank Recruitment, 2010)**

(*a*) 30 (*b*) 70

(*c*) 80 (*d*) 120

(*e*) None of these

136. The bus fare for one person is ₹ 420 from Agra to Aligarh and the train fare between the same places for one person is equal to three-fourths the bus fare for two persons between the same places. What is the total fare paid by 3 persons travelling by bus and 4 persons travelling by train between the two places? **(Bank P.O., 2010)**

(*a*) ₹ 3360 (*b*) ₹ 3406

(*c*) ₹ 3440 (*d*) ₹ 3460

(*e*) None of these

137. The cost of 6 pens and 3 pencils is ₹ 84. One-third of the cost of one pen is equal to the cost of one pencil. What is the total cost of 4 pens and 5 pencils? **(Bank Recruitment, 2010)**

(*a*) ₹ 66 (*b*) ₹ 68

(*c*) ₹ 72 (*d*) ₹ 78

(*e*) None of these

138. If an amount of ₹ 4,36,563 is distributed equally amongst 69 persons, how much amount would each person get? **(Bank Recruitment, 2009)**

(*a*) ₹ 5876 (*b*) ₹ 5943

(*c*) ₹ 6148 (*d*) ₹ 6327

(*e*) None of these

139. 32 shirt pieces of 120 cm each can be cut from a reel of cloth. After cutting these pieces 80 cm of cloth remains. What is the length of reel of cloth in metres? **(Bank Recruitment, 2009)**

(*a*) 38.70 metres (*b*) 39.20 metres

(*c*) 3870 metes (*d*) 3920 metres

(*e*) None of these

140. A canteen requires 798 bananas for a week. Total how many bananas did it require for the months of January, February and March 2008? **(Bank Recruitment, 2008)**

(*a*) 10277 (*b*) 10374 (*c*) 10480

(*d*) 10586 (*e*) None of these

141. Ram has ₹ 6 more than Mohan and ₹ 9 more than Sohan. All the three have ₹ 33 in all. Ram has a share of **(R.R.B., 2006)**

(*a*) ₹ 7 (*b*) ₹ 10

(*c*) ₹ 13 (*d*) ₹ 16

142. What is the maximum number of half-pint bottles of cream that can be filled with a 4-gallon can of cream? (2pt. = 1qt. and 4qt. = 1gal.) **(Campus Recruitment, 2010)**

(*a*) 16 (*b*) 24

(*c*) 30 (*d*) 64

143. The sum of the weights of *A* and *B* is 80 kg. Half of the weight of *A* is equal to $\frac{5}{6}$ times the weight of *B*. Find the weight of *B*.

(*a*) 20 kg (*b*) 30 kg

(*c*) 40 kg (*d*) 60 kg

144. *a* is greater than *b* by 2 and *b* is greater than *c* by 10. If $a + b + c = 130$, then $(b + c) - a$ =?

(*a*) 34 (*b*) 38

(*c*) 42 (*d*) 44

(*e*) None of these

145. The price of item *X* rises by ₹ 40 per year and that of item *Y* by ₹ 15 per year. If the price of item *X* and *Y* in the year 2002 was ₹ 420 and ₹ 630 respectively, in which year the price of item *X* will be ₹ 40 more than the price of item *Y*?

(*a*) 2010 (*b*) 2011

(*c*) 2012 (*d*) 2013

146. How many pieces of 85 cm length can be cut from a rod 42.5 metres long?

(*a*) 30 (*b*) 40

(*c*) 60 (*d*) None of these

147. On Sports Day, if 30 children were made to stand in a column, then 16 columns could be formed. If 24 children were made to stand in a column, then how many columns could be formed?

(*a*) 20 (*b*) 22

(*c*) 29 (*d*) 45

148. The number of students in each section of a school is 24. After admitting new students, three new sections were started. Now, the total number of sections is 16 and there are 21 students in each section. The number of new students admitted is

(*a*) 14 (*b*) 24
(*c*) 48 (*d*) 114

149. A man earns ₹ 20 on the first day and spends ₹ 15 on the next day. He again earns ₹ 20 on the third day and spends ₹ 15 on the fourth day. If he continues to save like this, how soon will he have ₹ 60 in hand? **(M.A.T., 2006)**

(*a*) On 17th day (*b*) On 27th day
(*c*) On 30th day (*d*) On 40th day

150. A car company sold 150 cars in a special 6-day sale. Each day, the company sold 6 more than the previous day. How many cars were sold on the 6th day?

(*a*) 35 (*b*) 40
(*c*) 50 (*d*) 60
(*e*) 70

151. A group of 1200 persons consisting of captains and soldiers is travelling in a train. If for every 15 soldiers there is one captain, then the number of captains in the group is

(*a*) 70 (*b*) 75
(*c*) 80 (*d*) 82

152. It costs ₹ x each to make the first thousand copies of a compact disc and ₹ y to make each subsequent copy. If z is greater than 1000, how much will it cost to make z copies of the compact disc?

(*a*) $zx - zy$ (*b*) $1000x + yz$
(*c*) $1000\ (x - y) + yz$ (*d*) $1000\ (z - y) + xz$

153. The total monthly salary of 4 men and 2 women is ₹ 46,000. If a woman earns ₹500 more than a man, what is the monthly salary of a woman?

(*a*) ₹ 6500 (*b*) ₹ 7500
(*c*) ₹ 8000 (*d*) ₹ 9000

154. A pineapple costs ₹ 7 each. A watermelon costs ₹ 5 each. X spends ₹ 38 on these fruits. The number of pineapples purchased is

(*a*) 2 (*b*) 3
(*c*) 4 (*d*) Data inadequate

155. Water boils at 212°F or 100°C and melts at 32°F or 0°C. If the temperature of a particular day is 35°C, it is equivalent to

(*a*) 85°F (*b*) 90°F
(*c*) 95°F (*d*) 99°F

156. 74 is divided into two parts so that 5 times one part and 11 times the other part are together equal to 454. The parts are **(R.R.B., 2006)**

(*a*) 14, 60 (*b*) 60, 14
(*c*) 30, 44 (*d*) 44, 30

157. A sink contains exactly 12 litres of water. If water is drained from the sink until it holds exactly 6 litres of water less than the quantity drained away, then how many litres of water were drained away? **(M.A.T., 2006)**

(*a*) 2 (*b*) 3
(*c*) 6 (*d*) 9

158. A family has several children. Each boy in the family has as many sisters as brothers and each girl has twice as many brothers as sisters.. How many brothers and sisters are there? **(SNAP, 2005)**

(*a*) 4 brothers, 3 sisters (*b*) 4 brothers, 4 sisters
(*c*) 3 brothers, 4 sisters (*d*) Cannot say

159. If 1 Japanese Yen = 0.01 US Dollars, 100 US Dollars = 5000 Indian Rupees (INR), how many Japanese Yens are 100 INR? **(JMET, 2008)**

(*a*) 20 (*b*) 200
(*c*) 500 (*d*) 2000

160. 12 buckets of water fill a tank when the capacity of each bucket is 13.5 litres. How many buckets will be needed to fill the same tank, if the capacity of each bucket is 9 litres?

(*a*) 8 (*b*) 15
(*c*) 16 (*d*) 18

161. $\left[1+\cfrac{1}{1+\cfrac{1}{1+\frac{1}{3}}}\right] \div 1\frac{4}{7}$ is equal to **(M.B.A., 2007)**

(*a*) 1 (*b*) $1\frac{1}{3}$
(*c*) $1\frac{1}{4}$ (*d*) $1\frac{1}{7}$

162. $\frac{13}{48}$ is equal to **(C.P.O., 2006)**

(*a*) $\cfrac{1}{3+\cfrac{1}{1+\frac{1}{16}}}$ (*b*) $\cfrac{1}{2+\cfrac{1}{1+\frac{1}{8}}}$

(*c*) $\cfrac{1}{3+\cfrac{1}{1+\cfrac{1}{1+\frac{1}{8}}}}$ (*d*) $\cfrac{1}{3+\cfrac{1}{1+\cfrac{1}{2+\frac{1}{4}}}}$

163. Find the value of $\cfrac{1}{1+\cfrac{1}{3-\cfrac{4}{2+\cfrac{1}{3-\frac{1}{2}}}}} + \cfrac{3}{3-\cfrac{4}{3+\cfrac{1}{2-\frac{1}{2}}}}$.

(*a*) $\frac{13}{7}$ (*b*) $\frac{15}{7}$
(*c*) $\frac{11}{21}$ (*d*) $\frac{17}{28}$

164. If $2 = x + \dfrac{1}{1+\dfrac{1}{3+\dfrac{1}{4}}}$, then the value of x is

(a) $\frac{12}{17}$ (b) $\frac{13}{17}$
(c) $\frac{18}{17}$ (d) $\frac{21}{17}$

165. If $\dfrac{2+\dfrac{1}{3\frac{4}{5}}}{2+\dfrac{1}{3+\dfrac{1}{1+\frac{1}{4}}}} = x$, then the value of x is

(a) $\frac{1}{7}$ (b) $\frac{3}{7}$
(c) 1 (d) $\frac{8}{7}$

166. $8 - 8 \times \dfrac{2\frac{1}{5} - 1\frac{2}{7}}{2 - \dfrac{1}{6-\frac{1}{6}}}$ is equal to

(a) 2 (b) 4
(c) 6 (d) 8

167. $\dfrac{2}{2+\dfrac{2}{3+\dfrac{2}{3+\frac{2}{3}}} \times 0.39}$ is simplified to

(a) $\frac{1}{3}$ (b) 2
(c) 6 (d) None of these

168. Simplify: $\dfrac{1}{1+\dfrac{\frac{2}{3}}{1+\frac{2}{3}+\dfrac{\frac{8}{9}}{1-\frac{2}{3}}}}$.

(a) $\frac{11}{13}$ (b) $\frac{13}{15}$
(c) $\frac{13}{11}$ (d) $\frac{15}{13}$

169. If $\dfrac{2}{2+\dfrac{2}{2+\frac{2}{x}}} = 3$, then x is equal to

(a) $-\frac{4}{7}$ (b) $\frac{4}{7}$
(c) $-\frac{4}{9}$ (d) $\frac{4}{9}$

170. If $\frac{37}{13} = 2 + \dfrac{1}{x+\dfrac{1}{y+\frac{1}{z}}}$, where x, y, z are natural numbers, then x, y, z are

(a) 1, 2, 5 (b) 1, 5, 2
(c) 5, 2, 11 (d) 11, 2, 5

171. Let $x = 1 + \dfrac{1}{1+\dfrac{1}{1+\dfrac{1}{1+\ldots\infty}}}$. Which of the following is correct?

(a) $x^2 + x + 1 = 0$ (b) $x^2 - x + 1 = 0$
(c) $x^2 + x - 1 = 0$ (d) $x^2 - x - 1 = 0$

172. Let $P = \dfrac{1}{1+\dfrac{1}{1+\dfrac{1}{3+\dfrac{1}{4+\ldots.}}}}$ and $Q = \dfrac{1}{2+\dfrac{1}{3+\dfrac{1}{4+\dfrac{1}{\ldots.}}}}$.

$\ldots.$ $\ldots.$
$+\frac{1}{1008}$ $+\frac{1}{1008}$

Then, $P + Q$ when calculated, gives

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

173. $\dfrac{\left[\left(1+\frac{1}{10+\frac{1}{10}}\right)\left(1+\frac{1}{10+\frac{1}{10}}\right)-\left(1-\frac{1}{10+\frac{1}{10}}\right)\left(1-\frac{1}{10+\frac{1}{10}}\right)\right]}{\left[\left(1+\frac{1}{10+\frac{1}{10}}\right)+\left(1-\frac{1}{10+\frac{1}{10}}\right)\right]}$ simplifies to

(a) $\frac{20}{101}$ (b) $\frac{90}{101}$
(c) $\frac{100}{101}$ (d) $\frac{101}{100}$

174. Which of the following values of x and y satisfy the following equations I and II?

I. $3x + y = 19$ II. $x - y = 9$

(a) $-7, -2$ (b) $-7, 2$
(c) $7, -2$ (d) $7, 2$

175. If $4x = p(x + 3) + q(x - 1)$ is an identity, then the values of p and q are **(I.A.M., 2007)**

(a) 1, – 3 (b) 1, 3
(c) 1, 1 (d) 3, 1

176. If $x = y = 2z$ and $xyz = 256$, then x =?
(Campus Recruitment, 2005)
(a) 2 (b) 4
(c) 8 (d) None of these

177. If $3y + 9x = 54$ and $\frac{28x}{13y} = \frac{140}{39}$, then what is the value of $y - x$? (Bank P.O., 2009)
(a) – 2 (b) – 1
(c) 1 (d) 2 (e) None of these

178. If $3x + 7y = 75$ and $5x - 5y = 25$, then what is the value of $x + y$? (Bank P.O., 2007)
(a) 14 (b) 15
(c) 16 (d) 17
(e) None of these

179. If $a + b = 5$ and $3a + 2b = 20$, then $(3a + b)$ will be:
(a) 10 (b) 15
(c) 20 (d) 25

180. If $2p + 3q = 18$ and $2p - q = 2$, then $2p + q$ =?
(a) 6 (b) 7
(c) 10 (d) 20

181. If $2x + y = 5$ and $3x - 4y = 2$, then the value of $2xy$ is
(a) 4 (b) 6
(c) 8 (d) 10

182. If $3x - 5y = 5$ and $\frac{x}{x+y} = \frac{5}{7}$, then what is the value of $2xy$ is
(a) 3 (b) 4
(c) 6 (d) 9
(e) None of these

183. If $4x + 3y = 18xy$ and $2x - 5y + 4xy = 0$, then the values of x and y will be respectively
(a) $-\frac{1}{2}$ and $-\frac{1}{3}$ (b) – 1 and – 3
(c) $\frac{1}{2}$ and $\frac{1}{3}$ (d) $\frac{1}{4}$ and $\frac{1}{3}$

184. If $2x + y = 17$; $y + 2z = 15$ and $x + y = 9$, then what is the value of $4x + 3y + z$?
(a) 41 (b) 43
(c) 45 (d) 55
(e) None of these

185. If $3x - 4y + z = 7$; $2x - z + 3y = 19$; $x + 2y + 2z = 24$, then what is the value of z?
(a) 4 (b) 5
(c) 6 (d) 8

186. If $2x + y = 15$, $2y + z = 25$ and $2z + x = 26$, what is the value of z?
(a) 4 (b) 7
(c) 9 (d) 11

187. If $2x + 3y = 31$, $y - z = 4$ and $x + 2z = 11$, then what is the value of $x + y + z$?
(a) 12 (b) 13
(c) 15 (d) 16

188. The price of 10 chairs is equal to that of 4 tables. The price of 15 chairs and 2 tables together is ₹ 4000. The total price of 12 chairs and 3 tables is
(a) ₹ 3500 (b) ₹ 3750
(c) ₹ 3840 (d) ₹ 3900

189. If two jeans and three shirts cost ₹ 4000 and three jeans and two shirts cost ₹ 3500, how much does a jean cost? (P.C.S., 2009)
(a) ₹ 500 (b) ₹ 1000
(c) ₹ 1500 (d) ₹ 2000

190. Cost of 8 pens and 4 pencils is ₹ 176 and the cost of 2 pens and 2 pencils is ₹ 48. What is the cost of one pen? (Bank P.O., 2009)
(a) ₹ 12 (b) ₹ 14
(c) ₹ 16 (d) ₹ 18
(e) None of these

191. The cost of two dozen apples and three dozen bananas is ₹ 136. The cost of 5 dozen bananas and one dozen apples is ₹ 110. What is the price of one dozen bananas? (Bank Recruitment, 2009)
(a) ₹ 16 (b) ₹ 18
(c) ₹ 20 (d) ₹ 24
(e) None of these

192. The cost of one pencil, two pens and four erasers is ₹ 22 while the cost of five pencils, four pens and two erasers is ₹ 32. How much will three pencils, three pens and three erasers cost?
(Campus Recruitment, 2010)
(a) ₹ 21 (b) ₹ 24
(c) ₹ 27 (d) ₹ 30

193. Ram Singh goes to Pushkar Mela with ₹ 10000 to buy exactly 100 animals. He finds that cows are sold at ₹ 1000, horses at ₹ 300 and chicken at ₹ 50. How many chicken should he buy to meet his target of 100 animals? (SNAP, 2005)
(a) 88 (b) 90
(c) 92 (d) 94

194. 3 men and 4 boys can earn ₹ 756 in 7 days. 11 men and 13 boys can earn ₹ 3008 in 8 days. In what time will 7 men with 9 boys earn ₹ 2480? (P.C.S., 2006)
(a) 8 days (b) 9 days
(c) 10 days (d) 11 days

195. At a certain fast food restaurant, Brian can buy 3 burgers, 7 shakes and one order of fries for ₹ 120 exactly. At the same place, it would cost ₹ 164.50 for 4 burgers, 10 shakes and one order of fries. How much would it cost for an ordinary meal of one burger, one shake and one fries?
(a) ₹ 21 (b) ₹ 31
(c) ₹ 41 (d) Cannot be determined

196. If $2x^2 + 12x + 18 = 0$, what is the value of x? **(Bank P.O., 2006)**

(*a*) – 3 (*b*) – 2
(*c*) 2 (*d*) 3
(*e*) More than one answer

197. If $x^2 - 7x = -12$, what is the value of x? **(C.E.T., 2006)**

(*a*) – 3 or – 4 (*b*) 3 or 4
(*c*) 3 or – 4 (*d*) Cannot be determined
(*e*) None of these

198. The roots of the equation $2x^2 - 11x + 15 = 0$ are **(Campus Recruitment, 2008)**

(*a*) $3, \frac{5}{2}$ (*b*) $5, \frac{3}{2}$
(*c*) $-3, -\frac{5}{2}$ (*d*) None of these

199. The value of $\left(1-\frac{1}{2}\right)\left(1-\frac{1}{3}\right)\left(1-\frac{1}{4}\right)\cdots\left(1-\frac{1}{m}\right)$ is **(P.C.S., 2008)**

(*a*) 1 (*b*) $\frac{1}{m}$
(*c*) $\frac{1}{2m}$ (*d*) $\frac{1}{1\cdot 2\cdot 3\cdots(m-1)\,m}$

200. The expression $\left(1+\frac{1}{3}\right)\left(1+\frac{1}{4}\right)\left(1+\frac{1}{5}\right)\cdots\left(1+\frac{1}{n}\right)$ simplifies to **(M.B.A. 2006, 2008)**

(*a*) $\frac{n+1}{3}$ (*b*) $\frac{n}{n+1}$
(*c*) $\frac{3}{n}$ (*d*) $1+\frac{1}{3}\cdot\frac{1}{4}\cdot\frac{1}{5}\cdots\frac{1}{n}$

201. When simplified, the product $\left(2-\frac{1}{3}\right)\left(2-\frac{3}{5}\right)\left(2-\frac{5}{7}\right)\cdots\left(2-\frac{997}{999}\right)$ is equal to **(R.R.B., 2007)**

(*a*) $\frac{5}{999}$ (*b*) $\frac{1001}{999}$
(*c*) $\frac{1}{1001}$ (*d*) $\frac{1001}{3}$

202. $\frac{3}{4}\left(1+\frac{1}{3}\right)\left(1+\frac{2}{3}\right)\left(1-\frac{2}{5}\right)\left(1+\frac{6}{7}\right)\left(1-\frac{12}{13}\right) = ?$

(*a*) $\frac{1}{5}$ (*b*) $\frac{1}{6}$
(*c*) $\frac{1}{7}$ (*d*) None of these

203. The value of $\left(1-\frac{1}{3^2}\right)\left(1-\frac{1}{4^2}\right)\left(1-\frac{1}{5^2}\right)\cdots\left(1-\frac{1}{11^2}\right)\left(1-\frac{1}{12^2}\right)$ is

(*a*) $\frac{11}{20}$ (*b*) $\frac{13}{15}$
(*c*) $\frac{13}{18}$ (*d*) $\frac{15}{16}$
(*e*) None of these

204. What is the value of the following expression?

$$\frac{1}{(2^2-1)}+\frac{1}{(4^2-1)}+\frac{1}{(6^2-1)}+\cdots+\frac{1}{(20^2-1)}$$

(*a*) $\frac{9}{19}$ (*b*) $\frac{10}{19}$
(*c*) $\frac{10}{21}$ (*d*) $\frac{11}{21}$

205. Find the sum : $\frac{1}{2}+\frac{1}{6}+\frac{1}{12}+\frac{1}{20}+\frac{1}{30}+\frac{1}{42}+\frac{1}{56}+\frac{1}{72}+\frac{1}{90}+\frac{1}{110}+\frac{1}{132}$.

(*a*) $\frac{7}{8}$ (*b*) $\frac{11}{12}$
(*c*) $\frac{15}{16}$ (*d*) $\frac{17}{18}$

206. The sum of the first 35 terms of the series $\frac{1}{2}+\frac{1}{3}-\frac{1}{4}-\frac{1}{2}-\frac{1}{3}+\frac{1}{4}+\frac{1}{2}+\frac{1}{3}-\frac{1}{4}$..... is :

(*a*) $-\frac{1}{2}$ (*b*) $-\frac{1}{4}$
(*c*) $\frac{1}{4}$ (*d*) None of these

207. $\left(1\frac{1}{2}+11\frac{1}{2}+111\frac{1}{2}+1111\frac{1}{2}\right)$ is equal to **(S.S.C., 2010)**

(*a*) 617 (*b*) 618
(*c*) $1234\frac{1}{2}$ (*d*) 1236

208. $\left(999\frac{999}{1000}\times 7\right)$ is equal to **(C.P.O., 2007)**

(*a*) $6633\frac{7}{1000}$ (*b*) $6993\frac{7}{1000}$
(*c*) $6999\frac{993}{1000}$ (*d*) $7000\frac{7}{1000}$

209. The value of $999\frac{995}{999}\times 999$ is

(*a*) 990809 (*b*) 998996
(*c*) 998999 (*d*) 999824

210. $\left(999\frac{1}{7}+999\frac{2}{7}+999\frac{3}{7}+999\frac{4}{7}+999\frac{5}{7}+999\frac{6}{7}\right)$ is simplified to

(*a*) 2997 (*b*) 5979
(*c*) 5994 (*d*) 5997

211. The value of $998\frac{2}{17}+998\frac{3}{17}+998\frac{5}{17}+998\frac{8}{17}+998\frac{16}{17}$ is **(I.A.M., 2007)**

(*a*) 4990 (*b*) 4992
(*c*) 9998 (*d*) 10000

212. The simplest value of $\frac{1}{1\times2}+\frac{1}{2\times3}+\frac{1}{3\times4}+....+\frac{1}{9\times10}$ is **(P.C.S., 2008)**

(*a*) $\frac{1}{10}$ (*b*) $\frac{9}{10}$
(*c*) 1 (*d*) 10

213. $\left(\frac{1}{1.4}+\frac{1}{4.7}+\frac{1}{7.10}+\frac{1}{10.13}+\frac{1}{13.16}\right)$ is equal to **(S.S.C., 2007)**

(*a*) $\frac{1}{3}$ (*b*) $\frac{3}{8}$
(*c*) $\frac{5}{16}$ (*d*) $\frac{41}{7280}$

214. When simplified, the sum $\frac{1}{2}+\frac{1}{6}+\frac{1}{12}+\frac{1}{20}+\frac{1}{30}+....+\frac{1}{n(n+1)}$ is equal to **(S.S.C., 2006)**

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

215. The value of $1+\frac{1}{4\times3}+\frac{1}{4\times3^2}+\frac{1}{4\times3^3}$ is

(*a*) $\frac{121}{108}$ (*b*) $\frac{3}{2}$
(*c*) $\frac{31}{2}$ (*d*) None of these

216. $\frac{1}{1\cdot2\cdot3}+\frac{1}{2\cdot3\cdot4}+\frac{1}{3\cdot4\cdot5}+\frac{1}{4\cdot5\cdot6}$ is equal to

(*a*) $\frac{7}{30}$ (*b*) $\frac{11}{30}$
(*c*) $\frac{13}{30}$ (*d*) $\frac{17}{30}$

217. The value of $\frac{3}{1^2\cdot2^2}+\frac{5}{2^2\cdot3^2}+\frac{7}{3^2\cdot4^2}+\frac{9}{4^2\cdot5^2}+\frac{11}{5^2\cdot6^2}+\frac{13}{6^2\cdot7^2}+\frac{15}{7^2\cdot8^2}+\frac{17}{8^2\cdot9^2}+\frac{19}{9^2\cdot10^2}$ is **(S.S.C., 2004)**

(*a*) $\frac{1}{100}$ (*b*) $\frac{99}{100}$
(*c*) 1 (*d*) $\frac{101}{100}$

218. The sum of the first 99 terms of the series $\frac{3}{4}+\frac{5}{36}+\frac{7}{144}+\frac{9}{400}+....$

(*a*) $\frac{99}{100}$ (*b*) $\frac{999}{1000}$
(*c*) $\frac{9999}{10000}$ (*d*) 1

219. Mayank, Mirza, Little and Jaspal bought a motorbike for ₹ 60000. Mayank paid one-half of the sum of the amounts paid by the other boys, Mirza paid one-third of the sum of the amounts paid by the other boys and Little paid one-fourth of the sum of the amounts paid by the other boys. How much did Jaspal have to pay?

(*a*) ₹ 13000 (*b*) ₹ 15000
(*c*) 17000 (*d*) None of these

220. Income of a company doubles after every one year. If the initial income was ₹ 4 lakhs, what would be the income after 5 years? **(Bank P.O., 2003)**

(*a*) ₹ 1.24 crores (*b*) ₹ 1.28 crores
(*c*) ₹ 2.52 crores (*d*) ₹ 2.56 crores
(*e*) None of these

221. Breeding of a certain species of insects is incredible everyday the total number of such insects in a closed glass jar is double the number on the previous day. There was just one insect in the jar on 1/2/2007, and the jar was full to the brim with these insects on 28/2/2007. On which date of February was the jar quarter-full? **(P.C.S., 2008)**

(*a*) 7 (*b*) 14
(*c*) 26 (*d*) None of these

222. The flowers in a basket double every minute and the basket gets full in one hour. In how much time, the basket was $\frac{1}{32}$ full?

(*a*) 12 minutes (*b*) 32 minutes
(*c*) 45 minutes (*d*) 55 minutes

223. A man's investment doubles in every 5 years. If he invested ₹ 5000 in each of the years 1990, 1995, 2000 and 2005, then what was the total amount received by him in 2010?

(*a*) ₹ 30000 (*b*) ₹ 70000
(*c*) ₹ 140000 (*d*) ₹ 150000

224. After measuring 120 metres of a rope, it was discovered that the measuring metre rod was 3 cm longer. The true length of the rope measured is **(S.S.C., 2007)**

(*a*) 116 m 40 cm (*b*) 121 m 20 cm
(*c*) 123 m (*d*) 123 m 60 cm

225. Smita was asked to multiply a certain number by 36. She multiplied it by 63 instead and got an answer 3834 more than the correct one. What was the number to be multiplied? **(Bank P.O., 2008)**

(*a*) 126 (*b*) 142
(*c*) 148 (*d*) 152
(*e*) None of these

226. A boy multiplied 423 by a number and obtained 65589 as his answer. If both the fives in the answer are wrong and all other figures are correct, the correct answer is:
(*a*) 60489 (*b*) 61189
(*c*) 62189 (*d*) 62389

227. A candidate was asked to find $\frac{7}{8}$ of a positive number. He found $\frac{7}{18}$ of the same by mistake. If his answer was 770 less than the correct one, then the original given number was **(Campus Recruitment, 2010)**
(*a*) 1260 (*b*) 1548
(*c*) 6160 (*d*) None of these

228. A student was asked to divide a number by $\frac{17}{8}$. Instead, he actually multiplied it by $\frac{17}{8}$ and hence got 225 more than the expected answer. What was the expected answer?
(*a*) 64 (*b*) 126
(*c*) 136 (*d*) None of these

229. One junior student is asked to divide half a number by 6 and the other half by 4 and then add the quantities. Instead of doing so, the student divides the given number by 5. If the answer is 4 short of the correct answer, then the number is
(*a*) 320 (*b*) 360
(*c*) 400 (*d*) 480 **(M.B.A., 2008)**

230. If $3\frac{2}{3}$ is subtracted from $9\frac{1}{9}$ and the difference is multiplied by 450, what is the final answer? **(Bank P.O., 2009)**
(*a*) 2045 (*b*) 2250
(*c*) 2540 (*d*) Cannot be determined
(*e*) None of these

231. By how much is $\frac{3}{4}$ of 968 less than $\frac{7}{8}$ of 1008? **(Bank P.O., 2010)**
(*a*) 146 (*b*) 154
(*c*) 158 (*d*) 165
(*e*) None of these

232. If $x = y - \frac{y}{10}$, where y is a positive integer which increases in value, then x **(P.C.S., 2009)**
(*a*) first increases in value then decreases
(*b*) decreases in value
(*c*) increases in value
(*d*) first decreases then increases in value

233. The difference between $\frac{3}{4}$th of $\frac{4}{5}$th of a number and $\frac{1}{6}$th of $\frac{2}{5}$th of the same number is 648. What is the number? **(Bank P.O., 2009)**
(*a*) 1110 (*b*) 1215
(*c*) 1325 (*d*) 1440
(*e*) None of these

234. Which number gives the same result when added to $1\frac{1}{2}$ and when multiplied by $1\frac{1}{2}$?
(*a*) 1 (*b*) 3
(*c*) 5 (*d*) 7

235. $\frac{5}{12}$ of which sum is equal to $3\frac{3}{4}$ of ₹ 100?
(*a*) ₹ 750 (*b*) ₹ 800
(*c*) ₹ 900 (*d*) ₹ 1000

236. $\frac{3}{8}$ is what part of $\frac{1}{12}$?
(*a*) $\frac{3}{7}$ (*b*) $\frac{1}{12}$
(*c*) $\frac{4}{3}$ (*d*) None of these

237. The smallest fraction which should be subtracted from the sum of $1\frac{3}{4}$, $2\frac{1}{2}$, $5\frac{7}{12}$, $3\frac{1}{3}$ and $2\frac{1}{4}$ to make the result a whole number is
(*a*) $\frac{5}{12}$ (*b*) $\frac{7}{12}$
(*c*) $\frac{1}{2}$ (*d*) 7

238. What fraction should be added to the sum of $5\frac{3}{4}$, $4\frac{4}{5}$ and $7\frac{3}{8}$ to make the result a whole number? **(M.B.A., 2006)**
(*a*) $\frac{1}{40}$ (*b*) $\frac{2}{40}$
(*c*) $\frac{3}{40}$ (*d*) $\frac{4}{40}$

239. If x is a positive number, then which of the following fractions has the greatest value?
(*a*) $\frac{x}{x}$ (*b*) $\frac{x}{x+1}$
(*c*) $\frac{x+1}{x}$ (*d*) $\frac{x+2}{x+3}$

240. By how much does $\frac{6}{7/8}$ exceed $\frac{6/7}{8}$?

(*a*) $6\frac{1}{8}$ (*b*) $6\frac{3}{4}$

(*c*) $7\frac{3}{4}$ (*d*) $7\frac{5}{6}$

241. If $\frac{4}{5}$ of an estate be worth ₹ 16,800, then the value of $\frac{3}{7}$ of the estate is

(*a*) ₹ 9000 (*b*) ₹ 21,000

(*c*) ₹ 72,000 (*d*) ₹ 90,000

242. Two-fifth of one-fourth of three-seventh of a number is 15. What is half of that number?

(*a*) 94 (*b*) 96

(*c*) 188 (*d*) 196

(*e*) None of these

243. What fraction of an hour is a second?

(*a*) $\frac{1}{24}$ (*b*) $\frac{1}{60}$

(*c*) $\frac{1}{120}$ (*d*) $\frac{1}{3600}$

244. When a ball bounces, it rises to $\frac{3}{4}$ of the height from which it fell. If the ball is dropped from a height of 32 m, how high will it rise at the third bounce?

(*a*) 13 m (*b*) $13\frac{1}{2}$ m

(*c*) $14\frac{1}{2}$ m (*d*) None of these

245. Sanket earns twice as much in the month of March as in each of the other months of the year. What part of his entire annual earnings was earned in March?

(*a*) $\frac{1}{7}$ (*b*) $\frac{1}{6}$

(*c*) $\frac{2}{11}$ (*d*) $\frac{2}{13}$

246. If one-third of a tank holds 80 litres of water, then the quantity of water that half of the tank holds is

(*a*) $\frac{80}{3}$ litres (*b*) 100 litres

(*c*) 120 litres (*d*) 240 litres

247. A person travels 3.5 km from place *A* to place *B*. Out of this distance, he travels $1\frac{2}{3}$ km on bicycle, $1\frac{1}{6}$ km on scooter and the rest on foot. What portion of the whole distance does he cover on foot?

(*a*) $\frac{3}{19}$ (*b*) $\frac{4}{11}$

(*c*) $\frac{4}{21}$ (*d*) $\frac{5}{6}$

248. What fraction of $\frac{4}{7}$ must be added to itself to make the sum $1\frac{1}{14}$?

(*a*) $\frac{1}{2}$ (*b*) $\frac{4}{7}$

(*c*) $\frac{7}{8}$ (*d*) $\frac{15}{14}$

249. Express $\frac{2}{3}$ of $\frac{1}{4}$ of ₹ 25.20 as a fraction of $1\frac{1}{2}$ of ₹ 36.

(*a*) $\frac{5}{8}$ (*b*) $\frac{5}{42}$

(*c*) $\frac{7}{90}$ (*d*) $\frac{11}{90}$

250. A 70 cm long wire is to be cut into two pieces such that one piece will be $\frac{2}{5}$ as long as the other. How many centimetres will the shorter piece be?

(*a*) 10 (*b*) 14

(*c*) 20 (*d*) 28

251. A certain amount is distributed among *A*, *B* and *C*. *A* gets $\frac{3}{16}$ and *B* gets $\frac{1}{4}$ of the whole amount. If *C* gets ₹ 81, then *B* gets

(*a*) ₹ 30 (*b*) ₹ 32

(*c*) ₹ 36 (*d*) ₹ 40

252. $\frac{1}{10}$ of a pole is coloured red, $\frac{1}{20}$ white, $\frac{1}{30}$ blue, $\frac{1}{40}$ black, $\frac{1}{50}$ violet, $\frac{1}{60}$ yellow and the rest is green. If the length of the green portion of the pole is 12.08 metres, then the length of the pole is **(S.S.C., 2004)**

(*a*) 16 m (*b*) 18 m

(*c*) 20 m (*d*) 30 m

253. If we multiply a fraction by itself and divide the product by its reciprocal, the fraction thus obtained is $18\frac{26}{27}$. The original fraction is

(*a*) $\frac{8}{27}$ (*b*) $1\frac{1}{3}$

(*c*) $2\frac{2}{3}$ (*d*) None of these

254. The marks scored in an examination are converted from 50 to 10 for the purpose of internal assessment. The highest marks were 47 and the lowest were 14. The difference between the maximum and the minimum internal assessment scores is
(*a*) 3.3 (*b*) 4.8
(*c*) 6.6 (*d*) 7.4

255. One-third of Rahul's savings in National Savings Certificate is equal to one-half of his savings in Public Provident Fund. If he has ₹ 1,50,000 as total savings, how much has he saved in Public Provident Fund?
(*a*) ₹ 30,000 (*b*) ₹ 50,000
(*c*) ₹ 60,000 (*d*) ₹ 90,000

256. In a family, the father took $\frac{1}{4}$ of the cake and he had 3 times as much as each of the other members had. The total number of family members is
(*a*) 3 (*b*) 7
(*c*) 10 (*d*) 12

257. A waiter's salary consists of his salary and tips. During one week his tips were $\frac{5}{4}$ of his salary. What fraction of his income came from tips?
(*a*) $\frac{4}{9}$ (*b*) $\frac{5}{4}$
(*c*) $\frac{5}{8}$ (*d*) $\frac{5}{9}$

258. A sum of ₹ 1360 has been divided among *A*, *B* and *C* such that *A* gets $\frac{2}{3}$ of what *B* gets and *B* gets $\frac{1}{4}$ of what *C* gets. *B*'s share is **(M.A.T., 2002)**
(*a*) ₹ 120 (*b*) ₹ 160
(*c*) ₹ 240 (*d*) ₹ 300

259. Three friends had dinner at a restaurant. When the bill was received, Amita paid $\frac{2}{3}$ as much as Veena paid and Veena paid $\frac{1}{2}$ as much as Tanya paid. What fraction of the bill did Veena pay? **(SNAP, 2005)**
(*a*) $\frac{1}{3}$ (*b*) $\frac{3}{11}$
(*c*) $\frac{12}{31}$ (*d*) $\frac{5}{8}$

260. $\frac{1}{4}$ of a tank holds 135 litres of water. What part of the tank is full if it contains 180 litres of water?
(*a*) $\frac{1}{6}$ (*b*) $\frac{1}{3}$
(*c*) $\frac{2}{3}$ (*d*) $\frac{2}{5}$

261. A tank is $\frac{2}{5}$ full. If 16 litres of water is added to the tank, it becomes $\frac{6}{7}$ full. The capacity of the tank is
(*a*) 28 litres (*b*) 32 litres
(*c*) 35 litres (*d*) 42 litres

262. A drum of kerosene is $\frac{3}{4}$ full. When 30 litres of kerosene is drawn from it, it remains $\frac{7}{12}$ full. The capacity of the drum is **(S.S.C., 2010)**
(*a*) 120 litres (*b*) 135 litres
(*c*) 150 litres (*d*) 180 litres

263. A tin of oil was $\frac{5}{8}$ full. When 10 bottles of oil was taken out and 8 bottles of oil was poured into it, it was $\frac{3}{5}$ full. How many bottles of oil can the tin contain?
(*a*) 20 (*b*) 30
(*c*) 40 (*d*) 80

264. 1 m of an object is to be represented by 10 cm on the drawing scale. The representative fraction (R.F.) of the scale is
(*a*) $\frac{1}{10}$ (*b*) $\frac{1}{20}$
(*c*) $\frac{1}{100}$ (*d*) None of these

265. An area of 100 sq. cm on the map represents an area of 49 sq. km on the field. The R.F. of the scale to be used is
(*a*) $\frac{1}{10000}$ (*b*) $\frac{1}{20000}$
(*c*) $\frac{1}{49000}$ (*d*) $\frac{1}{70000}$

266. The fluid contained in a bucket can fill four large bottles or seven small bottles. A full large bottle is used to fill an empty small bottle. What fraction of the fluid is left over in the large bottle when the small one is full?
(*a*) $\frac{2}{7}$ (*b*) $\frac{3}{7}$
(*c*) $\frac{4}{7}$ (*d*) $\frac{5}{7}$

267. To fill a tank, 25 buckets of water is required. How many buckets of water will be required to fill the same tank if the capacity of the bucket is reduced to two-fifth of its present?
(*a*) 10 (*b*) 35
(*c*) $62\frac{1}{2}$ (*d*) Cannot be determined
(*e*) None of these

268. A stationary engine has enough fuel to run 12 hours when its tank is $\frac{4}{5}$ full. How long will it run when the tank is $\frac{1}{3}$ full? **(Campus Recruitment, 2009)**

(*a*) Less than 2 hours (*b*) 2 hours
(*c*) 3 hours (*d*) 4 hours
(*e*) 5 hours

269. A tree grows only $\frac{3}{5}$ as fast as the one beside it. In four years the combined growth of the trees is eight feet. How much does the shorter tree grow in 2 years? **(Campus Recruitment, 2008)**

(*a*) Less than 2 feet (*b*) 2 feet
(*c*) $2\frac{1}{2}$ feet (*d*) 3 feet
(*e*) More than 3 feet

270. A car is filled with four and a half gallons of fuel for a round trip. If the amount of fuel taken while going is $\frac{1}{4}$ more than the amount taken for coming, what is the amount of fuel consumed while coming back? **(Campus Recruitment, 2009)**

(*a*) Less than 2 gallons (*b*) 2 gallons
(*c*) $2\frac{1}{2}$ gallons (*d*) 3 gallons
(*e*) More than 3 gallons

271. The lowest temperature in the night in a city is one-third more than $\frac{1}{2}$ the highest during the day. Sum of the lowest temperature and the highest temperature is 100 degrees. Then what is the lowest temperature? **(Campus Recruitment, 2010)**

(*a*) 30 degrees (*b*) 40 degrees
(*c*) 36 degrees (*d*) None of these

272. In a class there are 18 boys who are over 160 cm tall. If these boys constitute three-fourths of the boys and the total number of boys is two-thirds of the number of students in the class, then what is the number of girls in the class?

(*a*) 6 (*b*) 12
(*c*) 18 (*d*) 24

273. Peter gave one-fourth of the amount he had to Michael. Michael in turn gave half of what he received from Peter to Sam. If the difference between the remaining amount with Peter and the amount received by Sam is ₹ 500, how much money did Michael receive from Peter?

(*a*) ₹ 100 (*b*) ₹ 200
(*c*) ₹ 400 (*d*) Data inadequate
(*e*) None of these

274. Four children *A*, *B*, *C* and *D* divide a bag of sweets. *A* takes $\frac{1}{3}$ of them, *B* $\frac{2}{5}$th of the remainder and the rest is equally shared between *C* and *D*. What fraction of the sweets did *C* or *D* get?

(*a*) $\frac{1}{4}$ (*b*) $\frac{1}{5}$
(*c*) $\frac{1}{6}$ (*d*) $\frac{1}{17}$

275. Rita travelled 1200 km by air, which formed $\frac{2}{5}$th of her journey. One-third of the whole journey she travelled by car and the remaining journey by train. Find the distance travelled by the train. **(R.R.B., 2006)**

(*a*) 480 km (*b*) 800 km
(*c*) 1600 km (*d*) 1800 km

276. A man spends one-quarter of his income on food, one-fifth of it on rent and remaining, which is ₹ 231, on other commodities. Find his total income.

(*a*) ₹ 400 (*b*) ₹ 410
(*c*) ₹ 420 (*d*) ₹ 460

277. A boy read $\frac{3}{8}$th of a book on one day and $\frac{4}{5}$th of the remainder on another day. If there were 30 pages unread, how many pages did the book contain? **(I.M.T. 2002; XAT, 2006)**

(*a*) 240 (*b*) 300
(*c*) 600 (*d*) None of these

278. An institute organised a fete and $\frac{1}{5}$ of the girls and $\frac{1}{8}$ of the boys participated in the same. What fraction of the total number of students took part in the fete?

(*a*) $\frac{2}{13}$ (*b*) $\frac{13}{40}$
(*c*) Data inadequate (*d*) None of these

279. At an International Dinner, $\frac{1}{5}$ of the people attending were French men. If the number of French women at the dinner was $\frac{2}{3}$ greater than the number of French men, and there were no other French people at the dinner, then what fraction of the people at the dinner were not French? **(M.B.A., 2003)**

(*a*) $\frac{1}{5}$ (*b*) $\frac{2}{5}$
(*c*) $\frac{2}{3}$ (*d*) $\frac{7}{15}$

280. In a class, $\frac{3}{5}$ of the students are girls and rest are boys. If $\frac{2}{9}$ of the girls and $\frac{1}{4}$ of the boys are absent, what part of the total number of students is present?

(*a*) $\frac{17}{25}$ (*b*) $\frac{18}{49}$

(*c*) $\frac{23}{30}$ (*d*) $\frac{23}{36}$

281. One-third of the boys and one-half of the girls of a college participated in a social work project. If the number of participating students is 300 out of which 100 are boys, what is the total number of students in the college?

(*a*) 500 (*b*) 600

(*c*) 700 (*d*) 800

282. To win an election, a candidate needs $\frac{3}{4}$ of the votes cast. If after $\frac{2}{3}$ of the votes have been counted, a candidate has $\frac{5}{6}$ of what he needs, then what part of the remaining votes does he still need? **(M.A.T., 2008)**

(*a*) $\frac{1}{8}$ (*b*) $\frac{3}{8}$

(*c*) $\frac{1}{10}$ (*d*) $\frac{1}{4}$

283. A fires 5 shots to *B*'s 3 but *A* kills only once in 3 shots while *B* kills once in 2 shots. When *B* has missed 27 times, *A* has killed

(*a*) 30 birds (*b*) 60 birds

(*c*) 72 birds (*d*) 90 birds

284. If every 2 out of 3 readymade shirts need alterations in the collar, every 3 out of 4 need alterations in the sleeves, and every 4 out of 5 need it in the body, how many alterations will be required for 60 shirts?

