Chapter 17

AVERAGE

KEY FACTS

1. Average of n observations $= \dfrac{\text{Sum of } n \text{ observations}}{n}$

2. Sum of n observations = Average of n observations $\times$ n

Solved Examples

Ex. 1. ***What is the average of squares of consecutive odd numbers between 1 and 13 ?***

Sol. The consecutive odd numbers from 1 to 13 = 3, 5, 7, 9, 11

$\therefore$ Required average $= \dfrac{3^2+5^2+7^2+9^2+11^2}{5} = \dfrac{9+25+49+81+121}{5} = \dfrac{285}{5} =$ **57**

Ex. 2. ***The average age of r boys in a class is a years. If the average age of s of them is b years, then what is the average age of the remaining boys ?***

Sol. Total age of r boys = $r \times a = ra$ years

Total age of s boys = $s \times b = sb$ years

$\therefore$ Total age of remaining boys = $ra - sb$

Total number of remaining boys $= r - s$

$\therefore$ Average age of remaining boys = $\dfrac{ra - sb}{r - s}$ **years.**

Ex. 3. ***The average marks of 48 students in a class is 45. The average marks of the boys in the class is 40 and the average marks of the girls in the class is 50. What is the ratio between the numbers of boys and the number of girls in the class ?***

Sol. Total marks of 48 students = $48 \times 45 = 2160$

Let the number of boys be B and the number of girls be $(48 - B)$. Then,

Total marks of boys = $40B$

Total marks of girls = $50\,(48 - B) = 2400 - 50B$

$\Rightarrow$ $40B + 2400 - 50B = 2160 \Rightarrow 10B = 240 \Rightarrow B = 24$

$\therefore$ Number of girls = $48 - 24 = 24$.

$\therefore$ Required ratio = $24 : 24 =$ **1 : 1**.

Ex. 4. ***From a class 24 boys, a boy aged 10 years leaves the class and in his place a new boy is admitted. As a result the average age of the class is increased by 2 months. What is the age of the new boys ?***

Sol. Let the average age of the class be x years.
Then the total age of the class = $24x$ years

New average age of the class = $\left(x-\frac{2}{12}\right)$ years = $\left(x-\frac{1}{6}\right)$ years

Let the age of the new boy be y years.

Given, $\frac{24x-10+y}{24} = x-\frac{1}{6}$

$\Rightarrow$ $24x - 10 + y = 24x - 4 \Rightarrow y = 6$.

$\therefore$ The age of the new boy is **6 years**.

Ex. 5. ***The average of 8 numbers is 20. The average of first two numbers is $15\frac{1}{2}$ and that of next three is $21\frac{1}{3}$. If the sixth number be less than the seventh and eighth numbers by 4 and 7 respectively, then find the eighth number ?***

Sol. Let the sixth number be x. Then,
Seventh number = $x + 4$, Eighth number = $x + 7$
Total of all 8 numbers = $8 \times 20 = 160$

Total of first 2 numbers = $2 \times \frac{31}{2} = 31$

Total of next 3 numbers = $3 \times \frac{64}{3} = 64$

Given, $31 + 64 + x + x + 4 + x + 7 = 160$

$\Rightarrow$ $3x + 106 = 160 \Rightarrow 3x = 160 - 106 = 54 \Rightarrow x = 18$

$\therefore$ Eigth number = $18 + 7 =$ **25**.

Ex. 6. ***The average age of 8 persons in a committee is increased by 2 years when two men aged 35 years and 45 years are substituted by two women. What is the average age of these two women ?***

Sol. Let the average age of 8 persons be x years. Then,
Total age of 8 persons = $8x$
Also let y_1, and y_2 be the ages of the two women who replaced the two men. Then,

$$\frac{8x-35-45+(y_1+y_2)}{8} = x+2$$

$\Rightarrow$ $8x - 80 + y_1 + y_2 = 8x + 16 \Rightarrow y_1 + y_2 = 96$

$\therefore$ Average age of the two women = $\frac{y_1+y_2}{2} = \frac{96}{2} =$ **48 years**.