(*a*) 24 (*b*) 123

(*c*) 133 (*d*) 143

285. The sum of three fractions is $2\frac{11}{24}$. When the largest fraction is divided by the smallest, the fraction thus obtained is $\frac{7}{6}$ which is $\frac{1}{3}$ more than the middle one. The fractions are

(*a*) $\frac{3}{5}, \frac{4}{7}, \frac{2}{3}$ (*b*) $\frac{7}{8}, \frac{5}{6}, \frac{3}{4}$

(*c*) $\frac{7}{9}, \frac{2}{3}, \frac{3}{5}$ (*d*) None of these

286. A millionaire bought a lot of hats $\frac{1}{4}$ of which were brown. The millionaire sold $\frac{2}{3}$ of the hats including $\frac{4}{5}$ of the brown hats. What fraction of the unsold hats were brown? **(Campus Recruitment, 2010)**

(*a*) $\frac{1}{60}$ (*b*) $\frac{1}{15}$

(*c*) $\frac{3}{20}$ (*d*) $\frac{3}{5}$

(*e*) $\frac{3}{4}$

287. Equal amounts of water were poured into two empty jars of different capacities, which made one jar $\frac{1}{4}$ full and the other jar $\frac{1}{3}$ full. If the water in the jar with lesser capacity is, then poured into the jar with the greater capacity, what fraction of the larger jar will be filled with water? **(M.A.T., 2005)**

(*a*) $\frac{1}{2}$ (*b*) $\frac{2}{3}$

(*c*) $\frac{3}{4}$ (*d*) $\frac{2}{7}$

288. Mr. X spends $\frac{1}{4}$ of his income on food and $\frac{1}{3}$ less than what he spent on food, on the education of his children. What fraction of his income did he spend on food and education?

(*a*) $\frac{2}{7}$ (*b*) $\frac{1}{2}$

(*c*) $\frac{5}{12}$ (*d*) $\frac{7}{12}$

289. A body of 7300 troops is formed of 4 battalions so that $\frac{1}{2}$ of the first, $\frac{2}{3}$ of the second, $\frac{3}{4}$ of the third and $\frac{4}{5}$ of the fourth are all composed of the same number of men. How many men are there in the second battalion? **(M.A.T., 2008)**

(*a*) 1500 (*b*) 1600

(*c*) 1800 (*d*) 2400

290. After reading $\frac{3}{5}$ of the biology homework on Monday night, Sanjay read $\frac{1}{3}$ of the remaining homework on Tuesday night. What fraction of the original homework would Sanjay have to read on Wednesday night to complete the assignment?

(a) $\frac{1}{5}$ (b) $\frac{1}{15}$
(c) $\frac{2}{15}$ (d) $\frac{4}{15}$

291. The highest score in an inning was $\frac{3}{11}$ of the total and the next highest was $\frac{3}{11}$ of the remainder. If the scores differed by 9, the total score was
(a) 110 (b) 121
(c) 132 (d) 143

292. Mechanics are paid twice the hourly wages of sales people. Custodial workers are paid one-third the hourly wages of mechanics. What fraction of the hourly wages of custodial workers are sales people paid? **(M.B.A., 2006)**
(a) $\frac{1}{3}$ (b) $\frac{1}{2}$
(c) $\frac{2}{3}$ (d) $\frac{3}{2}$
(e) $\frac{4}{3}$

293. Ganeshi's monthly income is twice Jassi's monthly income. Two-third of Jassi's monthly income is equal to Sukhvinder's monthly income. If Sukhvinder's annual income is ₹ 2.34 lakhs, what is Ganeshi's monthly income? **(Bank Recruitment, 2010)**
(a) ₹ 14625 (b) ₹ 29250
(c) ₹ 28230 (d) ₹ 58500
(e) None of these

294. The cost of 36 kg of rice last year was ₹ 1044 and the cost of 24 kg of rice this year is ₹ 768. What is the difference between the cost per kg of rice last year and the cost per kg of rice this year? **(Bank Recruitment, 2008)**
(a) ₹ 3 (b) ₹ 4
(c) ₹ 5 (d) ₹ 6
(e) None of these

295. The cost of 12 belts and 30 wallets is ₹ 8940. What is the cost of 4 belts and 10 wallets? **(Bank Recruitment, 2009)**
(a) ₹ 2780 (b) ₹ 2870
(c) ₹ 2890 (d) ₹ 2980
(e) None of these

296. The cost of 5 pendants and 8 chains is ₹ 1,45,785. What would be the cost of 15 pendants and 24 chains? **(Bank P.O., 2009)**
(a) ₹ 3,25,285 (b) ₹ 4,39,355
(c) ₹ 5,50,000 (d) Cannot be determined
(e) None of these

297. The cost of 21 tables and 35 chairs is ₹ 41825. What is the cost of 9 tables and 15 chairs?
(a) ₹ 17775 (b) ₹ 17925
(c) ₹ 18075 (d) ₹ 18725
(e) None of these

298. The cost of 13 kg of sugar is ₹ 195, the cost of 17 kg of rice is ₹ 544 and the cost of 21 kg of wheat is ₹ 336. What is the total cost of 21 kg of sugar, 26 kg of rice and 19 kg of wheat? **(M.A.T., 2009)**
(a) ₹ 1306 (b) ₹ 1451
(c) ₹ 1500 (d) ₹ 1636

299. The most economical price among the following is **(Campus Recruitment, 2008)**
(a) 10 kilo for ₹ 160 (b) 2 kilo for ₹ 30
(c) 4 kilo for ₹ 70 (d) 20 kilo for ₹ 340
(e) 8 kilo for ₹ 130

300. There are 200 questions on a 3 hour examination. Among these questions are 50 Mathematics problems. It is suggested that twice as much time be spent on each Maths problem as for each other question. How many minutes should be spent on Mathematics problems? **(Campus Recruitment, 2010)**
(a) 36 (b) 60
(c) 72 (d) 100

301. What part of an hour elapses from 4.56 P.M. to 5.32 P.M.? **(R.R.B., 2006)**
(a) $\frac{1}{4}$ (b) $\frac{1}{2}$
(c) $\frac{3}{5}$ (d) $\frac{3}{4}$

302. 72 hours 6 minutes ÷ 14 =?
(a) 59 minutes (b) 5 hours 9 minutes
(c) 6 hours 9 minutes (d) 7 hours 8 minutes

303. A class starts at 10 a.m. and lasts till 1.27 p.m. Four periods are held during this interval. After every period, 5 minutes are given free to the students. The exact duration of each period is
(a) 42 minutes (b) 48 minutes
(c) 51 minutes (d) 53 minutes

304. A light was seen at intervals of 13 seconds. It was seen for the first time at 1 hr. 54 min. 50 secs. a.m. and the last time at 3 hrs. 17 min. 49 secs. a.m. How many times was the light seen? **(A.A.O. Exam., 2003)**
(a) 360 (b) 375
(c) 378 (d) 384

305. A woman works continuously for 7 days in the kitchen and refuses to work on the 8th day when her husband takes over. If she starts her work on a Sunday, then the 10th time she rests will be on which day of the week?
(a) Sunday (b) Monday
(c) Tuesday (d) Friday

306. If $x * y = x^2 + y^2 - xy$, then the value of 9 * 11 is
(*a*) 93 (*b*) 103
(*c*) 113 (*d*) 121

307. If $a * b = \frac{ab}{a+b}$, find the value of $3 * (3 * -1)$.
(*a*) – 3 (*b*) – 1.5
(*c*) – 1 (*d*) $\frac{2}{3}$

308. If $a * b = 2a - 3b + ab$, then 3 * 5 + 5 * 3 is equal to
(*a*) 22 (*b*) 24
(*c*) 26 (*d*) 28

309. If $x \oplus y = x^2 + 2y$, what is the value of p if $4 \oplus (3 \oplus p) = 50$?
(*a*) 4 (*b*) 7
(*c*) 8 (*d*) 12.5

310. If $a * b * c$ means $\frac{a+b}{c}$ for all numbers except 0, then $(a * b * c) * a * b$ is equal to
(*a*) 0 (*b*) 1
(*c*) $\frac{a+b+c}{ab}$ (*d*) $\frac{a+b+ac}{bc}$
(*e*) $\frac{ab+bc+ca}{a+b+c}$

Directions* (*Questions 311 to 313*): *Each question below consists of a number. Your task is to follow the following steps in order to find the result from the given alternatives. **(M.C.A., 2005)**

Step I: Multiply the number by 3 and add the square of the number.
Step II: Divide the result obtained after Step I by 5 and add 6.
Step III: Divide the result obtained after Step II by 3 and then square the resulting number.

311. 6 (*a*) 13 (*b*) 30
(*c*) 31.03 (*d*) 31.36

312. 2.5 (*a*) 8.10 (*b*) 8.51 (approx.)
(*c*) 18.05 (*d*) 80.50 (approx.)

313. 5 (*a*) 2.80 (*b*) 12.80
(*c*) 20.08 (approx.) (*d*) 21.80 (approx.)

314. If the operation $\wedge$ is defined by the equation $x \wedge y = 2x + y$, what is the value of a in $2 \wedge a = a \wedge 3$? **(Campus Recruitment, 2009)**
(*a*) 0 (*b*) – 1
(*c*) 1 (*d*) 4

315. If $\oplus$ is an operation such that $a + b = \begin{cases} 2a, \text{ when } a > b \\ a + b, \text{ when } a < b \\ a^2, \text{ when } a = b \end{cases}$,
then $\left[\frac{(5 \oplus 7) + (4 \oplus 4)}{3(5 \oplus 5) - (15 \oplus 11) - 3}\right]$ is equal to **(C.P.O., 2007)**
(*a*) $\frac{1}{3}$ (*b*) $\frac{2}{3}$
(*c*) $\frac{14}{13}$ (*d*) $\frac{14}{23}$

316. At Srinagar, starting at 9 a.m. on a certain day, snow began to fall at a rate of $1\frac{1}{4}$ inches every two hours until 3 p.m. If there was already $2\frac{1}{4}$ inches of snow on the ground at 9 a.m., how many inches of snow was on the ground at 3 p.m. that day?
(*a*) $3\frac{3}{4}$ (*b*) 6
(*c*) 7 (*d*) $7\frac{1}{2}$

317. A squirrel starts climbing up a tree at the speed of 6 metres a minute but after every 6 metres it slips down 4 metres in the next minute. It will be able to reach the top 120 metres high in **(R.R.B., 2006)**
(*a*) 20 minutes (*b*) 60 minutes
(*c*) 115 minutes (*d*) $1\frac{1}{2}$ hours

318. Ram had ₹ 1000 in his Savings Bank Account. Every month in the first week he needs money, so he withdraws ₹ 500, but by the end of the month, he deposits ₹ 750. After how many months the original amount will grow three times? **(R.R.B., 2005)**
(*a*) 6 months (*b*) 7 months
(*c*) 8 months (*d*) 9 months

319. The growth of a medicinal plant of height 1 metre, is 1 cm/day and it is growing straight vertically upward. A man cuts 6 cm from the top, at a regular interval of every 11 days. Its height will be 2 metres after **(I.A.M., 2007)**
(*a*) 220 days (*b*) 250 days
(*c*) 275 days (*d*) None of these

320. A stairway 10 ft. high is such that each step accounts for half a foot upward and one foot forward. What distance will an ant travel if it starts from ground level to reach the top of the stairway? **(R.R.B., 2009)**
(*a*) 30 ft. (*b*) 33 ft.
(*c*) 10 ft. (*d*) 29 ft.

321. The sum of all proper fractions whose denominators are less than or equal to 100, is
(*a*) $22\frac{1}{4}$ (*b*) 1925
(*c*) 2475 (*d*) None of these

322. The value of $\frac{1-x^4}{1+x} \div \frac{1+x^2}{x} \times \frac{1}{x(1-x)}$ is
(*a*) 1 (*b*) $1 - x^2$
(*c*) $\frac{1}{x}$ (*d*) $1 + x$
(*e*) None of these

323. $\frac{17}{15}\times\frac{17}{15}+\frac{2}{15}\times\frac{2}{15}-\frac{17}{15}\times\frac{4}{15}$ is equal to

(*a*) 0 (*b*) 1
(*c*) 10 (*d*) 11

324. $2\times13\frac{3}{4}\times5\frac{1}{4}+5\frac{1}{4}\times5\frac{1}{4}+13\frac{3}{4}\times13\frac{3}{4}=?$

(*a*) 311 (*b*) 316
(*c*) 361 (*d*) 380

325. The simplification of $\left(\frac{75983\times75983-45983\times45983}{30000}\right)$ yields the result

(*a*) 121796 (*b*) 121866
(*c*) 121956 (*d*) 121966

326. Simplify: $\frac{13\frac{4}{7}\times13\frac{4}{7}+8\frac{3}{7}\times8\frac{3}{7}}{13\frac{4}{7}+8\frac{3}{7}}$ **(R.R.B., 2006)**

(*a*) 18 (*b*) 20
(*c*) 22 (*d*) 24

327. $\frac{(a-b)^2-(a+b)^2}{-4a}=\frac{x}{y}$. On simplifying the given equation, which of the following equations will be obtained? **(Bank P.O., 2009)**

(*a*) $xy = b$ (*b*) $bx = y$
(*c*) $ab = x$ (*d*) $yb = x$
(*e*) $ay = x$

328. What is $\frac{\frac{7}{8}\times\frac{7}{8}+\frac{5}{6}\times\frac{5}{6}+\frac{7}{8}\times\frac{5}{3}}{\frac{7}{8}\times\frac{7}{8}-\frac{5}{6}\times\frac{5}{6}}$ equal to? **(S.S.C., 2007)**

(*a*) $\frac{41}{24}$ (*b*) $\frac{1}{24}$
(*c*) 41 (*d*) None of these

329. The simplified value of $1998^2-1997^2+1996^2-1995^2+1994^2-1993^2$ is

(*a*) 11953 (*b*) 11958
(*c*) 11963 (*d*) 11973

330. $\frac{(856+167)^2+(856-167)^2}{856\times856+167\times167}=?$

(*a*) 1 (*b*) 2
(*c*) 689 (*d*) 1023

331. $\frac{(469+174)^2-(469-174)^2}{469\times174}=?$ **(M.B.A., 2002)**

(*a*) 2 (*b*) 4
(*c*) 295 (*d*) 643

332. If $a - b = 3$ and $a^2 + b^2 = 29$, find the value of ab. **(R.R.B., 2003)**

(*a*) 10 (*b*) 12
(*c*) 15 (*d*) 18

333. If $\frac{x^2-1}{x+1}=4$, $x = ?$

(*a*) 0 (*b*) 1
(*c*) 5 (*d*) Cannot be determined
(*e*) None of these

334. $\frac{\left(3\frac{2}{3}\right)^2-\left(2\frac{1}{2}\right)^2}{\left(4\frac{3}{4}\right)^2-\left(3\frac{1}{3}\right)^2}\div\frac{3\frac{2}{3}-2\frac{1}{2}}{4\frac{3}{4}-3\frac{1}{3}}=?$

(*a*) $\frac{37}{97}$ (*b*) $\frac{74}{97}$
(*c*) $1\frac{23}{74}$ (*d*) None of these

335. The simplified value of

$$\frac{\left(1+\frac{1}{1+\frac{1}{100}}\right)\left(1+\frac{1}{1+\frac{1}{100}}\right)-\left(1-\frac{1}{1+\frac{1}{100}}\right)\left(1-\frac{1}{1+\frac{1}{100}}\right)}{\left(1+\frac{1}{1+\frac{1}{100}}\right)+\left(1-\frac{1}{1+\frac{1}{100}}\right)}$$ is

(*a*) 100 (*b*) $\frac{200}{101}$
(*c*) 200 (*d*) $\frac{202}{100}$

336. The value of $\frac{769435\times770001-566}{769435+770001\times769434}$ is

(*a*) − 1 (*b*) − 2
(*c*) 1 (*d*) 2

337. If $a - b = 1$, then the value of $a^3 - b^3 - 3ab$ will be

(*a*) − 3 (*b*) − 1
(*c*) 1 (*d*) 3

338. If $x - y = 1$ and $x^2 + y^2 = 41$, then the value of $x + y$ will be

(*a*) 5 or 4 (*b*) − 5 or − 4
(*c*) ± 9 (*d*) ± 1

339. If $x^4 + y^4 = 17$ and $x + y = 1$, then what is the value of $x^2y^2 - 2xy$?

(*a*) 8 (*b*) 10
(*c*) 12 (*d*) 16

340. If $x = a + m$, $y = b + m$, $z = c + m$, the value of $\frac{x^2+y^2+z^2-yz-zx-xy}{a^2+b^2+c^2-ab-bc-ca}$ is

(*a*) 1 (*b*) $\frac{x+y+z}{a+b+c}$
(*c*) $\frac{a+b+c}{x+y+z}$ (*d*) not possible to find

341. If $a + b + c = 13$, $a^2 + b^2 + c^2 = 69$, then find $ab + bc + ca$.
(a) – 50 (b) 50
(c) 69 (d) 75

342. If $\frac{x^2+y^2+z^2-64}{xy-yz-zx} = -2$ and $x + y = 3z$, then the value of z is
(a) 2 (b) 3
(c) 4 (d) None of these

343. $\left(\frac{785\times785\times785+435\times435\times435}{785\times785+435\times435-785\times435}\right)$ simplifies to
(a) 350 (b) 785
(c) 1220 (d) 1320

344. $\left(\frac{147\times147+147\times143+143\times143}{147\times147\times147-143\times143\times143}\right) = ?$
(a) $\frac{1}{4}$ (b) 290
(c) $\frac{1}{290}$ (d) 4

345. $\frac{(13)^3+7^3}{(13)^2+7^2-?} = 20$
(a) 6 (b) 20
(c) 91 (d) None of these

346. The value of $\frac{\left(\frac{3}{5}\right)^3-\left(\frac{2}{5}\right)^3}{\left(\frac{3}{5}\right)^2-\left(\frac{2}{5}\right)^2}$ is **(S.S.C., 2003)**
(a) $\frac{1}{5}$ (b) $\frac{19}{25}$
(c) $\frac{21}{25}$ (d) 1

347. $\frac{38\times38\times38+34\times34\times34+28\times28\times28-38\times34\times84}{38\times38+34\times34+28\times28-38\times34-34\times28-38\times28}$
is equal to
(a) 24 (b) 32
(c) 44 (d) 100

348. The value of $\frac{(x-y)^3+(y-z)^3+(z-x)^3}{9(x-y)(y-z)(z-x)}$ is equal to
(a) 0 (b) $\frac{1}{9}$
(c) $\frac{1}{3}$ (d) 1

349. If $x = 5$, $y = 3$, the value of $\frac{x^3-y^3}{x^2-y^2}-\frac{3xy}{x+y}$ will be **(P.C.S., 2009)**
(a) 1 (b) $\frac{1}{2}$
(c) $\frac{3}{2}$ (d) $\frac{5}{2}$

350. If $a + b + c = 11$ and $ab + bc + ca = 20$, then the value of the expression $a^3 + b^3 + c^3 - 3abc$ will be
(a) 121 (b) 341
(c) 671 (d) 781

351. The value of $\frac{(x-y)^3+(y-z)^3+(z-x)^3}{(x^2-y^2)^3+(y^2-z^2)^3+(z^2-x^2)^3}$ is
(a) 0
(b) 1
(c) $[2(x + y + z)]^{-1}$
(d) $[(x + y)(y + z)(z + x)]^{-1}$

352. If $a + b + c = 0$, the value of $\frac{a^2}{bc}+\frac{b^2}{ca}+\frac{c^2}{ab}$ is
(a) $3abc$ (b) $\frac{1}{3}$
(c) 1 (d) 3

353. If $a = 29$, $b = 24$, $c = 27$, the value of $a^3 + b^3 + c^3 - 3abc$ is
(a) 1420 (b) 1520
(c) 1620 (d) 1920

354. If $\frac{x^2-1}{x} = 4$, then $\frac{x^6-1}{x^3}$ is
(a) 63 (b) 66
(c) 75 (d) 76

355. $(32)^3 + (79)^3 - (111)^3 + 3 \times 32 \times 79 \times 111$ is equal to
(a) 0 (b) 1
(c) 10000 (d) 30007

356. If $(x + y) = 3$, $xy = 2$, then what is the value of $x^3 + y^3$?
(a) 6 (b) 7
(c) 8 (d) 9
(e) None of these

357. The value of $\frac{x^2-(y-z)^2}{(x+z)^2-y^2}+\frac{y^2-(x-z)^2}{(x+y)^2-z^2}+\frac{z^2-(x-y)^2}{(y+z)^2-x^2}$ is **(M.B.A., 2006)**
(a) – 1 (b) 0
(c) 1 (d) None of these

358. If $\frac{p}{a}+\frac{q}{b}+\frac{r}{c}=1$ and $\frac{a}{p}+\frac{b}{q}+\frac{c}{r}=0$ where a, b, c, p, q, r are non-zero real numbers, then $\frac{p^2}{a^2}+\frac{q^2}{b^2}+\frac{r^2}{c^2}$ is equal to
(a) 0 (b) 1
(c) 3 (d) 9

359. If $x^4 - y^4 = 15$, then find the value of $x^4 + y^4$, where x and y are natural numbers.
(*a*) 17 (*b*) 31
(*c*) 71 (*d*) 113

360. Along a yard 225 metres long, 26 trees are planted at equal distances, one tree being at each end of the yard. What is the distance between two consecutive trees?
(*a*) 8 metres (*b*) 9 metres
(*c*) 10 metres (*d*) 15 metres

361. In a garden, there are 10 rows and 12 columns of mango trees. The distance between the two trees is 2 metres and a distance of one metre is left from all sides of the boundary of the garden. The length of the garden is
(*a*) 20 m (*b*) 22 m
(*c*) 24 m (*d*) 26 m

362. A farmer has decided to build a wire fence along one straight side of his property. For this, he planned to place several fence-posts at 6 m intervals, with posts fixed at both ends of the side. After he bought the posts and wire, he found that the number of posts he had bought was 5 less than required. However, he discovered that the number of posts he had bought would be just sufficient if he spaced them 8 m apart. What is the length of the side of his property and how many posts did he buy? **(M.A.T., 2007)**
(*a*) 100 m, 15 (*b*) 100 m, 16
(*c*) 120 m, 15 (*d*) 120 m, 16

363. On a 2 km road, a total number of 201 trees are planted on each side of the road at equal distances. How many such trees in all will be planted on both sides of a 50 km road such that the distance between two consecutive trees is the same as that of the consecutive trees on the 2 km road?
(*a*) 501 (*b*) 5000
(*c*) 5001 (*d*) 5025
(*e*) 5050

364. When all the students in a school are made to stand in rows of 54, 30 such rows are formed. If the students are made to stand in rows of 45, how many such rows will be formed? **(Bank P.O., 2010)**
(*a*) 25 (*b*) 32
(*c*) 36 (*d*) 42
(*e*) None of these

365. There are x trees and y parrots. If in each tree only one parrot is sitting, then one parrot remains without a tree. If in each tree, two parrots are sitting, then one tree remains without a parrot. Therefore, x and y are respectively
(*a*) 3 and 4 (*b*) 4 and 5
(*c*) 5 and 6 (*d*) 6 and 7

366. In a classroom, there are certain number of benches. If 6 students are made to sit on a bench, then to accommodate all of them, one more bench is needed. However, if 7 students are made to sit on a bench, then after accommodating all of them, space for 5 students is left. What is the total number of students in the class?
(*a*) 30 (*b*) 42
(*c*) 72 (*d*) None of these

367. There are benches in a classroom. If 4 students sit on each bench, then three benches are left vacant and if 3 students sit on each bench, then 3 students are left standing. The total number of students in the class is
(*a*) 36 (*b*) 42
(*c*) 48 (*d*) 54

368. Students of a class are preparing for a drill and are made to stand in rows. If 4 students are extra in a row, then there would be 2 rows less. But there would be 4 more rows if 4 students are less in a row. The number of students in the class is **(M.A.T., 2006)**
(*a*) 56 (*b*) 65
(*c*) 69 (*d*) 96

369. If a sum of ₹ 275 is to be divided between Ram and Shyam so that Ram gets $\frac{3}{4}$th more of what Shyam gets, then the share of Ram will be
(*a*) ₹ 100 (*b*) ₹ 160
(*c*) ₹ 175 (*d*) ₹ 200

370. Sweets were distributed equally among 64 children. After giving 7 sweets to each child 15 sweets were left out. Total how many sweets were there? **(Bank P.O., 2009)**
(*a*) 436 (*b*) 446
(*c*) 448 (*d*) 463
(*e*) None of these

371. X gives $\frac{1}{2}$ of his property to his wife and $\frac{1}{2}$ of the rest to his son. The remainder is divided equally between his two daughters. The share of each daughter is
(*a*) $\frac{1}{4}$ (*b*) $\frac{1}{6}$
(*c*) $\frac{1}{8}$ (*d*) $\frac{2}{3}$

372. If each child is given 10 sweets, there are 3 sweets left over. But if each is given 11, then the number of sweets is 4 less. Find the number of sweets. **(R.R.B., 2009)**
(*a*) 37 (*b*) 57
(*c*) 73 (*d*) 75

373. 180 oranges are distributed among 70 boys and girls such that each boy gets 2 and each girl gets 3 oranges. The number of boys are
(*a*) 25 (*b*) 30
(*c*) 40 (*d*) 70

374. A farmer divides his herd of cows among his four sons so that first son gets one-half of the herd, the second son gets one-fourth, the third son one-fifth and the fourth son 7 cows. The total number of cows in the herd is **(R.R.B., 2006)**
(*a*) 100 (*b*) 140
(*c*) 180 (*d*) 240

375. A man had two sons. To the elder, he left $\frac{5}{11}$ of his property, to the younger $\frac{5}{11}$ of the remainder, the rest to the widow. Find the share of the sons if the widow gets ₹ 3600. **(M.B.A. 2007)**
(*a*) ₹ 1200, ₹ 1000 (*b*) ₹ 6600, ₹ 2000
(*c*) ₹ 7500, ₹ 1000 (*d*) None of these

376. If ₹ 370 are divided among 10 men, 12 women and 20 boys such that each man gets an amount equal to that received by one woman and one boy together and each woman gets twice the amount received by a boy, then the amount received by 10 men would be
(*a*) ₹ 100 (*b*) ₹ 120
(*c*) ₹ 130 (*d*) ₹ 150

377. A sum of ₹ 750 is distributed among *A*, *B*, *C* and *D* in such a manner that *A* gets as much as *B* and *C* together, *B* gets ₹ 125 more than *C* and *D* gets as much as *C*. What is *A*'s share?
(*a*) ₹ 100 (*b*) ₹ 225
(*c*) ₹ 275 (*d*) ₹ 325

378. A bonus of ₹ 1000 is to be divided among three people so that Rohit receives twice as much as Sachin, who receives one-fifth as much as Gagan. How much money should Gagan receive?
(*a*) ₹ 100 (*b*) ₹ 250
(*c*) ₹ 375 (*d*) ₹ 625

379. Three boys agree to divide a bag of marbles in the following manner. The first boy takes one more than half the marbles. The second takes a third of the number remaining. The third boy finds that he is left with twice as many marbles as the second boy. The original number of marbles **(M.B.A., 2011)**
(*a*) is 8 or 38
(*b*) is 14 or 32
(*c*) is 20 or 26
(*d*) Cannot be determined from the given data

380. A man has divided his total money in his will in such a way that half of it goes to his wife, $\frac{2}{3}$rd of the remaining among his three sons equally and the rest among his four daughters equally. If each daughter gets ₹ 20,000, how much money will each son get?
(*a*) ₹ 48,233.33 (*b*) ₹ 50,333.33
(*c*) ₹ 53,333.33 (*d*) Data inadequate
(*e*) None of these

381. Anand, Bijoy, Chetan and Dharma together have ₹ 47 with them. Anand and Bijoy together have ₹ 27; Chetan and Anand have ₹ 25 and Dharma and Anand have ₹ 23. How much money does Bijoy have?
(*a*) ₹ 9 (*b*) ₹ 11
(*c*) ₹ 13 (*d*) ₹ 28

382. When a sum of money was distributed to 12 persons instead of 16 persons, each person got ₹ 400 more. What was the sum?
(*a*) ₹ 14400 (*b*) ₹ 16000
(*c*) ₹ 19200 (*d*) Data inadequate
(*e*) None of these

383. After distributing the sweets equally among 25 children, 8 sweets remain. Had the number of children been 28, 22 sweets would have been left after equally distributing. What was the total number of sweets?
(*a*) 328 (*b*) 348
(*c*) 358 (*d*) Data inadequate

384. On a school's Annual Day sweets were to be equally distributed amongst 112 children. But on that particular day, 32 children were absent. Thus the remaining children got 6 extra sweets. How many sweets was each child originally supposed to get? **(Bank P.O., 2009)**
(*a*) 15 (*b*) 18
(*c*) 24 (*d*) Cannot be determined
(*e*) None of these

385. A sum of money is equally divided among a number of children. Had there been 16 children more, each would have received ₹ 2 less and had there been 16 fewer, each would have received ₹ 3 more. Find the sum of the money distributed.
(*a*) ₹ 880 (*b*) ₹ 896
(*c*) ₹ 928 (*d*) ₹ 960

386. Vidushi and Sanya distributed ₹ 100 each in charity. Vidushi distributes money to 5 more people than Sanya and Sanya gives each ₹ 1 more than Vidushi. How many people are recipients of the charity?
(*a*) 45 (*b*) 60
(*c*) 90 (*d*) None of these

387. In a classroom the number of boys is three times the number of girls. Which of the following numbers does not represent the total number of students in the classroom?
(*a*) 40 (*b*) 42
(*c*) 44 (*d*) 48

388. There are some boys and girls in a room. The square of the number of girls is less than the square of the number of boys by 28. If there were two more girls, the number of boys would have been the same as that of the girls. The total number of boys and girls in the room is (C.P.O., 2007)

(*a*) 7 (*b*) 10
(*c*) 14 (*d*) 56

389. A classroom has equal number of boys and girls. Eight girls left to play kho-kho, leaving twice as many boys as girls in the classroom. What was the total number of girls and boys present initially?

(*a*) 16 (*b*) 24
(*c*) 32 (*d*) Cannot be determined
(*e*) None of these

390. What is the value of the expression $(1 + x)(1 + x^2)(1 + x^4)(1 + x^8)(1 - x)$?

(*a*) $x^8 + 1$ (*b*) $x^{16} - 1$
(*c*) $1 + x^{16}$ (*d*) $1 - x^{16}$

391. The expression $\frac{1}{x-1}-\frac{1}{x+1}-\frac{2}{x^2+1}-\frac{4}{x^4+1}$ is equal to

(*a*) $\frac{8}{x^8+1}$ (*b*) $\frac{8}{x^8-1}$
(*c*) $\frac{8}{x^7-1}$ (*d*) $\frac{8}{x^7+1}$

392. $\left(x+\frac{1}{x}\right)\left(x-\frac{1}{x}\right)\left(x^2+\frac{1}{x^2}-1\right)\left(x^2+\frac{1}{x^2}+1\right)$ is equal to (S.S.C., 2006)

(*a*) $x^6-\frac{1}{x^6}$ (*b*) $x^8-\frac{1}{x^8}$
(*c*) $x^6+\frac{1}{x^6}$ (*d*) $x^8+\frac{1}{x^8}$

393. If $\left(x+\frac{1}{x}\right)=3$, then $\left(x^2+\frac{1}{x^2}\right)=?$

(*a*) 7 (*b*) 9
(*c*) 10 (*d*) 27

394. If $\left(a-\frac{1}{a}\right)=p$, then $\left(a^2+\frac{1}{a^2}\right)$ is equal to

(*a*) p (*b*) $p - 2$
(*c*) $p + 2$ (*d*) None of these

395. If $\frac{x-1}{x}=3$, then the value of $1+\frac{1}{x^2}$ is

(*a*) 9 (*b*) 10
(*c*) 11 (*d*) None of these

396. If $\left(x^2+\frac{1}{x^2}\right)=34$, then $\left(x+\frac{1}{x}\right)$ is equal to

(*a*) 3 (*b*) 4
(*c*) 5 (*d*) None of these

397. If $\left(x+\frac{1}{x}\right)=2$, then $\left(x-\frac{1}{x}\right)$ is equal to (R.R.B., 2006)

(*a*) 0 (*b*) 1
(*c*) 2 (*d*) 5

398. If $\left(a+\frac{1}{a}\right)=6$, then $\left(a^4+\frac{1}{a^4}\right)=?$ (R.R.B., 2008)

(*a*) 1154 (*b*) 1158
(*c*) 1160 (*d*) 1164

399. If $\left(x-\frac{1}{x}\right)=2$, then the value of $\left(x^4+\frac{1}{x^4}\right)$ is

(*a*) 4 (*b*) 8
(*c*) 12 (*d*) 34

400. If $\left(x-\frac{1}{x}\right)=\sqrt{21}$, the value of $\left(x^2+\frac{1}{x^2}\right)\left(x+\frac{1}{x}\right)$ is

(*a*) 42 (*b*) 63
(*c*) 115 (*d*) 120
(*e*) 125

401. If $\left(x^4+\frac{1}{x^4}\right)=322$, the value of $\left(x-\frac{1}{x}\right)$ is

(*a*) 4 (*b*) $3\sqrt{2}$
(*c*) 6 (*d*) 8

402. If $x+\frac{1}{x}=p$, the value of $x^3+\frac{1}{x^3}$ is

(*a*) $p^3+\frac{1}{p^3}$ (*b*) $p^3 - 3p$
(*c*) p^3 (*d*) $p^3 + 3p$

403. If $x-\frac{1}{x}=1$, then the value of $x^3-\frac{1}{x^3}$ is equal to

(*a*) 2 (*b*) 3
(*c*) 4 (*d*) 8

404. If $\left(a^4+\frac{1}{a^4}\right)=1154$, then the value of $\left(a^3+\frac{1}{a^3}\right)=?$

(*a*) 198 (*b*) 200
(*c*) 216 (*d*) None of these

405. If $\left(x+\frac{1}{x}\right)=3$, then the value of $\left(x^6+\frac{1}{x^6}\right)$ is

(*a*) 322 (*b*) 364
(*c*) 414 (*d*) 927

406. If $\left(x+\frac{1}{x}\right)=\sqrt{13}$, then the value of $\left(x^3-\frac{1}{x^3}\right)$ is (Delhi Police, 2010)

(*a*) 26 (*b*) 27
(*c*) 30 (*d*) 36

407. If $\left(4b^2+\frac{1}{b^2}\right)=2$, then $\left(8b^3+\frac{1}{b^3}\right)=?$ (S.S.C., 2008)

(*a*) 0 (*b*) 1
(*c*) 2 (*d*) 5

408. If $\left(2p+\frac{1}{p}\right)=4$, the value of $\left(p^3+\frac{1}{8p^3}\right)$ is **(S.S.C., 2010)**

(*a*) 4 (*b*) 5
(*c*) 8 (*d*) 15

409. In a herd of cows, the number of legs are 14 more than twice the number of heads. The number of cows in the herd is **(P.C.S., 2009)**

(*a*) 5 (*b*) 7
(*c*) 10 (*d*) 12

410. In a group of buffaloes and ducks, the number of legs is 24 more than twice the number of heads. What is the number of buffaloes in the group?

(*a*) 6 (*b*) 8
(*c*) 10 (*d*) 12

411. Krishan has some hens and some cows. If the total number of animal heads is 59 and the total number of feet is 190, how many cows does Krishan have? **(M.A.T., 2009)**

(*a*) 23 (*b*) 32
(*c*) 36 (*d*) Cannot be determined

412. There are some parrots and some tigers in a forest. If the total number of animal heads in the forest is 858 and the total number of animal legs is 1846, what is the number of parrots in the forest? **(Bank P.O., 2010)**

(*a*) 800 (*b*) 833
(*c*) 845 (*d*) Cannot be determined
(*e*) None of these

413. A certain number of horses and an equal number of men are going somewhere. Half of the owners are on their horses' back while the remaining ones are walking along leading their horses. If the number of legs walking on the ground is 70, then how many horses are there?

(*a*) 10 (*b*) 12
(*c*) 14 (*d*) 16

414. A railway half-ticket costs half the full fare and the reservation charge is the same on half ticket as on full ticket. One reserved first class ticket from Chennai to Trivandrum costs ₹ 216 and one full reserved and one half reserved first class tickets cost ₹ 327. What is the basic first class full fare and what is the reservation charge? **(R.R.B., 2009)**

(*a*) ₹ 105, ₹ 6 (*b*) ₹ 216, ₹ 12
(*c*) ₹ 210, ₹ 6 (*d*) ₹ 210, ₹ 12

415. An employee may claim ₹ 7 for each km when he travels by taxi and ₹ 6 for each km if he drives his own car. If in one week he claimed ₹ 675 for travelling 90 km, how many kms did he travel by taxi? **(L.I.C.A.A.O., 2007)**

(*a*) 135 (*b*) 155
(*c*) 162 (*d*) 170

416. In a party 15 people shake their hands with each other. How many times did the hand-shakes take place? **(R.R.B., 2009)**

(*a*) 105 (*b*) 120
(*c*) 135 (*d*) 165

417. In a group of children, each child exchanges a gift with every other child. If the number of gifts is 132, then the number of children in the group is

(*a*) 10 (*b*) 11
(*c*) 12 (*d*) 13

418. A man has 1044 candles. After burning, he can make a new candle from 9 stubs left behind. Find the maximum number of candles that can be made.

(*a*) 116 (*b*) 120
(*c*) 130 (*d*) 140

419. A computer printed 176400 lines in a given day. If the printer was in operation for 7 hours during the day, how many lines did it print per minute? **(Campus Recruitment, 2008)**

(*a*) 280 (*b*) 360
(*c*) 420 (*d*) 440

420. A man takes 8 minutes to type a page. If 1710 pages are to be typed in the afternoon between 1 o' clock to 2 o' clock, how many men are required? **(R.R.B., 2009)**

(*a*) 221 (*b*) 249
(*c*) 256 (*d*) None of these

421. Ashu reads at an average rate of 30 pages per hour while Neeru reads at an average rate of 40 pages per hour. If Ashu starts reading a novel at 2: 30 and Neeru begins reading an identical copy of the same book at 3: 20, at what time will they be reading the same page?

(*a*) 5: 00 (*b*) 5: 50
(*c*) 6: 40 (*d*) 7: 00
(*e*) 7: 30

422. In a test, a candidate secured 336 marks out of maximum marks *x*. If the maximum marks *x* had been converted into 400 marks, he would have secured 192 marks. What was the maximum marks of the test? **(Bank P.O., 2009)**

(*a*) 500 (*b*) 650
(*c*) 700 (*d*) 750
(*e*) 800

423. The marks scored in an examination are converted from 50 to 10 for the purpose of internal assessment. The highest marks were 47 and the lowest were 14. The difference between the maximum and the minimum internal assessment scores is

(*a*) 3.3 (*b*) 4.8
(*c*) 6.6 (*d*) 7.4

424. In an examination, a student scores 4 marks for every correct answer and loses 1 mark for every wrong answer. A student attempted all the 200 questions and scored in all 200 marks. The number of questions he answered correctly was **(S.S.C., 2010)**

(*a*) 60 (*b*) 68
(*c*) 80 (*d*) 82

425. On a 26 question test, five points were deducted for each wrong answer and eight points were credited for each correct answer. If all the questions were answered, how many were correct if the score was zero?

(*a*) 6 (*b*) 9
(*c*) 10 (*d*) 13

426. In an examination, a student attempted 15 questions correctly and secured 40 marks. If there were two types of questions (2 marks and 4 marks questions), how many questions of 2 marks did he attempt correctly?

(*a*) 5 (*b*) 10
(*c*) 20 (*d*) 40

427. In an examination there are 30 questions. 1 mark is given for each correct answer and 0.25 is deducted for every incorrect answer. Ankur attempted all the questions and scored 13.75. How many incorrect answers did he have? **(XAT, 2009)**

(*a*) 10 (*b*) 11
(*c*) 12 (*d*) 15
(*e*) None of these

428. For aiming at a target a person gets one rupee each time when he hits it and loses one rupee when he misses it. If he gets ₹ 30 after aiming at the target one hundred times, then how many times did he miss the target? **(P.C.S., 2009)**

(*a*) 25 (*b*) 35
(*c*) 40 (*d*) 45

429. There are some cows, bulls and 45 hens in a group. One caretaker looks after 15 animals. The number of bulls is twice the number of cows. If the number of heads is less than the total number of feet by 186 (including the caretakers), how many caretakers are there?

(*a*) 5 (*b*) 6
(*c*) 8 (*d*) 9
(*e*) None of these

430. A man's basic pay for a 40 hours' week is ₹ 200. Overtime is paid at 25% above the basic rate. In a certain week, he worked overtime and his total was ₹ 300. He, therefore, worked for a total of (in hours) **(L.I.C.A.A.O., 2007)**

(*a*) 52 (*b*) 56
(*c*) 58 (*d*) 62

431. In a regular week, there are 5 working days and for each day, the working hours are 8. A man gets ₹ 24 per hour for regular work and ₹ 32 per hour for overtime. If he earns ₹ 4320 in 4 weeks, then how many hours does he work for?

(*a*) 160 (*b*) 175
(*c*) 180 (*d*) 195

432. David gets on the elevator at the 11th floor of a building and rides up at the rate of 57 floors per minute. At the same time, Albert gets on an elevator at the 51st floor of the same building and rides down at the rate of 63 floors per minute. If they continue travelling at these rates, then at which floor will their paths cross? **(M.B.A., 2008)**

(*a*) 19th (*b*) 28th
(*c*) 30th (*d*) 37th

433. Mr. Shah decided to walk down the escalator of a tube station. He found that if he walks down 26 steps, he requires 30 seconds to reach the bottom. However, if he steps down 34 stairs he would only require 18 seconds to get to the bottom. If the time is measured from the moment the top step begins to descend to the time he steps off the last step at the bottom, find out the height of the stairway in steps. **(Campus Recruitment, 2009)**

(*a*) 42 (*b*) 46
(*c*) 52 (*d*) 54

434. Mohan engaged a servant on the condition that he would pay him ₹ 200 and a uniform after 10 days. The servant served only for 5 days and got ₹ 20 and a uniform. Find the price of the uniform. **(R.R.B. 2006)**

(*a*) ₹ 80 (*b*) ₹ 120
(*c*) ₹ 140 (*d*) ₹ 160

435. A labourer was engaged for 20 days on the condition that he will receive ₹ 60 for each day he works and he will be fined ₹ 5 for each day he is absent. If he received ₹ 745 in all, then the number of days on which he remained absent is

(*a*) 3 (*b*) 5
(*c*) 7 (*d*) 9

436. The taxi charges in a city comprise of a fixed charge, together with the charge of the distance covered. For a journey of 16 km, the charges paid are ₹ 156 and for a journey of 24 km, the charges paid are ₹ 204. What will a person have to pay for travelling a distance of 30 km?