Ex. 7. ***The average of the age of a husband and wife, five years ago was 25 years. The average of the present age of husband, wife and a child born during the time is 21 years. Determine the present age of the child.***

Sol. Sum of the ages of husband and wife, **5 years ago** = $2 \times 25 = 50$ years
Sum of the ages of husband and wife, **at present** = $50 + 5 + 5 = 60$ years
Sum of the ages of husband, wife and child, at present = $3 \times 21 = 63$ years

$\therefore$ Present age of the child = $(63 - 60)$ years = **3 years.**

Ex. 8. ***Of the three numbers, the first is twice the second and the second is twice the third. The average of the reciprocal of the numbers is $\frac{7}{72}$. What are the three numbers ?***

Sol. Let the third number be x. Then
Second number = $2x$ and first number = $4x$

Sum of the reciprocals of these 3 numbers = $\frac{1}{4x}+\frac{1}{2x}+\frac{1}{x} = \frac{1+2+4}{4x} = \frac{7}{4x}$

Given, $\frac{7}{4x} = 3 \times \frac{7}{72} \Rightarrow 4x = 24 \Rightarrow x = 6$

$\therefore$ The three numbers are $4 \times 6, 2 \times 6, 6$, *i.e.*, $24, 12, 6$.

Ex. 9. ***The average temperature of Monday to Wednesday was 37°C and of Tuesday to Thursday was 34°C. If the temperature on Thursday was $\frac{4}{5}$ that of Monday, what was the temperature on Thursday ?***

Sol. Let the temperatures on Monday, Tuesday, Wednesday and Thursday be M, T, W and Th respectively. Then,

$M + T + W = 3 \times 37°C = 111°C$ … (i)

$T + W + Th = 3 \times 34°C = 102°C$ … (ii)

$\Rightarrow$ Eq (i) – Eq (ii)

$\Rightarrow M - Th = 111°C - 102°C = 9°C$

Also given, $Th = \frac{4}{5}M \Rightarrow M - \frac{4}{5}M = 9 \Rightarrow \frac{M}{5} = 9 \Rightarrow M = 45°C$

$\therefore$ Temperature on Thursday $= \frac{4}{5} \times 45°C =$ **36°C.**

Ex. 10. ***The average age of a class is 40 years. 12 new students with an average age of 32 years join the class, there by decreasing the average by 4 years. What is the original strength of the class ?***

Sol. Let the original strength of the class be x. Then,

Total age of x students = $40x$ years

Total age of 12 new students $= 12 \times 32 = 384$ years

New average of $(x + 12)$ students $= 40 - 4 = 36$ years

$\therefore$ Total age of $(x + 12)$ students $= (x + 12) \times 36 = (36x + 432)$ years

$\therefore 40x + 384 = 36x + 432$

$\Rightarrow 4x = 48 \Rightarrow x =$ **12**.

Question Bank–17

1. The average of the squares of the first ten natural numbers is
(a) 40 (b) 50
(c) 47.5 (d) 38.5

2. The average of the two digit numbers, which remain the same when the digits interchange their positions is
(a) 33 (b) 44
(c) 55 (d) 66

3. If the average of m numbers is n^2 and that of n numbers is m^2, then the average of $(m + n)$ numbers is
(a) $m - n$ (b) mn
(c) $(m + n)$ (d) m/n

4. If the average of a, b, c is M and $ab + bc + ca = 0$, then the average of a^2, b^2, c^2 is
(a) M^2 (b) $3M^2$
(c) $6M^2$ (d) $9M^2$

5. The average of six numbers is x and the average of three of these is y. If the average of the remaining three is z, then
(a) $x = y + z$ (b) $2x = y + z$
(c) $x = 2y + 2z$ (d) $x = y + 2z$

6. The average weight of 120 students in the second year class of college is 56 kg. If the average weight of boys and that of girls in the class are 60 kg and 50 kg respectively, then the number of boys and girls in the class are respectively :
(a) 72, 64 (b) 38, 64
(c) 72, 48 (d) 62, 58

7. The average price of 10 books is Rs 12, while the average price of 8 of these books is Rs 11.75. Of the remaining two books, if the price of one is 60% more than the price of the other, what is the price of each of these two books ?
(a) Rs 8; Rs 12 (b) Rs 10; Rs 16
(c) Rs 5; Rs 7.50 (d) Rs 12; Rs 14

8. The average salary of male employees in a firm was Rs 5200 and that of females was Rs 4200. The average salary of all the employees was Rs 5000. What is the percentage of female employees ?
(a) 80% (b) 20%
(c) 40% (d) 30%

9. A batsman has a certain average of runs for 16 innings. In the 17th inning, he makes a score of 85 runs there by increasing the average by 3. What is the average of 17 innings ?
(a) 38 (b) 37
(c) 36 (d) 35

10. There are 50 boys in a class. One boy weighing 40 kg goes away and at the same time another boy joins the class. If the average weight of the class is thus decreased by 100 g, find the weight of the new boy?
(a) 32 kg (b) 40 kg
(c) 35 kg (d) 37 kg

11. X has twice as much money as that of Y and Y has 50% more money than that of Z. If the average money of all of them is Rs 110, then the money which X has
(a) Rs 55 (b) Rs 60
(c) Rs 90 (d) Rs 180

12. The average score of two sections is 28. The average score of section A is 30, in which there are 25 students. If there are 20 students in section B, then the average score of section B is
(a) 25.5 (b) 27.5
(c) 29 (d) 33

13. The average age of a father and his two sons is 27 years. Five years ago, the average age of the two sons was 12 years. If the difference between the ages of two sons is 4 years, then the present age of the father is
(a) 34 years (b) 47 years
(c) 64 years (d) 27 years

14. The average marks obtained by five students A, B, C, D and E is $52\frac{3}{5}$. If the average marks obtained by A, C and D are $53\frac{2}{3}$ and the average marks obtained by B, C and E are $52\frac{2}{3}$, then the marks obtained by C were
(a) 56 (b) 53
(c) 57 (d) 60

15. In an examination, a pupil's average marks were 63 per paper. If he had obtained 20 more marks for his Geography paper and 2 more marks for his History paper, his average per paper would have been 65. How many papers were there in the examination ?
(a) 8 (b) 9
(c) 10 (d) 11

16. The average of marks of 28 students in Mathematics was 50. Eight students left the school and then this average increased by 5. What is the average of marks obtained by the students who left the school ?
(a) 37.5 (b) 42.5
(c) 45 (d) 50.5

17. The average age of 11 players of a cricket team is decreased by 2 months when two of them aged 17 years and 20 years are replaced by two new players. The average age of the new players is
(a) 17 years 1 month (b) 17 years 7 months
(c) 17 years 11 months (d) 18 years 3 months

18. The average monthly salary of the workers in a workshop is 8500. If the average monthly salary of 7 technicians is Rs 10,000 and the average monthly salary of the rest is Rs 7800, the total number of workers in the workshop is
(a) 18 (b) 20
(c) 22 (d) 24

19. The average age of 30 boys in a class is 15 years. One boy aged 20 years left the class, but two new boys come in his place whose ages differ by 5 years. If the average age of all the boys now in the class still remains 15 years, the age of the younger new comer is
(a) 20 years (b) 15 years
(c) 10 years (d) 8 years

20. 3 years ago, the average age of a family of 5 members was 17 years. A baby having been born, the average age of the family is same today. The present age of the baby is
(a) 3 years (b) 2 years
(c) $1\frac{1}{2}$ years (d) 1 year

21. The average annual income (in Rs) of certain agricultural workers is S and that of other workers is T. The number of agricultural workers is 11 times that of other workers. Then, the average annual income (in Rs) of all the workers is
(a) $\frac{S+11T}{12}$ (b) $\frac{S+T}{2}$
(c) $\frac{11S+T}{12}$ (d) $\frac{1}{11S}+T$