(*a*) ₹ 236 (*b*) ₹ 240
(*c*) ₹ 248 (*d*) ₹ 252

437. M men agree to purchase a gift for ₹ D. If three men drop out how much more will each have to contribute towards the purchase of the gift? **(Campus Recruitment, 2008)**

(*a*) $\frac{D}{M-3}$ (*b*) $\frac{MD}{3}$
(*c*) $\frac{M}{D-3}$ (*d*) $\frac{3D}{M^2-3M}$

438. N number of persons decided to raise ₹ 3 lakhs by equal contributions from each. Had they contributed ₹ 50 each extra, the contribution would have been ₹ 3.25 lakhs. How many persons are there?
(*a*) 400 (*b*) 450
(*c*) 600 (*d*) Cannot be determined
(*e*) None of these

439. Each boy contributed rupees equal to the number of girls and each girl contributed rupees equal to the number of boys in a class of 60 students. If the total contribution thus collected is ₹ 1600, how many boys are there in the class? **(M.B.A., 2006)**
(*a*) 25 (*b*) 30
(*c*) 50 (*d*) Data inadequate

440. Eight people are planning to share equally the cost of a rental car. If one person withdraws from the arrangement and the others share equally the entire cost of the car, then the share of each of the remaining persons increased by
(*a*) $\frac{1}{7}$ (*b*) $\frac{1}{8}$
(*c*) $\frac{1}{9}$ (*d*) $\frac{7}{8}$

441. A person on tour has ₹ 360 for his daily expenses. If he extends his tour for 4 days, he has to cut his daily expenses by ₹ 3. Find the original duration of the tour.
(*a*) 15 days (*b*) 20 days
(*c*) 24 days (*d*) 30 days

442. Some students planned a picnic. The budget for food was ₹ 500. But, 5 of them failed to go and thus the cost of food for each member increased by ₹ 5. How many students attended the picnic? **(M.A.T., 2006)**
(*a*) 15 (*b*) 20
(*c*) 25 (*d*) 30

443. A class decided to have a party at a total cost of ₹ 720. Four students decided to stay out of the party. To meet the expenses the remaining students had to increase their share by ₹ 9. What is the original cost per student? **(M.A.T., 2010)**
(*a*) ₹ 18 (*b*) ₹ 20
(*c*) ₹ 24 (*d*) ₹ 36

444. A group of boys decided to buy a few CDs whose total price was between ₹ 200 and ₹ 250. But at the time of purchase, two of the boys declined to contribute as a result of which the remaining boys had to pay Re 1 more than they had originally planned. What was the price of the CDs if the boys contributed equally and in whole number of rupees?
(*a*) ₹ 210 (*b*) ₹ 220
(*c*) ₹ 230 (*d*) ₹ 240

445. Rahul owes ₹ X and gives a ₹ 50 note in payment. He receives the following change: $3X$ fifty-paise coins, 14 ten-paise coins and $4X$ five-paise coins. X is equal to:
(*a*) 12 (*b*) 16
(*c*) 18 (*d*) 22

446. A total of 324 coins of 20 paise and 25 paise make a sum of ₹ 71. The number of 25-paise coins is
(*a*) 120 (*b*) 124
(*c*) 144 (*d*) 200

447. A man has one-rupee, 5-rupee and 10-rupee currency notes of worth ₹ 480. If the number of notes of each denomination be same, then the total number of notes will be **(R.R.B., 2007)**
(*a*) 45 (*b*) 60
(*c*) 75 (*d*) 90

448. The total value of a collection of coins of denominations Re 1, 50-paise, 25-paise, 10-paise and 5-paise is ₹ 380. If the number of coins of each denomination is the same, then the number of one-rupee coins is
(*a*) 160 (*b*) 180
(*c*) 200 (*d*) 220

449. A bag contains three types of coins — 1-rupee coins, 50 p-coins and 25 p-coins totalling 175 coins. If the total value of the coins of each kind be the same, the total amount in the bag is
(*a*) ₹ 75 (*b*) ₹ 126
(*c*) ₹ 175 (*d*) ₹ 300

450. In a box, there are a certain number of coins which amount to ₹ 25. There are 2-rupee coins, 50-paise coins and 25-paise coins. If there are at least one 2-rupee coin, two 50-paise coins and two 25-paise coins, then what could be the minimum number of coins in the box?
(*a*) 12 (*b*) 14
(*c*) 16 (*d*) 18

Directions (*Questions 451 to 452*): *These questions are based on the following information:* **(Campus Recruitment, 2008)**

85 children went to an amusement park where they could ride on merry-go-round, roller coaster and Ferris wheel. It was known that 20 of them took all the three rides and 55 of them have taken at least two of the three rides. Each ride costs Re 1, and the total receipt of the amusement park was ₹ 145.

451. How many children took exactly one ride?
(*a*) 5 (*b*) 10
(*c*) 15 (*d*) 20

452. How many children did not try any of the rides?
(*a*) 5 (*b*) 10
(*c*) 15 (*d*) 20

453. In a class of 50 students, 25 take Bengali, 16 take Hindi, 12 students take no language. How many take both Bengali and Hindi? **(P.C.S., 2008)**
(*a*) 3 (*b*) 4
(*c*) 9 (*d*) 13

454. Out of 100 students in a class, 60 take tea, 40 take coffee and 25 take both. The number of students not taking either tea or coffee is **(P.C.S., 2009)**
(*a*) 25 (*b*) 28
(*c*) 30 (*d*) 32

455. In a class of 25 students, 12 have taken Mathematics, 8 have taken Mathematics but not Biology. The number of students who have taken both Mathematics and Biology is **(R.R.B., 2006)**
(*a*) 4 (*b*) 8
(*c*) 24 (*d*) 36

456. In a group of 52 persons, 16 drink tea but not coffee and 33 drink tea. How many drink coffee but not tea? **(M.B.A., 2008)**
(*a*) 3 (*b*) 7
(*c*) 17 (*d*) 19

457. In a town with population of 4000, 3000 people are egg eaters, 2000 meat eaters and 1500 eat both eggs and meat. How many are pure vegetarians?
(*a*) 400 (*b*) 500
(*c*) 1000 (*d*) 1500

458. There are 50 students admitted to a nursery class. Some students can speak only English and some can speak only Hindi. Ten students can speak both English and Hindi. If the number of students who can speak English is 21, then how many students can speak Hindi, how many can speak only Hindi and how many can speak only English?
(*a*) 21, 11 and 29 respectively
(*b*) 28, 18 and 22 respectively
(*c*) 37, 27 and 13 respectively
(*d*) 39, 29 and 11 respectively

459. In an office, $\frac{3}{4}$ of the staff can neither type nor take shorthand. However, $\frac{1}{5}$th can type and $\frac{1}{3}$rd can take shorthand. What part of the whole staff can do both?
(*a*) $\frac{1}{5}$ (*b*) $\frac{3}{40}$
(*c*) $\frac{13}{40}$ (*d*) $\frac{17}{60}$

460. In a group of players in a college, 20 are in the basketball team, 24 in the hockey team and 27 in the cricket team. If 12 play hockey and basketball, 10 play cricket and basketball, 14 play hockey and cricket and 7 play all the three games, then the total number of players in the group is
(*a*) 42 (*b*) 43
(*c*) 45 (*d*) 49

461. In the cinema set of a movie, 125 mechanical aliens were created. Some of these aliens had peculiar features. 40 had two noses, 30 had three legs, 20 had four ears, 10 had two noses and three legs, 12 had three legs and four ears, 5 had two noses and four ears and 3 had all the three unusual features. How many were there without any of these unusual features?
(*a*) 5 (*b*) 35
(*c*) 80 (*d*) None of these

Directions ***(Questions 462 to 466): These questions are based on the following information:*** **(S.B.I.P.O., 2007)**

Children in a class play only one or two or all of the three games – badminton, football and cricket. 5 children play only cricket, 8 children play only football and 7 children play only badminton. 3 children play only two games – badminton and football, 4 children play only two games – cricket and football, and another 4 children play only two games – badminton and cricket. 2 children play all the three games.

462. How many children play football as well as cricket?
(*a*) 4 (*b*) 6
(*c*) 7 (*d*) 15
(*e*) None of these

463. In all, how many children play badminton?
(*a*) 12 (*b*) 13
(*c*) 14 (*d*) 17
(*e*) None of these

464. In all, how many children play football?
(*a*) 8 (*b*) 14
(*c*) 15 (*d*) 17
(*e*) None of these

465. How many children play badminton as well as cricket?
(*a*) 4 (*b*) 6
(*c*) 9 (*d*) 10
(*e*) None of these

466. Total how many children are there in the class?
(*a*) 31 (*b*) 33
(*c*) 35 (*d*) 36
(*e*) None of these

467. A survey on a sample of 25 new cars being sold at a local auto dealer was conducted to see which of the three popular options – air-conditioning, radio and power windows – were already installed. **(M.A.T., 2006)**

The survey found:
15 had air-conditioning
2 had air-conditioning and power windows but not radios
12 had radio
6 had air-conditioning and radio but no power-windows
11 had power-windows
4 had radio and power windows
3 had all three options

What is the number of cars that had none of the options?
(*a*) 1 (*b*) 2
(*c*) 3 (*d*) 4

468. In a class of 50 students, 23 speak English, 15 speak Hindi and 18 speak Punjabi. 3 speak only English and Hindi, 6 speak only Hindi and Punjabi and 6 speak only English and Punjabi. If 9 speak only English, then how many speak all the three?
(*a*) 1 (*b*) 2
(*c*) 3 (*d*) 5

469. In a hospital, there were 200 Diabetes, 150 Hyperglycaemia and 150 Gastro-enteritis patients. Of these, 80 patients were treated for both Diabetes and Hyperglycaemia. Sixty patients were treated for Gastro-enteritis and Hyperglycaemia, while 70 were treated for Diabetes and Gastro-enteritis. Some of these patients have all the three diseases. Doctor Dennis treats patients with only Diabetes. Doctor Hormis treats patients with only Hyperglycaemia and Doctor Gerard treats patients with only Gastro-enteritis. Doctor Paul is a Generalist. Therefore, he can treat patients with multiple diseases. Patients always prefer a specialist for their disease. If Dr. Dennis had 80 patients, then the other three doctors can be arranged in terms of the number of patients treated as
(*a*) Paul > Hormis > Gerard
(*b*) Gerard > Paul > Hormis
(*c*) Paul > Gerard > Hormis
(*d*) None of these

470. In a joint family of 18 members, 10 take milk, 8 take tea and 6 take coffee; 5 take milk as well as tea but none takes milk and coffee. The number of members who take tea as well as coffee is
(*a*) None (*b*) 1
(*c*) 2 (*d*) 3

Directions ***(Questions 471 to 475): Study the following information carefully to answer the given questions:***
(Bank P.O., 2006)

The teachers' colony has 2800 members, out of which 650 members read only English newspaper. 550 members read only Hindi newspaper and 450 members read only Marathi newspaper. The number of members reading all the 3 newspapers is 100. Members reading Hindi as well as English newspaper are 200. 400 members read Hindi as well as Marathi newspaper and 300 members read English as well as Marathi newspaper.

471. Find the number of members reading Hindi newspaper.
(*a*) 750 (*b*) 980 (*c*) 1000
(*d*) 1020 (*e*) None of these

472. How many members read only one newspaper?
(*a*) 1540 (*b*) 1560
(*c*) 1640 (*d*) 1650
(*e*) None of these

473. Find the number of members reading no newspaper.
(*a*) 150 (*b*) 460
(*c*) 550 (*d*) 750(*e*) None of these

474. How many members read at least two newspapers?
(*a*) 500 (*b*) 600
(*c*) 800 (*d*) 1000
(*e*) None of these

475. Find the difference between the number of members reading English as well as Marathi newspaper and the number of members reading English as well as Hindi newspaper.
(*a*) 50 (*b*) 100
(*c*) 200 (*d*) 300
(*e*) None of these

476. In a garrison, there was some pilferage of ration everyday. If the pilferage was 12 kg a day, the ration would have lasted for 75 days. If the pilferage was restricted to 8 kg per day, the ration would have lasted for 90 days. For how many days would the ration have lasted, if there was no pilferage?
(*a*) 105 (*b*) 120
(*c*) 150 (*d*) 180

477. Two candles having the same lengths are such that one burns out completely in 3 hours at a uniform rate and the other in 4 hours. At what time should both the candles be lighted together so that at 4 P.M. the length of one is twice the length of the other?
(A.A.O. Exam, 2010)
(*a*) 1: 24 P.M. (*b*) 1: 30 P.M.
(*c*) 1: 36 P.M. (*d*) 1: 42 P.M.

478. A man purchased 40 fruits – apples and oranges – for ₹ 17. Had he purchased as many oranges as apples and as many apples as oranges, he would have paid ₹ 15. Find the cost of one pair of an apple and an orange. **(SNAP, 2007)**
(*a*) 60 paise (*b*) 70 paise
(*c*) 80 paise (*d*) 1 rupee

479. A buyer purchased few books of equal value for a total cost of ₹ 720. If the value of each were ₹ 2 less than the price at which the buyer originally bought, she could have purchased 4 more books than what she had bought. How many books did she originally purchase? **(M.A.T., 2006)**
(*a*) 18 (*b*) 20
(*c*) 34 (*d*) 36

480. A small confectioner bought a certain number of pastries flavoured pineapple, mango and black-forest from the bakery, giving for each pastry as many rupees as there were pastry of that kind; altogether he bought 23 pastries and spent ₹ 211. Find the number of each kind of pastry that he bought, if mango pastry is cheaper than pineapple pastry and dearer than black-forest pastry. **(I.I.F.T., 2010)**
(*a*) (10, 9, 4) (*b*) (11, 9, 3)
(*c*) (10, 8, 5) (*d*) (11, 8, 4)

481. One test tube contains some acid and another test tube contains an equal quantity of water. To prepare a solution, 20 grams of the acid is poured into the second test tube. Then, two-thirds of the so-formed solution is poured from the second tube into the first. If the fluid in first test tube is four times that in the second, what quantity of water was taken initially? **(M.A.T. 2009; N.M.A.T., 2005)**

(*a*) 40 grams (*b*) 60 grams
(*c*) 80 grams (*d*) 100 grams

482. One bottle is half-full of milk and another bottle with twice the capacity is one-quarter full of milk. If water is added so that both the bottles are full and the contents of both are then poured into a third bottle that is empty and large enough to hold the contents of both, what fraction of the contents in the third bottle is milk? **(Campus Recruitment, 2008)**

(*a*) $\frac{1}{4}$ (*b*) $\frac{1}{3}$
(*c*) $\frac{2}{3}$ (*d*) $\frac{3}{8}$

483. A train started with 540 passengers. At the first stop $\frac{1}{9}$ of them got down and 24 got up. On its second stop $\frac{1}{8}$ of the passengers then existing got down and 9 got up. With how many passengers did it reach the third stop? **(R.R.B., 2008)**

(*a*) 450 (*b*) 500
(*c*) 540 (*d*) 550

484. A train started from a station with a certain number of passengers. At the first halt, half of the passengers got down and 125 passengers got in. At the second halt, half of the passengers left and 100 entered. Then the train left for its destination with 250 passengers. The number of passengers in the train at the start was

(*a*) 250 (*b*) 350
(*c*) 450 (*d*) 550

485. The total number of digits used in numbering the pages of a book having 366 pages, is **(R.R.B., 2008)**

(*a*) 732 (*b*) 990
(*c*) 1098 (*d*) 1305

486. A printer numbers the pages of a book starting with 1 and uses 3189 digits in all. How many pages does the book have?

(*a*) 1000 (*b*) 1074
(*c*) 1075 (*d*) 1080

487. In a class, there are two sections *A* and *B*. If 10 students of section *B* shift over to section *A*, the strength of *A* becomes three times the strength of *B*. But if 10 students shift over from *A* to *B*, both *A* and *B* become equal in strength. How many students are there in sections *A* and *B*? **(R.R.B., 2006)**

(*a*) 80, 40 (*b*) 90, 40
(*c*) 45, 15 (*d*) 50, 30

488. Recently my brother and I played chess for chocolates. Whoever lost the game gave the other a chocolate. After the last game we counted the chocolates. I had 20 more chocolates than I started with, although he won 7 games. There were no draws. How many games did we play?

(*a*) 27 (*b*) 34
(*c*) 37 (*d*) 54

489. Robin says, "If Jai gives me ₹ 40, he will have half as much as Atul, but if Atul gives me ₹ 40, then the three of us will have the same amount." What is the total amount of money that Robin, Jai and Atul have between them?

(*a*) ₹ 240 (*b*) ₹ 320
(*c*) ₹ 360 (*d*) ₹ 420

490. *A*, *B*, *C* and *D* play a game of cards. *A* says to *B*, "If I give you 8 cards, you will have as many as *C* has and I shall have 3 less than what *C* has. Also, if I take 6 cards from *C*, I shall have twice as many as *D* has." If *B* and *D* together have 50 cards, how many cards has *A* got?

(*a*) 23 (*b*) 27
(*c*) 37 (*d*) 40

491. *A*, *B*, *C*, *D* and *E* play a game of cards. *A* says to *B*, "If you give me 3 cards, you will have as many as *E* has and if I give you 3 cards, you will have as many as *D* has." *A* and *B* together have 10 cards more than what *D* and *E* together have. If *B* has 2 cards more than what *C* has and the total number of cards be 133, how many cards does *B* have?

(*a*) 22 (*b*) 23
(*c*) 25 (*d*) 35

492. *A* gives *B* as many rupees as *B* has and *C* as many rupees as *C* has. Similarly, *B* then gives *A* and *C* as many rupees as each then has. *C*, similarly, then gives *A* and *B* as many rupees as each then has. If each finally has ₹ 16, with how many rupees does *A* start? **(M.B.A., 2010)**

(*a*) 26 (*b*) 28
(*c*) 30 (*d*) 32

493. Iqbal dealt some cards to Mushtaq and himself from a pack of playing cards and laid the rest aside. Iqbal then said to Mushtaq, "If you give me a certain number of your cards, I will have four times as many cards as you have. If I give you the same number of cards, I will have thrice as many cards as you." How many cards did Iqbal have?

(*a*) 9 (*b*) 12
(*c*) 31 (*d*) 35
(*e*) None of these

494. While out on picnic, a group of boys came upon an apple tree. One of the boys climbed the tree and picked enough apples for each boy to have three, with none left over. Then along came three boys, making it impossible to divide the picked apples evenly. However, after picking one more apple and adding it to the total, every boy had two apples, with none left over. How many apples were finally divided?

(*a*) 10 (*b*) 12
(*c*) 16 (*d*) 18

495. A teacher bought a certain number of friendship bands for the students in the classroom for Friendship Day celebrations. Each student gives a friendship band to every other student. However, on the Friendship Day, 2 students were absent as a result of which 122 friendship bands were not utilized. But one out of the two absent students came late. Find the number of friendship bands which finally remained unutilized.

(*a*) 57 (*b*) 59
(*c*) 62 (*d*) 64

496. Reena bought chocolates to distribute among her friends on her 18th birthday. If she gives 3 chocolates to each friend, one friend will get only 2 chocolates. Also, if she gives 2 chocolates to each friend, she will be left with 15 chocolates. How many chocolates did she buy?

(*a*) 44 (*b*) 47
(*c*) 50 (*d*) None of these

497. A certain organisation has three committees. Only two persons are members of all committees, but every pair of committees have three members in common. What is the least possible number of members on any one committee? **(Campus Recruitment, 2008)**

(*a*) 4 (*b*) 5
(*c*) 6 (*d*) None of these

498. In a certain game, each player scores either 2 points or 5 points. If n players score 2 points and m players score 5 points, and the total number of points scored is 50, what is the least possible difference between m and n?

(*a*) 1 (*b*) 3
(*c*) 5 (*d*) 7

499. A school has to buy at least 15 chairs within a budgetary ceiling of ₹ 2000. A chair with arms costs ₹ 160 and one without arms costs ₹ 100. What is the maximum number of chairs with arms that the school can buy?

(*a*) 7 (*b*) 8
(*c*) 9 (*d*) 12

500. On Monday, a certain animal shelter housed 55 cats and dogs. By Friday, exactly $\frac{1}{5}$ of the cats and $\frac{1}{4}$ of the dogs had been adopted; no new cats or dogs were brought to the shelter during this period. What is the greatest possible number of pets that could have been adopted from the animal shelter between Monday and Friday?

(*a*) 11 (*b*) 12
(*c*) 13 (*d*) 14

501. Out of two-thirds of the total number of basketball matches, a team has won 17 matches and lost 3 of them. What is the maximum number of matches that the team can lose and still win more than three-fourth of the total number of matches if it is true that no match can end in a tie?

(*a*) 3 (*b*) 4
(*c*) 5 (*d*) 6

502. Manick visited his cousin Aniket during the summer vacation. In the mornings, they both would go for swimming. In the evenings, they would play tennis. They would engage in at most one activity per day i.e., either they went swimming or played tennis each day. There were days when they took rest and stayed home all day long. There were 32 mornings when they did nothing, 18 evenings when they stayed at home, and a total of 28 days when they swam or played tennis. What duration of the summer vacation did Manick stay with Aniket? **(M.B.A. 2011)**

(*a*) 36 days (*b*) 39 days
(*c*) 46 days (*d*) 58 days

503. 10 cows can graze in a field for 15 days and 20 cows can graze in the same field for 10 days. For how many days can 30 cows graze in the field?

(*a*) 5 days (*b*) $7\frac{1}{2}$ days
(*c*) $7\frac{2}{3}$ days (*d*) $8\frac{1}{3}$ days
(*e*) Cannot be determined

504. Grass in a lawn grows equally thick and at a uniform rate. It takes 24 days for 70 cows and 60 days for 30 cows to eat the whole of the grass. How many cows are needed to eat the grass in 96 days?

(*a*) 18 (*b*) 20
(*c*) 24 (*d*) 36
(*e*) None of these

Directions ***(Questions 505-506): These questions are based on the following information:***

In a holy city, there are ten shrines and a certain number of holy lakes. A group of pilgrims stayed in the city for a few days and visited the shrines and lakes during their stay. At the end of the stay it turned out that in all each shrine was visited exactly by 4 pilgrims and each lake was visited exactly by 6 pilgrims. Each pilgrim visited exactly 5 shrines and 3 lakes.

505. The number of lakes in the holy city is

(*a*) 4 (*b*) 6

(*c*) 8 (*d*) 10

506. The number of pilgrims in the group is

(*a*) 4 (*b*) 6

(*c*) 8 (*d*) 10

507. From a number of apples, a man sells half the number of existing apples plus 1 to the first customer, sells $\frac{1}{3}$rd of the remaining apples plus 1 to the second customer and $\frac{1}{5}$th of the remaining apples plus 1 to the third customer. He then finds that he has 3 apples left. How many apples did he have originally?

(*a*) 15 (*b*) 18

(*c*) 20 (*d*) 25

508. Ravi has two examinations on Wednesday – Engineering Mathematics in the morning and Engineering Drawing in the afternoon. He has a fixed amount of time to read the textbooks of both these subjects on Tuesday. During this time he can read 80 pages of Engineering Mathematics and 100 pages of Engineering Drawing. Alternatively, he can also read 50 pages of Engineering Mathematics and 250 pages of Engineering Drawing. Assume that the amount of time it takes to read one page of the textbook of either subject is constant. Ravi is confident about Engineering Drawing and wants to devote full time to reading Engineering Mathematics. The number of Engineering Mathematics text book pages he can read on Tuesday is **(M.B.A., 2007)**

(*a*) 60 (*b*) 100

(*c*) 300 (*d*) 500

509. Rohan went to the post-office to buy five-rupee, two-rupee and one-rupee stamps. He paid the clerk ₹ 20, and since he had no change, he gave Rohan three more one-rupee stamps. If the number of stamps of each type that he had ordered initially was more than one, what was the total number of stamps that he bought?

(*a*) 8 (*b*) 9

(*c*) 10 (*d*) 12

510. Aditya went to a stationery shop to buy some Parker pens. Gel pens cost ₹ 300 each while fountain pens cost ₹ 400 each. Aditya spent a total of ₹ 3600 on pens. If he had bought as many fountain pens as the number of gel pens he actually bought and vice versa, he would have saved an amount equal to half the cost of one pen of one of the two types. Find the total number of pens he bought.

(*a*) 8 (*b*) 9

(*c*) 10 (*d*) 12

Directions ***(Questions 511-513): Study the following information carefully to answer these questions:***

A young girl Roopa leaves home with x flowers and goes to the bank of a nearby river. On the bank of the river, there are four places of worship, standing in a row. She dips all the x flowers into the river, the number of flowers doubles. Then, she enters the first place of worship and offers y flowers to the deity. She dips the remaining flowers into the river, and again the number of flowers doubles. She goes to the second place of worship and offers y flowers to the deity. She dips the remaining flowers into the river and again the number of flowers doubles. She goes to the third place of worship and offers y flowers to the deity. She dips the remaining flowers into the river and again the number of flowers doubles. She goes to the fourth place of worship and offers y flowers to the deity. Now she is left with no flowers in hand.

511. If Roopa leaves home with 30 flowers, the number of flowers she offers to each deity is

(*a*) 30 (*b*) 31

(*c*) 32 (*d*) 33

512. The minimum number of flowers that could be offered to each deity is

(*a*) 0 (*b*) 15

(*c*) 16 (*d*) Cannot be determined

513. The minimum number of flowers with which Roopa leaves home is

(*a*) 0 (*b*) 15

(*c*) 16 (*d*) Cannot be determined

514. The owner of a local jewellery store hired 3 watchmen to guard his diamonds, but a thief still got in and stole some diamonds. On the way out the thief met each watchman, one at a time. To each he gave $\frac{1}{2}$ of the diamonds he had then, and 2 more besides. He escaped with one diamond. How many did he steal originally?

(*a*) 25 (*b*) 36

(*c*) 40 (*d*) None of these

515. Three friends returning from a movie, stopped to eat at a restaurant. After dinner, they paid their bill

and noticed a bowl of mints, at the front counter. Divya took $\frac{1}{3}$ of the mints, but returned four because she had a momentary pang of guilt. Reema then took one-fourth of what was left but returned three for similar reasons. Shweta then took half of the remainder but threw two back into the bowl. The bowl had only 17 mints left when the raid was over. How many mints were originally in the bowl?

(*a*) 31 (*b*) 38
(*c*) 41 (*d*) None of these

516. At a stationery shop it costs ₹ 185 for 4 gel-pens, 8 ball-point pens and one marker pen and ₹ 315 for 7 gel-pens, 15 ball-point pens and one marker pen. Then what would be the cost of one gel-pen, one ball-point pen and one marker pen?

(*a*) ₹ 45 (*b*) ₹ 55
(*c*) ₹ 60 (*d*) ₹ 70

517. In a cricket match, Team A scored 232 runs without losing a wicket. The score consisted of byes, wides and runs scored by two opening batsmen, Ram and Shyam. The runs scored by the two batsmen are 26 times wides. There are 8 more byes than wides. If the ratio of runs scored by Ram and Shyam is 6: 7, then the runs scored by Ram is **(M.B.A., 2008)**

(*a*) 88 (*b*) 96
(*c*) 102 (*d*) 112
(*e*) None of these

518. Balls are arranged in rows to form an equilateral triangle. The first row consists of one ball, the second row consists of two balls and so on. If 669 more balls are added, then all the balls can be arranged in the shape of a square and each of the sides then contains 8 balls less than each side of the triangle had. The initial number of balls is

(*a*) 1500 (*b*) 1540
(*c*) 1600 (*d*) 1690

Directions ***(Questions 519 and 520): Refer to the data below and answer these questions:***

It took a group of men 5 days to shift 545 crates. Every day after the first, 6 more men than the previous day were put on the job. Also, every day after the first, each man, by arrangement, shifted 5 fewer crates than the earlier day. The result was that during the latter part of the period, the number of crates shifted per day began to go down.

519. What was the number of crates shifted on the third day?

(*a*) 26 (*b*) 137
(*c*) 152 (*d*) 169
(*e*) None of these

520. What was the number of men on the fifth day?

(*a*) 1 (*b*) 7
(*c*) 13 (*d*) 19
(*e*) None of these

521. $\frac{20+8\times0.5}{20-?}=12$. Find the value in place of (?)

[Indian Railway Group 'D' Exam, 2014]

(*a*) 2 (*b*) 8
(*c*) 18 (*d*) None of these

522. If $\frac{a}{b}+\frac{b}{a}=2$, then the value of $(a-b)$ is

[SSC—CHSL (10 + 2) Exam, 2015]

(*a*) 1 (*b*) 2
(*c*) –1 (*d*) 0

523. $24.96^2 \div (34.11 \div 20.05) + 67.96 - 89.11 = ?$

[IBPS—Bank Spl. Officers (IT) Exam, 2015]

(*a*) 884 (*b*) 346
(*c*) 252 (*d*) 424
(*e*) 366

524. If $\frac{x+1}{x-1}=\frac{a}{b}$ and $\frac{1-y}{1+y}=\frac{b}{a}$, then the value of $\frac{x-y}{1+xy}$ is **[SSC—CHSL (10+2) Exam, 2015]**

(*a*) $\frac{2ab}{a^2-b^2}$ (*b*) $\frac{a^2-b^2}{2ab}$
(*c*) $\frac{a^2+b^2}{2ab}$ (*d*) $\frac{a^2-b^2}{ab}$

525. $200 \div 25 \times 4 + 12 - 3 = ?$

[United India Insurance Co. Ltd. (UIICL) Assistant (Online) Exam, 2015]

(*a*) 35 (*b*) 40
(*c*) 30 (*d*) 41
(*e*) 50

526. $14 \times 627 \div \sqrt{1089} = (?)^3 + 141$

[IDBI Bank Executive Officers Exam, 2015]

(*a*) $5\sqrt{5}$ (*b*) $(125)^3$
(*c*) 25 (*d*) 5
(*e*) None of these

527. Evaluate: (923 – 347) / ? = 32 **[NICL—AAO Exam, 2015]**

(*a*) 35 (*b*) 20
(*c*) 18 (*d*) 15
(*e*) 40

Direction: What approximate value will come in place of the question mark (?) in the following question? *(You are not expected to calculate the exact value).*

528. 1559.95 – 7.99 × 24.96 – $?^2$ = 1154

[IBPS Bank PO/MT (Pre.) Exam, 2015]

(*a*) 14 (*b*) 24
(*c*) 32 (*d*) 18
(*e*) 8

529. Solve $1\frac{4}{5}+20-280\div 25=?$

[IBPS—RRB Office Assistant (Online) Exam, 2015]

(*a*) $8\frac{1}{5}$ (*b*) $9\frac{1}{2}$
(*c*) $11\frac{1}{2}$ (*d*) $10\frac{3}{5}$
(*e*) $12\frac{1}{5}$

530. ((64 – 38) × 4) ÷ 13 = ?

[IBPS—RRB Office Assistant (Online) Exam, 2015]

(*a*) 4 (*b*) 1
(*c*) 8 (*d*) 2
(*e*) 5

531. If $x + y = 2a$ then the value of $\frac{a}{x-a}+\frac{a}{y-a}$ is

[SSC—CHSL (10+2) Exam, 2015]

(*a*) 2 (*b*) 0
(*c*) –1 (*d*) 1

Directions (*Questions 532 to 533*): What approximate value should come in place of question mark(?) in the following questions? *(NOTE: You are not expected to calculate the exact value).*

532. 421 ÷ 35 × 299.97 ÷ 25.05 = $?^2$

[IBPS—Bank PO/MT Exam, 2015]

(*a*) 22 (*b*) 24
(*c*) 28 (*d*) 12
(*e*) 18

533. 19.99 × 15.98 + 224.98 + 125.02 = ?

[IBPS—Bank PO/MT Exam, 2015]

(*a*) 620 (*b*) 580
(*c*) 670 (*d*) 560
(*e*) 520

534. 3625 × ? = 1450

[United India Insurance (UIICL) Assistant (Online) Exam, 2015]

(*a*) $\frac{1}{3}$ (*b*) $\frac{2}{5}$
(*c*) $\frac{1}{5}$ (*d*) $\frac{4}{5}$
(*e*) $\frac{3}{5}$

535. Solve: 128.43 + 30.21 + ? = 173

[NICL—AAO Exam, 2015]

(*a*) 35.66 (*b*) 29.66
(*c*) 43.66 (*d*) 24.66
(*e*) 14.36

536. Evaluate :123 × 999 + 123

(*a*) 246999 (*b*) 123000
(*c*) 246000 (*d*) 123999

[ESIC—UDC Exam, 2016]

537. Simplify $\frac{(359+256)^2+(359-256)^2}{359\times 359+256\times 256}$

[ESIC—UDC Exam, 2016]

(*a*) 1089 (*b*) 615
(*c*) 516 (*d*) 2

538. 84368 + 65466 – 72009 – 13964 = ?

[SBI—Jr. Associates (Pre.) Exam, 2016]

(*a*) 61481 (*b*) 62921
(*c*) 63861 (*d*) 64241
(*e*) None of these

539. Solve 4376 + 3209 – 1784 + 97 = 3125 + ?

[SBI—Jr. Associates (Pre.) Exam, 2016]

(*a*) 2713 (*b*) 2743
(*c*) 2773 (*d*) 2793
(*e*) 2737

540. Solve $14\times 627\div\sqrt{(1089)}=(?)^3+141$

[IBPS—Bank Spl. Officer (Marketing) Exam, 2016]

(*a*) $5\sqrt{5}$ (*b*) $(125)^3$
(*c*) 25 (*d*) 5
(*e*) None of these

541. If $\left(x+\frac{1}{x}\right)=3$, then $\left(x^2+\frac{1}{x^2}\right)$ is

[UPSSSC—Lower Subordinate (Pre.) Exam, 2016]

(*a*) $\frac{10}{3}$ (*b*) $\frac{82}{9}$
(*c*) 7 (*d*) 11

542. If $x + y + z = 0$, then, $x^3 + y^3 + z^3 + 3\,xyz$ is equal to

[CDS 2016]

(*a*) 0 (*b*) 6 *xyz*
(*c*) 12 *xyz* (*d*) *xyz*

543. What is the remainder when 4^{96} is divided by 6?

[CDS 2016]

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

Direction: In the question given below, if the given mathematical symbols are changed from '+' to '÷', '−' to '×', '÷', to '−' and from '×' to '+', then choose your answers form the following options.

544. Solve 67 × 119 + 17 − 27 ÷ 259 = ?

[DMRC—Customer Relationship Assistant (CRA) Exam, 2016]

(*a*) −13 (*b*) −3

(*c*) 4 (*d*) 7

545. Solve $\frac{(0.73)^3+(0.27)^3}{(0.73)^2+(0.27)^2-0.73\times0.27}=?$

[UPSSSC—Lower Subordinate (Pre.) Exam, 2016]

(*a*) 0.27 (*b*) 0.4087

(*c*) 0.73 (*d*) 1

ANSWERS

1. (*c*)	**2.** (*b*)	**3.** (*a*)	**4.** (*a*)	**5.** (*c*)	**6.** (*c*)	**7.** (*e*)	**8.** (*b*)	**9.** (*b*)	**10.** (*d*)
11. (*b*)	**12.** (*d*)	**13.** (*d*)	**14.** (*c*)	**15.** (*a*)	**16.** (*a*)	**17.** (*c*)	**18.** (*c*)	**19.** (*a*)	**20.** (*a*)
21. (*c*)	**22.** (*c*)	**23.** (*c*)	**24.** (*d*)	**25.** (*c*)	**26.** (*d*)	**27.** (*c*)	**28.** (*c*)	**29.** (*a*)	**30.** (*a*)
31. (*c*)	**32.** (*b*)	**33.** (*a*)	**34.** (*d*)	**35.** (*c*)	**36.** (*b*)	**37.** (*b*)	**38.** (*d*)	**39.** (*d*)	**40.** (*e*)
41. (*e*)	**42.** (*a*)	**43.** (*e*)	**44.** (*c*)	**45.** (*e*)	**46.** (*d*)	**47.** (*e*)	**48.** (*d*)	**49.** (*a*)	**50.** (*d*)
51. (*a*)	**52.** (*d*)	**53.** (*d*)	**54.** (*a*)	**55.** (*d*)	**56.** (*a*)	**57.** (*b*)	**58.** (*d*)	**59.** (*a*)	**60.** (*c*)
61. (*c*)	**62.** (*c*)	**63.** (*d*)	**64.** (*d*)	**65.** (*b*)	**66.** (*d*)	**67.** (*b*)	**68.** (*b*)	**69.** (*c*)	**70.** (*d*)
71. (*d*)	**72.** (*b*)	**73.** (*c*)	**74.** (*d*)	**75.** (*c*)	**76.** (*d*)	**77.** (*a*)	**78.** (*c*)	**79.** (*c*)	**80.** (*a*)
81. (*c*)	**82.** (*c*)	**83.** (*c*)	**84.** (*a*)	**85.** (*d*)	**86.** (*a*)	**87.** (*d*)	**88.** (*b*)	**89.** (*c*)	**90.** (*c*)
91. (*a*)	**92.** (*a*)	**93.** (*e*)	**94.** (*c*)	**95.** (*a*)	**96.** (*c*)	**97.** (*b*)	**98.** (*a*)	**99.** (*c*)	**100.** (*c*)
101. (*b*)	**102.** (*b*)	**103.** (*d*)	**104.** (*b*)	**105.** (*a*)	**106.** (*c*)	**107.** (*b*)	**108.** (*c*)	**109.** (*a*)	**110.** (*b*)
111. (*d*)	**112.** (*a*)	**113.** (*c*)	**114.** (*b*)	**115.** (*c*)	**116.** (*d*)	**117.** (*b*)	**118.** (*b*)	**119.** (*b*)	**120.** (*c*)
121. (*d*)	**122.** (*b*)	**123.** (*d*)	**124.** (*a*)	**125.** (*c*)	**126.** (*c*)	**127.** (*c*)	**128.** (*d*)	**129.** (*c*)	**130.** (*d*)
131. (*c*)	**132.** (*a*)	**133.** (*c*)	**134.** (*a*)	**135.** (*e*)	**136.** (*e*)	**137.** (*b*)	**138.** (*d*)	**139.** (*b*)	**140.** (*b*)
141. (*d*)	**142.** (*d*)	**143.** (*b*)	**144.** (*a*)	**145.** (*c*)	**146.** (*d*)	**147.** (*a*)	**148.** (*b*)	**149.** (*a*)	**150.** (*b*)
151. (*b*)	**152.** (*c*)	**153.** (*c*)	**154.** (*c*)	**155.** (*c*)	**156.** (*b*)	**157.** (*d*)	**158.** (*a*)	**159.** (*b*)	**160.** (*d*)
161. (*a*)	**162.** (*d*)	**163.** (*b*)	**164.** (*d*)	**165.** (*c*)	**166.** (*b*)	**167.** (*d*)	**168.** (*b*)	**169.** (*a*)	**170.** (*b*)
171. (*d*)	**172.** (*a*)	**173.** (*a*)	**174.** (*c*)	**175.** (*b*)	**176.** (*c*)	**177.** (*a*)	**178.** (*d*)	**179.** (*d*)	**180.** (*c*)
181. (*a*)	**182.** (*a*)	**183.** (*c*)	**184.** (*e*)	**185.** (*b*)	**186.** (*d*)	**187.** (*c*)	**188.** (*d*)	**189.** (*a*)	**190.** (*e*)
191. (*e*)	**192.** (*c*)	**193.** (*d*)	**194.** (*c*)	**195.** (*b*)	**196.** (*a*)	**197.** (*b*)	**198.** (*a*)	**199.** (*b*)	**200.** (*a*)
201. (*d*)	**202.** (*c*)	**203.** (*c*)	**204.** (*c*)	**205.** (*b*)	**206.** (*b*)	**207.** (*d*)	**208.** (*c*)	**209.** (*b*)	**210.** (*d*)
211. (*b*)	**212.** (*b*)	**213.** (*c*)	**214.** (*c*)	**215.** (*a*)	**216.** (*a*)	**217.** (*b*)	**218.** (*c*)	**219.** (*a*)	**220.** (*b*)
221. (*c*)	**222.** (*d*)	**223.** (*d*)	**224.** (*d*)	**225.** (*b*)	**226.** (*a*)	**227.** (*d*)	**228.** (*a*)	**229.** (*d*)	**230.** (*e*)
231. (*e*)	**232.** (*c*)	**233.** (*b*)	**234.** (*b*)	**235.** (*c*)	**236.** (*d*)	**237.** (*a*)	**238.** (*c*)	**239.** (*c*)	**240.** (*b*)
241. (*a*)	**242.** (*e*)	**243.** (*d*)	**244.** (*b*)	**245.** (*d*)	**246.** (*c*)	**247.** (*c*)	**248.** (*c*)	**249.** (*c*)	**250.** (*c*)
251. (*c*)	**252.** (*a*)	**253.** (*c*)	**254.** (*c*)	**255.** (*c*)	**256.** (*c*)	**257.** (*d*)	**258.** (*c*)	**259.** (*b*)	**260.** (*b*)
261. (*c*)	**262.** (*d*)	**263.** (*d*)	**264.** (*a*)	**265.** (*d*)	**266.** (*b*)	**267.** (*c*)	**268.** (*e*)	**269.** (*a*)	**270.** (*b*)
271. (*b*)	**272.** (*b*)	**273.** (*b*)	**274.** (*b*)	**275.** (*b*)	**276.** (*c*)	**277.** (*a*)	**278.** (*a*)	**279.** (*d*)	**280.** (*c*)
281. (*c*)	**282.** (*b*)	**283.** (*a*)	**284.** (*c*)	**285.** (*b*)	**286.** (*c*)	**287.** (*a*)	**288.** (*c*)	**289.** (*c*)	**290.** (*d*)

291. (b)	**292.** (d)	**293.** (d)	**294.** (a)	**295.** (d)	**296.** (e)	**297.** (b)	**298.** (b)	**299.** (b)	**300.** (c)
301. (c)	**302.** (b)	**303.** (b)	**304.** (d)	**305.** (c)	**306.** (b)	**307.** (a)	**308.** (a)	**309.** (a)	**310.** (d)
311. (d)	**312.** (b)	**313.** (d)	**314.** (c)	**315.** (b)	**316.** (b)	**317.** (c)	**318.** (c)	**319.** (d)	**320.** (d)
321. (c)	**322.** (a)	**323.** (b)	**324.** (c)	**325.** (d)	**326.** (c)	**327.** (d)	**328.** (c)	**329.** (d)	**330.** (b)
331. (b)	**332.** (a)	**333.** (c)	**334.** (b)	**335.** (b)	**336.** (c)	**337.** (c)	**338.** (c)	**339.** (a)	**340.** (a)
341. (b)	**342.** (c)	**343.** (c)	**344.** (a)	**345.** (c)	**346.** (b)	**347.** (d)	**348.** (c)	**349.** (b)	**350.** (c)
351. (d)	**352.** (d)	**353.** (b)	**354.** (d)	**355.** (a)	**356.** (d)	**357.** (c)	**358.** (b)	**359.** (a)	**360.** (b)
361. (c)	**362.** (d)	**363.** (c)	**364.** (c)	**365.** (a)	**366.** (c)	**367.** (c)	**368.** (d)	**369.** (c)	**370.** (d)
371. (c)	**372.** (c)	**373.** (b)	**374.** (b)	**375.** (d)	**376.** (d)	**377.** (d)	**378.** (d)	**379.** (d)	**380.** (c)
381. (c)	**382.** (c)	**383.** (c)	**384.** (a)	**385.** (d)	**386.** (a)	**387.** (b)	**388.** (c)	**389.** (c)	**390.** (d)
391. (b)	**392.** (a)	**393.** (a)	**394.** (d)	**395.** (d)	**396.** (d)	**397.** (a)	**398.** (a)	**399.** (d)	**400.** (c)
401. (a)	**402.** (b)	**403.** (c)	**404.** (a)	**405.** (a)	**406.** (d)	**407.** (a)	**408.** (b)	**409.** (b)	**410.** (d)
411. (c)	**412.** (e)	**413.** (c)	**414.** (c)	**415.** (a)	**416.** (a)	**417.** (c)	**418.** (c)	**419.** (c)	**420.** (d)
421. (b)	**422.** (c)	**423.** (c)	**424.** (c)	**425.** (c)	**426.** (b)	**427.** (e)	**428.** (b)	**429.** (b)	**430.** (b)
431. (b)	**432.** (c)	**433.** (b)	**434.** (d)	**435.** (c)	**436.** (b)	**437.** (d)	**438.** (e)	**439.** (d)	**440.** (a)
441. (b)	**442.** (b)	**443.** (d)	**444.** (b)	**445.** (c)	**446.** (b)	**447.** (d)	**448.** (c)	**449.** (a)	**450.** (d)
451. (c)	**452.** (c)	**453.** (a)	**454.** (a)	**455.** (a)	**456.** (d)	**457.** (b)	**458.** (d)	**459.** (d)	**460.** (a)
461. (d)	**462.** (b)	**463.** (e)	**464.** (d)	**465.** (b)	**466.** (b)	**467.** (b)	**468.** (d)	**469.** (c)	**470.** (b)
471. (e)	**472.** (d)	**473.** (e)	**474.** (e)	**475.** (b)	**476.** (c)	**477.** (c)	**478.** (c)	**479.** (d)	**480.** (b)
481. (d)	**482.** (b)	**483.** (a)	**484.** (b)	**485.** (b)	**486.** (b)	**487.** (d)	**488.** (b)	**489.** (c)	**490.** (d)
491. (c)	**492.** (a)	**493.** (c)	**494.** (c)	**495.** (c)	**496.** (b)	**497.** (a)	**498.** (b)	**499.** (b)	**500.** (c)
501. (b)	**502.** (b)	**503.** (b)	**504.** (b)	**505.** (a)	**506.** (c)	**507.** (c)	**508.** (b)	**509.** (c)	**510.** (c)
511. (c)	**512.** (c)	**513.** (b)	**514.** (b)	**515.** (d)	**516.** (b)	**517.** (b)	**518.** (b)	**519.** (d)	**520.** (e)
521. (c)	**522.** (d)	**523.** (b)	**524.** (a)	**525.** (d)	**526.** (d)	**527.** (c)	**528.** (a)	**529.** (d)	**530.** (c)
531. (b)	**532.** (d)	**533.** (c)	**534.** (b)	**535.** (e)	**536.** (b)	**537.** (d)	**538.** (c)	**539.** (c)	**540.** (d)
541. (c)	**542.** (b)	**543.** (a)	**544.** (b)	**545.** (a)					

SOLUTIONS

1. $304 \times 141 = 42864$.