22. The average monthly income of X and Y is Rs 5050. The average monthly income of Y and Z is Rs 6250 and the average monthly income of X and Z is Rs 5200. The monthly income of X is
(a) Rs 4050 (b) Rs 3500
(c) Rs 4000 (d) Rs 5000

23. The average of four positive integers is 72.5. The highest integer is 117 and the lowest integer is 15. The difference between the remaining two integers is 12. Which is the higher of these two remaining integers ?
(a) 70 (b) 73
(c) 85 (d) 80

24. The average score of a class of boys and girls in an examination is A. The ratio of boys and girls in the class is 3 : 1. If the average score of the boys is $(A + 1)$, the average score of the girls is
(a) $(A - 1)$ (b) $(A - 3)$
(c) $(A + 1)$ (d) $(A + 3)$

25. Of the four numbers, the first is twice the second, the second is one-third of the third and third is 5 times the fourth. The average of the numbers is 24.75. The largest of these numbers is
(a) 9 (b) 25
(c) 30 (d) 45

26. The average temperature of the town in the first four days of a month was 58 degrees. The average for second, third, fourth and fifth days was 60 degrees. If the temperatures if the first and fifth days were in the ratio 7 : 8, then what is the temperature on the fifth day ?
(a) 64 degrees (b) 62 degrees
(c) 56 degrees (d) 48 degrees

27. A company produces on an average 4000 items per month for the first three months. How many items it must produce on an average per month over the next 9 months to average 4375 items per month over the whole year ?
(a) 4500 (b) 4600
(c) 4680 (d) 4710

28. The average of 5 consecutive numbers is m. If the next three natural numbers are also included, how much more than m will the average of these 8 numbers be ?
(a) 2 (b) 1
(c) 1.4 (d) 1.5

29. The average weight of three men A, B and C is 84 kg. D joins them and the average weight of the four becomes 80 kg. If E whose weight is 3 kg more than that of D replaces A, the average weight of B, C, D and E becomes 79 kg. The weight of A is
(a) 65 kg (b) 70 kg
(c) 75 kg (d) 80 kg

30. The batting average of a cricket player for 40 innings is 50 runs. His highest score in an innings exceeds his lowest score by 172 runs. If these two innings are excluded, the average of the remaining 38 innings is 48 runs. Determine his highest score, scored in one innings.
(a) 175 (b) 180
(c) 174 (d) 185

Answers

1. (d)	**2.** (c)	**3.** (b)	**4.** (b)	**5.** (b)	**6.** (c)	**7.** (b)	**8.** (b)	**9.** (b)	**10.** (c)
11. (d)	**12.** (a)	**13.** (b)	**14.** (a)	**15.** (d)	**16.** (a)	**17.** (b)	**18.** (c)	**19.** (b)	**20.** (b)
21. (c)	**22.** (c)	**23.** (c)	**24.** (b)	**25.** (d)	**26.** (a)	**27.** (a)	**28.** (d)	**29.** (c)	**30.** (c)

Hints and Solutions

1. (d) Average
$$= \frac{1^2+2^2+3^2+4^2+5^2+6^2+7^2+8^2+9^2+10^2}{10}$$
$$= \frac{1+4+9+16+25+36+49+64+81+100}{10}$$
$$= \frac{385}{10} = 38.5$$

2. (c) The required two digit numbers are 11, 22, 33, 44, 55, 66, 77, 88, 99.
$\therefore$ Required Average
$$= \frac{11+22+33+44+55+66+77+88+99}{9}$$
$$= \frac{495}{9} = 55$$

3. (b) Average of m numbers $= n^2$
$\therefore$ Sum of m numbers $= m \times n^2 = mn^2$
Average of n numbers $= m^2$
$\therefore$ Sum of n numbers $= n \times m^2 = m^2n$
$\therefore$ Required average $= \frac{mn^2 + nm^2}{m+n} = \frac{mn(n+m)}{m+n} = mn$