2. $A + B = 96 \Rightarrow \frac{1}{2}B + B = 96 \Rightarrow \frac{3}{2}B = 96 \Rightarrow B = \left(96 \times \frac{2}{3}\right) = 64.$

$\therefore\ A = \left(\frac{1}{2} \times 64\right) = 32.$

3. $1888 \div 32 \div 8 = \frac{1888}{32} \div 8 = 59 \div 8 = \frac{59}{8} = 7.375.$

4. Given exp. $= -2508 + 221 = -2287.$

5. Given exp. $= \frac{4848}{24} \times 11 - 222 = 202 \times 11 - 222$

$= 2222 - 222 = 2000.$

6. Given exp. $= \frac{425 \times 4000}{16000} \times 12 = \frac{425}{4} \times 12 = 425 \times 3 = 1275.$

7. Let $[(84)^2 \div 28 \times 12] \div 24 = 7 \times x.$

Then, $\left[\frac{84 \times 84}{28} \times 12\right] \div 24 = 7x \Leftrightarrow [84 \times 3 \times 12] \div 24 = 7x$

$\Leftrightarrow 7x = \frac{3024}{24} = 126 \Leftrightarrow x = 18.$

8. Let the missing number be x.

Then, $\frac{354750}{4096 + x} = 55 \Leftrightarrow 55(4096 + x) = 354750$

$\Leftrightarrow 55x = 354750 - 225280$

$\Leftrightarrow 55x = 129470 \Leftrightarrow x = 2354.$

9. Given expression = 41 × 44 = 1804.

10. Given expression = (– 224) + 2826 = 2602.

11. Let 853 + x ÷ 17 = 1000.

Then, $853+\frac{x}{17}=1000 \Leftrightarrow \frac{x}{17}=1000-853=147$

$\Leftrightarrow x = 147 \times 17 = 2499.$

12. Let $(x - 968) \div 79 \times 4 = 512.$

Then, $\frac{x-968}{79}\times 4=512 \Leftrightarrow x-968=\frac{512\times 79}{4}=10112$

$\Leftrightarrow x = 10112 + 968 = 11080.$

13. Given exp. $=\left[\frac{125\times 125}{50}\times 20\right]\div 25 = 6250 \div 25 = 250.$

14. Given exp. $= 999\times 99\times\frac{9}{99}\div 9\div 3 = 999\times 99\times\frac{9}{99}\times\frac{1}{9}\div 3$

$=999\times 99\times\frac{9}{99}\times\frac{1}{9}\times\frac{1}{3} = 333.$

15. $(x - a)\ (x - b)\ (x - c)\ ...\ (x - y)\ (x - z)$

$= (x - a)\ (x - b)\ (x - c)\ ...\ (x - x)\ (x - y)\ (x - z)$

$= \{(x - a)\ (x - b)\ (x - c)\ ...\ (x - w)\} \times 0 \times [(x - y)\ (x - z)]$

$= 0.$

16. Given exp. $= 1 - [1 - \{1 - (1 - 0)\}] = 1 - [1 - \{1 - 1\}]$

$= 1 - [1 - 0] = 1 - 1 = 0.$

17. Let 2 x 6 – 12 ÷ 4 + 2 = 11.

Then, 2 x 6 – 3 + 2 = 11 $\Leftrightarrow$ 2 x 6 = 11 + 3 – 2 = 12.

So 'x' must be replaced by '×'.

18. Let $45 - [28 - \{37 - (15 - x)\}] = 58.$

Then, $45 - [28 - \{37 - 15 + x\}] = 58$

$\Leftrightarrow 45 - [28 - \{22 + x\}] = 58$

$\Leftrightarrow 45 - [28 - 22 - x] = 58 \Leftrightarrow 45 - [6 - x] = 58$

$\Leftrightarrow 45 - 6 + x = 58$

$\Leftrightarrow 39 + x = 58 \Leftrightarrow x = 58 - 39 = 19.$

19. Given exp. $=\frac{7^3\times 7^2}{6^3\times 2^4\times 3^4}=\frac{7^{(3+2)}}{6^3\times(2\times 3)^4}=\frac{7^5}{6^3\times 6^4}$

$=\frac{7^5}{6^{(3+4)}}=\frac{7^5}{6^7}.$

20. $\frac{113\times 4 - x\times 2}{13\times 9 - 5\times 7}=5 \Leftrightarrow \frac{452-2x}{117-35}=5 \Leftrightarrow \frac{452-2x}{82}=5$

$\Leftrightarrow 452 - 2x = 410$

$\Leftrightarrow 2x = 452 - 410 = 42 \Leftrightarrow x = 21.$

21. Given expression $=\frac{252-48}{122-20}=\frac{204}{102}=2.$

22. Given expression $=\frac{15}{21}-\frac{10}{14}+\frac{5}{7}=\frac{5}{7}-\frac{5}{7}+\frac{5}{7}=\frac{5}{7}.$

23. Given expression $=\frac{3+2\times 3}{4+3\times\frac{2}{3}}=\frac{3+6}{4+2}=\frac{9}{6}=\frac{3}{2}.$

24. Given expression $=\frac{4+72-14}{738-730}=\frac{76-14}{8}=\frac{62}{8}=7.75.$

25. Given expression $=\frac{2700-240}{1120+110}=\frac{2460}{1230}=2.$

26. Given exp. $=\frac{8-[5-(-1)]\div 2}{|2|-|-3|\div 3}=\frac{8-[5+1]\div 2}{2-3\div 3}=\frac{8-6\div 2}{2-1}$

$= 8 - 3 = 5.$

27. $(2^2 + 4^2 + 6^2 + ... + 20^2) = 2^2\ (1^2 + 2^2 + 3^2 + ... + 10^2)$

$= 4 \times 385 = 1540.$

28. Given exp. $=\frac{9}{4}+\frac{4}{3}-\frac{9}{2}=\frac{27+16-54}{12}=-\frac{11}{12}.$

29. Let $4\frac{3}{7}-1\frac{3}{14}=x+2\frac{3}{28}.$

Then, $\frac{31}{7}-\frac{17}{14}=x+\frac{59}{28} \Leftrightarrow x=\frac{31}{7}-\frac{17}{14}-\frac{59}{28}$

$\Leftrightarrow x=\frac{124-34-59}{28}=\frac{31}{28}=1\frac{3}{28}.$

30. Given exp. $=\frac{7}{4}-\frac{6}{5}+\frac{13}{8}=\frac{70-48+65}{40}=\frac{87}{40}=2\frac{7}{40}.$

31. Given exp. $=\frac{37}{3}+\frac{65}{6}-\frac{23}{3}-\frac{11}{7}=\frac{518+455-322-66}{42}$

$=\frac{585}{42}=\frac{195}{14}=13\frac{13}{14}.$

32. Given exp. $=\frac{87}{13}-\frac{48}{11}+\frac{12}{5}=\frac{4785-3120+1716}{715}$

$=\frac{3381}{715}=4\frac{521}{715}.$

33. Given exp. $=\frac{28+14+7+4+2+1}{28}=\frac{56}{28}=2.$

34. Given exp. $=\frac{1}{(7/3)}+\frac{1}{(7/4)}=\frac{3}{7}+\frac{4}{7}=\frac{7}{7}=1.$

35. Let $\frac{35}{6}-\frac{35}{9}-x=1.$

Then, $x=\frac{35}{6}-\frac{35}{9}-1=\frac{35}{6}-\left(\frac{35}{9}+1\right)$

$=\frac{35}{6}-\frac{44}{9}=\frac{105-88}{18}=\frac{17}{18}.$

36. $\frac{1}{x}=4-\left(\frac{1}{3}+\frac{1}{2}\right)=4-\left(\frac{2+3}{6}\right)=4-\frac{5}{6}$

$=\frac{24-5}{6}=\frac{19}{6} \Rightarrow x=\frac{6}{19}.$

37. $\frac{\cancel{133}^{19}\cancel{532}}{\cancel{648}^{81}_{3}}\times\frac{\cancel{54}^{2}\cancel{432}}{\cancel{588}^{147}_{21}}=\frac{38}{63}.$

38. Given expression $=\frac{\cancel{21}^{3}}{\cancel{11}}\times\frac{\cancel{121}^{11}}{\cancel{7}}\times\frac{217}{\cancel{6}_{2}}=\frac{2387}{2}=1193\frac{1}{2}.$

39. Given expression $=\left(\frac{3}{7}\times 455+\frac{5}{8}\times 456\right)=(3\times 65+5\times 57)$

$= 195 + 285 = 480.$

40. Given expression $=\left(\frac{3}{5}\times\frac{4}{7}\times\frac{5}{9}\times\frac{21}{24}\times 504\right)=84.$

41. Given exp. $= \left(\frac{41}{6}\times\frac{16}{3}+\frac{53}{3}\times\frac{9}{2}\right)=\left(\frac{328}{9}+\frac{159}{2}\right)$

$= \frac{656+1431}{18}=\frac{2087}{18}=115\frac{17}{18}.$

42. Given exp. $= \frac{24}{5}\div\frac{32}{5}=\frac{24}{5}\times\frac{5}{32}=\frac{3}{4}.$

43. Given exp. $= \frac{5}{4}+\frac{14}{9}\times\frac{13}{8}\times\frac{2}{13}=\frac{5}{4}+\frac{7}{18}=\frac{45+14}{36}=\frac{59}{36}=1\frac{23}{36}.$

44. Given exp. $= \frac{225}{836}\times\frac{152}{245}\div\frac{120}{77}=\frac{225}{836}\times\frac{152}{245}\times\frac{77}{120}=\frac{3}{28}.$

45. Given exp. $= \left(\frac{82}{5}-\frac{181}{15}\right)\div\frac{247}{81}=\left(\frac{246-181}{15}\right)\times\frac{81}{247}$

$= \frac{65}{15}\times\frac{81}{247}=\frac{27}{19}=1\frac{8}{19}.$

46. Let $18\frac{3}{4}\times x\div\frac{6}{37}=1480.$

Then, $\frac{75}{4}\times x\times\frac{37}{6}=1480 \Leftrightarrow x=\frac{1480\times4\times6}{75\times37}=\frac{64}{5}=12\frac{4}{5}.$

47. Given exp. $= \frac{3}{2}\times\frac{11}{5}\div\frac{5}{4}\div\frac{33}{15}=\frac{3}{2}\times\frac{11}{5}\times\frac{4}{5}\div\frac{33}{15}$

$= \frac{3}{2}\times\frac{11}{5}\times\frac{4}{5}\times\frac{15}{33}=\frac{6}{5}=1\frac{1}{5}.$

48. $3\frac{x}{7}\times2\frac{y}{5}=10 \Leftrightarrow \frac{21+x}{7}\times\frac{10+y}{5}=10$

$\Leftrightarrow (21+x)(10+y)=350$ ...(*i*)

Clearly, $x = 4$, $y = 4$ satisfy the equation (*i*).

49. Given exp. $= 1+2\div\left\{1+2\div\frac{4}{3}\right\}=1+2\div\left\{1+2\times\frac{3}{4}\right\}$

$= 1+2\div\left\{1+\frac{3}{2}\right\}=1+2\div\frac{5}{2}=1+2\times\frac{2}{5}$

$= 1+\frac{4}{5}=\frac{9}{5}=1\frac{4}{5}.$

50. Given exp. $= \frac{\cancel{81}^{27}}{\cancel{8}_{2}}\text{ of }\frac{\cancel{12}^{3}}{\cancel{15}_{5}}\div\frac{\cancel{35}^{5}}{\cancel{36}_{9}}\text{ of }\frac{\cancel{20}^{5}}{\cancel{49}_{7}}=\frac{81}{10}\div\frac{25}{63}$

$= \frac{81}{10}\times\frac{63}{25}=\frac{5103}{250}=20\frac{103}{250}.$

51. Given exp. $= \frac{\left(-\frac{2}{3}-\frac{1}{3}\right)+\left(\frac{4}{5}+\frac{1}{5}\right)+\left(\frac{3}{4}-\frac{1}{2}\right)}{\left(\frac{2}{3}-\frac{4}{3}+\frac{1}{3}\right)-\left(\frac{1}{5}+\frac{4}{5}\right)+\frac{1}{2}}$

$= \frac{-1+1+\frac{1}{4}}{-\frac{1}{3}-1+\frac{1}{2}}=\frac{\frac{1}{4}}{\frac{-2-6+3}{6}}=\frac{\frac{1}{4}}{-\frac{5}{6}}$

$= \frac{1}{4}\times\left(-\frac{6}{5}\right)=\frac{-3}{10}.$

52. $\frac{\left(\frac{1}{2}-\frac{1}{4}+\frac{1}{5}-\frac{1}{6}\right)}{\left(\frac{2}{5}-\frac{5}{9}+\frac{3}{5}-\frac{7}{18}\right)}=\frac{\left(\frac{30-15+12-10}{60}\right)}{\left(\frac{2}{5}+\frac{3}{5}\right)-\left(\frac{5}{9}+\frac{7}{18}\right)}$

$= \frac{\left(\frac{17}{60}\right)}{1-\frac{17}{18}}=\left(\frac{17}{60}\times18\right)=\frac{51}{10}=5\frac{1}{10}.$

53. $\left(34\times4\frac{1}{2}\right)=34\times\left(4+\frac{1}{2}\right)=(34\times4)+\left(34\times\frac{1}{2}\right)$

$= (30+4)\times4+\left(34\times\frac{1}{2}\right)$

$= (30\times4)+(4\times4)+\left(34\times\frac{1}{2}\right).$

54. Let $\frac{3}{8}$ of $168\times15\div5+x=549\div9+235.$

Then, $63\times15\div5+x=61+235 \Leftrightarrow 63\times3+x=296$

$\Leftrightarrow 189+x=296$

$\Leftrightarrow x=107.$

55. Let $\frac{5}{3}\div\frac{2}{7}\times\frac{x}{7}=\frac{5}{4}\times\frac{2}{3}\div\frac{1}{6}.$

Then, $\frac{5}{3}\times\frac{7}{2}\times\frac{x}{7}=\frac{5}{4}\times\frac{2}{3}\times6$

$\Leftrightarrow \frac{5}{6}x=5 \Leftrightarrow x=\left(\frac{5\times6}{5}\right)=6.$

56. Let $5\frac{2}{3}\div x\frac{5}{6}=2.$

Then, $\frac{17}{3}\div x\frac{5}{6}=2 \Leftrightarrow x\frac{5}{6}=\frac{17}{3}\times\frac{1}{2}=\frac{17}{6} \Leftrightarrow x\frac{5}{6}=2\frac{5}{6}.$

$\therefore \quad x = 2.$

57. Given equation is : $\frac{(5x+1)}{x}\times\frac{(4y+3)}{4}=20$

$\Leftrightarrow (5x+1)(4y+3)=80x$ ...(*i*)

Clearly, $x = 3$ and $y = 3$ satisfy (*i*).

58. Required difference $= \frac{19}{16}-\frac{16}{19}=\frac{19^2-16^2}{304}$

$= \frac{(19+16)(19-16)}{304}=\frac{35\times3}{304}=\frac{105}{304}.$

59. Required number $= \frac{37\frac{1}{2}}{1/8}=\frac{75/2}{1/8}=\frac{75}{2}\times8=300.$

60. $a = (4\div3)\div3\div4=\frac{4}{3}\times\frac{1}{3}\times\frac{1}{4}=\frac{1}{9}.$

$b = 4\div(3\div3)\div4=4\div1\div4=1.$

$c = 4\div3\div(3\div4)=4\div3\div\frac{3}{4}=\frac{4}{3}\times\frac{4}{3}=\frac{16}{9}.$

Clearly, c is the greatest.

61. **I.** $\frac{3}{4}\div\frac{5}{6}=\frac{3}{4}\times\frac{6}{5}=\frac{9}{10}.$

II. $3\div[(4\div5)\div6]=3\div\left(\frac{4}{5}\times\frac{1}{6}\right)=3\div\frac{4}{30}=3\times\frac{30}{4}=\frac{45}{2}.$

III. $[3\div(4\div5)]\div6=\left[3\div\frac{4}{5}\right]\div6=\left[3\times\frac{5}{4}\right]\div6=\frac{15}{4}\times\frac{1}{6}=\frac{5}{8}.$

IV. $3\div4\div(5\div6)=3\div4\div\frac{5}{6}=\frac{3}{4}\times\frac{6}{5}=\frac{9}{10}.$

So, I and IV are equal.

62. Given exp. $=\left(\frac{5}{7}\times\frac{19}{13}\right)\div\left(\frac{19}{7}\times\frac{4}{13}\right)=\frac{5\times19}{7\times13}\times\frac{7\times13}{19\times4}=\frac{5}{4}.$

63. Given exp. $=\frac{11}{4}\div\frac{8}{3}\div\frac{13}{12}=\frac{11}{4}\times\frac{3}{8}\times\frac{12}{13}=\frac{99}{104}.$

64. Given exp. $=\frac{2}{3}\times\frac{3}{\frac{5}{6}\div\frac{2}{3}\text{ of }\frac{5}{4}}=\frac{2}{3}\times\frac{3}{\frac{5}{6}\div\frac{5}{6}}=\frac{2}{3}\times3=2.$

65. Let $\frac{4335}{x}\div\frac{15}{8}=\frac{289}{528}.$

Then, $\frac{4335}{x}=\frac{289}{528}\times\frac{15}{8}\Leftrightarrow\frac{4335}{x}=\frac{289\times5}{176\times8}$

$\Leftrightarrow x=\left(\frac{4335\times176\times8}{289\times5}\right)=4224.$

$\therefore$ Missing digit = 2.

66. Let $\frac{16}{3}-\frac{11}{3}\div\frac{4}{3}\div x+\frac{16}{5}\div\frac{6}{5}=7.$ Then,

$\frac{16}{3}-\frac{11}{3}\times\frac{3}{4}\times\frac{1}{x}+\frac{16}{5}\times\frac{5}{6}=7$

$\Leftrightarrow\frac{16}{3}-\frac{11}{4x}+\frac{8}{3}=7$

$\Leftrightarrow\frac{24}{3}-\frac{11}{4x}=7$

$\Leftrightarrow\frac{11}{4x}=8-7=1$

$\Leftrightarrow 4x=11\Leftrightarrow x=\frac{11}{4}=2\frac{3}{4}.$

67. Given exp. $=9-\frac{11}{9}\text{ of }\frac{36}{11}\div\frac{36}{7}\text{ of }\frac{7}{9}=9-4\div4=9-1=8.$

68. Let $\frac{5}{6}\div\frac{6}{7}\times x-\frac{8}{9}\div\frac{8}{5}+\frac{3}{4}\times\frac{10}{3}=\frac{25}{9}.$ Then,

$\frac{5}{6}\times\frac{7}{6}\times x-\frac{8}{9}\times\frac{5}{8}+\frac{3}{4}\times\frac{10}{3}=\frac{25}{9}\Leftrightarrow\frac{35}{36}x-\frac{5}{9}+\frac{5}{2}=\frac{25}{9}$

$\Leftrightarrow\frac{35}{36}x=\frac{25}{9}+\frac{5}{9}-\frac{5}{2}=\frac{10}{3}-\frac{5}{2}$

$\Leftrightarrow\frac{35}{36}x=\frac{5}{6}\Leftrightarrow x=\left(\frac{5}{6}\times\frac{36}{35}\right)=\frac{6}{7}.$

69. Given exp. $=\frac{3}{4}\div\frac{9}{4}\text{ of }\frac{2}{3}-\frac{\left(\frac{3-2}{6}\right)}{\left(\frac{3+2}{6}\right)}\times\frac{10}{3}+\frac{5}{6}$

$=\frac{3}{4}\div\frac{3}{2}-\frac{1}{6}\times\frac{6}{5}\times\frac{10}{3}+\frac{5}{6}$

$=\frac{3}{4}\times\frac{2}{3}-\frac{2}{3}+\frac{5}{6}=\left(\frac{1}{2}-\frac{2}{3}+\frac{5}{6}\right)$

$=\left(\frac{3-4+5}{6}\right)=\frac{4}{6}=\frac{2}{3}.$

70. $\frac{\frac{7}{3}+1\frac{1}{2}\text{ of }\frac{5}{3}}{2+1\frac{2}{3}}=\frac{\frac{7}{3}+\frac{3}{2}\text{ of }\frac{5}{3}}{2+\frac{5}{3}}=\frac{\frac{7}{3}+\frac{5}{2}}{\frac{11}{3}}=\frac{29}{6}\times\frac{3}{11}=\frac{29}{22}.$

$\therefore$ Required answer $=\frac{29}{22}-\frac{1}{4}=\frac{58-11}{44}=\frac{47}{44}=1\frac{3}{44}.$

71. Given exp. $=\frac{\frac{1}{3}+\frac{3}{4}\left(\frac{6-5}{15}\right)}{\frac{5}{3}\text{ of }\frac{3}{4}-\frac{1}{5}}=\frac{\frac{1}{3}+\frac{3}{4}\times\frac{1}{15}}{\frac{5}{4}-\frac{1}{5}}$

$=\frac{\frac{1}{3}+\frac{1}{20}}{\frac{25-4}{20}}=\frac{23}{60}\times\frac{20}{21}=\frac{23}{63}.$

72. Given exp. $=1-\left(\frac{\frac{5}{3}}{\frac{7}{2}}+\frac{\frac{7}{6}}{\frac{7}{2}}\right)=1-\left(\frac{5}{3}\times\frac{2}{7}+\frac{7}{6}\times\frac{2}{7}\right)$

$=1-\left(\frac{10}{21}+\frac{1}{3}\right)=1-\frac{17}{21}=\frac{4}{21}.$

73. Given exp. $=\frac{5}{2}\text{ of }\frac{3}{4}\times\frac{1}{2}\div\frac{3}{2}+\frac{1}{2}\div\frac{3}{2}\left[\frac{2}{3}-\frac{1}{3}\right]$

$=\frac{5}{2}\text{ of }\frac{3}{4}\times\frac{1}{2}\div\frac{3}{2}+\frac{1}{2}\div\left(\frac{3}{2}\times\frac{1}{3}\right)$

$=\frac{15}{8}\times\frac{1}{2}\div\frac{3}{2}+\frac{1}{2}\div\frac{1}{2}$

$=\frac{15}{8}\times\frac{1}{2}\times\frac{2}{3}+\frac{1}{2}\times2=\frac{5}{8}+1=1\frac{5}{8}.$

74. Given exp. $=\frac{\frac{8}{7}-\frac{2}{3}+\frac{2}{5}\times\frac{25}{24}}{1-\frac{1}{7}\left[\frac{1}{3}+\frac{2}{5}\times\frac{5}{3}\right]}=\frac{\frac{8}{7}-\frac{2}{3}+\frac{5}{12}}{1-\frac{1}{7}\left[\frac{1}{3}+\frac{2}{3}\right]}$

$=\frac{\frac{96-56+35}{84}}{\left(1-\frac{1}{7}\right)}=\frac{75}{84}\times\frac{7}{6}=\frac{25}{24}=1\frac{1}{24}.$

75. Given exp. $=\frac{6}{\left(\frac{10}{3}\right)}\div\frac{4-\frac{2}{\left(\frac{7}{2}\right)}}{\left(\frac{7}{2}\right)}-\frac{2}{5}\text{ of }\left\{\frac{6}{9}+\frac{1}{3}\right\}$

$=\frac{6\times3}{10}\div\frac{4-\frac{2\times2}{7}}{\left(\frac{7}{2}\right)}-\frac{2}{5}\text{ of }1$

$=\frac{9}{5}\div\frac{\left(4-\frac{4}{7}\right)}{\left(\frac{7}{2}\right)}-\frac{2}{5}=\frac{9}{5}\div\left(\frac{24}{7}\times\frac{2}{7}\right)-\frac{2}{5}$

$=\frac{9}{5}\times\frac{49}{48}-\frac{2}{5}=\frac{147}{80}-\frac{2}{5}=\frac{147-32}{80}=\frac{115}{80}=\frac{23}{16}=1\frac{7}{16}.$

76. Given exp. $=\left(\frac{45}{8}\times\frac{7}{45}\right)\text{of}\left(\frac{73}{11}\times\frac{8}{73}\right)\div\frac{8}{9}\left(\frac{25}{11}+\frac{13}{22}\right)\text{of}\frac{3}{5}$

$=\frac{7}{8}\text{ of }\frac{8}{11}\div\left(\frac{8}{9}\times\frac{63}{22}\right)\text{of}\frac{3}{5}$

$=\frac{7}{11}\div\frac{28}{11}\text{ of }\frac{3}{5}=\frac{7}{11}\div\frac{84}{55}=\frac{7}{11}\times\frac{55}{84}=\frac{5}{12}.$

77. Given exp. $= \dfrac{\frac{1}{3}\times 3\times\frac{1}{3}}{\frac{1}{3}\div\frac{1}{9}} - \frac{1}{9} = \dfrac{\frac{1}{3}}{\frac{1}{3}\times 9} - \frac{1}{9} = \frac{1}{3}\times\frac{1}{3} - \frac{1}{9} = \frac{1}{9} - \frac{1}{9} = 0.$

78. Given exp. $= \dfrac{\frac{1}{2}\div\frac{1}{4}}{\frac{1}{2}+\frac{1}{4}} = \dfrac{\frac{1}{2}\times 4}{\frac{2+1}{4}} = 2\times\frac{4}{3} = \frac{8}{3} = 2\frac{2}{3}.$

79. Given exp. $= \dfrac{\frac{13}{4} - \frac{4}{5}\text{ of }\frac{5}{6}}{\frac{13}{3}\div\frac{1}{5} - \left(\frac{3}{10}+\frac{106}{5}\right)} = \dfrac{\frac{13}{4}-\frac{2}{3}}{\frac{13}{3}\times 5 - \frac{215}{10}}$

$= \dfrac{\frac{31}{12}}{\frac{65}{3}-\frac{43}{2}} = \left(\frac{31}{12}\times 6\right) = \frac{31}{2} = 15\frac{1}{2}.$

80. Let $\dfrac{\frac{15}{2}-\frac{23}{4}}{\frac{7}{2}+x} \div \dfrac{\frac{1}{2}+\frac{5}{4}}{\frac{6}{5}+\frac{7}{2}} = \frac{6}{10}.$

Then, $\left[\frac{7}{4}\times\frac{2}{(7+2x)}\right]\div\left[\frac{7}{4}\times\frac{10}{47}\right] = \frac{3}{5}$

$\Leftrightarrow \dfrac{7}{2(7+2x)} = \frac{3}{5}\times\frac{7}{4}\times\frac{10}{47} = \frac{21}{94}$

$\Leftrightarrow 7+2x = \left(\frac{7}{2}\times\frac{94}{21}\right) = \frac{47}{3}$

$\Leftrightarrow 2x = \frac{47}{3} - 7 = \frac{26}{3} \Leftrightarrow x = \left(\frac{26}{3}\times\frac{1}{2}\right) = \frac{13}{3} = 4\frac{1}{3}.$

81. $\frac{5}{3}+\frac{3}{4} = \frac{20+9}{12} = \frac{29}{12} = 2\frac{5}{12} < 5; \frac{7}{3}+\frac{11}{5}$

$= \dfrac{35+33}{15} = \frac{68}{15} = 4\frac{8}{15} < 5;$

$\frac{11}{4}+\frac{8}{3} = \frac{33+32}{12} = \frac{65}{12} = 5\frac{5}{12} > 5; \frac{13}{5}+\frac{11}{6}$

$= \dfrac{78+55}{30} = \frac{133}{30} = 4\frac{13}{30} < 5.$

82. Given exp. $= 5 - \left[\frac{3}{4} + \left\{\frac{5}{2} - \left(\frac{1}{2} + \frac{7-6}{42}\right)\right\}\right]$

$= 5 - \left[\frac{3}{4} + \left\{\frac{5}{2} - \left(\frac{1}{2}+\frac{1}{42}\right)\right\}\right]$

$= 5 - \left[\frac{3}{4} + \left\{\frac{5}{2} - \frac{22}{42}\right\}\right] = 5 - \left[\frac{3}{4}+\frac{83}{42}\right] = 5 - \frac{229}{84}$

$= \left(\frac{420-229}{84}\right) = \frac{191}{84} = 2\frac{23}{84}.$

83. Given exp. $= -1+4+3 = 6.$

84. $x^3 - x^2 - x = (-3)^3 - (-3)^2 - (-3) = -27 - 9 + 3 = -33.$

85. Putting $S = 8$ and $R = 16$, we have:

$R = gS - 4 \Leftrightarrow 16 = 8g - 4$

$\Leftrightarrow 8g = 20 \Leftrightarrow g = \frac{20}{8} = \frac{5}{2}.$

$\therefore$ When $S = 10$, $R = gS - 4$

$\Leftrightarrow R = \frac{5}{2}\times 10 - 4 = 25 - 4 = 21.$

86. $\dfrac{x(y-z)}{y(x+y+z)} = \dfrac{5(3-2)}{3(5+3+2)} = \dfrac{5}{3\times 10} = \dfrac{1}{6}.$

87. $a^3 - b^3 + 3a^2b = 7^3 - 5^3 + 3\times 7^2\times 5$

$= 343 - 125 + 735 = 953.$

88. Given exp. $= -7m - [3n - \{8m - 4n + 10m\}]$

$= -7m - [3n - \{18m - 4n\}]$

$= -7m - [3n - 18m + 4n] = -7m - [7n - 18m]$

$= -7m - 7n + 18m = 11m - 7n.$

89. $\frac{2}{a}+\frac{1}{b} = \frac{2b+a}{ab} = \frac{6}{4} = \frac{3}{2}.$

90. Let $\frac{a}{3} = \frac{b}{4} = \frac{c}{7} = k$. Then, $a = 3k$, $b = 4k$, $c = 7k$.

$\therefore \dfrac{(a+b+c)}{c} = \dfrac{3k+4k+7k}{7k} = \dfrac{14k}{7k} = 2.$

91. Given exp. $= 2a^3 - [3a^3 + 4b^3 - \{-5a^3\} + 5a^3 - 7b^3]$

$= 2a^3 - [3a^3 + 4b^3 + 5a^3 + 5a^3 - 7b^3]$

$= 2a^3 - [13a^3 - 3b^3] = 2a^3 - 13a^3 + 3b^3$

$= -11a^3 + 3b^3.$

92. $\dfrac{1}{1+a}+\dfrac{1}{1+b}+\dfrac{1}{1+c} = \dfrac{1}{1+\frac{x}{y+z}} + \dfrac{1}{1+\frac{y}{z+x}} + \dfrac{1}{1+\frac{z}{x+y}}$

$= \dfrac{y+z}{x+y+z} + \dfrac{z+x}{x+y+z} + \dfrac{x+y}{x+y+z}$

$= \dfrac{2(x+y+z)}{(x+y+z)} = 2.$

93. $(-2x-6)^2 = [-2(x+3)]^2 = 4(x+3)^2 = 4y.$

94. $(x+a)(x+b) = x^2 + ax + bx + ab = x^2 + (a+b)x + ab.$

95. $\left[1+\frac{1}{x+1}\right]\left[1+\frac{1}{x+2}\right]\left[1+\frac{1}{x+3}\right]\left[1+\frac{1}{x+4}\right]$

$= \left[\frac{(x+1)+1}{x+1}\right]\left[\frac{(x+2)+1}{x+2}\right]\left[\frac{(x+3)+1}{x+3}\right]\left[\frac{(x+4)+1}{x+4}\right]$

$= \left(\frac{x+2}{x+1}\right)\left(\frac{x+3}{x+2}\right)\left(\frac{x+4}{x+3}\right)\left(\frac{x+5}{x+4}\right) = \frac{x+5}{x+1}.$

96. $(a-b)-(c+d) = 6$ and $(c-d)-(a+b) = 3$

$\Rightarrow (a-c)-(b+d) = 6$ and $(c-a)-(b+d) = 3$

$\Rightarrow (b+d) = (a-c) - 6$ and $(b+d) = (c-a) - 3$

$\Rightarrow (a-c) - 6 = (c-a) - 3 \Rightarrow 2(a-c) = 3$

$\Rightarrow (a-c) = \frac{3}{2} = 1.5.$

97. $\dfrac{3a+2b}{3a-2b} = \dfrac{3\frac{a}{b}+2}{3\frac{a}{b}-2} = \dfrac{3\times\frac{4}{3}+2}{3\times\frac{4}{3}-2} = \dfrac{6}{2} = 3.$

98. $\left(\frac{6}{7} - \frac{5x-y}{5x+y}\right) = \frac{6}{7} - \left(\dfrac{5\frac{x}{y}-1}{5\frac{x}{y}+1}\right) = \frac{6}{7} - \left(\dfrac{5\times\frac{6}{5}-1}{5\times\frac{6}{5}+1}\right)$

$= \dfrac{6}{7} - \left(\dfrac{6-1}{6+1}\right) = \dfrac{6}{7} - \dfrac{5}{7} = \dfrac{1}{7}.$

99. $\dfrac{x^2+y^2}{x^2-y^2}=\dfrac{\dfrac{x^2}{y^2}+1}{\dfrac{x^2}{y^2}-1}=\dfrac{\left(\dfrac{x}{y}\right)^2+1}{\left(\dfrac{x}{y}\right)^2-1}=\dfrac{\left(\dfrac{1}{3}\right)^2+1}{\left(\dfrac{1}{3}\right)^2-1}$

$=\dfrac{\left(\dfrac{1}{9}+1\right)}{\left(\dfrac{1}{9}-1\right)}=\dfrac{10}{9}\times\left(-\dfrac{9}{8}\right)=-\dfrac{5}{4}.$

100. $\dfrac{x}{2y}=\dfrac{6}{7}\ \Rightarrow\ \dfrac{x}{y}=\left(2\times\dfrac{6}{7}\right)=\dfrac{12}{7}.$

$\therefore\quad \dfrac{x-y}{x+y}+\dfrac{14}{19}=\dfrac{\dfrac{x}{y}-1}{\dfrac{x}{y}+1}+\dfrac{14}{19}=\dfrac{\dfrac{12}{7}-1}{\dfrac{12}{7}+1}+\dfrac{14}{19}=\dfrac{(5/7)}{(19/7)}+\dfrac{14}{19}$

$=\left(\dfrac{5}{7}\times\dfrac{7}{19}\right)+\dfrac{14}{19}=\dfrac{5}{19}+\dfrac{14}{19}=\dfrac{19}{19}=1.$

101. $\dfrac{a}{b}=\dfrac{4}{5}$ and $\dfrac{b}{c}=\dfrac{15}{16}\ \Rightarrow\ \left(\dfrac{a}{b}\times\dfrac{b}{c}\right)=\left(\dfrac{4}{5}\times\dfrac{15}{16}\right)\ \Rightarrow\ \dfrac{a}{c}=\dfrac{3}{4}.$

$\therefore\quad \dfrac{c^2-a^2}{c^2+a^2}=\dfrac{1-\left(\dfrac{a^2}{c^2}\right)}{1+\left(\dfrac{a^2}{c^2}\right)}=\dfrac{1-\left(\dfrac{a}{c}\right)^2}{1+\left(\dfrac{a}{c}\right)^2}=\dfrac{1-\dfrac{9}{16}}{1+\dfrac{9}{16}}=\dfrac{(7/16)}{(25/16)}=\dfrac{7}{25}.$

102. $x=y\ \Leftrightarrow\ 1-q=2q+1\ \Leftrightarrow\ 3q=0\ \Leftrightarrow\ q=0.$

103. $\dfrac{x}{5}-\dfrac{x}{6}=4\ \Leftrightarrow\ \dfrac{6x-5x}{30}=4\ \Leftrightarrow\ x=120.$

104. $\dfrac{3x}{2y}=\dfrac{21}{22}\ \Rightarrow\ \dfrac{x}{y}=\left(\dfrac{21}{22}\times\dfrac{2}{3}\right)=\dfrac{7}{11}\ \Rightarrow\ x=\dfrac{7}{11}y.$

$4x+5y=83\ \Rightarrow\ 4\times\dfrac{7}{11}y+5y=83\ \Rightarrow\ \dfrac{28}{11}y+5y=83$

$\Rightarrow\ 83y=83\times 11\ \Rightarrow\ y=11.$

$\therefore\quad x=\dfrac{7}{11}y=\left(\dfrac{7}{11}\times 11\right)=7.$

So, $y-x=11-7=4.$

105. $\dfrac{ab}{a+b}=\dfrac{\dfrac{x}{x+y}\cdot\dfrac{y}{x-y}}{\dfrac{x}{x+y}+\dfrac{y}{x-y}}=\dfrac{\dfrac{xy}{x^2-y^2}}{\dfrac{x(x-y)+y(x+y)}{x^2-y^2}}=\dfrac{xy}{x^2+y^2}.$

106. $\dfrac{a}{b}=\dfrac{1}{3}\ \Rightarrow\ b=3a;\dfrac{b}{c}=2\ \Rightarrow\ c=\dfrac{b}{2}=\dfrac{3a}{2};$

$\dfrac{c}{d}=\dfrac{1}{2}\ \Rightarrow\ d=2c=2\left(\dfrac{3a}{2}\right)=3a;$

$\dfrac{d}{e}=3\ \Rightarrow\ e=\dfrac{d}{3}=\left(\dfrac{3a}{3}\right)=a;\dfrac{e}{f}=\dfrac{1}{4}\ \Rightarrow\ f=4e=4a.$

$\therefore\quad \dfrac{abc}{def}=\dfrac{(a)(3a)\left(\dfrac{3a}{2}\right)}{(3a)(a)(4a)}=\dfrac{9}{2}a^3\times\dfrac{1}{12a^3}=\dfrac{3}{8}.$

107. $\dfrac{m}{n}=\dfrac{4}{3}$ and $\dfrac{r}{t}=\dfrac{9}{14}\ \Rightarrow\ \dfrac{mr}{nt}=\dfrac{4}{3}\times\dfrac{9}{14}=\dfrac{6}{7}.$

$\therefore\quad \dfrac{3mr-nt}{4nt-7mr}=\dfrac{3\dfrac{mr}{nt}-1}{4-7\dfrac{mr}{nt}}=\dfrac{3\times\dfrac{6}{7}-1}{4-7\times\dfrac{6}{7}}$

$=\dfrac{\dfrac{18}{7}-1}{4-6}=\dfrac{11}{7}\times\left(-\dfrac{1}{2}\right)=-\dfrac{11}{14}.$

108. $a+\dfrac{1}{b}=1\ \Rightarrow ab+1=b\Rightarrow ab-b=-1$

$\Rightarrow b(a-1)=-1\Rightarrow\ b=\dfrac{1}{(1-a)}.$

$b+\dfrac{1}{c}=1\ \Rightarrow bc+1=c\Rightarrow bc-c=-1$

$\Rightarrow c(b-1)=-1\Rightarrow\ c=\dfrac{1}{(1-b)}.$

$\therefore\quad c+\dfrac{1}{a}=\dfrac{1}{(1-b)}+\dfrac{1}{a}=\dfrac{1}{1-\left(\dfrac{1}{1-a}\right)}+\dfrac{1}{a}=\dfrac{1}{\dfrac{(1-a)-1}{(1-a)}}+\dfrac{1}{a}$

$=\dfrac{(1-a)}{-a}+\dfrac{1}{a}=\dfrac{(a-1)}{a}+\dfrac{1}{a}=\dfrac{a-1+1}{a}=\dfrac{a}{a}=1.$

109. $y+\dfrac{1}{z}=1\ \Rightarrow yz+1=z\Rightarrow yz-z=-1$

$\Rightarrow z(y-1)=-1\Rightarrow\ z=\dfrac{1}{(1-y)}.$

$x+\dfrac{1}{y}=1\ \Rightarrow xy+1=y\Rightarrow xy-y=-1$

$\Rightarrow y(x-1)=-1\Rightarrow\ y=\dfrac{1}{(1-x)}.$

$\therefore\quad xyz=x\left(\dfrac{1}{1-x}\right)\left(\dfrac{1}{1-y}\right)=x\left(\dfrac{1}{1-x}\right)\left(\dfrac{1}{1-\dfrac{1}{1-x}}\right)$

$=x\left(\dfrac{1}{1-x}\right)\left(\dfrac{1-x}{-x}\right)=-1.$

110. $\dfrac{x}{(2x+y+z)}=a\Rightarrow x=a(2x+y+z)$ ...(*i*)

$\dfrac{y}{(x+2y+z)}=a\Rightarrow y=a(x+2y+z)$ ...(*ii*)

$\dfrac{z}{(x+y+2z)}=a\Rightarrow z=a(x+y+2z)$ ...(*iii*)

Adding (*i*), (*ii*) and (*iii*), we get: $x+y+z$

$=a(4x+4y+4z)\Rightarrow\ a=\dfrac{x+y+z}{4(x+y+z)}=\dfrac{1}{4}.$

111. $\dfrac{a}{b+c}=K\Rightarrow a=K(b+c)$ ...(*i*)

$\dfrac{b}{c+a}=K\Rightarrow b=K(c+a)$ ...(*ii*)

$\dfrac{c}{a+b}=K\Rightarrow c=K(a+b)$ ...(*iii*)

Adding (*i*), (*ii*), and (*iii*), we get: $a + b + c = K(2a + 2b + 2c) \Rightarrow K = \frac{a+b+c}{2(a+b+c)} = \frac{1}{2}$.

112. $a - 8 = b \Rightarrow a - b = 8$ and $b - a = -8$.
$\therefore \quad |a - b| - |b - a| = |8| - |-8| = 8 - 8 = 0.$

113. $x = \frac{a}{a-1} = 1 + \frac{1}{a-1} = 1 + y. \qquad \therefore \quad x > y.$

114. a is positive and $a < 1 \Rightarrow \frac{1}{a} > 1. \qquad \therefore \quad \left(a + \frac{1}{a}\right) > 2.$

115. $\frac{a}{x} + \frac{y}{b} = 1 \Rightarrow \frac{a}{x} = 1 - \frac{y}{b} = \frac{b-y}{b} \Rightarrow \frac{x}{a} = \frac{b}{b-y}.$

$\frac{b}{y} + \frac{z}{c} = 1 \Rightarrow \frac{z}{c} = 1 - \frac{b}{y} = \frac{y-b}{y} \Rightarrow \frac{c}{z} = \frac{y}{y-b} = \frac{-y}{(b-y)}.$

$\therefore \quad \frac{x}{a} + \frac{c}{z} = \frac{b}{(b-y)} - \frac{y}{(b-y)} = \frac{(b-y)}{(b-y)} = 1.$

116. $a^2 + b^2 = 45$ ...(*i*)
and $b^2 + c^2 = 40$ ...(*ii*)
Subtracting, we get: $a^2 - c^2 = 5 \Rightarrow (a + c)(a - c) = 5.$
$\therefore \quad (a + c) = 5$ and $(a - c) = 1.$
Solving, we get: $a = 3$, $c = 2$. Putting $c = 2$ in (*ii*), we get: $b = 6$.

117. $x + y = 15 \Rightarrow (x + y)^2 = (15)^2 = 225$
$\Rightarrow x^2 + y^2 + 2xy = 225$
$\Rightarrow x^2 + y^2 = 225 - 2xy = 225 - 2 \times 56$
$= 225 - 112 = 113.$

118. $(a - b) = 4 \Rightarrow (a - b)^2 = 4^2 = 16 \Rightarrow a^2 + b^2 - 2ab = 16$
$\Rightarrow a^2 + b^2 = 16 + 2ab = 16 + 2 \times 2$
$= 16 + 4 = 20.$

119. $a = bc$ and $c = a - b \Rightarrow a = b(a - b) \Rightarrow a = ab - b^2$

$\Rightarrow b^2 = ab - a = a(b - 1) \Rightarrow a = \frac{b^2}{b-1}.$

120. $a + b + c = 0 \Rightarrow a = -(b + c) \Rightarrow a^2 = (b + c)^2.$

$\therefore \quad \frac{a^2}{(a^2 - bc)} + \frac{b^2}{(b^2 - ca)} + \frac{c^2}{(c^2 - ab)}$

$= \frac{(b+c)^2}{(b+c)^2 - bc} + \frac{b^2}{b^2 + c(b+c)} + \frac{c^2}{c^2 + b(b+c)}$

$= \frac{(b+c)^2}{b^2 + c^2 + bc} + \frac{b^2}{b^2 + c^2 + bc} + \frac{c^2}{b^2 + c^2 + bc}$

$= \frac{b^2 + c^2 + 2bc + b^2 + c^2}{b^2 + c^2 + bc} = \frac{2(b^2 + c^2 + bc)}{b^2 + c^2 + bc} = 2.$

121. $\frac{x^2 - y^2}{x^2 + y^2} = \frac{\left(\frac{x^2}{y^2}\right) - 1}{\left(\frac{x^2}{y^2}\right) + 1} = \frac{\left(\frac{x}{y}\right)^2 - 1}{\left(\frac{x}{y}\right)^2 + 1} = \frac{\left(\frac{a+2}{a-2}\right)^2 - 1}{\left(\frac{a+2}{a-2}\right)^2 + 1}$

$= \frac{(a+2)^2 - (a-2)^2}{(a+2)^2 + (a-2)^2} = \frac{4 \times a \times 2}{2(a^2 + 4)} = \frac{4a}{a^2 + 4}.$

122. $3x + 7 = 7x + 5 \Rightarrow 7x - 3x = 2 \Rightarrow 4x = 2 \Rightarrow x = \frac{1}{2}.$

Now, $3x + 7 = x^2 + P \Rightarrow \frac{3}{2} + 7 = \frac{1}{4} + P$

$\Rightarrow P = \frac{17}{2} - \frac{1}{4} = \frac{33}{4} = 8\frac{1}{4}.$

123. $\frac{2a+b}{a+4b} = 3 \Rightarrow 2a + b = 3(a + 4b) \Rightarrow a = -11b.$

$\frac{a+b}{a+2b} = \frac{-11b+b}{-11b+2b} = \frac{-10b}{-9b} = \frac{10}{9}.$

124. $(2a + 3b)(2c - 3d) = (2a - 3b)(2c + 3d)$

$\Rightarrow \frac{(2a+3b)}{(2a-3b)} = \frac{(2c+3d)}{(2c-3d)}$

$\Rightarrow \frac{2\left(\frac{a}{b}\right) + 3}{2\left(\frac{a}{b}\right) - 3} = \frac{2\left(\frac{c}{d}\right) + 3}{2\left(\frac{c}{d}\right) - 3} \Rightarrow \frac{a}{b} = \frac{c}{d}.$

125. $(a + b + 2c + 3d)(a - b - 2c + 3d)$
$= (a - b + 2c - 3d)(a + b - 2c - 3d)$
$\Rightarrow [(a + b) + (2c + 3d)][(a - b) - (2c - 3d)]$
$= [(a - b) + (2c - 3d)][(a + b) - (2c + 3d)]$
$\Rightarrow (a + b)(a - b) - (a + b)(2c - 3d) + (a - b)(2c + 3d) - (2c + 3d)(2c - 3d)$
$= (a - b)(a + b) - (a - b)(2c + 3d) + (a + b)(2c - 3d) - (2c + 3d)(2c - 3d)$
$\Rightarrow (a + b)(2c - 3d) = (a - b)(2c + 3d)$
$\Rightarrow 2ac - 3ad + 2bc - 3bd = 2ac + 3ad - 2bc - 3bd$
$\Rightarrow 4bc = 6ad \quad \Rightarrow \quad 2bc = 3ad.$

126. $\frac{x+y}{x-y} \div \frac{(x+y)^2}{x^2 - y^2} = \frac{x+y}{x-y} \times \frac{(x^2 - y^2)}{(x+y)^2}$

$= \frac{(x^2 - y^2)}{(x-y)(x+y)} = \frac{(x^2 - y^2)}{(x^2 - y^2)} = 1.$

127. $\frac{a^2 - b^2 - 2bc - c^2}{a^2 + b^2 + 2ab - c^2} = \frac{a^2 - (b^2 + 2bc + c^2)}{(a^2 + b^2 + 2ab) - c^2} = \frac{a^2 - (b+c)^2}{(a+b)^2 - c^2}$

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

128. $x + y + z = 0 \Rightarrow y = -(x + z).$
$\therefore \quad x^2 + xy + y^2 = x^2 + x(-x - z) + (x + z)^2$
$= x^2 - x^2 - xz + x^2 + z^2 + 2xz$
$= x^2 + z^2 + zx.$

129. $(s - a)^2 + (s - b)^2 + (s - c)^2 + s^2$
$= (s^2 + a^2 - 2sa) + (s^2 + b^2 - 2sb) + (s^2 + c^2 - 2sc) + s^2$
$= 4s^2 + (a^2 + b^2 + c^2) - 2s(a + b + c)$
$= (2s)^2 + (a^2 + b^2 + c^2) - (a + b + c)(a + b + c)$
$= (a + b + c)^2 + (a^2 + b^2 + c^2) - (a + b + c)^2$
$= a^2 + b^2 + c^2.$

130. $[(x + y)^2 - z^2] + [(y + z)^2 - x^2] + [(z + x)^2 - y^2]$
$= 4 + 9 + 36$
$\Rightarrow \quad (x + y + z)(x + y - z) + (x + y + z)(y + z - x) + (x + y + z)(z + x - y) = 49$
$\Rightarrow \quad (x + y + z)[(x + y - z) + (y + z - x) + (z + x - y)] = 49$
$\Rightarrow \quad (x + y + z)(x + y + z) = 49 \Rightarrow (x + y + z)^2 = 49$
$\Rightarrow \quad (x + y + z) = \pm 7.$

131. $a + b = 2c \Rightarrow a = 2c - b$.

$$\therefore \quad \frac{a}{a-c}+\frac{b}{b-c}=\frac{2c-b}{(2c-b)-c}+\frac{b}{(b-c)}=\frac{2c-b}{c-b}+\frac{b}{b-c}$$

$$=\frac{b-2c}{b-c}+\frac{b}{b-c}=\frac{b-2c+b}{b-c}=\frac{2(b-c)}{b-c}=2.$$

132. $$\frac{x}{x-1}+\frac{1}{x+1}+\frac{2x}{1-x^2}=\frac{x}{x-1}+\frac{1}{x+1}-\frac{2x}{x^2-1}$$

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

$$=\frac{x^2+x+x-1-2x}{x^2-1}=\frac{x^2-1}{x^2-1}=1.$$

133. $$\frac{(a+b)^2}{(a^2-b^2)}=\frac{(a+b)(a+b)}{(a+b)(a-b)}=\frac{a+b}{a-b}.$$

134. $ab + bc + ca = 0 \Rightarrow ab = -bc - ca$, $bc = -ab - ca$, $ca = -ab - bc$.

$$\therefore \quad \frac{1}{a^2-bc}+\frac{1}{b^2-ca}+\frac{1}{c^2-ab}$$

$$=\frac{1}{a^2+ab+ac}+\frac{1}{b^2+ab+bc}+\frac{1}{c^2+bc+ca}$$

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

$$=\frac{bc+ca+ab}{abc(a+b+c)}=0. \quad [\because ab + bc + ca = 0]$$

135. Number of boxes required $= \dfrac{15\times 1000}{250} = 60.$

136. Bus fare for 1 person = ₹ 420.

Train fare for 1 person $= ₹\left(\frac{3}{4}\times 840\right) = ₹\ 630.$

$\therefore$ Total fare = ₹ (3 × 420 + 4 × 630)
= ₹ (1260 + 2520) = ₹ 3780.

137. Let the cost of one pen be ₹ x. Then, cost of 1 pencil $= ₹\left(\frac{x}{3}\right)$.

$$\therefore \quad 6x+3\times\frac{x}{3}=84\Rightarrow 7x=84\Rightarrow x=12.$$

So, total cost of 4 pens and 5 pencils

$$= ₹\left(4x+\frac{5x}{3}\right)=₹\left(\frac{17x}{3}\right)=₹\left(\frac{17\times 12}{3}\right)=₹\ 68.$$

138. Amount received by each person $= ₹\left(\frac{436563}{69}\right) = ₹\ 6327.$

$$\begin{array}{r} 69\overline{)436563}\ 6327 \\ \underline{414} \\ 225 \\ \underline{207} \\ 186 \\ \underline{138} \\ 483 \\ \underline{483} \\ \times \end{array}$$

139. Length of reel = (32 × 120 + 80) cm = 3920 cm = 39.20 m.

140. Number of bananas required daily $= \dfrac{798}{7} = 114.$

$\therefore$ Required number $= [114 \times (\overset{\text{Jan}}{31} + \overset{\text{Feb}}{29} + \overset{\text{Mar}}{31})]$

= (114 × 91) = 10374.

141. Suppose Mohan has ₹ x. Then, Ram has ₹ $(x + 6)$ and Sohan has ₹ $(x - 3)$.

$\therefore$ $x + (x + 6) + (x - 3) = 33 \Leftrightarrow 3x = 30 \Leftrightarrow x = 10.$

So, Ram's share = ₹ (10 + 6) = ₹ 16.

142. 4 gal = (4 × 4) qt = 16 qt = (16 × 2) pt = 32 pt.

$\therefore$ Number of bottles $= \dfrac{32}{\left(\frac{1}{2}\right)} = 64.$

143. $$\frac{1}{2}A=\frac{5}{6}B\Rightarrow A=\left(2\times\frac{5}{6}\right)B=\frac{5}{3}B.$$

$$\therefore \quad A+B=80\Rightarrow\frac{5}{3}B+B=80\Rightarrow\frac{8}{3}B=80$$

$$\Rightarrow B=\left(\frac{80\times 3}{8}\right)=30\text{ kg}.$$

144. $a = b + 2 \Rightarrow b = a - 2$

And, $b = c + 10 \Rightarrow c = b - 10 = (a - 2) - 10 = a - 12.$

$a + b + c = 130 \Rightarrow a + (a - 2) + (a - 12) = 130$

$\Rightarrow 3a = 144 \Rightarrow a = 48.$

$\therefore$ $(b + c) - a = [(a - 2) + (a - 12)] - a$

$= (2a - 14) - a = (a - 14) = 48 - 14 = 34.$

145. Let the given condition be fulfilled n years after 2002.

Then, price of item X after n years = ₹ $(420 + 40n)$.

price of item Y after n years = ₹ $(630 + 15n)$.

$\therefore$ $420 + 40n = (630 + 15n) + 40$

$\Rightarrow$ $420 + 40n = 670 + 15n \Rightarrow 25n = 250 \Rightarrow n = 10.$

So, the required year is 10 years after 2002 i.e., 2012.

146. Number of pieces $= \left(\dfrac{42.5\times 100}{85}\right) = \dfrac{4250}{85} = 50.$

147. Total number of children = (30 × 16) = 480.

$\therefore$ Number of columns of 24 children each $= \left(\dfrac{480}{24}\right) = 20.$

148. Original number of sections = (16 − 3) = 13.
Original number of students = (24 × 13) = 312.
Present number of students = (21 × 16) = 336.
Number of new students admitted = (336 − 312) = 24.

149. Money earned in 2 days = ₹ (20 − 15) = ₹ 5.

Money earned in 16 days $= ₹\left(\frac{5}{2}\times 16\right) = ₹\ 40.$

On 17th day, money in hand = ₹ (40 + 20) = ₹ 60.

150. Let the number of cars sold on the first day be x.

Then, $x + (x + 6) + (x + 12) + (x + 18) + (x + 24) + (x + 30) = 150$

$\Leftrightarrow 6x + 90 = 150 \Leftrightarrow 6x = 60 \Leftrightarrow x = 10.$

$\therefore$ Number of cars sold on 6th day = (10 + 30) = 40.

151. Let the number of captains in the group be x.

Then, number of soldiers = $15x$.

$\therefore$ $x + 15x = 1200 \Leftrightarrow 16x = 1200 \Leftrightarrow x = 75.$

152. Required cost = ₹ $[1000 \times x + (z - 1000) \times y]$

= ₹ $(1000x + zy - 1000y)$

= ₹ $[1000(x - y) + yz]$.

153. Let the monthly salary of a man be ₹ x.
Then, monthly salary of a woman = ₹ $(x + 500)$.
$\therefore \quad 4x + 2(x + 500) = 46000 \Leftrightarrow 6x = 45000 \Leftrightarrow x = 7500.$
Monthly salary of a woman = $x + 500$ = ₹ 8000.

154. Let the number of pineapples and watermelons be x and y respectively.

Then, $7x + 5y = 38$ or $5y = (38 - 7x)$ or $y = \dfrac{38 - 7x}{5}$.

Clearly, y is a whole number, only when $(38 - 7x)$ is divisible by 5. This happens when $x = 4$.

155. Let F and C denote the temperatures in Fahrenheit and Celsius respectively.

Then, $\dfrac{F - 32}{212 - 32} = \dfrac{C - 0}{100 - 0} \Leftrightarrow \dfrac{F - 32}{180} = \dfrac{C}{100}$.

If $C = 35$, then $F = \left(\dfrac{35}{100} \times 180\right) + 32 = 63 + 32 = 95.$

156. Let the two parts be x and $(74 - x)$.
Then, $5x + 11(74 - x) = 454 \Leftrightarrow 6x = 360 \Leftrightarrow x = 60.$
So, the two parts are 60 and 14.

157. Let the quantity of water drained away be x litres.
Then, $12 - x = x - 6 \Rightarrow 2x = 18 \Rightarrow x = 9.$

158. Let the number of boys in the family be x.
Then each boy has $(x - 1)$ brothers and $(x - 1)$ sisters.
So, number of girls = $(x - 1)$.
Thus each girl has x brothers and $(x - 2)$ sisters.
$\therefore \quad x = 2(x - 2) \Leftrightarrow x = 2x - 4 \Leftrightarrow x = 4.$
So, there are 4 boys and 3 girls i.e., 4 brothers and 3 sisters in the family.

159. 5000 INR = 100 USD = $\left(100 \times \dfrac{1}{0.01}\right)$ Japanese Yen

= 10000 Japanese Yen

$\Rightarrow$ 1 INR = 2 Japanese Yen

$\Rightarrow$ 100 INR = 200 Japanese Yen.

160. Capacity of the tank = (13.5 × 12) litres = 162 litres.

$\therefore$ Required number of buckets = $\left(\dfrac{162}{9}\right) = 18.$

161. Given exp. $= \left[1 + \dfrac{1}{1 + \dfrac{1}{(4/3)}}\right] \div \dfrac{11}{7} = \left[1 + \dfrac{1}{1 + \dfrac{3}{4}}\right] \div \dfrac{11}{7}$

$= \left[1 + \dfrac{1}{(7/4)}\right] \div \dfrac{11}{7} = \left(1 + \dfrac{4}{7}\right) \div \dfrac{11}{7} = \dfrac{11}{7} \div \dfrac{11}{7} = 1.$

162. (*a*) $\dfrac{1}{3 + \dfrac{1}{1 + \dfrac{1}{16}}} = \dfrac{1}{3 + \dfrac{1}{(17/16)}} = \dfrac{1}{3 + \dfrac{16}{17}} = \dfrac{1}{(67/17)} = \dfrac{17}{67}.$

(*b*) $\dfrac{1}{2 + \dfrac{1}{1 + \dfrac{1}{8}}} = \dfrac{1}{2 + \dfrac{1}{(9/8)}} = \dfrac{1}{2 + \dfrac{8}{9}} = \dfrac{1}{(26/9)} = \dfrac{9}{26}.$

(*c*) $\dfrac{1}{3 + \dfrac{1}{1 + \dfrac{1}{1 + \dfrac{1}{8}}}} = \dfrac{1}{3 + \dfrac{1}{1 + \dfrac{1}{(9/8)}}} = \dfrac{1}{3 + \dfrac{1}{1 + \dfrac{8}{9}}}$

$= \dfrac{1}{3 + \dfrac{1}{(17/9)}} = \dfrac{1}{3 + \dfrac{9}{17}} = \dfrac{1}{\left(\dfrac{60}{17}\right)} = \dfrac{17}{60}.$

(*d*) $\dfrac{1}{3 + \dfrac{1}{1 + \dfrac{1}{2 + \dfrac{1}{4}}}} = \dfrac{1}{3 + \dfrac{1}{1 + \dfrac{1}{(9/4)}}} = \dfrac{1}{3 + \dfrac{1}{1 + \dfrac{4}{9}}}$

$= \dfrac{1}{3 + \dfrac{1}{(13/9)}} = \dfrac{1}{3 + \dfrac{9}{13}} = \dfrac{1}{(48/13)} = \dfrac{13}{48}.$

163. Given exp. $= \dfrac{1}{1 + \dfrac{1}{3 - \dfrac{4}{2 + \dfrac{1}{(5/2)}}}} + \dfrac{3}{3 - \dfrac{4}{3 + \dfrac{1}{(3/2)}}}$

$= \dfrac{1}{1 + \dfrac{1}{3 - \dfrac{4}{2 + \dfrac{2}{5}}}} + \dfrac{3}{3 - \dfrac{4}{3 + \dfrac{2}{3}}}$

$= \dfrac{1}{1 + \dfrac{1}{3 - \dfrac{4}{(12/5)}}} + \dfrac{3}{3 - \dfrac{4}{(11/3)}}$

$= \dfrac{1}{1 + \dfrac{1}{3 - \dfrac{20}{12}}} + \dfrac{3}{3 - \dfrac{12}{11}} = \dfrac{1}{1 + \dfrac{1}{3 - \dfrac{5}{3}}} + \dfrac{3}{(21/11)}$

$= \dfrac{1}{1 + \dfrac{1}{(4/3)}} + \dfrac{33}{21}$

$= \dfrac{1}{1 + \dfrac{3}{4}} + \dfrac{11}{7} = \dfrac{1}{(7/4)} + \dfrac{11}{7} = \dfrac{4}{7} + \dfrac{11}{7} = \dfrac{15}{7}.$

164. $x = 2 - \dfrac{1}{1 + \dfrac{1}{(13/4)}} = 2 - \dfrac{1}{1 + \dfrac{4}{13}} = 2 - \dfrac{1}{(17/13)} = 2 - \dfrac{13}{17} = \dfrac{21}{17}.$

165. $x = \dfrac{2 + \dfrac{1}{(19/5)}}{2 + \dfrac{1}{3 + \dfrac{1}{(5/4)}}} = \dfrac{2 + \dfrac{5}{19}}{2 + \dfrac{1}{3 + \dfrac{4}{5}}} = \dfrac{2 + \dfrac{5}{19}}{2 + \dfrac{1}{(19/5)}} = \dfrac{2 + \dfrac{5}{19}}{2 + \dfrac{5}{19}} = 1.$

166. Given exp. $= 8 - 8 \times \dfrac{\dfrac{11}{5} - \dfrac{9}{7}}{2 - \dfrac{1}{(35/6)}}$

$= 8 - 8 \times \dfrac{\dfrac{32}{35}}{2 - \dfrac{6}{35}} = 8 - 8 \times \dfrac{32}{35} \times \dfrac{35}{64} = 8 - 4 = 4.$

167. Given exp. $= \dfrac{2}{2 + \dfrac{2}{3 + \dfrac{2}{(11/3)}} \times 0.39} = \dfrac{2}{2 + \dfrac{2}{3 + \dfrac{6}{11}} \times 0.39}$

$$= \frac{2}{2+\frac{2}{(39/11)}\times 0.39}$$

$$= \frac{2}{2+\frac{22}{39}\times\frac{39}{100}} = \frac{2}{2+\frac{22}{100}}$$

$$= \frac{2}{2+\frac{11}{50}} = \frac{2}{(111/50)} = \frac{100}{111}.$$

168. Given exp. $= \dfrac{1}{1+\dfrac{\frac{2}{3}}{\frac{5}{3}+\frac{8}{9}}} = \dfrac{1}{1+\dfrac{2/3}{\frac{5}{3}+\frac{8}{9}\times 3}}$

$$= \frac{1}{1+\frac{2/3}{(13/3)}} = \frac{1}{1+\frac{2}{13}} = \frac{13}{15}.$$

169. $\dfrac{2}{2+\dfrac{2}{2+\frac{2}{x}}} = 3 \Leftrightarrow \dfrac{2}{2+\dfrac{2}{\left(\frac{2x+2}{x}\right)}} = 3$

$$\Leftrightarrow \frac{2}{2+\frac{2x}{2x+2}} = 3 \Leftrightarrow \frac{2}{\frac{2(2x+2)+2x}{2x+2}} = 3$$

$$\Leftrightarrow \frac{2(2x+2)}{2(3x+2)} = 3$$

$$\Leftrightarrow \frac{(2x+2)}{(3x+2)} = 3 \Leftrightarrow 2x+2 = 9x+6$$

$$\Leftrightarrow 7x = -4 \Leftrightarrow x = -\frac{4}{7}.$$

170. $2+\dfrac{1}{x+\frac{1}{y+\frac{1}{z}}} = \frac{37}{13} = 2\frac{11}{13} = 2+\frac{11}{13} \Rightarrow \dfrac{1}{x+\frac{1}{y+\frac{1}{z}}}$

$$= \frac{11}{13} \Rightarrow x+\frac{1}{y+\frac{1}{z}} = \frac{13}{11}$$

$$\Rightarrow x+\frac{1}{y+\frac{1}{z}} = 1+\frac{2}{11}$$

$$\Rightarrow x = 1, y+\frac{1}{z} = \frac{11}{2} = 5\frac{1}{2} = 5+\frac{1}{2}$$

$\Rightarrow$ $x = 1$, $y = 5$, $z = 2$.

171. Clearly, we have: $x = 1+\dfrac{1}{x} = \dfrac{x+1}{x}$.

$\Rightarrow$ $x^2 = x + 1$ $\Rightarrow$ $x^2 - x - 1 = 0$.

172. Let $x = \dfrac{1}{3+\dfrac{1}{4+\cdots\cdots+\dfrac{1}{1008}}}$.

Then, $P = \dfrac{1}{1+\frac{1}{1+x}} = \dfrac{1+x}{2+x}$, $Q = \dfrac{1}{2+x}$.

$\therefore$ $P+Q = \dfrac{1+x}{2+x}+\dfrac{1}{2+x} = \dfrac{2+x}{2+x} = 1.$

173. Given exp. $= \dfrac{a^2-b^2}{a+b}$, where $a = \left(1+\dfrac{1}{10+\frac{1}{10}}\right)$ and

$$b = \left(1-\frac{1}{10+\frac{1}{10}}\right)$$

$$= (a-b) = \left(1+\frac{1}{10+\frac{1}{10}}\right)-\left(1-\frac{1}{10+\frac{1}{10}}\right)$$

$$= 2\times\frac{1}{(101/10)} = \frac{20}{101}.$$

174. $3x + y = 19$ ...(*i*) and $x - y = 9$ ...(*ii*)

Adding (*i*) and (*ii*), we get: $4x = 28$ or $x = 7$.

Putting $x = 7$ in (*i*), we get: $y = -2$.

175. $4x = p(x + 3) + q(x - 1) \Rightarrow 4x = px + 3p + qx - q$

$\Rightarrow 4x = (p + q)x + (3p - q)$

$\Rightarrow p + q = 4$ and $3p - q = 0$

$\Rightarrow p + q = 4$ and $p = \dfrac{q}{3}$

$\Rightarrow \dfrac{q}{3}+q = 4 \Rightarrow \dfrac{4q}{3} = 4 \Rightarrow q = 3.$

$p + q = 4$ and $q = 3 \Rightarrow p = 1$.

176. $xyz = 256 \Rightarrow (2z)(2z)z = 256 \Rightarrow 4z^3$

$= 256 \Rightarrow z^3 = 64 \Rightarrow z = 4.$

$\therefore$ $x = 2z = (2 \times 4) = 8.$

177. $\dfrac{28x}{13y} = \dfrac{140}{39} \Rightarrow \dfrac{x}{y} = \left(\dfrac{140}{39}\times\dfrac{13}{28}\right) = \dfrac{5}{3} \Rightarrow x = \dfrac{5}{3}y.$

$3y + 9x = 54 \Rightarrow y + 3x = 18$

$\Rightarrow y+3\times\dfrac{5}{3}y = 18 \Rightarrow 6y = 18 \Rightarrow y = 3.$

$\therefore$ $x = \left(\dfrac{5}{3}\times 3\right) = 5.$

So, $y - x = (3 - 5) = -2$.

178. $3x + 7y = 75$ ...(*i*)

$5x - 5y = 25 \Rightarrow x - y = 5 \Rightarrow 7x - 7y = 35$ ...(*ii*)

Adding (*i*) and (*ii*), we get: $10x = 110$ or $x = 11$.

Putting $x = 11$ in (*i*), we get: $7y = 42$ or $y = 6$.

$\therefore$ $x + y = (11 + 6) = 17.$

179. $a + b = 5$ ...(*i*) and $3a + 2b = 20$ ...(*ii*)

Multiplying (*i*) by 2 and subtracting from (*ii*), we get: $a = 10$.

Putting $a = 10$ in (*i*), we get: $b = -5$.

$\therefore$ $(3a + b) = 3 \times 10 + (-5) = 30 - 5 = 25.$

180. $(2p + 3q) + (2p - q) = 18 + 2 \Rightarrow 4p + 2q = 20$

$\Rightarrow 2(2p+q) = 20 \Rightarrow 2p+q = 10.$

181. $2x + y = 5$ ...(*i*) and $3x - 4y = 2$ ...(*ii*)
Multiplying (*i*) by 4 and adding (*ii*) to it, we get:
$11x = 22$ or $x = 2$.
Putting $x = 2$ in (*i*), we get: $y = 1$.
So, $2xy = 2 \times 2 \times 1 = 4$.

182. $3x - 5y = 5$ ...(*i*) and $\frac{x}{x+y} = \frac{5}{7} \Rightarrow 7x = 5x + 5y$

$\Rightarrow \quad 2x - 5y = 0$ ...(*ii*)
Subtracting (*ii*) from (*i*), we get: $x = 5$.
Putting $x = 5$ in (*i*), we get: $y = 2$. So, $x - y = 5 - 2 = 3$.

183. $4x + 3y = 18xy$ ...(*i*) and $2x - 5y = -4xy$ ...(*ii*)
Dividing (*i*) and (*ii*) by xy, we get:
$\frac{3}{x} + \frac{4}{y} = 18$ ...(*iii*) and $\frac{5}{x} - \frac{2}{y} = 4$ ...(*iv*)
Multiplying (*iv*) by 2 and adding (*iii*) to it, we get:
$\frac{13}{x} = 26$ or $x = \frac{1}{2}$.
Putting $x = \frac{1}{2}$ in (*iii*), we get : $y = \frac{1}{3}$.

184. $2x + y = 17$ ...(*i*)
$y + 2z = 15$ ...(*ii*)
and $x + y = 9$ ...(*iii*)
Subtracting (*iii*) from (*i*), we get: $x = 8$.
Putting $x = 8$ in (*i*), we get: $y = 1$. Putting $y = 1$ in (*ii*), we get: $2z = 14$ or $z = 7$.
$\therefore \quad 4x + 3y + z = 4 \times 8 + 3 \times 1 + 7 = 42$.

185. $3x - 4y + z = 7$ ...(*i*)
$2x + 3y - z = 19$ ...(*ii*)
and $x + 2y + 2z = 24$ ...(*iii*)
Adding (*i*) and (*ii*), we get: $5x - y = 26$ ...(*iv*)
Subtracting (*i*) from (*ii*) and adding to (*iii*), we get:
$9y = 36$ or $y = 4$.
Putting $y = 4$ in (*iv*), we get: $5x = 30$ or $x = 6$.
Putting $x = 6$, $y = 4$ in (*iii*), we get: $2z = 10$ or $z = 5$.

186. $2x + y = 15$ ...(*i*)
$2y + z = 25$ ...(*ii*)
and $2z + x = 26$ ...(*iii*)
Adding (*i*), (*ii*) and (*iii*), we get: $3(x + y + z)$
$= 66$ or $x + y + z = 22$ ...(*iv*)
From (*ii*), we have: $y = \frac{25 - z}{2}$. From (*iii*), we have:
$x = 26 - 2z$.

$\therefore \quad (26 - 2z) + \left(\frac{25 - z}{2}\right) + z = 22 \Leftrightarrow 77 - 3z = 44$

$\Leftrightarrow \quad 3z = 33 \Leftrightarrow z = 11$.

187. $2x + 3y = 31$ ...(*i*)
$y - z = 4$ ...(*ii*)
and $x + 2z = 11$ ...(*iii*)
Multiplying (*iii*) by 2 and subtracting from (*i*), we get:
$3y - 4z = 9$ ...(*iv*)
Solving (*ii*) and (*iv*), we get: $y = 7$, $z = 3$.
Putting $y = 7$ in (*i*), we get: $x = 5$.
$\therefore \quad x + y + z = (5 + 7 + 3) = 15$.

188. Let the cost of a chair and that of a table be ₹ x and ₹ y respectively.
Then, $10x = 4y$ or $y = \frac{5}{2}x$.

$\therefore \quad 15x + 2y = 4000 \Leftrightarrow 15x + 2 \times \frac{5}{2}x$

$= \quad 4000 \Leftrightarrow 20x = 4000 \Leftrightarrow x = 200$.

So, $y = \left(\frac{5}{2} \times 200\right) = 500$.

$\therefore$ Cost of 12 chairs and 3 tables $= 12x + 3y$
$=$ ₹ $(12 \times 200 + 3 \times 500) =$ ₹ $(2400 + 1500)$
$=$ ₹ 3900.

189. Let the price of a jean be ₹ x and that of a shirt be ₹ y.
Then, $2x + 3y = 4000$ ...(*i*) and $3x + 2y = 3500$ ...(*ii*)
Adding (*i*) and (*ii*),
we get: $5x + 5y = 7500$ or $x + y = 1500$ ...(*iii*)
Subtracting (*ii*) from (*i*), we get: $-x + y = 500$ ...(*iv*)
Adding (*iii*) and (*iv*), we get: $2y = 2000$ or $y = 1000$.
Putting $y = 1000$ in (*iii*), we get: $x = 500$.
Hence, cost of a jean = ₹ 500.

190. Let the cost of one pen be ₹ x and that of one pencil be ₹ y.
Then, $8x + 4y = 176$ or $2x + y = 44$ ...(*i*)
And, $2x + 2y = 48$ or $x + y = 24$ ...(*ii*)
Subtracting (*ii*) from (*i*), we get: $x = 20$.
Hence, cost of 1 pen = ₹ 20.

191. Let the cost of 1 dozen apples be ₹ x and that of 1 dozen bananas be ₹ y. Then,
$2x + 3y = 136$ ...(*i*) and, $x + 5y = 110$ or $2x + 10y = 220$ ...(*ii*)
Subtracting (*i*) from (*ii*), we get: $7y = 84$ or $y = 12$.

192. Let the cost of 1 pencil, 1 pen and 1 eraser be ₹ x, ₹ y and ₹ z respectively.
Then, $x + 2y + 4z = 22$ ...(*i*)
and $5x + 4y + 2z = 32$ ...(*ii*)
Adding (*i*) and (*ii*), we get:
$6(x + y + z) = 54$ or $x + y + z = 9$.
$\therefore$ Cost of 3 pencils, 3 pens and 3 erasers
$= 3(x + y + z) =$ ₹ $(3 \times 9) =$ ₹ 27.

193. Let the number of cows and horses bought be x and y respectively.
Then, number of chicken bought $= 100 - (x + y)$.
$1000x + 300y + 50\,[100 - (x + y)] = 10000$
$\Rightarrow \quad 1000x + 300y + 5000 - 50(x + y) = 10000$
$\Rightarrow \quad 950x + 250y = 5000 \Rightarrow 50(19x + 5y) = 5000$
$\Rightarrow \quad 19x + 5y = 100 \Rightarrow 5y = 100 - 19x \Rightarrow y = \frac{100 - 19x}{5}$.
Clearly, for y to be a whole number, $(100 - 19x)$ must be divisible by 5 and this is possible only when $x = 5$.
When $x = 5$, $y = \frac{100 - 19 \times 5}{5} = \frac{5}{5} = 1$.
$\therefore$ Number of chicken $= [100 - (5 + 1)] = 94$.

194. Let 1 man's daily earning be ₹ x and 1 boy's daily earning be ₹ y.

Then, $3x + 4y = \frac{756}{7} = 108$ ...(*i*)

And, $11x + 13y = \frac{3008}{8} = 376$ ...(*ii*)

Multiplying (*i*) by 11 and (*ii*) by 3, we get:

$33x + 44y = 1188$ ...(*iii*)

$33x + 39y = 1128$ ...(*iv*)

Subtracting (*iv*) from (*iii*), we get: $5y = 60$ or $y = 12$.

Putting $y = 12$ in (*i*), we get: $3x = 60$ or $x = 20$.

∴ Required time

$= \frac{2480}{7x+9y} = \frac{2480}{7\times 20 + 9\times 12} = \frac{2480}{248} = 10$ days.

195. Let the price of 1 burger, 1 shake and 1 fries be ₹ x, ₹ y and ₹ z respectively. Then,

$3x + 7y + z = 120$ ...(*i*)

$4x + 10y + z = 164.50$ ...(*ii*)

Subtracting (*i*) from (*ii*), we get: $x + 3y = 44.50$

or $2x + 6y = 89$ ...(*iii*)

Subtracting (*iii*) from (*i*), we get: $x + y + z = (120 - 89) = 31$.

∴ Cost of 1 burger, 1 shake and 1 fries = ₹ 31.

196. $2x^2 + 12x + 18 = 0 \Leftrightarrow x^2 + 6x + 9 = 0$

$\Leftrightarrow x^2 + 3x + 3x + 9 = 0$

$\Leftrightarrow x(x + 3) + 3(x + 3) = 0$

$\Leftrightarrow (x + 3)^2 = 0 \Leftrightarrow x = -3.$

197. $x^2 - 7x = -12 \Leftrightarrow x^2 - 7x + 12 = 0$

$\Leftrightarrow x^2 - 3x - 4x + 12 = 0$

$\Leftrightarrow x(x - 3) - 4(x - 3) = 0$

$\Leftrightarrow (x - 3)(x - 4) = 0$

$\Leftrightarrow x = 3$ or $x = 4.$

198. $2x^2 - 11x + 15 = 0 \Leftrightarrow 2x^2 - 6x - 5x + 15 = 0$

$\Leftrightarrow 2x(x - 3) - 5(x - 3) = 0$

$\Leftrightarrow (x - 3)(2x - 5) = 0$

$\Leftrightarrow x = 3$ or $x = \frac{5}{2}.$

199. Given exp. $= \frac{1}{2}\times\frac{2}{3}\times\frac{3}{4}\times.....\times\frac{m-1}{m} = \frac{1}{m}.$

200. Given exp. $= \frac{4}{3}\times\frac{5}{4}\times\frac{6}{5}\times.....\times\frac{n+1}{n} = \frac{n+1}{3}.$

201. Given exp. $= \frac{5}{3}\times\frac{7}{5}\times\frac{9}{7}\times.....\times\frac{1001}{999} = \frac{1001}{3}.$

202. Given exp. $= \frac{3}{4}\times\frac{4}{3}\times\frac{5}{3}\times\frac{3}{5}\times\frac{13}{7}\times\frac{1}{13} = \frac{1}{7}.$

203. Given exp.

$= \left(\frac{3^2-1}{3^2}\right)\left(\frac{4^2-1}{4^2}\right)\left(\frac{5^2-1}{5^2}\right).....\left(\frac{11^2-1}{11^2}\right)\left(\frac{12^2-1}{12^2}\right)$

$= \left[\frac{(3+1)(3-1)}{(2+1)(4-1)}\right]\left[\frac{(4+1)(4-1)}{(3+1)(5-1)}\right]\left[\frac{(5+1)(5-1)}{(4+1)(6-1)}\right]$

$.....\left[\frac{(11+1)(11-1)}{(10+1)(12-1)}\right]\left[\frac{(12+1)(12-1)}{(11+1)(13-1)}\right]$

$= \frac{(3-1)}{(2+1)}\times\frac{(12+1)}{(13-1)} = \frac{2}{3}\times\frac{13}{12} = \frac{13}{18}.$

204. Given exp. $= \frac{1}{(2-1)(2+1)} + \frac{1}{(4-1)(4+1)}$

$+ \frac{1}{(6-1)(6+1)} + ... + \frac{1}{(20-1)(20+1)}$

$= \frac{1}{1\times 3} + \frac{1}{3\times 5} + \frac{1}{5\times 7} + ... + \frac{1}{19\times 21}$

$= \frac{1}{2}\left(1 - \frac{1}{3}\right) + \frac{1}{2}\left(\frac{1}{3} - \frac{1}{5}\right) + \frac{1}{2}\left(\frac{1}{5} - \frac{1}{7}\right) + ... + \frac{1}{2}\left(\frac{1}{19} - \frac{1}{21}\right)$

$= \frac{1}{2}\left(1 - \frac{1}{21}\right) = \frac{1}{2}\times\frac{20}{21} = \frac{10}{21}.$

205. Given exp. $= \left(1 - \frac{1}{2}\right) + \left(\frac{1}{2} - \frac{1}{3}\right) + \left(\frac{1}{3} - \frac{1}{4}\right)$

$+ \left(\frac{1}{4} - \frac{1}{5}\right) + ... + \left(\frac{1}{11} - \frac{1}{12}\right) = \left(1 - \frac{1}{12}\right) = \frac{11}{12}.$

206. Clearly, sum of first 6 terms is zero. So, sum of first 30 terms = 0.

∴ Required sum $= \left(\frac{1}{2} + \frac{1}{3} - \frac{1}{4} - \frac{1}{2} - \frac{1}{3}\right) = -\frac{1}{4}.$

207. Given exp. $= (1 + 11 + 111 + 1111) + \left(\frac{1}{2}\times 4\right)$

$= 1234 + 2 = 1236.$

208. Given exp. $= \left(1000 - \frac{1}{1000}\right)\times 7 = \left(7000 - \frac{7}{1000}\right)$

$= 6999\frac{993}{1000}.$

209. Given exp. $= \left(1000 - \frac{4}{999}\right)\times 999 = 999000 - 4 = 998996.$

210. Given exp. $= \left(1000 - \frac{6}{7}\right) + \left(1000 - \frac{5}{7}\right) + \left(1000 - \frac{4}{7}\right)$

$+ \left(1000 - \frac{3}{7}\right) + \left(1000 - \frac{2}{7}\right) + \left(1000 - \frac{1}{7}\right)$

$= 6000 - \left(\frac{6}{7} + \frac{5}{7} + \frac{4}{7} + \frac{3}{7} + \frac{2}{7} + \frac{1}{7}\right)$

$= 6000 - \frac{21}{7} = 6000 - 3 = 5997.$

Another Method:

Given exp. $= (999\times 6) + \left(\frac{1}{7} + \frac{2}{7} + \frac{3}{7} + \frac{4}{7} + \frac{5}{7} + \frac{6}{7}\right)$

$= 5994 + \frac{21}{7} = 5994 + 3 = 5997.$

211. Given exp. $= (998\times 5) + \left(\frac{2}{17} + \frac{3}{17} + \frac{5}{17} + \frac{8}{17} + \frac{16}{17}\right)$

$= 4990 + \frac{34}{17} = 4990 + 2 = 4992.$

212. Given exp. $= \left(1 - \frac{1}{2}\right) + \left(\frac{1}{2} - \frac{1}{3}\right) + \left(\frac{1}{3} - \frac{1}{4}\right) + ... + \left(\frac{1}{9} - \frac{1}{10}\right)$

$= \left(1 - \frac{1}{10}\right) = \frac{9}{10}.$

213. Given exp. $= \frac{1}{3}\left(1-\frac{1}{4}\right)+\frac{1}{3}\left(\frac{1}{4}-\frac{1}{7}\right)+\frac{1}{3}\left(\frac{1}{7}-\frac{1}{10}\right)$
$+\frac{1}{3}\left(\frac{1}{10}-\frac{1}{13}\right)+\frac{1}{3}\left(\frac{1}{13}-\frac{1}{16}\right)$
$= \frac{1}{3}\left[\left(1-\frac{1}{4}\right)+\left(\frac{1}{4}-\frac{1}{7}\right)+\left(\frac{1}{7}-\frac{1}{10}\right)+\left(\frac{1}{10}-\frac{1}{13}\right)+\left(\frac{1}{13}-\frac{1}{16}\right)\right]$
$= \frac{1}{3}\left(1-\frac{1}{16}\right)=\frac{1}{3}\times\frac{15}{16}=\frac{5}{16}.$

214. Given exp. $= \left(1-\frac{1}{2}\right)+\left(\frac{1}{2}-\frac{1}{3}\right)+\left(\frac{1}{3}-\frac{1}{4}\right)+\left(\frac{1}{4}-\frac{1}{5}\right)$
$+.....+\left(\frac{1}{n}-\frac{1}{n+1}\right)$
$= \left(1-\frac{1}{n+1}\right)=\frac{n}{n+1}.$

215. Given exp. $= \frac{4\times3^3+3^2+3+1}{4\times3^3}=\frac{108+9+3+1}{108}=\frac{121}{108}.$

216. Given exp. $= \frac{4\cdot5\cdot6+5\cdot6+2\cdot6+2\cdot3}{1\cdot2\cdot3\cdot4\cdot5\cdot6}=\frac{120+30+12+6}{720}$
$= \frac{168}{720}=\frac{7}{30}.$

217. Given exp. $= \left(\frac{1}{1^2}-\frac{1}{2^2}\right)+\left(\frac{1}{2^2}-\frac{1}{3^2}\right)+\left(\frac{1}{3^2}-\frac{1}{4^2}\right)$
$+\left(\frac{1}{4^2}-\frac{1}{5^2}\right)+.....+\left(\frac{1}{9^2}-\frac{1}{10^2}\right)$
$=\left(\frac{1}{1^2}-\frac{1}{10^2}\right)=\left(1-\frac{1}{100}\right)=\frac{99}{100}.$

218. Given exp. $= \frac{4-1}{4\times1}+\frac{9-4}{9\times4}+\frac{16-9}{16\times9}+.....$
$= \left(1-\frac{1}{4}\right)+\left(\frac{1}{4}-\frac{1}{9}\right)+\left(\frac{1}{9}-\frac{1}{16}\right)+.....$
$= \left(\frac{1}{1^2}-\frac{1}{2^2}\right)+\left(\frac{1}{2^2}-\frac{1}{3^2}\right)+\left(\frac{1}{3^2}-\frac{1}{4^2}\right)+.....$

$\therefore$ 99th term of the series $= \left(\frac{1}{99^2}-\frac{1}{100^2}\right).$

$\therefore$ Given exp. $= \left(\frac{1}{1^2}-\frac{1}{2^2}\right)+\left(\frac{1}{2^2}-\frac{1}{3^2}\right)+\left(\frac{1}{3^2}-\frac{1}{4^2}\right)$
$+.....+\left(\frac{1}{98^2}-\frac{1}{99^2}\right)+\left(\frac{1}{99^2}-\frac{1}{100^2}\right)$
$= \left(1-\frac{1}{100^2}\right)=\left(1-\frac{1}{10000}\right)=\frac{9999}{10000}.$

219. Suppose Mayank, Mirza and Little paid ₹ x, ₹ y and ₹ z respectively.

Then, $x=\frac{1}{2}(60000-x),\ y=\frac{1}{3}(60000-y),\ z=\frac{1}{4}(60000-z).$

$\Rightarrow$ $2x = 60000 - x,\ 3y = 60000 - y,\ 4z = 60000 - z$

$\Rightarrow$ $3x = 60000,\ 4y = 60000,\ 5z = 60000$

$\Rightarrow$ $x = 20000,\ y = 15000,\ z = 12000.$

Amount paid by Jaspal
$=$ ₹ $[60000 - (20000 + 15000 + 12000)] =$ ₹ $13000.$

220. Income after 1 year $=$ ₹ (4×2^1) lakhs.

Income after 2 years $=$ ₹ $(4 \times 2 \times 2)$ lakhs
$=$ ₹ (4×2^2) lakhs

$\therefore$ Income after 5 years $=$ ₹ (4×2^5) lakhs $=$ ₹ 128 lakhs
$=$ ₹ 1.28 crores.

221. Since the population doubles every day, so it was half-full on 27/2/2007 and quarter-full on 26/2/2007.

222. Since the number doubles every minute, so the basket was $\frac{1}{2^n}$ full in $(60 - n)$ minutes.

Thus, it was $\frac{1}{32}\left(=\frac{1}{2^5}\right)$ full in $(60 - 5)$ i.e., 55 minutes.

223. Total amount received by the man in 2010
$=$ ₹ $[(5000 \times 2^4) + (5000 \times 2^3) + (5000 \times 2^2) + (5000 \times 2)]$
$=$ ₹ $(80000 + 40000 + 20000 + 10000) =$ ₹ $150000.$

224. True length of the rope $= 120$ m $+ (3 \times 120)$ cm
$= 120$ m $+ 360$ cm
$= 120$ m $+ 3$ m 60 cm $= 123$ m 60 cm.

225. Let the number be x. Then, $63x - 36x = 3834$
$\Leftrightarrow 27x = 3834$
$\Leftrightarrow x = 142.$

226. Among the given numbers, only 60489 is a multiple of 423.

227. Let the given number be x.

Then, $\frac{7}{8}x-\frac{7}{18}x=770\Leftrightarrow\frac{63x-28x}{72}=770\Leftrightarrow\frac{35x}{72}=770$
$\Leftrightarrow x=\left(\frac{770\times72}{35}\right)=1584.$

228. Let the number be x.

Then, $\frac{17}{8}x-\frac{8}{17}x=225\Leftrightarrow\frac{289x-64x}{136}=225$
$\Leftrightarrow\frac{225}{136}x=225\Leftrightarrow x=136.$

$\therefore$ Expected answer $= 136 \div \frac{17}{8}=\left(136\times\frac{8}{17}\right)=64.$

229. Let the number be $2x$.

Then, $\left(\frac{x}{6}+\frac{x}{4}\right)-\frac{2x}{5}=4\Leftrightarrow\frac{10x+15x-24x}{60}=4\Leftrightarrow x=240.$

Hence, required number $= 2x = 480.$

230. Final answer $= \left(9\frac{1}{9}-3\frac{2}{3}\right)\times450=\left(\frac{82}{9}-\frac{11}{3}\right)\times450$
$= \left(\frac{49}{9}\times450\right)=2450.$

231. $\frac{7}{8}$ of $1008-\frac{3}{4}$ of $968=\left(\frac{7}{8}\times1008\right)-\left(\frac{3}{4}\times968\right)$
$= 882 - 726 = 156.$

232. $x=y-\frac{y}{10}\Rightarrow x=\frac{9y}{10}\Rightarrow x=\frac{9}{10}\times y\Rightarrow x\propto y.$

Thus, as y increases, x also increases.