4. (b) Given, $\frac{a+b+c}{3} = M \Rightarrow a+b+c = 3M$
Now, $(a+b+c)^2 = a^2+b^2+c^2+2(ab+bc+ca)$
$\Rightarrow (3M)^2 = a^2+b^2+c^2+0 \Rightarrow a^2+b^2+c^2 = 9M^2$
Average of a^2, b^2, c^2 $= \frac{a^2+b^2+c^2}{3}$
$$= \frac{9M^2}{3} = 3M^2$$

5. (b) Sum of six numbers $= 6x$
Sum of three of these 6 numbers $= 3y$
Sum of remaining three numbers $= 3z$
$\therefore$ $3y + 3z = 6x \Rightarrow 2x = y + z$

6. (c) Let the number of boys be x. Then,
The number of girls $= (120 - x)$
Total weight of 120 students in the class
$= 120 \times 56$ kg $= 6720$ kg
Total weight of x boys $= 60x$ kg
Total weight of $(120-x)$ girls $= (120-x) \times 50$ kg
$= 6000 - 50x$
Given, $60x + 6000 - 50x = 6720$

$\Rightarrow 10x = 720 \Rightarrow x = 72$

$\therefore$ Number of boys = 72,

Number of girls = 120 – 72 = 48

7. (b) Total price of the remaining two books

$= 10 \times 12 - 8 \times 11.75$

$= 120 - 94 = \text{Rs } 26$

Suppose the price of one book = Rs x

Then, price of the other book = x + 60% of x

$= \frac{160}{100}x = \frac{8x}{5}$

Given, $x + \frac{8x}{5} = 26 \Rightarrow \frac{13x}{5} = 26$

$\Rightarrow x = \frac{26 \times 5}{13} = \text{Rs } 10$

$\therefore$ Price of the other book = Rs $\frac{8 \times 10}{5}$ = **Rs 16**.

8. (b) Let the number of male and female employees be M and F respectively. Then,

Total salary of male employees = Rs 5200 M

Total salary of female employees = Rs 4200 F

Total number of employees = $M + F$

$\therefore$ Total salary of all the employees

= Rs 5000 $(M + F)$

$\therefore 5200M + 4200F = 5000M + 5000F$

$\Rightarrow 200M = 800F \Rightarrow \frac{M}{F} = \frac{4}{1} \Rightarrow M : F = 4 : 1$

$\therefore$ Percentage of female employees $= \left(\frac{1}{5} \times 100\right)\%$

$= 20\%$.

9. (b) Let the average of runs for 16 innings be A.

Then, average of runs for 17 innings = $A + 3$

Total runs for 16 innings = 16 A

$\Rightarrow$ Total runs for 17 innings = $16A + 85$

Given, $\frac{16A + 85}{17} = A + 3$

$\Rightarrow 16A + 85 = 17A + 51 \Rightarrow A = 34$

$\therefore$ Average of 17 innings = 34 + 3 = 37.

10. (c) Let the average weight of the class be x kg.

Total weight of 50 boys = $50x$ kg

If y is weight of the new boy, then

$50x - 40 + y = 50 \times (x - 0.1)$

$\Rightarrow 50x - 40 + y = 50x - 5 \Rightarrow y = 35$ kg.

11. (d) Let Z have Rs X. Then,

Y has 150% of Rs X = Rs $\frac{150X}{100}$ = Rs $\frac{3X}{2}$

X has $2 \times$ Rs $\frac{3X}{2}$ = Rs $3X$

Given, $\frac{X + \frac{3X}{2} + 3X}{3} = 110$

$\Rightarrow \frac{2X + 3X + 6X}{2} = 330$

$\Rightarrow 11X = 660 \Rightarrow X = 60$

$\therefore$ Amount that X has = 3 × 60 = Rs 180.