233. Let the number be x. Then,

$$\frac{3}{4}\text{ of }\frac{4}{5}\text{ of }x-\frac{1}{6}\text{ of }\frac{2}{5}\text{ of }x=648$$

$$\Rightarrow \quad \frac{3x}{5}-\frac{x}{15}=648\Rightarrow\frac{8x}{15}=648\Rightarrow x=\frac{648\times15}{8}=1215.$$

234. Let the required number be x.

Then, $x+1\frac{1}{2}=x\times1\frac{1}{2}\Rightarrow x+\frac{3}{2}=\frac{3}{2}x\Rightarrow\frac{x}{2}=\frac{3}{2}\Rightarrow x=3.$

235. Let the required sum be ₹ x.

Then, $\frac{5}{12}\text{ of }x=3\frac{3}{4}\text{ of }100\Leftrightarrow\frac{5x}{12}=\left(\frac{15}{4}\times100\right)=375$

$$\Leftrightarrow x=\left(\frac{375\times12}{5}\right)=900.$$

236. Let x of $\frac{1}{12}=\frac{3}{8}$. Then, $\frac{x}{12}=\frac{3}{8}\Leftrightarrow x=\left(\frac{3}{8}\times12\right)=\frac{9}{2}.$

237. Sum of given fractions $=\frac{7}{4}+\frac{5}{2}+\frac{67}{12}+\frac{10}{3}+\frac{9}{4}$

$$=\left(\frac{21+30+67+40+27}{12}\right)=\frac{185}{12}.$$

The whole number just less than $\frac{185}{12}$ is 15.

Let $\frac{185}{12}-x=15$. Then, $x=\left(\frac{185}{12}-15\right)=\frac{5}{12}.$

238. Sum of given fractions $=5\frac{3}{4}+4\frac{4}{5}+7\frac{3}{8}=\frac{23}{4}+\frac{24}{5}+\frac{59}{8}$

$$=\frac{230+192+295}{40}=\frac{717}{40}=17\frac{37}{40}.$$

$\therefore$ Required fraction $=\left(18-17\frac{37}{40}\right)=\frac{3}{40}.$

239. Clearly, $\frac{x+1}{x}$ is the only fraction in which the numerator is greater than the denominator. So, it is the greatest fraction.

240. $\frac{6}{7/8}-\frac{6/7}{8}=6\times\frac{8}{7}-\frac{6}{7}\times\frac{1}{8}=\frac{48}{7}-\frac{6}{56}$

$$=\frac{384-6}{56}=\frac{378}{56}=\frac{27}{4}=6\frac{3}{4}.$$

241. Let the value of the estate be ₹ x.

Then, $\frac{4}{5}\text{ of }x=16800\Leftrightarrow x=\left(\frac{16800\times5}{4}\right)=21000$

$$\Leftrightarrow \frac{3}{7}x=\left(\frac{3}{7}\times21000\right)=9000.$$

242. Let the number be x. Then,

$$\frac{2}{5}\text{ of }\frac{1}{4}\text{ of }\frac{3}{7}\text{ of }x=15\Leftrightarrow x=\left(15\times\frac{7}{3}\times4\times\frac{5}{2}\right)=350$$

$$\Leftrightarrow \frac{1}{2}x=175.$$

243. Required fraction $=\frac{1\text{ sec.}}{1\text{ hr.}}=\frac{1\text{ sec.}}{(1\times60\times60)\text{ sec.}}=\frac{1}{3600}.$

244. Height at the third bounce $=\left[32\times\left(\frac{3}{4}\right)^3\right]\text{m}=\left(32\times\frac{27}{64}\right)\text{m}$

$$=\frac{27}{2}\text{m}=13\frac{1}{2}\text{m}.$$

245. Suppose Sanket earns ₹ x in each of the other eleven months.

Then, Sanket's earning in March = ₹ $(2x)$.

Sanket's annual earning = ₹ $(11x + 2x)$ = ₹ $(13x)$.

$\therefore$ Required fraction $=\frac{2x}{13x}=\frac{2}{13}.$

246. Let the capacity of the tank be x litres.

Then, $\frac{1}{3}x=80\Leftrightarrow x=240\Leftrightarrow\frac{1}{2}x=120.$

247. Distance travelled on foot $=\left[\frac{7}{2}-\left(\frac{5}{3}+\frac{7}{6}\right)\right]\text{km}$

$$=\left(\frac{7}{2}-\frac{17}{6}\right)\text{km}=\frac{2}{3}\text{km}.$$

$\therefore$ Required fraction $=\frac{(2/3)}{(7/2)}=\left(\frac{2}{3}\times\frac{2}{7}\right)=\frac{4}{21}.$

248. Let the required fraction be x. Then,

$$\frac{4}{7}x+\frac{4}{7}=\frac{15}{14}\Leftrightarrow\frac{4}{7}x=\left(\frac{15}{14}-\frac{4}{7}\right)=\frac{7}{14}=\frac{1}{2}$$

$$\Leftrightarrow x=\left(\frac{1}{2}\times\frac{7}{4}\right)=\frac{7}{8}.$$

249. Required fraction $=\frac{\frac{2}{3}\text{ of }\frac{1}{4}\text{ of }₹\,25.20}{\frac{3}{2}\text{ of }₹\,36}=\frac{₹\,4.20}{₹\,54}=\frac{42}{540}=\frac{7}{90}.$

250. Let the length of longer piece be x cm.

Then, length of shorter piece $=\left(\frac{2}{5}x\right)\text{cm}.$

$\therefore \quad x+\frac{2}{5}x=70\Leftrightarrow\frac{7x}{5}=70\Leftrightarrow x=\left(\frac{70\times5}{7}\right)=50.$

Hence, length of shorter piece $=\frac{2}{5}x=\left(\frac{2}{5}\times50\right)\text{cm}=20\text{cm}.$

251. Let the whole amount be ₹ x. Then,

A's share $=₹\left(\frac{3}{16}x\right)$; B's share $=₹\left(\frac{x}{4}\right)$;

and C's share $=₹\left[x-\left(\frac{3x}{16}+\frac{x}{4}\right)\right]=₹\left(\frac{9x}{16}\right).$

$\therefore \quad \frac{9x}{16}=81\Leftrightarrow x=\left(\frac{81\times16}{9}\right)=144.$

Hence, B's share $=₹\left(\frac{144}{4}\right)=₹\,36.$

252. Green portion $=\left[1-\left(\frac{1}{10}+\frac{1}{20}+\frac{1}{30}+\frac{1}{40}+\frac{1}{50}+\frac{1}{60}\right)\right]$

$$=\left[1-\frac{1}{10}\left(1+\frac{1}{2}+\frac{1}{3}+\frac{1}{4}+\frac{1}{5}+\frac{1}{6}\right)\right]$$

$= 1-\frac{1}{10}\times\frac{147}{60}=1-\frac{147}{600}=\frac{453}{600}.$

Let the length of the pole be x metres.

Then, $\frac{453}{600}x=12.08 \Leftrightarrow x=\left(\frac{12.08\times 600}{453}\right)=16.$

253. Let the fraction be $\frac{a}{b}$. Then,

$\left(\frac{a}{b}\times\frac{a}{b}\right)\div\frac{b}{a}=\frac{512}{27} \Leftrightarrow \frac{a}{b}\times\frac{a}{b}\times\frac{a}{b}=\frac{512}{27}$

$\Leftrightarrow \left(\frac{a}{b}\right)^3=\left(\frac{8}{3}\right)^3 \Leftrightarrow \frac{a}{b}=\frac{8}{3}=2\frac{2}{3}.$

254. Maximum internal assessment score $=\left(\frac{47}{50}\times 10\right)=9.4.$

Minimum internal assessment score $=\left(\frac{14}{50}\times 10\right)=2.8.$

$\therefore$ Required difference = (9.4 – 2.8) = 6.6.

255. Let savings in N.S.C. and P.P.F. be ₹ x and ₹ (150000 – x) respectively. Then,

$\frac{1}{3}x=\frac{1}{2}(150000-x) \Leftrightarrow \frac{x}{3}+\frac{x}{2}=75000$

$\Leftrightarrow \frac{5x}{6}=75000$

$\Leftrightarrow x=\left(\frac{75000\times 6}{5}\right)=90000.$

$\therefore$ Savings in Public Provident Fund = ₹ (150000 – 90000)
= ₹ 60000.

256. Let there be (x + 1) members. Then,

Father's share $=\frac{1}{4}$, share of each other member $=\frac{3}{4x}$.

$\therefore \quad 3\left(\frac{3}{4x}\right)=\frac{1}{4} \Leftrightarrow 4x=36 \Leftrightarrow x=9.$

Hence, total number of family members = 10.

257. Let salary = ₹ x. Then, tips = ₹ $\left(\frac{5}{4}x\right)$.

Total income $=₹\left(x+\frac{5}{4}x\right)=₹\left(\frac{9x}{4}\right).$

$\therefore$ Required fraction $=\left(\frac{5x}{4}\times\frac{4}{9x}\right)=\frac{5}{9}.$

258. Let C's share = ₹ x. Then, B's share = ₹ $\left(\frac{x}{4}\right)$, A's share

$= ₹\left(\frac{2}{3}\times\frac{x}{4}\right)=₹\frac{x}{6}.$

$\therefore \quad \frac{x}{6}+\frac{x}{4}+x=1360 \Leftrightarrow \frac{17x}{12}=1360$

$\Leftrightarrow x=\left(\frac{1360\times 12}{17}\right)=₹ 960.$

Hence, B's share $=₹\left(\frac{960}{4}\right)=₹ 240.$

259. Let Tanya's share = ₹ x. Then, Veena's share

$= ₹\left(\frac{x}{2}\right)$, Amita's share $=₹\left(\frac{2}{3}\times\frac{x}{2}\right)=₹\left(\frac{x}{3}\right).$

Total bill $=₹\left(x+\frac{x}{2}+\frac{x}{3}\right)=₹\left(\frac{11x}{6}\right).$

$\therefore$ Required fraction $=\left(\frac{x}{2}\times\frac{6}{11x}\right)=\frac{3}{11}.$

260. Let the capacity of the tank be x litres.

Then, $\frac{1}{4}x=135 \Leftrightarrow x=135\times 4=540.$

$\therefore$ Required fraction $=\left(\frac{180}{540}\right)=\frac{1}{3}.$

261. Let the capacity of the tank be x litres.

Then, $\frac{6}{7}x-\frac{2}{5}x=16$

$\Leftrightarrow 30x - 14x = 16 \times 35$
$\Leftrightarrow 16x = 560$
$\Leftrightarrow x = 35.$

262. Let the capacity of the drum be x litres.

Then, $\frac{3}{4}x-\frac{7}{12}x=30$

$\Leftrightarrow 9x - 7x = 12 \times 30$
$\Leftrightarrow 2x = 360$
$\Leftrightarrow x = 180.$

263. Let x be the number of bottles of oil that the tin can contain.

Then, $\frac{5}{8}x-\frac{3}{5}x=10-8 \Leftrightarrow 25x-24x=2\times 40 \Leftrightarrow x=80.$

264. R.F. $=\frac{10\text{ cm}}{1\text{ m}}=\frac{10\text{ cm}}{100\text{ cm}}=\frac{1}{10}.$

265. An area of 49 sq. km is represented by an area of 100 sq. cm on the map.

So, a distance of 7 km is represented by a length of 10 cm on the map.

$\therefore$ R.F. $=\frac{10\text{ cm}}{7\text{ km}}=\frac{10\text{ cm}}{7\times 10^5\text{ cm}}=\frac{1}{70000}.$

266. Let the capacity of the bucket be x litres. Then,

Capacity of 1 large bottle $=\frac{x}{4}$; Capacity of 1 small bottle $=\frac{x}{7}$.

Fluid left in large bottle $=\left(\frac{x}{4}-\frac{x}{7}\right)=\frac{3x}{28}.$

$\therefore$ Required fraction $=\left(\frac{3x/28}{x/4}\right)=\left(\frac{3x}{28}\times\frac{4}{x}\right)=\frac{3}{7}.$

267. Let the capacity of 1 bucket = x.

Then, capacity of tank = $25x$.

New capacity of bucket $=\frac{2}{5}x.$

$\therefore$ Required number of buckets $=\frac{25x}{(2x/5)}$

$=\left(25x\times\frac{5}{2x}\right)=\frac{125}{2}=62\frac{1}{2}.$

268. Clearly, more fuel, the longer will the engine run.

$\therefore \quad \frac{4}{5}:\frac{1}{3}::12:x$ or $\frac{4}{5}x=\frac{1}{3}\times 12=4$ or $x=4\times\frac{5}{4}=5.$

269. Suppose the taller tree grows x feet in 1 year.

Then, the shorter tree grows $\frac{3x}{5}$ ft in 1 year.

$\therefore \quad 4x+4\times\frac{3}{5}x=8\Leftrightarrow 4x+\frac{12}{5}x=8\Leftrightarrow\frac{32}{5}x=8$

$\Leftrightarrow x=\frac{8\times 5}{32}=\frac{5}{4}.$

Growth of shorter tree in 2 years $=\left(2\times\frac{3x}{5}\right)$ ft

$=\left(2\times\frac{3}{5}\times\frac{5}{4}\right)$ ft $=\frac{3}{2}$ ft $=1\frac{1}{2}$ ft.

270. Let the amount of fuel consumed while coming back be x gallons.

Then, amount of fuel consumed while going

$=\left(x+\frac{x}{4}\right)$ gallons $=\frac{5x}{4}$ gallons.

$\therefore \quad x+\frac{5x}{4}=4\frac{1}{2}\Leftrightarrow\frac{9x}{4}=\frac{9}{2}\Leftrightarrow x=\frac{9}{2}\times\frac{4}{9}=2.$

271. Let the highest temperature be x degrees.

Then, lowest temperature $=\left[\left(1+\frac{1}{3}\right)\frac{x}{2}\right]$ degrees

$=\left(\frac{4}{3}\times\frac{x}{2}\right)$ degrees $=\frac{2x}{3}$ degrees.

$\therefore \quad x+\frac{2x}{3}=100\Leftrightarrow\frac{5x}{3}=100\Leftrightarrow x=\frac{100\times 3}{5}=60.$

So, lowest temperature $=\left(\frac{2}{3}\times 60\right)$ degrees $=40$ degrees.

272. Let the total number of students in the class be x.

Then, number of boys $=\frac{2x}{3}$; number of girls $=\frac{x}{3}$.

Number of boys who are over 160 cm tall $=\left(\frac{3}{4}\times\frac{2x}{3}\right)=\frac{x}{2}.$

So, $\frac{x}{2}=18$ or $x=36.$

$\therefore \quad$ Number of girls $=\frac{36}{3}=12.$

273. Suppose initially Peter had ₹ x. Then,

Amount received by Michael $=₹\left(\frac{x}{4}\right)$. Amount remaining with Peter $=₹\left(x-\frac{x}{4}\right)=₹\left(\frac{3x}{4}\right).$

Amount received by Sam $=₹\left(\frac{1}{2}\times\frac{x}{4}\right)=₹\left(\frac{x}{8}\right).$

$\therefore \quad \frac{3x}{4}-\frac{x}{8}=500 \Leftrightarrow 5x=4000 \Leftrightarrow x=800.$

Hence, amount received by Michael $= (x/4) =$ ₹ 200.

274. A's share $=\frac{1}{3}$. Remainder $=\left(1-\frac{1}{3}\right)=\frac{2}{3}.$

B's share $=\frac{2}{5}$ of $\frac{2}{3}=\frac{4}{15}$. Rest $=\left(\frac{2}{3}-\frac{4}{15}\right)=\frac{6}{15}=\frac{2}{5}.$

C's share = D's share $=\frac{1}{2}$ of $\frac{2}{5}=\frac{1}{5}.$

275. Let the total length of the journey be x km.

Then, $\frac{2}{5}x=1200\Leftrightarrow x=\frac{1200\times 5}{2}=3000.$

Distance travelled by car $=\left(\frac{1}{3}\times 3000\right)$ km $=1000$ km.

$\therefore$ Distance travelled by train = [3000 – (1200 + 1000)] km = 800 km.

276. Let the total income be ₹ x.

Then, remaining money

$=₹\left[x-\left(\frac{x}{4}+\frac{x}{5}\right)\right]=₹\left(x-\frac{9x}{20}\right)=₹\frac{11x}{20}.$

So, $\frac{11x}{20}=231\Leftrightarrow x=\frac{231\times 20}{11}=420.$

277. Part read on first day $=\frac{3}{8}$. Remaining part $=\left(1-\frac{3}{8}\right)=\frac{5}{8}.$

Part read on second day $=\frac{4}{5}$ of $\frac{5}{8}=\frac{1}{2}.$

Unread part $=\left[1-\left(\frac{3}{8}+\frac{1}{2}\right)\right]=\frac{1}{8}.$

Let the number of pages be x.

Then, $\frac{1}{8}x=30$ or $x=30\times 8=240.$

278. Out of 5 girls, 1 took part in fete. Out of 8 boys, 1 took part in fete.

$\therefore$ Out of 13 students, 2 took part in fete.

Hence, $\frac{2}{13}$ of the total number took part in fete.

279. French men $=\frac{1}{5}$; French women $=\left(\frac{1}{5}+\frac{2}{3}\times\frac{1}{5}\right)=\frac{5}{15}=\frac{1}{3}.$

French people $=\left(\frac{1}{5}+\frac{1}{3}\right)=\frac{8}{15}.$

$\therefore$ Not French $=\left(1-\frac{8}{15}\right)=\frac{7}{15}.$

280. Girls $=\frac{3}{5}$; Boys $=\left(1-\frac{3}{5}\right)=\frac{2}{5}.$

Fraction of students absent $=\frac{2}{9}$ of $\frac{3}{5}+\frac{1}{4}$ of $\frac{2}{5}$

$=\frac{6}{45}+\frac{1}{10}=\frac{21}{90}=\frac{7}{30}.$

$\therefore \quad$ Fraction of students present $=\left(1-\frac{7}{30}\right)=\frac{23}{30}.$

281. Number of boys who participate = 100.

$\therefore \quad \frac{1}{3}$ of boys $=100$ or total number of boys $=300.$

Number of girls who participate = 200.

$\therefore \quad \frac{1}{2}$ of girls = 200 or total number of girls = 400.

Hence, total number of students = (300 + 400) = 700.

282. Let the number of votes cast be x. Then, number of votes required = $\frac{3x}{4}$.

Counted votes = $\frac{2x}{3}$. Uncounted votes = $\left(x-\frac{2x}{3}\right)=\frac{x}{3}$.

Votes won by the candidate $=\frac{5}{6}$ of $\frac{3x}{4}=\frac{5x}{8}$.

Remaining votes required = $\left(\frac{3x}{4}-\frac{5x}{8}\right)=\frac{x}{8}$.

$\therefore$ Required fraction = $\frac{(x/8)}{(x/3)}=\left(\frac{x}{8}\times\frac{3}{x}\right)=\frac{3}{8}$.

283. Let the total number of shots be x. Then,

Shots fired by A $=\frac{5}{8}x$; Shots fired by B $=\frac{3}{8}x$.

Killing shots by A $=\frac{1}{3}$ of $\frac{5}{8}x=\frac{5x}{24}$;

Shots missed by B $=\frac{1}{2}$ of $\frac{3}{8}x=\frac{3}{16}x$.

$\therefore \quad \frac{3x}{16}=27$ or $x=\left(\frac{27\times16}{3}\right)=144$.

Birds killed by A $=\frac{5x}{24}=\left(\frac{5}{24}\times144\right)=30$.

284. Number of alterations required in 1 shirt $=\left(\frac{2}{3}+\frac{3}{4}+\frac{4}{5}\right)$

$=\frac{133}{60}$.

$\therefore$ Number of alterations required in 60 shirts $=\left(\frac{133}{60}\times60\right)$

$= 133$.

285. Let the largest fraction be x and the smallest be y.

Then, $\frac{x}{y}=\frac{7}{6}$ or $y=\frac{6}{7}x$.

Let the middle one be z.

Then, $x+\frac{6}{7}x+z=\frac{59}{24}$ or $z=\left(\frac{59}{24}-\frac{13x}{7}\right)$.

$\therefore \quad \frac{59}{24}-\frac{13x}{7}+\frac{1}{3}=\frac{7}{6} \Leftrightarrow \frac{13x}{7}=\frac{59}{24}+\frac{1}{3}-\frac{7}{6}=\frac{39}{24}$

$\Leftrightarrow x=\left(\frac{39}{24}\times\frac{7}{13}\right)=\frac{7}{8}$.

So, $x=\frac{7}{8}$, $y=\frac{6}{7}\times\frac{7}{8}=\frac{3}{4}$ and $z=\frac{59}{24}-\frac{13}{7}\times\frac{7}{8}=\frac{20}{24}=\frac{5}{6}$.

Hence, the fractions are $\frac{7}{8}, \frac{5}{6}$ and $\frac{3}{4}$.

286. Let the number of hats purchased be x. Then, number of brown hats = $\frac{x}{4}$.

Number of hats sold = $\frac{2x}{3}$. Number of hats left unsold

$=\left(x-\frac{2x}{3}\right)=\frac{x}{3}$.

Number of brown hats sold = $\frac{4}{5}$ of $\frac{x}{4}=\frac{x}{5}$. Number of brown hats left unsold = $\left(\frac{x}{4}-\frac{x}{5}\right)=\frac{x}{20}$.

$\therefore$ Required fraction = $\frac{\left(\frac{x}{20}\right)}{\left(\frac{x}{3}\right)}=\frac{x}{20}\times\frac{3}{x}=\frac{3}{20}$.

287. Let the capacities of the bigger and smaller jars be x litres and y litres respectively.

Then, $\frac{x}{4}=\frac{y}{3}\Rightarrow y=\frac{3}{4}x$.

Quantity of water in bigger jar = $\left(\frac{x}{4}+\frac{y}{3}\right)$litres

$=\left(\frac{x}{4}+\frac{1}{3}\times\frac{3}{4}x\right)$litres $=\frac{x}{2}$ litres.

Hence, $\frac{1}{2}$ of the larger jar is filled with water.

288. Let Mr. X's total income be ₹ x. Then, expenditure on food = ₹ $\frac{x}{4}$.

Expenditure on education = $₹\left[\left(1-\frac{1}{3}\right)\frac{x}{4}\right]$

$=₹\left(\frac{2}{3}\times\frac{x}{4}\right)=₹\frac{x}{6}$.

$\therefore$ Required fraction = $\frac{\left(\frac{x}{4}+\frac{x}{6}\right)}{x}=\frac{5x}{12}\times\frac{1}{x}=\frac{5}{12}$.

289. Let the number of men in the 1st, 2nd, 3rd and 4th battalions be x, y, z and t respectively.

Then, $\frac{1}{2}x=\frac{2}{3}y=\frac{3}{4}z=\frac{4}{5}t \Rightarrow x=\frac{4}{3}y, z=\frac{8}{9}y, t=\frac{5}{6}y$.

Now, $x + y + z + t = 7300$

$\Rightarrow \quad \frac{4}{3}y+y+\frac{8}{9}y+\frac{5}{6}y=7300$

$\Rightarrow \quad \frac{24y+18y+16y+15y}{18}=7300$

$\Rightarrow \quad 73y = 7300 \times 18 \Rightarrow y = 1800$.

290. Required fraction = Fraction of work left after Tuesday

$=1-\left(\frac{3}{5}+\frac{1}{3}\text{ of }\frac{2}{5}\right)=1-\left(\frac{3}{5}+\frac{2}{15}\right)$

$=1-\frac{11}{15}=\frac{4}{15}$.

291. Let the total score be x. Then, highest score = $\frac{3x}{11}$.

Remainder = $\left(x-\frac{3x}{11}\right)=\frac{8x}{11}$. Next highest score

$= \frac{3}{11}$ of $\frac{8x}{11} = \frac{24x}{121}$.

$\therefore \quad \frac{3x}{11} - \frac{24x}{121} = 9 \Leftrightarrow 33x - 24x = 9 \times 121$

$\Leftrightarrow 9x = 9 \times 121 \Leftrightarrow x = 121.$

292. Let the hourly wage of each sales person be ₹ x.
Then, hourly wage of each mechanic = ₹ $(2x)$.

Hourly wage of each custodial worker = $₹\left(\frac{2x}{3}\right)$.

$\therefore$ Required fraction = $\frac{x}{\left(\frac{2x}{3}\right)} = \frac{3}{2}$.

293. Sukhvinder's monthly income = $₹\left(\frac{234000}{12}\right) = ₹\ 19500.$

Jassi's monthly income = $₹\left(\frac{3}{2} \times 19500\right) = ₹\ 29250.$

$\therefore$ Ganeshi's monthly income = ₹ (2×29250) = ₹ 58500.

294. Cost per kg of rice last year = $₹\left(\frac{1044}{36}\right) = ₹\ 29.$

Cost per kg of rice this year = $₹\left(\frac{768}{24}\right) = ₹\ 32.$

$\therefore$ Required difference = ₹ $(32 - 29)$ = ₹ 3.

295. $12B + 30W = 8940 \Rightarrow \frac{1}{3}(12B + 30W) = \frac{1}{3} \times 8940$

$\Rightarrow 4B + 10W = 2980.$

296. $5P + 8C = 145785 \Rightarrow 3(5P + 8C) = 3 \times 145785$

$\Rightarrow 15P + 24C = 437355.$

297. $21T + 35C = 41825 \Rightarrow \frac{3}{7}(21T + 35C) = \frac{3}{7} \times 41825$

$\Rightarrow 9T + 15C = 17925.$

298. Cost of 1 kg of sugar = $₹\left(\frac{195}{13}\right) = ₹\ 15.$

Cost of 1 kg of rice = $₹\left(\frac{544}{17}\right) = ₹\ 32.$

Cost of 1 kg of wheat = $₹\left(\frac{336}{21}\right) = ₹\ 16.$

$\therefore$ Required cost = ₹ $(15 \times 21 + 32 \times 26 + 16 \times 19)$

= ₹ $(315 + 832 + 304)$ = ₹ 1451.

299. (a) Price per kg = $₹\left(\frac{160}{10}\right) = ₹\ 16;$

(b) Price per kg = $₹\left(\frac{30}{2}\right) = ₹\ 15;$

(c) Price per kg = $₹\left(\frac{70}{4}\right) = ₹\ 17.50;$

(d) Price per kg = $₹\left(\frac{340}{20}\right) = ₹\ 17;$

(e) Price per kg = $₹\left(\frac{130}{8}\right) = ₹\ 16.25.$

Clearly, the most economical price is 2 kilo for ₹ 30.

300. Let the time spent on each Maths problem be $(2x)$ minutes and that spent on each other question be x minutes.
Then, $50 \times 2x + 150x = 3 \times 60 \Leftrightarrow 250x = 180$

$\Leftrightarrow x = \frac{180}{250} = \frac{18}{25}.$

$\therefore$ Total time spent on Mathematics problems

$= \left(50 \times 2 \times \frac{18}{25}\right) \text{min} = 72 \text{ min}.$

301. Duration from 4.56 P.M. to 5.32 P.M. = 36 min.

$= \left(\frac{36}{60}\right) \text{hour} = \frac{3}{5} \text{ hour}.$

302. 72 hr 6 min = $(72 \times 60 + 6)$ min = 4326 min.

$\therefore$ 72 hr 6 min $\div$ 14 = 4326 min $\div$ 14

= 309 min

= 5 hr 9 min.

$$\begin{array}{r|l} & 309 \\ \hline 14 & 4326 \\ & 42 \\ \hline & 126 \\ & 126 \\ \hline & \times \end{array}$$

303. Time between 10 a.m. and 13.27 hours = 3 hrs. 27 min. = 207 min.
Total duration of free time = (5×3) min = 15 min.
Remaining time = $(207 - 15)$ min. = 192 min.
$\therefore$ Duration of each of the 4 periods

$= \left(\frac{192}{4}\right) \text{min.} = 48 \text{ min}.$

304.

	Hrs.	Min.	Sec.
	3	17	49
(–)	1	54	50
	1	22	59

Total time = $(1 \times 60 + 22)$ min. + 59 sec.
= $(82 \times 60 + 59)$ sec.
= 4979 sec.

$\therefore$ Number of times the light is seen = $\left(\frac{4979}{13} + 1\right) = 384.$

305. The woman works from Sunday to Saturday and rests for the first time on Sunday. She then works from Monday to Sunday and rests for the second time on Monday. Likewise, she rests for the third time on Tuesday. Thus, starting from Sunday, for the 10th time she would rest on Tuesday. (as the cycle repeats after every 7 days)

306. $9 * 11 = 9^2 + (11)^2 - 9 \times 11 = 81 + 121 - 99 = 103.$

307. $(3 * -1) = \frac{3 \times (-1)}{3 + (-1)} = \frac{-3}{2}$. So, $3 * (3 * -1)$

$= 3 * \left(\frac{-3}{2}\right) = \frac{3 \times \left(\frac{-3}{2}\right)}{3 + \left(\frac{-3}{2}\right)} = \frac{-9}{2} \times \frac{2}{3} = -3.$

308. $3 * 5 + 5 * 3 = (2 \times 3 - 3 \times 5 + 3 \times 5) + (2 \times 5 - 3 \times 3 + 5 \times 3)$

$= (6 + 10 - 9 + 15) = 22.$

309. $4 \oplus (3 \oplus p) = 4 \oplus (3^2 + 2p) = 4 \oplus (9 + 2p) = 4^2 + 2(9 + 2p) = 34 + 4p.$

$\therefore \quad 34 + 4p = 50 \Rightarrow 4p = 50 - 34 = 16 \Rightarrow p = 4.$

310. $(a * b * c) * a * b = \left(\frac{a+b}{c}\right) * a * b = \frac{\left(\frac{a+b}{c}\right) + a}{b} = \frac{a + b + ac}{bc}.$

311. **Step I:** $6 \times 3 + 6^2 = 18 + 36 = 54$.
Step II: $(54 \div 5) + 6 = 10.8 + 6 = 16.8$.
Step III: $(16.8 \div 3)^2 = (5.6)^2 = 31.36$.

312. **Step I:** $2.5 \times 3 + (2.5)^2 = 7.5 + 6.25 = 13.75$.
Step II: $(13.75 \div 5) + 6 = 2.75 + 6 = 8.75$.
Step III: $(8.75 \div 3)^2 = (2.917)^2 = 8.508 \approx 8.51$.

313. **Step I:** $5 \times 3 + 5^2 = 15 + 25 = 40$.
Step II: $(40 \div 5) + 6 = 8 + 6 = 14$.
Step III: $(14 \div 3)^2 = (4.67)^2 \approx 21.80$.

314. $2 \wedge a = a \wedge 3 \Rightarrow 2 \times 2 + a = 2 \times a + 3$
$\Rightarrow 4 + a = 2a + 3 \Rightarrow a = 1$.

315. $\left[\dfrac{(5 \oplus 7) + (4 \oplus 4)}{3(5 \oplus 5) - (15 \oplus 11) - 3}\right] = \left[\dfrac{(5+7) + 4^2}{3 \times 5^2 - 2 \times 15 - 3}\right]$

$= \left[\dfrac{12 + 16}{75 - 30 - 3}\right] = \dfrac{28}{42} = \dfrac{2}{3}$.

316. Thickness of snow at 3 p.m. $= \left[2\dfrac{1}{4} + \left(3 \times 1\dfrac{1}{4}\right)\right]$ inches

$= \left(\dfrac{9}{4} + 3 \times \dfrac{5}{4}\right)$ inches

$= \left(\dfrac{9}{4} + \dfrac{15}{4}\right)$ inches

$= \left(\dfrac{24}{4}\right)$ inches $= 6$ inches.

317. In 2 min, the squirrel climbs $(6 - 4)$ m $= 2$ m.
In (2×57), i.e., 114 min, the squirrel climbs (2×57) m $= 114$ m.
In 115 min, the squirrel climbs $(114 + 6)$ m $= 120$ m to reach the top.

318. For the money to grow 3 times, Ram needs to deposit ₹ $(3000 - 1000)$ = ₹ 2000.
A net amount of ₹ $(750 - 500)$ = ₹ 250 is deposited in 1 month.
So, a net amount of ₹ 2000 will be deposited in $\left(\dfrac{2000}{250}\right) = 8$ months.

319. In 11 days, the height of the plant increases by $(11 - 6)$ cm i.e., 5 cm.
In (11×18) i.e., 198 days, the height of the plant increases by (5×18) i.e., 90 cm.
In the next 10 days, the height of the plant increases by another 10 cm.
So, in 208 days, the height of the plant will increase by $(90 + 10) = 100$ cm or 1 m and become 2 m.

320. Number of steps $= \left(10 \div \dfrac{1}{2}\right) = 20$.
To reach the top, the ant covers the height of 20 steps and the width of 19 steps because the moment it ascends the height of 20th step, it reaches the top.
∴ Distance travelled by the ant
$= \left[\left(\dfrac{1}{2} \times 20\right) + (1 \times 19)\right]$ ft $= (10 + 19)$ ft $= 29$ ft.

321. Required sum $= \dfrac{1}{2} + \left(\dfrac{1}{3} + \dfrac{2}{3}\right) + \left(\dfrac{1}{4} + \dfrac{2}{4} + \dfrac{3}{4}\right) + \left(\dfrac{1}{5} + \dfrac{2}{5} + \dfrac{3}{5} + \dfrac{4}{5}\right) + \ldots$
$+ \left(\dfrac{1}{100} + \dfrac{2}{100} + \dfrac{3}{100} + \ldots + \dfrac{99}{100}\right)$

$= \dfrac{1}{2} + \dfrac{2}{2} + \dfrac{3}{2} + \dfrac{4}{2} + \ldots.. + \dfrac{99}{2}$

$= \dfrac{1}{2} \times (1 + 2 + 3 + \ldots.. + 99)$

$= \dfrac{1}{2} \times \dfrac{99 \times 100}{2} = 2475$.

322. Given exp. $= \dfrac{(1 - x^2)(1 + x^2)}{(1 + x)} \times \dfrac{x}{1 + x^2} \times \dfrac{1}{x(1 - x)}$

$= \dfrac{(1 - x)(1 + x)(1 + x^2)\,x}{(1 + x)(1 + x^2)\,x(1 - x)} = 1$.

323. Given exp. $= \left(\dfrac{17}{15}\right)^2 + \left(\dfrac{2}{15}\right)^2 - 2 \times \dfrac{17}{15} \times \dfrac{2}{15} = \left(\dfrac{17}{15} - \dfrac{2}{15}\right)^2 = 1$.

324. Given exp. $= \left(13\dfrac{3}{4}\right)^2 + \left(5\dfrac{1}{4}\right)^2 + 2 \times 13\dfrac{3}{4} \times 5\dfrac{1}{4}$

$= \left(13\dfrac{3}{4} + 5\dfrac{1}{4}\right)^2 = \left(\dfrac{55}{4} + \dfrac{21}{4}\right)^2 = \left(\dfrac{76}{4}\right)^2 = (19)^2 = 361$.

325. Given exp. $= \dfrac{(75983)^2 - (45983)^2}{75983 - 45983}$

$= \dfrac{(75983 - 45983)(75983 + 45983)}{(75983 - 45983)}$

$= 75983 + 45983 = 121966$.

326. Given exp. $= \dfrac{a^2 - b^2}{a - b}$, $\left(\text{where } a = 13\dfrac{4}{7}, b = 8\dfrac{3}{7}\right)$

$= a + b = 13\dfrac{4}{7} + 8\dfrac{3}{7} = \dfrac{95}{7} + \dfrac{59}{7} = \dfrac{154}{7} = 22$.

327. $\dfrac{(a - b)^2 - (a + b)^2}{-4a} = \dfrac{x}{y} \Leftrightarrow \dfrac{(a^2 + b^2 - 2ab) - (a^2 + b^2 + 2ab)}{-4a}$

$= \dfrac{x}{y}$

$\Leftrightarrow \dfrac{-4ab}{-4a} = \dfrac{x}{y} \Leftrightarrow b = \dfrac{x}{y} \Leftrightarrow x = yb$.

328. Given exp. $= \dfrac{\left(\dfrac{7}{8} + \dfrac{5}{6}\right)^2}{\left(\dfrac{7}{8}\right)^2 - \left(\dfrac{5}{6}\right)^2} = \dfrac{\left(\dfrac{7}{8} + \dfrac{5}{6}\right)^2}{\left(\dfrac{7}{8} + \dfrac{5}{6}\right)\left(\dfrac{7}{8} - \dfrac{5}{6}\right)}$

$= \dfrac{\left(\dfrac{7}{8} + \dfrac{5}{6}\right)}{\left(\dfrac{7}{8} - \dfrac{5}{6}\right)} = \left(\dfrac{41}{24} \times 24\right) = 41$.

329. Given exp. $= (1998 + 1997)(1998 - 1997) + (1996 + 1995)(1996 - 1995) + (1994 + 1993)(1994 - 1993)$
$= 1998 + 1997 + 1996 + 1995 + 1994 + 1993 = 11973$.

330. Given exp. $= \dfrac{(a+b)^2+(a-b)^2}{a^2+b^2}$ (where $a = 856, b = 167$)

$= \dfrac{2(a^2+b^2)}{(a^2+b^2)} = 2.$

331. Given exp. $= \dfrac{(a+b)^2-(a-b)^2}{ab} = \dfrac{4ab}{ab}$

$= 4$ (where $a = 469, b = 174$).

332. $2ab = (a^2 + b^2) - (a - b)^2 = 29 - 9 = 20 \Rightarrow ab = 10.$

333. $\dfrac{x^2-1}{x+1} = 4 \Leftrightarrow \dfrac{(x+1)(x-1)}{x+1} = 4 \Leftrightarrow x - 1 = 4 \Leftrightarrow x = 5.$

334. If $a = 3\dfrac{2}{3}, b = 2\dfrac{1}{2}, c = 4\dfrac{3}{4}, d = 3\dfrac{1}{3}$, then

Given exp. $= \dfrac{(a^2-b^2)}{(c^2-d^2)} \div \dfrac{(a-b)}{(c-d)} = \dfrac{(a^2-b^2)}{(c^2-d^2)} \times \dfrac{(c-d)}{(a-b)}$

$= \dfrac{(a+b)}{(c+d)} = \dfrac{3\frac{2}{3}+2\frac{1}{2}}{4\frac{3}{4}+3\frac{1}{3}} = \dfrac{\frac{11}{3}+\frac{5}{2}}{\frac{19}{4}+\frac{10}{3}}$

$= \dfrac{37}{6} \times \dfrac{12}{97} = \dfrac{74}{97}.$

335. Given exp. $= \dfrac{a^2-b^2}{a+b} = a - b$

$= \left(1+\dfrac{1}{1+\frac{1}{100}}\right) - \left(1-\dfrac{1}{1+\frac{1}{100}}\right)$

$= 2 \times \dfrac{1}{(101/100)} = 2 \times \dfrac{100}{101} = \dfrac{200}{101}.$

336. Given exp. $= \dfrac{769435 \times 770001 - (770001 - 769435)}{769435 + 770001 \times (769435 - 1)}$

$= \dfrac{769435 \times 770001 - 770001 + 769435}{769435 + 770001 \times 769435 - 770001} = 1.$

337. $a - b = 1 \Rightarrow (a - b)^3 = 1^3 = 1 \Rightarrow a^3 - b^3 - 3ab\,(a - b) = 1$
$\Rightarrow a^3 - b^3 - 3ab = 1$ [$\because a - b = 1$]

338. $x - y = 1 \Rightarrow (x - y)^2 = 1 \Rightarrow x^2 + y^2 - 2xy = 1$
$\Rightarrow 41 - 2xy = 1 \Rightarrow 2xy = 40.$
$\therefore \quad (x + y)^2 = x^2 + y^2 + 2xy = 41 + 40 = 81$
$\Rightarrow (x + y) = \pm 9.$

339. $x + y = 1 \Rightarrow (x + y)^2 = 1^2 = 1 \Rightarrow x^2 + y^2 + 2xy = 1$
$\Rightarrow x^2 + y^2 = 1 - 2xy$
$\Rightarrow (x^2 + y^2)^2 = (1 - 2xy)^2$
$\Rightarrow x^4 + y^4 + 2x^2y^2 = 1 + 4x^2y^2 - 4xy$
$\Rightarrow 2x^2y^2 - 4xy = 17 - 1 = 16 \quad [\because x^4 + y^4 = 17]$
$\Rightarrow x^2y^2 - 2xy = 8.$

340. $\dfrac{x^2+y^2+z^2-yz-zx-xy}{a^2+b^2+c^2-ab-bc-ca}$

$= \dfrac{\begin{array}{r}(a+m)^2+(b+m)^2+(c+m)^2-(b+m)(c+m)\\-(c+m)(a+m)-(a+m)(b+m)\end{array}}{a^2+b^2+c^2-ab-bc-ca}$

$= \dfrac{\begin{array}{r}a^2+m^2+2am+b^2+m^2+2bm+c^2+m^2+2cm\\-bc-bm-cm-m^2-ca-cm-am-m^2\\-ab-am-bm-m^2\end{array}}{a^2+b^2+c^2-ab-bc-ca}$

$= \dfrac{a^2+b^2+c^2-ab-bc-ca}{a^2+b^2+c^2-ab-bc-ca} = 1.$

341. $(a + b + c)^2 = a^2 + b^2 + c^2 + 2(ab + bc + ca)$
$\Rightarrow \quad 2(ab + bc + ca) = (a + b + c)^2 - (a^2 + b^2 + c^2)$
$= 169 - 69 = 100$
$\Rightarrow \quad ab + bc + ca = 50.$

342. Given: $x^2 + y^2 + z^2 - 64 = -2(xy - yz - zx)$ ...(*i*)
Now, $[x + y + (-z)]^2 = x^2 + y^2 + z^2 + 2(xy - yz - zx)$
$\Rightarrow \quad (3z - z)^2 = x^2 + y^2 + z^2 + 2(xy - yz - zx)$
$\Rightarrow \quad -2(xy - yz - zx) = (x^2 + y^2 + z^2) - (2z)^2$ ...(*ii*)
From (*i*) and (*ii*), we get: $(2z)^2 = 64 \Leftrightarrow 4z^2 = 64$
$\Leftrightarrow z^2 = 16$
$\Leftrightarrow z = 4.$

343. Given exp. $= \left(\dfrac{a^3+b^3}{a^2+b^2-ab}\right) = (a + b)$ (where $a = 785, b = 435$)
$= (785 + 435) = 1220.$

344. Given exp. $= \left(\dfrac{a^2+ab+b^2}{a^3-b^3}\right) = \left(\dfrac{1}{a-b}\right)$

(where $a = 147, b = 143$) $= \left(\dfrac{1}{147-143}\right) = \dfrac{1}{4}.$

345. Let $\dfrac{13^3+7^3}{13^2+7^2-x} = 20.$

Then, $\dfrac{13^3+7^3}{13+7} = 13^2 + 7^2 - x$

$\Leftrightarrow 13^2 + 7^2 - 13 \times 7 = 13^2 + 7^2 - x$
$\Leftrightarrow x = 13 \times 7 = 91.$

346. Given exp. $= \dfrac{a^3-b^3}{a^2-b^2} = \dfrac{(a-b)(a^2+ab+b^2)}{(a-b)(a+b)} = \dfrac{(a^2+ab+b^2)}{(a+b)}$

$= \dfrac{\left(\frac{3}{5}\right)^2 + \left(\frac{3}{5} \times \frac{2}{5}\right) + \left(\frac{2}{5}\right)^2}{\left(\frac{3}{5}+\frac{2}{5}\right)}$

$= \dfrac{9}{25} + \dfrac{6}{25} + \dfrac{4}{25} = \dfrac{19}{25}.$

347. Given exp. $= \dfrac{a^3+b^3+c^3-3abc}{a^2+b^2+c^2-ab-bc-ca}$

$= a + b + c = (38 + 34 + 28) = 100.$

348. Since $(x - y) + (y - z) + (z - x) = 0$,
so $(x - y)^3 + (y - z)^3 + (z - x)^3 = 3(x - y)(y - z)(z - x).$
$\therefore \quad$ Given exp. $= \dfrac{3(x-y)(y-z)(z-x)}{9(x-y)(y-z)(z-x)} = \dfrac{1}{3}.$

349. $\dfrac{x^3-y^3}{x^2-y^2}-\dfrac{3xy}{x+y}=\dfrac{(x-y)(x^2+y^2+xy)}{(x-y)(x+y)}-\dfrac{3xy}{(x+y)}$

$=\dfrac{(x^2+y^2+xy)-3xy}{(x+y)}=\dfrac{(x^2+y^2-2xy)}{(x+y)}$

$=\dfrac{(x-y)^2}{(x+y)}=\dfrac{(5-3)^2}{(5+3)}=\dfrac{4}{8}=\dfrac{1}{2}.$

350. $(a+b+c)=11 \Rightarrow (a+b+c)^2=(11)^2=121$

$\Rightarrow a^2+b^2+c^2+2(ab+bc+ca)=121$

$\Rightarrow a^2+b^2+c^2+2\times 20=121$

$\Rightarrow a^2+b^2+c^2=121-40=81.$

$\therefore \quad a^3+b^3+c^3-3abc=(a+b+c)(a^2+b^2+c^2-ab-bc-ca)$

$=11\,(81-20)=11\times 61=671.$

351. Since $(x-y)+(y-z)+(z-x)=0$,

so $(x-y)^3+(y-z)^3+(z-x)^3=3(x-y)(y-z)(z-x)$.

Since $(x^2-y^2)+(y^2-z^2)+(z^2-x^2)=0$,

so $(x^2-y^2)^3+(y^2-z^2)^3+(z^2-x^2)^3=3(x^2-y^2)(y^2-z^2)(z^2-x^2)$.

$\therefore$ Given exp. $=\dfrac{3(x-y)(y-z)(z-x)}{3(x^2-y^2)(y^2-z^2)(z^2-x^2)}$

$=\dfrac{1}{(x+y)(y+z)(z+x)}$

$=[(x+y)(y+z)(z+x)]^{-1}.$

352. $\dfrac{a^2}{bc}+\dfrac{b^2}{ca}+\dfrac{c^2}{ab}=\dfrac{a^3+b^3+c^3}{abc}=\dfrac{3abc}{abc}=3.$

$[\because a+b+c=0 \Rightarrow a^3+b^3+c^3=3abc]$

353. $a^3+b^3+c^3-3abc=(a+b+c)(a^2+b^2+c^2-ab-bc-ca)$

$=(29+24+27)[(29)^2+(24)^2+(27)^2-29\times 24-24\times 27-27\times 29]$

$=80\,(841+576+729-696-648-783)=80\times 19=1520.$

354. $\dfrac{x^2-1}{x}=4\Rightarrow\left(\dfrac{x^2-1}{x}\right)^3=4^3=64$

$\Rightarrow \dfrac{x^6-1-3x^2(x^2-1)}{x^3}=64$

$\Rightarrow \dfrac{x^6-1-3x^2\cdot 4x}{x^3}=64$

$\Rightarrow x^6-1-12x^3=64x^3$

$\Rightarrow x^6-1=76x^3 \Rightarrow \dfrac{x^6-1}{x^3}=76.$

355. Let $a=32$, $b=79$, $c=-111$. Then, $a+b+c=0$.

So, $a^3+b^3+c^3=3abc \Rightarrow (32)^3+(79)^3-(111)^3$

$=3\times 32\times 79\times(-111)$

$\therefore$ Given exp. $=-(3\times 32\times 79\times 111)+3\times 32\times 79\times 111=0.$

356. $(x+y)=3 \Rightarrow (x+y)^2=9$

$\Rightarrow x^2+y^2+2xy=9$

$\Rightarrow x^2+y^2=9-2xy=9-4=5.$

$\therefore x^3+y^3=(x+y)(x^2+y^2-xy)=3\,(5-2)$

$=3\times 3=9.$ $[\because x+y=3,\ x^2+y^2=5,\ xy=2]$

357. Given expression $=\dfrac{(x+y-z)(x-y+z)}{(x+z+y)(x+z-y)}$

$+\dfrac{(y+x-z)(y-x+z)}{(x+y+z)(x+y-z)}+\dfrac{(z+x-y)(z-x+y)}{(y+z+x)(y+z-x)}$

$=\dfrac{(x+y-z)}{(x+y+z)}+\dfrac{(y-x+z)}{(x+y+z)}+\dfrac{(x-y+z)}{(x+y+z)}$

$=\dfrac{(x+y-z)+(y-x+z)+(x-y+z)}{(x+y+z)}$

$=\dfrac{x+y+z}{x+y+z}=1.$

358. $\dfrac{a}{p}+\dfrac{b}{q}+\dfrac{c}{r}=0\Rightarrow aqr+bpr+cpq=0$ ...(*i*)

$\dfrac{p}{a}+\dfrac{q}{b}+\dfrac{r}{c}=1\Rightarrow\left(\dfrac{p}{a}+\dfrac{q}{b}+\dfrac{r}{c}\right)^2=1$

$\Rightarrow \dfrac{p^2}{a^2}+\dfrac{q^2}{b^2}+\dfrac{r^2}{c^2}+2\left(\dfrac{pq}{ab}+\dfrac{pr}{ac}+\dfrac{qr}{bc}\right)=1$

$\Rightarrow \dfrac{p^2}{a^2}+\dfrac{q^2}{b^2}+\dfrac{r^2}{c^2}+\dfrac{2(pqc+prb+qra)}{abc}=1$

$\Rightarrow \dfrac{p^2}{a^2}+\dfrac{q^2}{b^2}+\dfrac{r^2}{c^2}=1$ [Using (*i*)]

359. $x^4-y^4=15 \Rightarrow (x^2-y^2)(x^2+y^2)=15=1\times 15$ or 3×5

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

$[\because x$ and y are natural numbers$]$

$\Rightarrow 2x^2=8 \Rightarrow x^2=4 \Rightarrow x=2.$

[Adding above two equations]

Putting $x=2$ in $x^2+y^2=5$, we get: $y=1$.

$\therefore \quad (x^4+y^4)=(2^4+1^4)=(16+1)=17.$

360. 26 trees have 25 gaps between them. Hence, required distance $=\left(\dfrac{225}{25}\right)\text{m}=9\text{ m}.$

361. Each row contains 12 plants.

12 plants have 11 gaps between them. So, total length of gaps = (11 × 2) metres and 1 metre is left on each side.

$\therefore$ Length = (22 + 2) m = 24 m.

362. Let the length of the side be x metres.

Then, number of posts required when placed 6 m apart $=\left(\dfrac{x}{6}+1\right)$.

And, number of posts required when placed 8 m apart $=\left(\dfrac{x}{8}+1\right)$.

$\therefore \left(\dfrac{x}{6}+1\right)-5=\left(\dfrac{x}{8}+1\right)\Leftrightarrow \dfrac{x}{6}-\dfrac{x}{8}=5\Leftrightarrow \dfrac{x}{24}=5\Leftrightarrow x=120\text{ m}.$

So, number of posts bought $=\left(\dfrac{120}{8}+1\right)=16.$

363. Gap between 2 consecutive trees $=\left(\dfrac{2000}{200}\right)\text{m}=10\text{ m}.$

$[\because$ 201 trees have 200 gaps between them$]$

$\therefore$ Required number of trees $=\left(\dfrac{50\times 1000}{10}+1\right)$

$=(5000+1)=5001.$

364. Total number of students = 54 × 30.

$\therefore$ Required number of rows = $\left(\frac{54\times 30}{45}\right)=36.$

365. Clearly, we have:

$x + 1 = y \Leftrightarrow x - y = -1$ ...(*i*)

And, $2(x - 1) = y \Leftrightarrow 2x - y = 2$ ...(*ii*)

Subtracting (*i*) from (*ii*), we get: $x = 3$. Putting $x = 3$ in (*i*), we get: $y = 4$.

366. Let the number of benches in the class be x.

Then, $6(x + 1) = 7x - 5 \Leftrightarrow x = 11$.

Hence, number of students in the class

$= 6(x + 1) = 6 \times 12 = 72.$

367. Let the number of benches in the class be x.

Then, $4(x - 3) = 3x + 3 \Leftrightarrow x = 15$.

$\therefore$ Total number of students = $3 \times 15 + 3 = 48$.

368. Let the number of students in a row be x and the total number of rows be y. Then,

total number of students in the class = xy.

$\therefore (x + 4)(y - 2) = xy \Rightarrow xy - 2x + 4y - 8 = xy$

$\Rightarrow 2x - 4y = -8 \Rightarrow x - 2y = -4$ ...(*i*)

And, $(x - 4)(y + 4) = xy \Rightarrow xy + 4x - 4y - 16 = xy$

$\Rightarrow 4x - 4y = 16 \Rightarrow x - y = 4$ ...(*ii*)

Subtracting (*i*) from (*ii*), we get: $y = 8$.

Putting $y = 8$ in (*ii*), we get: $x = 12$.

Hence, total number of students in the class = $xy = (12 \times 8) = 96$.

369. Let Shyam's share be ₹ x. Then, Ram's share

$= ₹\left(x+\frac{3}{4}x\right)=₹\frac{7x}{4}.$

$\therefore \quad x+\frac{7x}{4}=275 \Leftrightarrow \frac{11x}{4}=275 \Leftrightarrow x=\frac{275\times 4}{11}=100.$

So, Ram's share = $₹\left(\frac{7\times 100}{4}\right)=₹175.$

370. Total number of sweets = $(64 \times 7 + 15) = 448 + 15 = 463$.

371. Let the whole property be worth ₹ x. Then,

wife's share = $₹\frac{x}{2}$; Son's share = $₹\left(\frac{1}{2}\text{ of }\frac{x}{2}\right)=₹\frac{x}{4}.$

Remaining share = $₹\left[x-\left(\frac{x}{2}+\frac{x}{4}\right)\right]=₹\frac{x}{4}.$

$\therefore$ Share of each daughter = $₹\left(\frac{1}{2}\text{ of }\frac{x}{4}\right)=₹\frac{x}{8}.$

372. Let the number of children be x. Then, $10x + 3 = 11x - 4$

$\Rightarrow x = 7$.

$\therefore$ Number of sweets = $(10 \times 7 + 3) = 73$.

373. Let the number of boys be x. Then, number of girls

$= (70 - x)$.

$\therefore \quad 2x + 3(70 - x) = 180 \Leftrightarrow x = 30.$

374. Let the total number of cows in the herd be x.

Then, share of fourth son = $x-\left(\frac{x}{2}+\frac{x}{4}+\frac{x}{5}\right)=x-\frac{19x}{20}=\frac{x}{20}.$

$\therefore \quad \frac{x}{20}=7 \quad \text{or} \quad x=140.$

375. Let the total property be worth ₹ x.

Then, elder son's share = $₹\left(\frac{5x}{11}\right)$. Balance = $₹\left(x-\frac{5x}{11}\right)$

$= ₹\frac{6x}{11}.$

Younger son's share = $₹\left(\frac{5}{11}\text{ of }\frac{6x}{11}\right)=₹\left(\frac{30x}{121}\right).$

$\therefore$ Widow's share = $₹\left[x-\left(\frac{5x}{11}+\frac{30x}{121}\right)\right]$

$= ₹\left(x-\frac{85x}{121}\right)=₹\left(\frac{36x}{121}\right).$

$\frac{36x}{121}=3600 \Leftrightarrow x=\frac{3600\times 121}{36}=12100.$

So, elder son's share = $₹\left(\frac{5}{11}\times 12100\right)=₹5500;$

Younger son's share = $₹\left(\frac{30}{121}\times 12100\right)=₹3000.$

376. Suppose each boy gets ₹ x. Then, each woman gets ₹ $2x$ and each man gets ₹ $(x + 2x)$ i.e., ₹ $3x$.

So, $10 \times 3x + 12 \times 2x + 20x = 370 \Leftrightarrow 30x + 24x + 20x$

$= 370 \Leftrightarrow 74x$

$= 370 \Leftrightarrow x = 5.$

$\therefore$ Amount received by 10 men = $30x$ = ₹ (30×5)

= ₹ 150.

377. Let D's share = ₹ x. Then, C's share = ₹ x.

B's share = ₹ $(x + 125)$. A's share = ₹ $(x + x + 125)$

= ₹ $(2x + 125)$.

$\therefore \quad (2x + 125) + (x + 125) + x + x = 750$

$\Leftrightarrow \quad 5x = 500$

$\Leftrightarrow \quad x = 100.$

Hence, A's share = $2x + 125$ = ₹ $(2 \times 100 + 125)$

= ₹ 325.

378. Let Gagan's share = ₹ x.

Then, Sachin's share = $₹\left(\frac{x}{5}\right)$ and Rohit's share = $₹\left(\frac{2x}{5}\right).$

$\therefore \quad \frac{2x}{5}+\frac{x}{5}+x=1000 \quad \Leftrightarrow \quad 8x=5000 \quad \Leftrightarrow \quad x=625.$

379. If the second boy takes one-third of a certain number of marbles, the third boy is left with two-thirds of that number, which is twice the number with the second boy, regardless of the total number of marbles. Hence, the total number of marbles cannot be determined.

380. Wife's share = $\frac{1}{2}$. Remaining part = $\left(1-\frac{1}{2}\right)=\frac{1}{2}.$

Share of 3 sons = $\left(\frac{2}{3}\text{ of }\frac{1}{2}\right)=\frac{1}{3}.$ Remaining part

$=\left(\frac{1}{2}-\frac{1}{3}\right)=\frac{1}{6}.$

Each daughter's share = $\frac{1}{4}\times\frac{1}{6}=\frac{1}{24}.$

Let the total money be ₹ x. Then, $\frac{1}{24}x = 20000$

$\Leftrightarrow \quad x = 20000 \times 24 = 480000.$

$\therefore$ Each son's share = $₹\left[\frac{1}{3}\times\left(\frac{1}{3}\times 480000\right)\right]=₹53{,}333.33.$

381. $A + B + C + D = 47$ ...(*i*)
$A + B = 27$ ...(*ii*)
$A + C = 25$ ...(*iii*)
$A + D = 23$ ...(*iv*)
Adding (*ii*), (*iii*) and (*iv*), we get:
$2A + (A + B + C + D) = 75 \Leftrightarrow 2A + 47 = 75 \Leftrightarrow 2A = 28 \Leftrightarrow A = 14$.
Putting $A = 14$ in (*ii*), we get: $B = 13$.

382. Let the sum be ₹ x.
Then, $\frac{x}{12} - \frac{x}{16} = 400 \Leftrightarrow \frac{x}{48} = 400 \Leftrightarrow x = 400 \times 48 = 19200$.

383. Let the total number of sweets be $(25x + 8)$.
Then, $(25x + 8) - 22$ is divisible by 28
$\Leftrightarrow$ $(25x - 14)$ is divisible by 28
$\Leftrightarrow$ $28x - (3x + 14)$ is divisible by 28
$\Leftrightarrow$ $(3x + 14)$ is divisible by 28 $\Leftrightarrow x = 14$.
$\therefore$ Total number of sweets $= (25 \times 14 + 8) = 358$.

384. Let the total number of sweets be x. Then,
$$\frac{x}{80} - \frac{x}{112} = 6 \Leftrightarrow \frac{7x - 5x}{560} = 6 \Leftrightarrow \frac{x}{280} = 6 \Leftrightarrow x = 1680.$$
$\therefore$ Number of sweets each child was originally supposed to get $= \left(\frac{1680}{112}\right) = 15$.

385. Let the total number of children be n and the amount received by each child be ₹ x.
Then, total sum distributed = ₹ (nx).
So, $(n + 16)(x - 2) = nx$
$\Leftrightarrow nx - 2n + 16x - 32 = nx$
$\Leftrightarrow 16x - 2n = 32$ ...(*i*)
And, $(n - 16)(x + 3) = nx$
$\Leftrightarrow nx + 3n - 16x - 48 = nx$
$\Leftrightarrow 16x - 3n = -48$ ...(*ii*)
Subtracting (*ii*) from (*i*), we get: $n = 80$.
Putting $n = 80$ in (*i*), we get: $16x = 192$ or $x = 12$.
Hence, total sum distributed $= nx =$ ₹ $(80 \times 12) =$ ₹ 960.

386. Suppose, Sanya and Vidushi donate money to x and $(x + 5)$ people respectively.
Then, $\frac{100}{x} - \frac{100}{x+5} = 1 \Leftrightarrow 100(x + 5) - 100x = x(x + 5)$
$\Leftrightarrow x^2 + 5x - 500 = 0$
$\Leftrightarrow (x - 20)(x + 25) = 0 \Leftrightarrow x = 20$.
$\therefore$ Total number of recipients of charity $= x + (x + 5) = (2x + 5) = 45$.

387. Let the number of girls be x. Then, number of boys $= 3x$.
Total number of students $= x + 3x = 4x$.
Clearly, the total number of students must be a multiple of 4.

388. Let the number of boys be x. Then, number of girls $= (x - 2)$.
$\therefore$ $x^2 - (x - 2)^2 = 28$
$\Leftrightarrow$ $x^2 - (x^2 + 4 - 4x) = 28$
$\Leftrightarrow$ $4x - 4 = 28$
$\Leftrightarrow$ $4x = 32$
$\Leftrightarrow$ $x = 8$.
So, number of boys = 8; number of girls = 6.
$\therefore$ Total number of boys and girls = 8 + 6 = 14.

389. Let number of boys = x. Then, number of girls = x.
Now, $2(x - 8) = x$ or $x = 16$.
$\therefore$ Total number of students $= 2x = (2 \times 16) = 32$.

390. Given exp. $= (1 + x)(1 - x)(1 + x^2)(1 + x^4)(1 + x^8)$
$= (1 - x^2)(1 + x^2)(1 + x^4)(1 + x^8) = (1 - x^4)(1 + x^4)(1 + x^8)$
$= (1 - x^8)(1 + x^8) = (1 - x^{16})$.

391. Given exp. $= \left(\frac{1}{x-1} - \frac{1}{x+1}\right) - \frac{2}{x^2+1} - \frac{4}{x^4+1}$
$= \left[\frac{(x+1)-(x-1)}{(x-1)(x+1)}\right] - \frac{2}{x^2+1} - \frac{4}{x^4+1}$
$= \left(\frac{2}{x^2-1} - \frac{2}{x^2+1}\right) - \frac{4}{x^4+1}$
$= \left[\frac{2(x^2+1)-2(x^2-1)}{(x^2-1)(x^2+1)}\right] - \frac{4}{x^4+1}$
$= \frac{4}{x^4-1} - \frac{4}{x^4+1} = \frac{4(x^4+1)-4(x^4-1)}{(x^4-1)(x^4+1)}$
$= \frac{8}{(x^8-1)}$.

392. Given exp. $= \left[\left(x + \frac{1}{x}\right)\left(x^2 + \frac{1}{x^2} - x \cdot \frac{1}{x}\right)\right]\left[\left(x - \frac{1}{x}\right)\left(x^2 + \frac{1}{x^2} + x \cdot \frac{1}{x}\right)\right]$
$= \left(x^3 + \frac{1}{x^3}\right)\left(x^3 - \frac{1}{x^3}\right) = \left(x^6 - \frac{1}{x^6}\right)$.

393. $x + \frac{1}{x} = 3 \Rightarrow \left(x + \frac{1}{x}\right)^2 = 3^2 \Rightarrow x^2 + \frac{1}{x^2} + 2 \cdot x \cdot \frac{1}{x} = 9$
$\Rightarrow x^2 + \frac{1}{x^2} = 9 - 2 = 7$.

394. $a - \frac{1}{a} = p \Rightarrow \left(a - \frac{1}{a}\right)^2 = p^2 \Rightarrow a^2 + \frac{1}{a^2} - 2 \cdot a \cdot \frac{1}{a} = p^2$
$\Rightarrow a^2 + \frac{1}{a^2} = p^2 + 2$.

395. $\frac{x-1}{x} = 3 \Rightarrow 1 - \frac{1}{x} = 3 \Rightarrow \left(1 - \frac{1}{x}\right)^2 = 9$
$\Rightarrow 1 + \frac{1}{x^2} - \frac{2}{x} = 9$
$\Rightarrow 1 + \frac{1}{x^2} = 9 + \frac{2}{x} = 9 + \frac{2}{\left(-\frac{1}{2}\right)} = 9 - 4 = 5$.
$\left[\because \frac{x-1}{x} = 3 \Rightarrow 3x = x - 1 \Rightarrow 2x = -1 \Rightarrow x = -\frac{1}{2}\right]$

396. $x^2 + \frac{1}{x^2} = 34 \Rightarrow x^2 + \frac{1}{x^2} + 2 \cdot x^2 \cdot \frac{1}{x^2} = 34 + 2 = 36$
$\Rightarrow \left(x + \frac{1}{x}\right)^2 = 36 \Rightarrow \left(x + \frac{1}{x}\right) = 6$.

397. $\left(x+\frac{1}{x}\right)=2 \Rightarrow \left(x+\frac{1}{x}\right)^2=2^2$

$\Rightarrow x^2+\frac{1}{x^2}+2=4 \Rightarrow x^2+\frac{1}{x^2}=2$

$\Rightarrow x^2+\frac{1}{x^2}-2\cdot x\cdot\frac{1}{x}=2-2=0$

$\Rightarrow \left(x-\frac{1}{x}\right)^2=0 \Rightarrow x-\frac{1}{x}=0.$

398. $\left(a+\frac{1}{a}\right)=6 \Rightarrow \left(a+\frac{1}{a}\right)^2=6^2=36$

$\Rightarrow a^2+\frac{1}{a^2}+2=36 \Rightarrow \left(a^2+\frac{1}{a^2}\right)=34$

$\Rightarrow \left(a^2+\frac{1}{a^2}\right)^2=(34)^2$

$\Rightarrow a^4+\frac{1}{a^4}+2=1156 \Rightarrow \left(a^4+\frac{1}{a^4}\right)=1154.$

399. $\left(x-\frac{1}{x}\right)=2 \Rightarrow \left(x-\frac{1}{x}\right)^2=2^2=4$

$\Rightarrow x^2+\frac{1}{x^2}-2=4 \Rightarrow x^2+\frac{1}{x^2}=6$

$\Rightarrow \left(x^2+\frac{1}{x^2}\right)^2=6^2=36$

$\Rightarrow x^4+\frac{1}{x^4}+2=36 \Rightarrow x^4+\frac{1}{x^4}=34.$

400. $\left(x-\frac{1}{x}\right)=\sqrt{21} \Rightarrow \left(x-\frac{1}{x}\right)^2=(\sqrt{21})^2=21$

$\Rightarrow x^2+\frac{1}{x^2}-2=21 \Rightarrow x^2+\frac{1}{x^2}=23$

$\Rightarrow x^2+\frac{1}{x^2}+2=25$

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

$\therefore \quad \left(x^2+\frac{1}{x^2}\right)\left(x+\frac{1}{x}\right)=23\times 5=115.$

401. $x^4+\frac{1}{x^4}=322 \Rightarrow x^4+\frac{1}{x^4}+2=324$

$\Rightarrow \left(x^2+\frac{1}{x^2}\right)^2=(18)^2 \Rightarrow x^2+\frac{1}{x^2}=18$

$\Rightarrow x^2+\frac{1}{x^2}-2=16$

$\Rightarrow \left(x-\frac{1}{x}\right)^2=16 \Rightarrow \left(x-\frac{1}{x}\right)=4.$

402. $\left(x+\frac{1}{x}\right)=p \Rightarrow \left(x+\frac{1}{x}\right)^3=p^3$

$\Rightarrow x^3+\frac{1}{x^3}+3\cdot x\cdot\frac{1}{x}\left(x+\frac{1}{x}\right)=p^3$

$\Rightarrow x^3+\frac{1}{x^3}+3p=p^3 \Rightarrow x^3+\frac{1}{x^3}=p^3-3p.$

403. $\left(x-\frac{1}{x}\right)=1 \Rightarrow \left(x-\frac{1}{x}\right)^3=1$

$\Rightarrow x^3-\frac{1}{x^3}-3\cdot x\cdot\frac{1}{x}\left(x-\frac{1}{x}\right)=1$

$\Rightarrow x^3-\frac{1}{x^3}-3=1 \Rightarrow x^3-\frac{1}{x^3}=1+3=4.$

404. $\left(a^4+\frac{1}{a^4}\right)=1154 \Rightarrow a^4+\frac{1}{a^4}+2=1156$

$\Rightarrow \left(a^2+\frac{1}{a^2}\right)^2=1156 \Rightarrow \left(a^2+\frac{1}{a^2}\right)=34$

$\Rightarrow a^2+\frac{1}{a^2}+2=36$

$\Rightarrow \left(a+\frac{1}{a}\right)^2=36 \Rightarrow a+\frac{1}{a}=6$

$\Rightarrow \left(a+\frac{1}{a}\right)^3=6^3=216$

$\Rightarrow a^3+\frac{1}{a^3}+3\cdot a\cdot\frac{1}{a}\left(a+\frac{1}{a}\right)=216$

$\Rightarrow a^3+\frac{1}{a^3}+3\times 6=216$

$\Rightarrow a^3+\frac{1}{a^3}=216-18=198.$

405. $x+\frac{1}{x}=3 \Rightarrow \left(x+\frac{1}{x}\right)^3=3^3=27$

$\Rightarrow x^3+\frac{1}{x^3}+3\cdot x\cdot\frac{1}{x}\left(x+\frac{1}{x}\right)=27$

$\Rightarrow x^3+\frac{1}{x^3}+3\times 3=27 \Rightarrow x^3+\frac{1}{x^3}=18$

$\Rightarrow \left(x^3+\frac{1}{x^3}\right)^2=(18)^2=324$

$\Rightarrow x^6+\frac{1}{x^6}+2=324 \Rightarrow x^6+\frac{1}{x^6}=322.$

406. $x+\frac{1}{x}=\sqrt{13} \Rightarrow \left(x+\frac{1}{x}\right)^2-4=(\sqrt{13})^2-4=13-4=9$

$\Rightarrow \left(x-\frac{1}{x}\right)^2=9$

$\Rightarrow \left(x-\frac{1}{x}\right)=3$

$\Rightarrow \left(x-\frac{1}{x}\right)^3=3^3=27$

$\Rightarrow x^3-\frac{1}{x^3}-3\cdot x\cdot\frac{1}{x}\left(x-\frac{1}{x}\right)=27$

$\Rightarrow x^3-\frac{1}{x^3}-3\times 3=27 \Rightarrow x^3-\frac{1}{x^3}=27+9=36.$

407. $\left(4b^2+\frac{1}{b^2}\right)=2 \Rightarrow \left(2b+\frac{1}{b}\right)^2-4=2$

$\Rightarrow \left(2b+\frac{1}{b}\right)^2=6 \Rightarrow \left(2b+\frac{1}{b}\right)=\sqrt{6}$

$\Rightarrow \left(2b+\frac{1}{b}\right)^3=(\sqrt{6})^3=6\sqrt{6}$

$\Rightarrow 8b^3+\frac{1}{b^3}+3\times 2b\times\frac{1}{b}\cdot\left(2b+\frac{1}{b}\right)=6\sqrt{6}$

$\Rightarrow \left(8b^3+\frac{1}{b^3}\right)+6\sqrt{6}=6\sqrt{6}$

$\Rightarrow \left(8b^3+\frac{1}{b^3}\right)=0.$

408. $\left(2p+\frac{1}{p}\right)=4 \Rightarrow \frac{1}{2}\left(2p+\frac{1}{p}\right)=\frac{1}{2}\times 4 \Rightarrow \left(p+\frac{1}{2p}\right)=2$

$\Rightarrow \left(p+\frac{1}{2p}\right)^3=2^3=8$

$\Rightarrow p^3+\frac{1}{8p^3}+3p\cdot\frac{1}{2p}\left(p+\frac{1}{2p}\right)=8$

$\Rightarrow p^3+\frac{1}{8p^3}+3\times\frac{1}{2}\times 2=8$

$\Rightarrow p^3+\frac{1}{8p^3}=8-3=5.$

409. Let the number of cows in the herd be x.

Then, number of legs = $4x$; number of heads = x.

$\therefore \quad 4x - 2x = 14 \quad \text{or} \quad 2x = 14 \quad \text{or} \quad x = 7.$

410. Let the number of buffaloes be x and the number of ducks be y.

Then, $4x + 2y = 2(x + y) + 24 \Leftrightarrow 2x = 24 \Leftrightarrow x = 12.$

411. Let the number of hens be x and the number of cows be y.

Then, $x + y = 59$ ...(*i*)

and $2x + 4y = 190$ or $x + 2y = 95$ ...(*ii*)

Subtracting (*i*) from (*ii*), we get: $y = 36$.

412. Let the number of parrots be x and the number of tigers be y.

Then, $x + y = 858$ ...(*i*)

and $2x + 4y = 1846$ or $x + 2y = 923$ ...(*ii*)

Subtracting (*i*) from (*ii*), we get: $y = 65$.

Putting $y = 65$ in (*i*), we get: $x = 858 - 65 = 793$.

413. Let the number of horses be x. Then, number of men = x.

$\therefore \quad 4x+\frac{x}{2}\times 2=70 \Leftrightarrow 5x=70 \Leftrightarrow x=14.$

414. Let the full fare be ₹ x and the reservation charge be ₹ y per ticket.

Then, $x + y = 216$ ...(*i*)

and $\frac{3}{2}x+2y=327 \text{ or } 3x+4y=654$ ...(*ii*)

Multiplying (*i*) by 3 and subtracting from (*ii*), we get: $y = 6$.

Putting $y = 6$ in (*i*), we get: $x = 210$.

415. Let the distance travelled by taxi be x km.

Then, distance travelled by own car = $(90 - x)$ km.

$\therefore \quad 7x + 6(90 - x) = 675 \Leftrightarrow x = 675 - 540 = 135$ km.

416. Clearly, first man shakes hand with all other 14 men; second man shakes hand with 13 men (other than first man); third shakes hand with 12 men and so on.

$\therefore$ Total number of hand-shakes = $(14 + 13 + 12 + ... + 1)$

$= \frac{14\times 15}{2}=105.$

417. Let there be n children in the group.

Then, first child exchanges gifts with other $(n - 1)$ children; second child exchanges gifts with other $(n - 2)$ children; and so on.

So, number of gifts = $2\,[1 + 2 + ... + (n - 1)]$

$= 2\times\frac{n(n-1)}{2}=n(n-1).$

$\therefore \quad n(n - 1) = 132 \Leftrightarrow n^2 - n - 132 = 0$

$\Leftrightarrow n^2 - 12n + 11n - 132 = 0$

$\Leftrightarrow (n - 12)\,(n + 11) = 0 \Leftrightarrow n = 12.$

418. 1044 candles produce 1044 butts, from which $\frac{1044}{9}=116$ candles can be formed.

The resultant 116 butts give $\frac{116}{9}$ i.e., 12 candles and 8 butts.

12 resultant butts plus 8 remaining butts = 20 butts from which $\frac{20}{9}$ i.e., 2 candles and 2 butts will be obtained.

In the end, 4 butts will be left behind.

$\therefore$ Total number of candles formed

$= (116 + 12 + 2) = 130.$

419. Number of lines printed in 1 hour = $\frac{176400}{7}=25200.$

Number of lines printed per minute = $\frac{25200}{60}=420.$

420. Number of pages typed by 1 man in 1 hour = $\frac{60}{8}=7.5.$

$\therefore \quad$ Number of men required = $\frac{1710}{7.5}=228.$

421. Number of pages read by Ashu from 2: 30 to 3: 20 i.e., in 50 min or $\frac{5}{6}\text{ hr}=\left(\frac{5}{6}\times 30\right)=25.$

Let the two read the same page x hours after 3: 20.

Then, pages read by Ashu = $(25 + 30x)$. And, pages read by Neeru = $40x$.

$\therefore \quad 25+30x=40x \Rightarrow x=\frac{5}{2}=2\frac{1}{2}.$

Hence, the two read the same page $2\frac{1}{2}$ hours after 3: 20 i.e., at 5: 50.

422. $\frac{336}{x}=\frac{192}{400} \Rightarrow x=\frac{336\times 400}{192}=700.$

423. Maximum internal assessment score = $\left(\frac{47}{50}\times 10\right) = 9.4$.

Minimum internal assessment score = $\left(\frac{14}{50}\times 10\right) = 2.8$.

$\therefore$ Required difference = (9.4 – 2.8) = 6.6.

424. Let the number of questions answered correctly be x.
Then, number of wrong answers = $(200 - x)$.
$\therefore$ $4x - (200 - x) = 200 \Rightarrow 5x = 400 \Rightarrow x = 80$.

425. Let the number of correct answers be x. Then, number of wrong answers = $(26 - x)$.
$\therefore$ $8x - 5(26 - x) = 0 \Rightarrow 13x = 130 \Rightarrow x = 10$.

426. Suppose the student attempted x questions of 2 marks correctly.
Then, number of 4 marks questions attempted correctly $= (15 - x)$.
$\therefore$ $2x + 4(15 - x) = 40 \Leftrightarrow 2x + 60 - 4x = 40$
$\Leftrightarrow 2x = 20 \Leftrightarrow x = 10$.

427. Let the number of correct answers be x. Then, number of incorrect answers = $(30 - x)$.
$\therefore$ $x - 0.25\,(30 - x) = 13.75$
$\Leftrightarrow x - 7.5 + 0.25x = 13.75$
$\Leftrightarrow 1.25x = 21.25 \Leftrightarrow x = \frac{2125}{125} = 17$.
So, number of incorrect answers = 30 – 17 = 13.

428. Suppose he hits the target x times.
Then, he misses it $(100 - x)$ times.
$\therefore$ $x - (100 - x) = 30 \Rightarrow 2x = 130 \Rightarrow x = 65$.
So, number of times he misses the target = 100 – 65 = 35.

429. Let the number of cows be x. Then, number of bulls = $2x$.
Number of caretakers = $\frac{x + 2x + 45}{15} = \frac{3x + 45}{15} = \frac{x + 15}{5}$.
Number of heads = $x + 2x + 45 + \frac{x + 15}{5} = \frac{16x + 240}{5}$.
Number of feet = $4x + 4 \times 2x + 2 \times 45 + 2\left(\frac{x + 15}{5}\right)$
$= 4x + 8x + 90 + \left(\frac{2x + 30}{5}\right) = \frac{62x + 480}{5}$.
$\therefore$ $\frac{62x + 480}{5} - \frac{16x + 240}{5} = 186 \Rightarrow 46x + 240 = 930$
$\Rightarrow 46x = 690 \Rightarrow x = 15$.
Hence, number of caretakers = $\frac{x + 15}{5} = \frac{30}{5} = 6$.

430. Man's basic pay per hour = ₹ $\left(\frac{200}{40}\right)$ = ₹ 5.
Overtime charges per hour = 125% of ₹ 5 = ₹ 6.25.
Suppose the man worked overtime for x hours.
Then, $200 + 6.25x = 300 \Rightarrow 6.25x = 100 \Rightarrow x = 16$.
$\therefore$ Total number of working hours = (40 + 16) = 56.

431. Suppose the man works overtime for x hours.
Now, working hours in 4 weeks = (5 × 8 × 4) = 160.
$\therefore$ $160 \times 24 + x \times 32 = 4320 \Rightarrow 32x = 480 \Rightarrow x = 15$.
Hence, total hours of work = (160 + 15) = 175.

432. Suppose their paths cross after x minutes.
Then, $11 + 57x = 51 - 63x \Leftrightarrow 120x = 40 \Leftrightarrow x = \frac{1}{3}$.
Number of floors covered by David in $\frac{1}{3}$ min $= \left(\frac{1}{3}\times 57\right) = 19$.
So, their paths cross at (11 + 19) i.e., 30th floor.

433. Let the total number of steps be n.
Then, $\frac{30}{n - 26} = \frac{18}{n - 34} \Leftrightarrow 30(n - 34) = 18(n - 26)$
$\Leftrightarrow 30n - 18n = 552 \Leftrightarrow 12n = 552 \Leftrightarrow n = 46$.

434. Let the price of the uniform be ₹ x.
Then, servant's pay per day = ₹ $\left(\frac{200 + x}{10}\right)$.
$\therefore$ $5\left(\frac{200 + x}{10}\right) = 20 + x \Leftrightarrow 200 + x = 40 + 2x$
$\Leftrightarrow x = 160$.

435. Suppose he remained absent for x days.
Then, number of days on which he was present = $(20 - x)$.
$\therefore$ $60(20 - x) - 5x = 745 \Leftrightarrow 65x = 455 \Rightarrow x = 7$.

436. Let the fixed charge be ₹ x and variable charge be ₹ y per km.
Then, $x + 16y = 156$ ...(i) and $x + 24y = 204$ ...(ii)
Subtracting (i) from (ii), we get: $8y = 48$ or $y = 6$.
Putting $y = 6$ in (i), we get: $x = 60$.
$\therefore$ Cost of travelling 30 km = ₹ (60 + 30 × 6) = ₹ 240.

437. Original contribution = ₹ $\left(\frac{D}{M}\right)$.
New contribution = ₹ $\left(\frac{D}{M - 3}\right)$.
$\therefore$ Required contribution = ₹ $\left[\frac{D}{(M - 3)} - \frac{D}{M}\right]$
= ₹ $\frac{DM - D(M - 3)}{M(M - 3)}$
= ₹ $\left(\frac{3D}{M^2 - 3M}\right)$.

438. $N \times 50 = (325000 - 300000) = 25000 \Rightarrow N = 500$.

439. Let number of boys = x. Then, number of girls = $(60 - x)$.
$\therefore$ $x(60 - x) + (60 - x)\,x = 1600$
$\Leftrightarrow 2x^2 - 120x + 1600 = 0$
$\Leftrightarrow x^2 - 60x + 800 = 0$
$\Leftrightarrow (x - 40)\,(x - 20) = 0$
$\Leftrightarrow x = 40$ or $x = 20$.
So, we are not definite, Hence, data is inadequate.

440. Original share of 1 person = $\frac{1}{8}$. New share = $\frac{1}{7}$.
Increase = $\left(\frac{1}{7} - \frac{1}{8}\right) = \frac{1}{56}$.
$\therefore$ Required fraction = $\frac{(1/56)}{(1/8)} = \left(\frac{1}{56}\times 8\right) = \frac{1}{7}$.

441. Let the original duration of the tour be n days.

Then, $\frac{360}{n}-\frac{360}{n+4}=3 \Leftrightarrow 360\left[\frac{n+4-n}{n(n+4)}\right]=3$

$\Leftrightarrow n(n+4)=120\times 4=480$

$\Leftrightarrow n^2+4n-480=0 \Leftrightarrow (n+24)(n-20)=0 \Leftrightarrow n=20.$

442. Let the original number of students be x.

Then, $\frac{500}{x-5}-\frac{500}{x}=5 \Leftrightarrow \frac{1}{x-5}-\frac{1}{x}=\frac{1}{100} \Leftrightarrow x(x-5)=500$

$\Leftrightarrow x^2-5x-500=0$

$\Leftrightarrow (x-25)(x+20)=0 \Leftrightarrow x=25.$

Hence, number of students who attended the picnic $= (25-5)=20.$

443. Let the original cost per student be ₹ x.

Then, $\frac{720}{x}-\frac{720}{x+9}=4 \Leftrightarrow 720\left[\frac{x+9-x}{x(x+9)}\right]=4$

$\Leftrightarrow x(x+9)=1620$

$\Leftrightarrow x^2+9x-1620=0$

$\Leftrightarrow (x+45)(x-36)=0 \Leftrightarrow x=36.$

444. Let the total price of the CDs be ₹ x and the number of boys be n.

Then, $\frac{x}{n-2}-\frac{x}{n}=1 \Leftrightarrow \frac{nx-x(n-2)}{n(n-2)}=1$

$\Leftrightarrow 2x=n^2-2n \Leftrightarrow x=\frac{n^2-2n}{2}.$

Since x is a whole number, so n must be even.

For $n=20$, we have: $x=180<200$.

For $n=22$, we have: $x=220$.

For $n=24$, we have: $x=264>250$.

So, $n=22$, $x=$ ₹ 220.

445. $X+3X\times 0.50+14\times 0.10+4X\times 0.05=50$

$\therefore \quad X+1.5X+1.40+0.2X=50 \Leftrightarrow 2.7X=48.60$

$\Leftrightarrow X=18.$

446. Let the number of 20-paise coins be x. Then, number of 25-paise coins $= (324-x)$.

$\therefore \quad 0.20\times x+0.25(324-x)=71$

$\Leftrightarrow 20x+25(324-x)=7100$

$\Leftrightarrow 5x=1000 \Leftrightarrow x=200.$

Hence, number of 25-paise coins $= (324-x)=124.$

447. Let number of notes of each denomination be x.

Then, $x+5x+10x=480 \Leftrightarrow 16x=480 \Leftrightarrow x=30.$

Hence, total number of notes $=3x=90.$

448. Let the number of coins of each denomination be x.

Then, $x+0.5x+0.25x+0.10x+0.05x=380$

$\Rightarrow 1.9x=380 \Rightarrow x=\frac{380}{1.9}=200.$

Hence, number of one-rupee coins $=200.$

449. Let the number of 50 p-coins and 25 p-coins be x and y respectively.

Then, number of 1 rupee coins $= 175-(x+y)$.

$\therefore \quad 0.5x=0.25y \quad \text{or} \quad 2x=y.$

So, number of 50 p-coins $=x$, number of 25 p-coins $=2x$, number of 1 rupee coins $=(175-3x)$.

$\therefore \quad 175-3x=0.5x \Leftrightarrow 3.5x=175 \Leftrightarrow x=\frac{175}{3.5}=50.$

Hence, total amount $=(175-3x)+0.5x+0.25\times 2x$

$=175-3x+0.5x+0.5x=175-3x+x$

$=175-2x=$ ₹ $(175-2\times 50)=$ ₹ 75.

450. Total value of one 2-rupee coin, two 50-p coins and two 25-p coins

$=$ ₹ $(2+2\times 0.50+2\times 0.25)=$ ₹ 3.50.

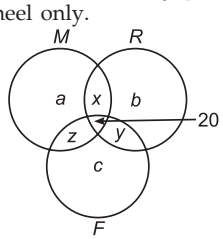
Remaining amount $=$ ₹ $(25-3.50)=$ ₹ 21.50.

For the minimum number of coins, we must have maximum amount in denominations of 2-rupee and 50-p which shall be ten 2-rupee and three 50-p coins i.e., 13 more coins.

$\therefore \quad$ Required number of coins $=(1+2+2)+13=18.$

Questions 451 and 452

Let the circles M, R and F represent the number of children who took ride on merry-go-round, roller coaster and Ferris wheel only.



Let $a=$ number of children who took ride on merry-go-round only;

$b=$ number of children who took ride on roller coaster only;

$c=$ number of children who took ride on Ferris wheel only;

$x=$ number of children who took ride on both merry-go-round and roller coaster;

$y=$ number of children who took ride on both roller-coaster and Ferris wheel;

$z=$ number of children who took ride on both merry-go-round and Ferris wheel.

Then, number of children who took exactly one ride $= a+b+c$;

number of children who took exactly two rides $= x+y+z$;

number of children who took all three rides $=20$;

number of children who took at least 2 rides $= x+y+z+20.$

$\therefore$ We have: $x+y+z+20=55 \Leftrightarrow x+y+z=35$

Total receipt $=$ ₹ $[a+b+c+2(x+y+z)+3\times 20]$

$=$ ₹ $(a+b+c+2\times 35+60)$

$=$ ₹ $(a+b+c+130).$

$\therefore a+b+c+130=145 \quad \text{or} \quad a+b+c=15.$

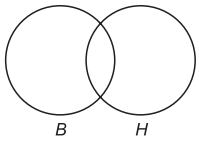
451. Number of children who took exactly one ride $= a+b+c=15.$

452. Number of children who did not try any ride

$=85-(a+b+c+x+y+z+20)$

$=85-(15+35+20)=15.$

453. Number of students who took any one or both the languages



$= 50 - 12 = 38.$

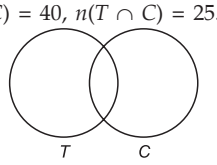
$n(B) = 25,\ n(H) = 16,\ n(B \cup H) = 38.$

$\therefore$ Number of students who take both Bengali and Hindi

$= n(B \cap H) = n(B) + n(H) - n(B \cup H)$

$= (25 + 16) - 38 = (41 - 38) = 3.$

454. $n(T) = 60,\ n(C) = 40,\ n(T \cap C) = 25.$



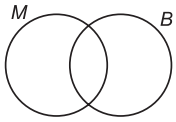
$\therefore$ Number of students who take either tea or coffee or both

$= n(T \cup C) = n(T) + n(C) - n(T \cap C)$

$= 60 + 40 - 25 = 100 - 25 = 75.$

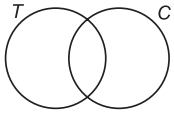
$\therefore$ Required number of students $= (100 - 75) = 25.$

455. $n(M \cup B) = 25,\ n(M) = 12,\ n(M - B) = 8.$



Number students who have taken both Mathematics and Biology $= n(M \cap B) = n(M) - n(M - B) = 12 - 8 = 4.$

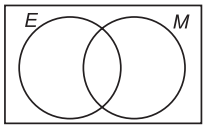
456. $n(T \cup C) = 52,\ n(T - C) = 16,\ n(T) = 33.$



Number of persons who drink coffee but not tea

$= n(C - T) = n(T \cup C) - n(T) = 52 - 33 = 19.$

457. $n(E) = 3000,\ n(M) = 2000,\ n(E \cap M) = 1500.$



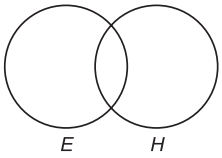
$n(E \cup M) = n(E) + n(M) - n(E \cap M) = 3000 + 2000 - 1500$

$= 3500.$

Number of pure vegetarians $= 4000 - n(E \cup M)$

$= 4000 - 3500 = 500.$

458. $n(E \cup H) = 50;\ n(E \cap H) = 10;\ n(E) = 21.$



Number of students who can speak Hindi $= n(H)$

$= n(E \cap H) + n(E \cup H) - n(E) = 10 + 50 - 21 = 39.$

Number of students who can speak only Hindi

$= n(H - E) = n(H) - n(E \cap H) = 39 - 10 = 29.$

Number of students who can speak only English

$= n(E - H) = n(E) - n(E \cap H) = 21 - 10 = 11.$

459. Let the total number of staff members be x.

Then, the number who can type or take shorthand

$$= \left(x - \frac{3x}{4}\right) = \frac{x}{4}.$$

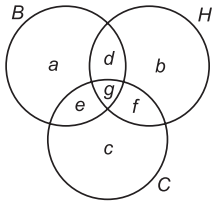
Let A and B represent the sets of persons who can type and take shorthand respectively.