12. (a) Total number of students in section A and B

= 25 + 20 = 45

Average score of both the sections = 28

$\therefore$ Total score of both the sections = 28 × 45 = 1260

Total score of section A = 25 × 30 = 750

Let the average score of section B = x

Then, total score of section B = $20x$

Given, $20x + 750 = 1260$

$\Rightarrow 20x = 510 \Rightarrow x = 25.5$.

13. (b) Let the ages of father and his two sons be x, y and z years respectively.

Given, $x + y + z = 3 \times 27 = 81$ … (i)

and $(y - 5) + (z - 5) = 2 \times 12 \Rightarrow y + z = 34$ … (ii)

From (i) and (ii)

Age of father (x) = 81 – 34 = 47 years.

14. (a) Total marks obtained by

$A + B + C + D + E = 5 \times 52\frac{3}{5} = 5 \times \frac{263}{5} = 263$ … (1)

Total marks obtained by

$A + C + D = 3 \times 53\frac{2}{3} = 3 \times \frac{161}{3} = 161$ …(2)

Total marks obtained by

$B + C + E = 3 \times 52\frac{2}{3} = 3 \times \frac{158}{3} = 158$ …(3)

$\therefore$ (1) — (2)

$\Rightarrow$ Marks obtained by

$B + E = 263 - 161 = 102$ … (4)

(3) — (4)

$\Rightarrow$ Marks obtained by C = 158 – 102 = 56.

15. (d) Let there be n papers in all.

Total marks originally for n papers = $63n$

Total marks with increased average = $65n$

Given, $65n - 63n = 20 + 2 \Rightarrow 2n = 22 \Rightarrow n = 11$.

16. (a) Total marks of 28 students in Mathematics

= 28 × 50 = 1400

New number of students = 28 – 8 = 20

New average of marks in Mathematics
$= 50 + 5 = 55$

$\therefore$ Total marks of 20 students in Mathematics
$= 20 \times 55 = 1100$

$\therefore$ Total marks of 8 students who left the school
$= 1400 - 1100 = 300$

$\therefore$ Average marks of these 8 students $= \frac{300}{8}$
$= 37.5.$

17. (b) Let the average age of 11 players be x.
Then, total age of 11 players $= 11x$
Total age of 9 players $= 11x - (17 + 20)$
$= 11x - 37$
Let y be the total age of the 2 new players.

Then $\frac{11x - 37 + y}{11} = x - \frac{1}{6} = \frac{6x - 1}{6}$

$\Rightarrow 66x - 222 + 6y = 66x - 11$

$\Rightarrow 6y = -11 + 222 = 211 \Rightarrow y = \frac{211}{6}$ years

$\therefore$ Average age of the two players $= \frac{y}{2} = \frac{211}{12}$
$= 17$ years 7 months.

18. (c) Let the total number of workers in the workshop be x.
Then, number of other workers (besides technicians) $= (x - 7)$
Given, $(x - 7) \times 7800 + 7 \times 10000 = 8500x$

$\Rightarrow 7800x - 54600 + 70000 = 8500x$

$\Rightarrow 700x = 15400 \Rightarrow x = \frac{15400}{700} \Rightarrow x = 22.$

19. (b) Total age of 30 boys $= 30 \times 15 = 450$
Total age of the rest of boys after the boy aged 20 years leaves $= 450 - 20 = 430$
Let x be the age of the younger new comer.

Then, $\frac{430 + x + (x + 5)}{31} = 15$

$\Rightarrow 435 + 2x = 31 \times 15 = 465$

$\Rightarrow 2x = 30 \Rightarrow x = 15$ years.

20. (b) Total age of the family three years ago
$= 17 \times 5 = 85$ years.
Let the present age of the child be x years.
Present total age of the family $= 85 + 5 \times 3 + x$
$= (100 + x)$ years.

Given $\frac{100 + x}{6} = 17$

$\Rightarrow 100 + x = 102 \Rightarrow x = 2$ years.