Then, $n(A \cup B) = \frac{x}{4},\ n(A) = \frac{x}{5}$ and $n(B) = \frac{x}{3}.$

$$n(A \cap B) = n(A) + n(B) - n(A \cup B)$$

$$= \left(\frac{x}{5} + \frac{x}{3} - \frac{x}{4}\right) = \left(\frac{12x + 20x - 15x}{60}\right) = \frac{17x}{60}.$$

460. Let circles B, H and C represent the number of players who play basketball, hockey and cricket respectively.



Then, $a + d + e + g = 20$ ...(*i*)

$b + d + f + g = 24$ ...(*ii*)

$c + e + f + g = 27$ ...(*iii*)

$d + g = 12$ ...(*iv*)

$e + g = 10$ ...(*v*)

$f + g = 14$ ...(*vi*)

$g = 7$ ...(*vii*)

From (*iv*), (*v*), (*vi*) and (*vii*), we have:

$d = 12 - g = 12 - 7 = 5;$

$e = 10 - g = 10 - 7 = 3;$

$f = 14 - g = 14 - 7 = 7.$

From (*iii*), we have: $c = 27 - (e + f + g)$

$= 27 - (3 + 7 + 7) = 10.$

From (*ii*), we have: $b = 24 - (d + f + g)$

$= 24 - (5 + 7 + 7) = 5.$

From (*i*), we have: $a = 20 - (d + e + g)$

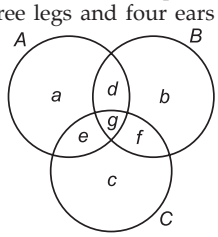
$= 20 - (5 + 3 + 7) = 5.$

Hence, total number of players $= a + b + c + d + e + f + g$

$= (5 + 5 + 10 + 5 + 3 + 7 + 7)$

$= 42.$

461. Let the circles A, B and C represent the aliens having two noses, three legs and four ears respectively.



Then, $a + d + e + g = 40$ ...(*i*)

$b + d + f + g = 30$ ...(*ii*)

$c + e + f + g = 20$ ...(*iii*)

$d + g = 10$ ...(*iv*)

$f + g = 12$ ...(*v*)

$e + g = 5$ ...(*vi*)

$g = 3$ ...(*vii*)

From (*iv*), (*v*), (*vi*) and (*vii*), we have:

$d = 10 - g = 10 - 3 = 7;$

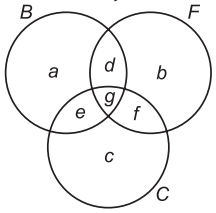
$e = 5 - g = 5 - 3 = 2;$

$f = 12 - g = 12 - 3 = 9.$

From (*iii*), we have: $c = 20 - (e + f + g)$
$= 20 - (2 + 9 + 3) = 20 - 14 = 6.$
From (*ii*), we have: $b = 30 - (d + f + g)$
$= 30 - (7 + 9 + 3) = 30 - 19 = 11.$
From (*i*), we have: $a = 40 - (d + e + g)$
$= 40 - (7 + 2 + 3) = 40 - 12 = 28.$
$\therefore$ Number of aliens who had one or more of the three unusual features
$= a + b + c + d + e + f + g$
$= (28 + 11 + 6 + 7 + 2 + 9 + 3) = 66.$
Hence, number of aliens without any of the unusual features $= (100 - 66) = 34.$

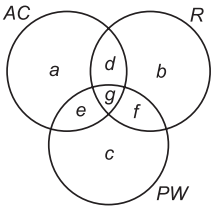
Questions 462 to 466

Let the circles *B*, *F* and *C* represent the children who play badminton, football and cricket respectively. Then, $c = 5, b = 8, a = 7, d = 3, f = 4, e = 4, g = 2.$



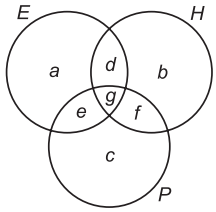
462. Required number $= f + g = 4 + 2 = 6.$
463. Required number $= a + d + e + g = 7 + 3 + 4 + 2 = 16.$
464. Required number $= b + d + f + g = 8 + 3 + 4 + 2 = 17.$
465. Required number $= e + g = 4 + 2 = 6.$
466. Required number $= a + b + c + d + e + f + g$
$= 7 + 8 + 5 + 3 + 4 + 4 + 2 = 33.$

467.



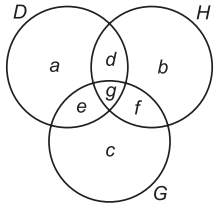
$a + d + e + g = 15$ ...(*i*)
$e = 2$ ...(*ii*)
$b + d + f + g = 12$ ...(*iii*)
$d = 6$ ...(*iv*)
$c + e + f + g = 11$ ...(*v*)
$f + g = 4$ ...(*vi*)
$g = 3$ ...(*vii*)
From (*i*), (*ii*), (*iv*) and (*vii*), we have: $a = 15 - (d + e + g)$
$= 15 - (6 + 2 + 3)$
$= 15 - 11 = 4.$
From (*vi*), we have: $f = 4 - g = 4 - 3 = 1.$
From (*iii*), we have: $b = 12 - (d + f + g)$
$= 12 - (6 + 1 + 3) = 2.$
From (*v*), we have: $c = 11 - (e + f + g)$
$= 11 - (2 + 1 + 3) = 5.$
$\therefore$ Number of cars which had at least one option
$= a + b + c + d + e + f + g$
$= 4 + 2 + 5 + 6 + 2 + 1 + 3 = 23.$
So, number of cars that had none of the options
$= 25 - 23 = 2.$

468. $a + d + e + g = 23$ ...(*i*)
$b + d + f + g = 15$ ...(*ii*)
$c + e + f + g = 18$ ...(*iii*)
$d = 3$ ...(*iv*)
$f = 6$ ...(*v*)
$e = 6$ ...(*vi*)
$a = 9$ ...(*vii*)



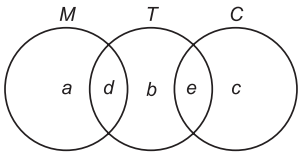
From (*i*), we have: $g = 23 - (a + d + e)$
$= 23 - (9 + 3 + 6) = 5.$
$\therefore$ Number of students who speak all the three languages $= g = 5.$

469. $a + d + e + g = 200$ ...(*i*)
$b + d + f + g = 150$ ...(*ii*)
$c + e + f + g = 150$ ...(*iii*)
$d + g = 80$ ...(*iv*)
$f + g = 60$ ...(*v*)
$e + g = 70$ ...(*vi*)
$a = 80$ ...(*vii*)



From (*i*), (*iv*) and (*vii*), we get:
$a + e = 200 - (d + g) = 200 - 80 = 120.$
$\Rightarrow \quad e = 120 - a = 120 - 80 = 40.$
From (*vi*), we have: $g = 70 - e = 70 - 40 = 30.$
From (*v*), we have: $f = 60 - g = 60 - 30 = 30.$
From (*iv*), we have: $d = 80 - g = 80 - 30 = 50.$
From (*ii*), we have: $b = 150 - (d + f + g) = 150 - (50 + 30 + 30) = 40.$
From (*iii*), we have: $c = 150 - (e + f + g)$
$= 150 - (40 + 30 + 30) = 50.$
Number of Dr Hormis' patients $= b = 40.$
Number of Dr Gerard's patients $= c = 50.$
Number of Dr Paul's patients $= d + e + f + g$
$= 50 + 40 + 30 + 30 = 150.$

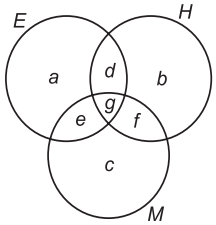
470. $a + b + c + d + e = 18$ ...(*i*)
$a + d = 10$ ...(*ii*)
$b + d + e = 8$ ...(*iii*)
$c + e = 6$ ...(*iv*)
$d = 5$ ...(*v*)



Adding (*ii*) and (*iv*) and subtracting from (*i*), we get:
$b = 18 - (10 + 6) = 18 - 16 = 2.$
From (*iii*), we have:
$e = 8 - (b + d) = 8 - (2 + 5) = 8 - 7 = 1.$
$\therefore$ Number of members who take tea as well as coffee $= e = 1.$

Questions 471 to 475

We have: $a = 650, b = 550,$
$c = 450, g = 100, d + g = 200,$
$f + g = 400, e + g = 300.$
So,
$e = 300 - g = 300 - 100 = 200; f = 400 - g = 400 - 100 = 300;$
$d = 200 - g = 200 - 100 = 100.$



471. Number of members reading Hindi newspaper
$= b + d + f + g = 550 + 100 + 300 + 100 = 1050.$

472. Number of members who read only one newspaper
$= a + b + c = 650 + 550 + 450 = 1650.$

473. Number of members reading no newspaper
$= 2800 - (a + b + c + d + e + f + g)$
$= 2800 - (650 + 550 + 450 + 100 + 200 + 300 + 100)$
$= 2800 - 2350 = 450.$

474. Number of members who read at least 2 newspapers
$= d + e + f + g = 100 + 200 + 300 + 100 = 700.$

475. Required difference $= (e + g) - (d + g) = e - d$
$= 200 - 100 = 100.$

476. Let the consumption of ration be x kg per day. Then,
$75(x + 12) = 90(x + 8)$
$\Leftrightarrow 75x + 900 = 90x + 720$
$\Leftrightarrow 15x = 180 \Leftrightarrow x = 12.$
$\therefore$ Total quantity of ration $= 75(x + 12)$
$= (75 \times 24)$ kg $= 1800$ kg.
Hence, it would last for $\left(\frac{1800}{12}\right)$ days i.e., 150 days.

477. Let l be the length of each candle and x be the number of hours before 4 P.M. when the candles should be lighted.
Length of first candle burnt $= \frac{l}{3} \times x$. Length of second candle burnt $= \frac{l}{4} \times x$.
Remaining length of first candle $= l - \frac{xl}{3}$.
Remaining length of second candle $= l - \frac{xl}{4}$.

$$\therefore\ l - \frac{xl}{4} = 2\left(l - \frac{xl}{3}\right) \Leftrightarrow l\left(1 - \frac{x}{4}\right) = 2l\left(1 - \frac{x}{3}\right)$$
$$\Leftrightarrow 1 - \frac{x}{4} = 2\left(1 - \frac{x}{3}\right) \Leftrightarrow \frac{2x}{3} - \frac{x}{4} = 1$$
$$\Leftrightarrow \frac{5x}{12} = 1 \Leftrightarrow x = \frac{12}{5} = 2\frac{2}{5}.$$

So, the candles should be lighted $2\frac{2}{5}$ hrs i.e., 2 hr 24 min before 4 P.M. i.e., at 1: 36 P.M.

478. Suppose the man bought x apples. Then, number of oranges bought $= (40 - x)$.
Let the cost of each apple be ₹ a and that of each orange be ₹ b.
Then, $ax + b(40 - x) = 17 \Leftrightarrow ax - bx = 17 - 40b$ ...(*i*)
And, $a(40 - x) + bx = 15 \Leftrightarrow ax - bx = 40a - 15$ ...(*ii*)
From (*i*) and (*ii*), we get:
$40a - 15 = 17 - 40b \Leftrightarrow 40a + 40b$
$= 32 \Leftrightarrow 40(a + b) = 32 \Leftrightarrow a + b = \frac{4}{5}.$
Hence, cost of 1 apple and 1 orange
$= ₹\ \frac{4}{5} = \left(\frac{4}{5} \times 100\right) p = 80\ p.$

479. Suppose she purchased n books for ₹ 720. Then, cost of each book $= ₹\left(\frac{720}{n}\right)$.

$$\therefore\ \frac{720}{n} - \frac{720}{n+4} = 2 \Rightarrow \frac{(n+4) - n}{n(n+4)}$$
$$= \frac{1}{360} \Rightarrow n^2 + 4n - 1440 = 0$$
$\Rightarrow (n + 40)(n - 36) = 0 \Rightarrow n = 36.$

480. Let the number of pineapple, mango and black-forest pastries be x, y and z respectively.
Then, cost of each pineapple pastry = ₹ x; cost of each mango pastry = ₹ y ;
cost of each black-forest pastry = ₹ z.
Thus, $x + y + z = 23$. And, $x^2 + y^2 + z^2 = 211$.
So, we have to find 3 numbers whose sum is 23 and the sum of whose squares is 211. Such a triplet is (11, 9, 3).

481. Suppose each tube contains x grams initially. Then,

$$4\left[\frac{1}{3}(x + 20)\right] = (x - 20) + \frac{2}{3}(x + 20)$$
$$\Leftrightarrow \frac{2}{3}(x + 20) = (x - 20)$$
$$\Leftrightarrow \frac{2}{3}x + \frac{40}{3} = x - 20$$
$$\Leftrightarrow \frac{x}{3} = \frac{40}{3} + 20 = \frac{100}{3} \Leftrightarrow x = 100.$$

482. Let the capacity of the first bottle be x litres.
Then, capacity of the second bottle $= 2x$ litres.
And, capacity of the third bottle $= (x + 2x)$ litres
$= 3x$ litres.
Quantity of milk in the first bottle $= \frac{x}{2}$ litres.
Quantity of milk in the second bottle $= \left(\frac{2x}{4}\right)$ litres $= \frac{x}{2}$ litres.
Quantity of milk in the third bottle $= \left(\frac{x}{2} + \frac{x}{2}\right)$ litres $= x$ litres.
$\therefore$ Required fraction $= \left(\frac{x}{3x}\right) = \frac{1}{3}.$

483. Number of passengers after the first stop
$= \left[540 - \left(\frac{1}{9} \text{ of } 540\right) + 24\right] = 504.$
Number of passengers after the second stop
$= \left[504 - \left(\frac{1}{8} \text{ of } 504\right) + 9\right] = 450.$

484. Let the number of passengers at the start be x.
Then, number of passengers after the first stop
$= \left(\frac{x}{2} + 125\right).$
Number of passengers after the second stop
$= \frac{1}{2}\left(\frac{x}{2} + 125\right) + 100 = \left(\frac{x}{4} + \frac{325}{2}\right).$

$$\therefore\ \frac{x}{4} + \frac{325}{2} = 250 \Rightarrow \frac{x}{4} = 250 - \frac{325}{2} = \frac{175}{2}$$
$$\Rightarrow x = \left(\frac{175}{2} \times 4\right) = 350.$$

485. Total number of digits =
(No. of digits in 1-digit page nos. + No. of digits in 2-digit page nos. + No. of digits in 3-digit page nos.)
$= (1 \times 9 + 2 \times 90 + 3 \times 267)$
$= (9 + 180 + 801) = 990.$

486. No. of digits in 1-digit page nos. $= 1 \times 9 = 9.$
No. of digits in 2-digit page nos. $= 2 \times 90 = 180.$
No. of digits in 3-digit page nos. $= 3 \times 900 = 2700.$
No. of digits in 4-digit page nos. $= 3189 - (9 + 180 + 2700) = 3189 - 2889 = 300.$

$\therefore$ No. of pages with 4-digit page nos. $= \left(\frac{300}{4}\right) = 75.$

Hence, total number of pages $= (999 + 75) = 1074.$

487. Let the number of students in sections A and B be x and y respectively. Then,

$x + 10 = 3(y - 10) \Rightarrow 3y - x = 40$ ...(*i*)

And, $x - 10 = y + 10 \Rightarrow x - y = 20$ ...(*ii*)

Adding (*i*) and (*ii*), we get: $2y = 60$ or $y = 30.$

Putting $y = 30$ in (*ii*), we get: $x = 50.$

488. Clearly, the boy lost 7 chocolates, regained the 7 lost chocolates and won 20 more.

$\therefore$ Number of games played $= (7 + 7 + 20) = 34.$

489. Clearly, we have:

$J - 40 = \frac{1}{2}A$ ...(*i*)

$A - 40 = J$ ...(*ii*)

$A - 40 = R + 40$ ...(*iii*)

Solving (*i*) and (*ii*), we get: $J = 120$ and $A = 160.$

Putting $A = 160$ in (*iii*), we get: $R = 80.$

$\therefore$ Total money $= R + J + A =$ ₹ $(80 + 120 + 160) =$ ₹ 360.

490. We have:

$B + 8 = C$ ...(*i*)

$A - 8 = C - 3$ ...(*ii*)

$A + 6 = 2D$ ...(*iii*)

$B + D = 50$ ...(*iv*)

Putting $C = A - 5$ from (*ii*) into (*i*), we have:

$B + 8 = A - 5$ or $A - B = 13$ ...(*v*)

Putting $D = 50 - B$ from (*iv*) into (*iii*), we have:

$A + 6 = 100 - 2B$ or $A + 2B = 94$ ...(*vi*)

Solving (*v*) and (*vi*), we get: $B = 27$, $A = 40.$

491. We have:

$B - 3 = E$ ...(*i*)

$B + 3 = D$ ...(*ii*)

$A + B = D + E + 10$ ...(*iii*)

$B = C + 2$ ...(*iv*)

$A + B + C + D + E = 133$ ...(*v*)

From (*i*) and (*ii*), we have: $2B = D + E$ ...(*vi*)

Using (*iii*), (*iv*) and (*vi*) in (*v*), we get:

$(B + 10) + B + (B - 2) + 2B = 133$

$\Leftrightarrow \quad 5B = 125$

$\Leftrightarrow \quad B = 25.$

492. Since A and B each has ₹ 16 in the end, so C gave each of them ₹ 8. So, before third transaction, C had ₹ $(16 + 8 \times 2) =$ ₹ 32 while A and B each had ₹ 8. Thus, in second transaction, B gave ₹ 4 to A and ₹ 16 to C. So, before second transaction, A had ₹ 4, B had ₹ $(8 + 4 + 16) =$ ₹ 28 and C had ₹ 16. Thus, in first transaction, A gave ₹ 14 to B and ₹ 8 to C. So, before first transaction, A had ₹ $(4 + 14 + 8) =$ ₹ 26, B had ₹ 14 and C had ₹ 8.

493. Suppose Iqbal has x cards and Mushtaq has y cards.
Let the number of cards given be z.

Then, $x + z = 4(y - z) \Rightarrow x - 4y = -5z$ ...(*i*)

And, $x - z = 3(y + z) \Rightarrow x - 3y = 4z$ ...(*ii*)

Subtracting (*i*) from (*ii*), we get: $y = 9z$. Putting $y = 9z$ in (*i*), we get: $x = 31z.$

Clearly, since a pack of playing cards has 52 cards, z cannot be greater than 1.

So, $x = 31$ and $y = 9$ [$\because z = 1$]

Hence, Iqbal had 31 cards.

494. Let the original number of boys be x. Then, number of apples first picked $= 3x.$

Final number of boys $= x + 3$. Final number of apples $= 3x + 1.$

$\therefore \quad \frac{3x+1}{x+3} = 2 \Leftrightarrow 3x + 1 = 2x + 6 \Leftrightarrow x = 5.$

Hence, required number of apples $= 3 \times 5 + 1 = 16.$

495. Let there be n students in the classroom.

Total number of friendship bands bought $= n(n - 1).$

If two students were absent, number of bands utilized $= (n - 2)(n - 3).$

$\therefore \quad n(n - 1) - (n - 2)(n - 3)$

$= 122 \Leftrightarrow n^2 - n - n^2 + 5n - 6$

$= 122 \Leftrightarrow 4n = 128 \Leftrightarrow n = 32.$

So, number of bands finally unutilized

$= 32 \times 31 - 31 \times 30 = 992 - 930 = 62.$

496. Let the total number of chocolates she bought be x and the total number of her friends be y.

Then, $3(y - 1) + 2 = x \Leftrightarrow x - 3y = -1$ ...(*i*)

And, $2y + 15 = x \Leftrightarrow x - 2y = 15$ ...(*ii*)

Subtracting (*i*) from (*ii*), we get: $y = 16$. Putting $y = 16$ in (*ii*), we get: $x = 47.$

497. Clearly, each committee has two members which are common to all three committees. In addition, it has a third member common to the second committee and a fourth one common to the third committee.

498. $2n + 5m = 50 \Leftrightarrow 2n = 50 - 5m \Leftrightarrow n = \frac{50 - 5m}{2}.$

Since n is a natural number, so $(50 - 5m)$ must be even and so, m must be even

i.e., $m = 2, 4, 6$ or 8

[$\because m < 10$, as for $m = 10$, $n = 0$]

If $m = 2$, $n = 20$;

If $m = 4$, $n = 15$;

If $m = 6$, $n = 10$;

If $m = 8$, $n = 5.$

$\therefore$ Least possible difference $= 8 - 5 = 3.$

499. Let the number of chairs with arms bought be x and those without arms be y.

Then, $x + y \geq 15$ or $y \geq 15 - x$

And, $160x + 100y \leq 2000$

$\Rightarrow \quad 160x + 100(15 - x) \leq 2000$

[$\because$ For maximum value of x, y has to be minimum]

$\Rightarrow \quad 160x + 1500 - 100x \leq 2000 \Rightarrow 60x \leq 500 \Rightarrow x \leq 8.$

Hence, maximum value of x is 8.

500. Let the number of cats be x. Then, number of dogs = $55 - x$.

Clearly, x is a multiple of 5 i.e., $x = 5n$ where $n \le 10$.

And, $(55 - x)$ is a multiple of 4 $\Rightarrow 55 - 5n = 4m$

$$\Rightarrow m = \frac{55 - 5n}{4}.$$

Since m is a natural number, $(55 - 5n)$ must be a multiple of 4 which happens for $n = 3$ or 7.

Case I. If $n = 3$, $m = 10$.

Number of cats = 15, Number of dogs = 40.

Number of pets adopted = $\left(\frac{1}{5}\times 15 + \frac{1}{4}\times 40\right) = 13.$

Case II. If $n = 7$, $m = 5$.

Number of cats = 35, Number of dogs = 20.

Number of pets adopted = $\left(\frac{1}{5}\times 35 + \frac{1}{4}\times 20\right) = 12.$

$\therefore$ Required number = 13.

501. The team has played a total of (17 + 3) = 20 matches. This constitutes $\frac{2}{3}$ of the matches. Hence, total number of matches played = 30. To win $\frac{3}{4}$ of them, a team has to win at least 23 of them. The team has thus to win a minimum of 6 matches out of remaining 10. So, it can lose a maximum of 4 of them.

502. Let M represent the number of mornings when they swam.

Then, total number of mornings in the vacation

$= 32 + M.$

Let E represent the number of evenings when they played tennis.

Then, total number of evenings in the vacation = $18 + E$.

$\therefore \quad 32 + M = 18 + E \Rightarrow E - M = 14.$ ...(*i*)

Total number of days when they swam or played

$= E + M.$

$\therefore \quad E + M = 28$ ...(*ii*)

Adding (*i*) and (*ii*), we get: $2E = 42$ or $E = 21$.

Hence, duration of vacations = $18 + E = 18 + 21 = 39$.

503. **Note:** $10 \times 15 \ne 20 \times 10$. So, this is not a question of Chain Rule and the original quantity of grass and its growth rate are to be considered.

Let g be the total units of grass in the field originally, r be the units of grass grown per day and c be the units of grass each cow eats per day.

Then, $g + 15r = (10 \times 15)\, c = 150c$ ...(*i*)

$g + 10r = (20 \times 10)\, c = 200c$ ...(*ii*)

Subtracting (*ii*) from (*i*), we get: $5r = -50c$ or $r = -10c$.

Putting $r = -10c$ in (*i*), we get: $g = 300c$.

Let the required number of days be x.

Then, $g + xr = 30xc \Rightarrow 300c - 10xc = 30xc \Rightarrow 40xc = 300c$

$\Rightarrow 40x = 300 \Rightarrow x = 7\frac{1}{2}.$

504. Let g be the total units of grass in the field originally, r be the units of grass grown per day and c be the units of grass each cow eats per day.

Then, units of grass consumed by 70 cows in 24 days

$= (70 \times 24 \times c) = 1680c.$

Units of grass consumed by 30 cows in 60 days

$= (30 \times 60 \times c) = 1800c.$

We have: $g + 24r = 1680c$ ...(*i*)

$g + 60r = 1800c$ ...(*ii*)

Subtracting (*i*) from (*ii*), we get: $36r = 120c \Rightarrow r = \frac{10}{3}c.$

Putting $r = \frac{10}{3}c$ in (*i*), we get: $g = 1600c$.

Let the required number of cows be x.

Then, $g + 96r = x \times 96 \times c \Rightarrow 1600c + \frac{96\times 10}{3}c = 96xc$

$\Rightarrow 1920c = 96xc \Rightarrow 96x = 1920 \Rightarrow x = 20.$

Questions 505 and 506

Let the total number of pilgrims in the group be x.

Then, total number of visits to shrines

= Number of shrines × Number of pilgrims visiting each shrine = $10 \times 4 = 40$.

So, $5x = 40$ or $x = 8$.

Let the number of lakes be n.

Then, total number of visits to lakes

= Number of lakes × Number of pilgrims visiting each lake = $6n$.

$\therefore \quad 6n = 8 \times 3 = 24$ or $n = 4$.

505. Number of lakes in the city = 4.

506. Number of pilgrims in the group = 8.

507. Let the total number of apples be x. Then,

Apples sold to 1st customer = $\left(\frac{x}{2} + 1\right)$. Remaining apples

$$= x - \left(\frac{x}{2} + 1\right) = \left(\frac{x}{2} - 1\right).$$

Apples sold to 2nd customer = $\frac{1}{3}\left(\frac{x}{2} - 1\right) + 1$

$$= \frac{x}{6} - \frac{1}{3} + 1 = \left(\frac{x}{6} + \frac{2}{3}\right).$$

Remaining apples = $\left(\frac{x}{2} - 1\right) - \left(\frac{x}{6} + \frac{2}{3}\right)$

$$= \left(\frac{x}{2} - \frac{x}{6}\right) - \left(1 + \frac{2}{3}\right) = \left(\frac{x}{3} - \frac{5}{3}\right).$$

Apples sold to 3rd customer = $\frac{1}{5}\left(\frac{x}{3} - \frac{5}{3}\right) + 1 = \left(\frac{x}{15} + \frac{2}{3}\right).$

Remaining apples = $\left(\frac{x}{3} - \frac{5}{3}\right) - \left(\frac{x}{15} + \frac{2}{3}\right)$

$$= \left(\frac{x}{3} - \frac{x}{15}\right) - \left(\frac{5}{3} + \frac{2}{3}\right) = \left(\frac{4x}{15} - \frac{7}{3}\right).$$

$$\therefore \quad \frac{4x}{15} - \frac{7}{3} = 3 \Leftrightarrow \frac{4x}{15} = \frac{16}{3} \Leftrightarrow x = \left(\frac{16}{3}\times\frac{15}{4}\right) = 20.$$

508. Let the time taken to read one page of Engineering Mathematics be M units and that taken to read one page of Engineering Drawing be D units.

Then, $80M + 100D = 50M + 250D \Rightarrow 30M = 150D \Rightarrow D = \frac{M}{5}.$

$\therefore \quad 80M + 100D = 80M + 100 \times \frac{M}{5}$

$= 80M + 20M = 100M.$

So, Ravi can read 100 pages of Engineering Mathematics.

509. Since Rohan paid ₹ 20 and because of lack of change, the clerk gave him stamps worth ₹ 3, it can be concluded that the total value of the stamps that he wanted to buy is ₹ 17. Since he ordered initially a minimum of 2 stamps of each denomination, if he bought exactly 2 stamps each, his total value is ₹ [2(5 + 2 + 1)] = ₹ 16. To make it ₹ 17, he must have bought 1 one-rupee stamp more.
So, total number of stamps ordered = (2 + 2 + 3) = 7.
Since the clerk gave him 3 more, so total number of stamps bought = (7 + 3) = 10.

510. Suppose Aditya bought x gel pens and y fountain pens. Then.

$300x + 400y = 3600 \Rightarrow 3x + 4y = 36 \quad ...(i)$

Also, $(300x + 400y) - (400x + 300y) = 150$ or 200

$\Rightarrow \quad 100y - 100x = 150$ or 200

$\Rightarrow \quad y - x = 1.5$ or $y - x = 2.$

If $y - x = 1.5$, we don't get integral values for x and y.

$\therefore \quad y - x = 2 \quad ...(ii)$

Solving (i) and (ii), we get: $x = 4$, $y = 6$.

Hence, total number of pens bought = 4 + 6 = 10.

Questions 511 to 513

Flowers left after first place of worship = $2x - y$.

Flowers left after second place of worship = $2(2x - y) - y$
$= 4x - 3y.$

Flowers left after third place of worship = $2(4x - 3y) - y$
$= 8x - 7y.$

Flowers left after fourth place of worship = $2(8x - 7y) - y$
$= 16x - 15y.$

$\therefore \quad 16x - 15y = 0 \Rightarrow 16x = 15y.$

511. If $x = 30$, then $y = \frac{16 \times 30}{15} = 32.$

512. For minimum y, we find the L.C.M. of 16 and 15 which is 240.

$\therefore \quad 16x = 15y = 240 \Rightarrow x = 15, y = 16.$

513. Clearly, required number = minimum value of x = 15.

514. Suppose the thief stole x diamonds.

Diamonds given to first watchman = $\frac{x}{2} + 2 = \frac{x+4}{2}.$

Remaining diamonds = $x - \left(\frac{x+4}{2}\right) = \frac{x-4}{2}.$

Diamonds given to second watchman = $\frac{x-4}{4} + 2 = \frac{x+4}{4}.$

Remaining diamonds = $\left(\frac{x-4}{2}\right) - \left(\frac{x+4}{4}\right) = \frac{x-12}{4}.$

Diamonds given to third watchman = $\frac{x-12}{8} + 2 = \frac{x+4}{8}.$

Remaining diamonds = $\left(\frac{x-12}{4}\right) - \left(\frac{x+4}{8}\right) = \frac{x-28}{8}.$

$\therefore \quad \frac{x-28}{8} = 1$ or $x - 28 = 8$ or $x = 36.$

Another Method: The thief escaped with 1 diamond.
Before third watchman, he had $(1 + 2) \times 2 = 6$ diamonds.
Before second watchman, he had $(6 + 2) \times 2 = 16$ diamonds.
Before first watchman, he had $(16 + 2) \times 2 = 36$ diamonds.
Thus, he stole 36 diamonds originally.

515. Let there be x mints in the bowl originally.
Then, mints left after Divya had taken from the bowl

$= \left(\frac{2}{3}x + 4\right).$

Mints left after Reema had taken from the bowl

$= \frac{3}{4}\left(\frac{2}{3}x + 4\right) + 3 = \left(\frac{x}{2} + 6\right).$

Mints left after Shweta had taken from the bowl

$= \frac{1}{2}\left(\frac{x}{2} + 6\right) + 2 = \left(\frac{x}{4} + 5\right).$

$\therefore \quad \frac{x}{4} + 5 = 17 \Rightarrow \frac{x}{4} = 12 \Rightarrow x = 48.$

516. Let the cost of one gel-pen, one ball-point pen and one marker pen be ₹ x, ₹ y and ₹ z respectively.
Then, $4x + 8y + z = 185 \quad ...(i)$

$7x + 15y + z = 315 \quad ...(ii)$

Subtracting (i) from (ii), we get: $3x + 7y = 130 \quad ...(iii)$

Multiplying (iii) by 2 and subtracting from (ii), we get:
$x + y + z = 55$
Hence, required cost = ₹ 55.

517. Let the number of byes, wides and runs be x, y and z respectively.
Then, $x + y + z = 232$. Also, $z = 26y$ and $x = y + 8.$ $...(i)$

$\therefore \quad (y + 8) + y + 26y = 232 \Leftrightarrow 28y = 224$

$\Leftrightarrow \quad y = 8.$ So, $z = 26y = 208.$

Let the number of runs scored by Ram and Shyam be $6a$ and $7a$ respectively.
Then, $6a + 7a = 208 \Leftrightarrow 13a = 208 \Leftrightarrow a = 16.$
Hence, runs scored by Ram = $6a = 6 \times 16 = 96.$

518. Let there be n rows of balls in the equilateral triangle.
So, total number of balls = $1 + 2 + ... + n = \quad n = \frac{n(n+1)}{2}.$

Since each row in the square has 8 balls less than that in the equilateral triangle, so the square has $(n - 8)$ rows with $(n - 8)$ balls in each row.
So, total number of balls = $(n - 8)^2$.

$\therefore \quad \frac{n(n+1)}{2} + 669 = (n-8)^2$

$\Rightarrow \quad n^2 + n + 1338 = 2(n^2 + 64 - 16n)$

$\Rightarrow \quad n^2 - 33n - 1210 = 0$

$\Rightarrow \quad n^2 - 55n + 22n - 1210 = 0$

$\Rightarrow \quad (n - 55)(n + 22) = 0 \Rightarrow n = 55 \quad [\because n \neq -22]$

So, initial number of balls

$= \frac{n(n+1)}{2} = \frac{55 \times 56}{2} = 55 \times 28 = 1540.$

Questions 519 and 520

Let the number of men in the beginning be m.
Suppose each man shifts c crates on the first day. Then,

$mc + (m + 6)(c - 5) + (m + 12)(c - 10) + (m + 18)(c - 15) + (m + 24)(c - 20) = 545$

$\Rightarrow$ $mc + mc - 5m + 6c - 30 + mc - 10m + 12c - 120 + mc - 15m + 18c - 270 + mc - 20m + 24c - 480 = 545$

$\Rightarrow$ $5mc - 50m + 60c = 1445$

$\Rightarrow$ $mc - 10m + 12c = 289$

$\Rightarrow$ $mc - 10m = 289 - 12c$

$\Rightarrow m = \dfrac{289 - 12c}{c - 10}$.

Clearly, $c > 20$

[$\because$ if $c < 20$, then number of crates shifted on 5th day i.e., $(c - 20) < 0$ which is not possible]

Thus, we have to find $c > 20$ such that m is an integer. This is not so for $c = 21$ and $c = 22$.

For $c = 23$, we have: $m = \dfrac{289 - 276}{13} = \dfrac{13}{13} = 1$.

519. Number of crates shifted on third day $= (m + 12)(c - 10)$
$= (1 + 12)(23 - 10)$
$= 13 \times 13 = 169$.

520. Number of men on 5th day $= m + 24 = 25$.

521. Let the missing number be x.

Given $\dfrac{20 + 8 \times 0.5}{20 - x} = 12$

$\Rightarrow \dfrac{20 + 4}{20 - x} = 12 \Rightarrow \dfrac{24}{20 - x} = 12$

$\Rightarrow 20 - x = \dfrac{24}{12} = 2$

$\Rightarrow x = 20 - 2 = 18$

Hence, the number is 18.

522. Given $\dfrac{a}{b} + \dfrac{b}{a} = 2$

$\Rightarrow \dfrac{a^2 + b^2}{ab} = 2$

$\Rightarrow a^2 + b^2 = 2ab$

$\Rightarrow a^2 + b^2 - 2ab = 0$

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

$\Rightarrow a - b = 0$

523. Given $(24.96)^2 \div (34.11 \div 20.05) + 67.96 - 89.11$

$(25)^2 \div (34 \div 20) + 68 - 89$

$\approx (25)^2 \div \left(\dfrac{34}{20}\right) + 68 - 89$

$\approx 625 \div 1.7 + 68 - 89$

$\approx 367.6 + 68 - 89 \approx 346$

524. $\dfrac{x + 1}{x - 1} = \dfrac{a}{b}$

By componendo and dividendo

$\dfrac{x + 1 + x - 1}{x + 1 - x + 1} = \dfrac{a + b}{a - b}$

$\Rightarrow \dfrac{2x}{2} = \dfrac{a + b}{a - b}$

$\Rightarrow x = \dfrac{a + b}{a - b}$ ....(i)

Again, $\dfrac{1 - y}{1 + y} = \dfrac{b}{a}$

$\Rightarrow \dfrac{1 + y}{1 - y} = \dfrac{a}{b}$

$\Rightarrow \dfrac{1 + y + 1 - y}{1 + y - 1 + y} = \dfrac{a + b}{a - b}$

$\Rightarrow \dfrac{2}{2y} = \dfrac{a + b}{a - b}$

$\Rightarrow \dfrac{1}{y} = \dfrac{a + b}{a - b}$

$\Rightarrow y = \dfrac{a - b}{a + b}$ ...(ii)

Subtracting equation (ii) from (i) we get

$\therefore x - y = \dfrac{a + b}{a - b} - \dfrac{a - b}{a + b}$

$\left\{\because (a + b)^2 - (a - b)^2 = 4ab \text{ and } a^2 - b^2 = (a - b)(a + b)\right\}$

$= \dfrac{(a + b)^2 - (a - b)^2}{(a + b)(a - b)} = \dfrac{4ab}{a^2 - b^2}$

Multiply equation (i) and (ii) we get

$xy = \dfrac{a + b}{a - b} \times \dfrac{a - b}{a + b} = 1$

$\therefore$ Expression

$= \dfrac{x - y}{1 + xy} = \dfrac{\dfrac{4ab}{a^2 - b^2}}{1 + 1}$

$= \dfrac{4ab}{2\left(a^2 - b^2\right)} = \dfrac{2ab}{a^2 - b^2}$

525. Given $200 \div 25 \times 4 + 12 - 3$

$= \dfrac{200}{25} \times 4 + 12 - 3$

$= 8 \times 4 + 12 - 3$

$= 32 + 12 - 3 = 44 - 3 = 41$

526. Let the number be a.

Given $14 \times 627 \div \sqrt{1089} = (a)^3 + 141$

$14 \times 627 \div \sqrt{1089} = a^3 + 141$

$\Rightarrow 14 \times 627 \div 33 = a^3 + 141$

$\Rightarrow 14 \times 19 = a^3 + 141$

$\Rightarrow 266 = a^3 + 141$

$\Rightarrow a^3 = 125$

$\Rightarrow a = \sqrt[3]{125}$

$\Rightarrow a = 5$

527. Let the number be x.

Given $(923 - 347)/x = 32$

$\Rightarrow x = \dfrac{576}{32} = 18$

$\Rightarrow x = 18$

528. Let the number be a.

Given $1559.95 - 7.99 \times 24.96 - a^2 = 1154$

$\Rightarrow 1560 - 8 \times 25 - a^2 = 1154$

$\Rightarrow 1360 - 200 - a^2 = 1154$

$\Rightarrow a^2 = 1360 - 1154 = 206$

$\Rightarrow a \approx \sqrt{206} \approx 14$

529. Given $1\frac{4}{5} + 20 - 280 \div 25$

$= 1\frac{4}{5} + 20 - \frac{280}{25}$

$= \frac{9}{5} + 20 - \frac{56}{5}$

$= \frac{9 + 100 - 56}{5}$

$= \frac{53}{5} = 10\frac{3}{5}$

530. $= \{(64 - 38) \times 4\} \div 13$

$= \frac{26 \times 4}{13} = 8$

531. Given $x + y = 2a$

$\therefore \frac{a}{x-a} + \frac{a}{y-a} = \frac{a(y-a) + a(x-a)}{(x-a)(y-a)}$

$= \frac{ay - a^2 + ax - a^2}{(x-a)(y-a)}$

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

$= \frac{a \cdot 2a - 2a^2}{(x-a)(y-a)}$

$= \frac{2a^2 - 2a^2}{(x-a)(y-a)} = 0$

532. Let the number be x.

Given $421 \div 35 \times 299.97 \div 25.05 = x^2$

$(x)^2 \approx 420 \div 35 \times 300 \div 25$

$= 12 \times 300 \div 25 = 12 \times 12$

$\Rightarrow x^2 = 12 \times 12$

$\therefore x = \sqrt{12 \times 12} = 12$

Hence, the number is 12.

533. Given

$= 19.99 \times 15.98 + 224.98 + 125.02$

$\approx 20 \times 16 + 225 + 125 = 320 + 225 + 125 = 670$

534. Given $3625 \times ? = 1450$

$? = \frac{1450}{3625} = \frac{725 \times 2}{725 \times 5} = \frac{2}{5}$

535. Given: $128.43 + 30.21 + ? = 173$

$? = 173 - 128.43 - 30.21$

$= 173 - 158.64 = 14.36$

536. Given expression

$= 123 \times 999 + 123$

$= 123 \times (999 + 1)$

$= 123 \times 1000$

$= 123000$

537. Given expression $\frac{(359+256)^2 + (359-256)^2}{359 \times 359 + 256 \times 256}$

$= \frac{(359+256)^2 + (359-256)^2}{(359)^2 + (256)^2}$

Let, $a = 359$ and $b = 256$

$\therefore$ expression $= \frac{(a+b)^2 + (a-b)^2}{a^2 + b^2}$

$= \frac{2(a^2 + b^2)}{a^2 + b^2} = 2$

538. $84368 + 65466 - 72009 - 13964$

$= 149834 - 85973 = 63861$

539. Let the number be x.

$4376 + 3209 - 1784 + 97 = 3125 + x$

$\Rightarrow 7682 - 1784 = 3125 + x$

or, $x = 7682 - 1784 - 3125$

$\Rightarrow x = 2773$

Hence, the number is 2773.

540. Let the missing number is a.

Given $14 \times 627 \div \sqrt{(1089)} = (a)^3 + 141$

$\frac{14 \times 627}{\sqrt{1089}} = (a)^3 + 141$

$\frac{14 \times 627}{33} = a^3 + 141$

$266 = a^3 + 141$

$a^3 = 266 - 141$

$a^3 = 125$

$a = \sqrt[3]{125} = 5$

541. Given $\left(x + \frac{1}{x}\right) = 3$

On squaring both sides, we get

$\left(x + \frac{1}{x}\right)^2 = 3^2$

$\Rightarrow \left(x + \frac{1}{x}\right)^2 = 9$

$\Rightarrow x^2 + \frac{1}{x^2} + 2 = 9$

$\Rightarrow x^2 + \frac{1}{x^2} = 7$

542. As we know

$a^3 + b^3 + c^3 - 3abc = (a^2 + b^2 + c^2 - ab - bc - ca)(a + b + c)$

When $a + b + c = 0$

Then $a^3 + b^3 + c^3 - 3abc = 0$

When $x + y + z = 0$

$\Rightarrow x^3 + y^3 + z^3 = 3xyz$

$\Rightarrow x^3 + y^3 + z^3 + 3xyz = 3xyz + 3xyz = 6xyz$

543. Unit digit of $4^1 = 4$
Unit digit of $4^2 = 1\underline{6}$
Unit digit of $4^3 = 6\underline{4}$
Unit digit $4^{96} = 4^{2\times 48} = 4^2 = 16$
$\because$ each unit digit of 4 repeats itself after two places
$\therefore$ 16 ÷ 6
$\therefore$ Remainder = 4

544. 67 × 119 + 17 − 27 ÷ 259
= 67 + 119 ÷ 17 × 27 − 259
= 67 + 7 × 27 − 259
= 67 + 189 − 259
= 256 − 259 = −3

545. Given = $\dfrac{(0.73)^3+(0.27)^3}{(0.73)^2+(0.27)^2-0.73\times 0.27}$

Let a = 0.73 and b = 0.27

$$=\frac{(0.73+0.27)\left[(0.73)^2+(0.27)^2-0.73\times 0.27\right]}{(0.73)^2+(0.27)^2-0.73\times 0.27}$$

$\left[\because a^3+b^3=(a+b)\left(a^2+b^2-ab\right)\right]$

= 0.73 + 0.27 = 1