21. (c) Let the number of other workers $= x$
Then, the number of agricultural workers $= 11x$
$\therefore$ Total income of other workers = Rs Tx
Total income of agricultural workers = Rs $11Sx$

$\therefore$ Average income of all the workers $= \frac{11Sx + Tx}{11x + x}$

$= \frac{x(11S + T)}{12x} = \frac{11S + T}{12}$

22. (c) Total income of $(X + Y) = 2 \times$ Rs 5050
$=$ Rs 10100
Total income of $(Y + Z) = 2 \times$ Rs 6250
$=$ Rs 12500
Total income of $(Z + X) = 2 \times$ Rs 5200
$=$ Rs 10400

$\therefore 2(X + Y + Z) =$ Rs 10100 + Rs 12500 + Rs10400
$=$ Rs 33000

$\Rightarrow X + Y + Z =$ Rs 16500

$\therefore$ X's monthly income $= (X + Y + Z) - (Y + Z)$
$=$ Rs 16500 – Rs 12500 = Rs 4000.

23. (c) Let the higher integer be x.
Then the other integer $= x - 12$

$\therefore \frac{15 + (x - 12) + x + 117}{4} = 72.5$

$\Rightarrow 120 + 2x = 72.5 \times 4 = 290$

$\Rightarrow 2x = 170 \Rightarrow x = 85.$

24. (b) Let the number of boys be $3x$ and the number of girls be x.
Then, total number of students $= 4x$
Average score of the class $= A$

$\therefore$ Total score of all the students $= 4Ax$
Average score of all the boys $= A + 1$

$\therefore$ Total score of all the boys $= 3x(A + 1)$
$= 3Ax + 3x$

$\Rightarrow$ Total score of all the girls $= 4Ax - 3Ax - 3x$
$= Ax - 3x = (A - 3)x$

$\Rightarrow$ Average score of the girls $= \frac{(A - 3)x}{x} = (A - 3)$

25. (d) Let the fourth number be x. Then,
Third number $= 5x$

Second number $= \frac{5x}{3}$

First number $= \frac{10x}{3}$

$\therefore\ x + 5x + \frac{5x}{3} + \frac{10x}{3} = (24.75 \times 4) = 99$

$\Rightarrow\ 3x + 15x + 5x + 10x = 99 \times 3$

$\Rightarrow\ 33x = 99 \times 3 \ \Rightarrow\ x = \frac{99 \times 3}{33} = 9$

$\therefore$ The numbers are 9, 45, 15, 30

$\Rightarrow$ Largest number = 45

26. (a) Sum of temperatures on 1st, 2nd, 3rd and 4th days $= (58 \times 4) = 232$ degrees … (1)

Sum of temperatures on 2nd, 3rd, 4th and 5th days $= (60 \times 4) = 240$ degrees …(2)

Subtracting eqn. (1) from eqn. (2), we get

Temp. on 5th day – Temp. on 1st = 8 degrees

Given, Temp. on 1st day : Temp. on 5th day = 7 : 8

$\therefore\ 8x - 7x = 8 \ \Rightarrow\ x = 8$

$\therefore$ Temperature on 5th day = 64 degrees.

27. (a) Total number of items produced for first three months $= 4000 \times 3 = 12000$

Total number of items required to be produced over a period of 12 months $= 4375 \times 12 = 52500$

$\Rightarrow$ Number of items to be produced over a period of 9 months $= 52500 - 12000 = 40500$

$\therefore$ Average number of articles per month produced over 9 months $= \frac{40500}{9} = 4500$

28. (d) Let the five consecutive numbers be

$x, x+1, x+2, x+3, x+4$

Then $\frac{x + x + 1 + x + 2 + x + 3 + x + 4}{5} = m$

$\Rightarrow\ 5x + 10 = 5m \ \Rightarrow\ 5x = 5(m-2) \ \Rightarrow\ x = m - 2.$

$\therefore$ The 8 consecutive numbers are

$m-2, m-1, m, m+1, m+2, m+3, m+4, m+5$

Average of these 8 numbers

$$= \frac{m-2+m-1+m+m+1+m+2+m+3+m+4+m+5}{8}$$

$$= \frac{8m+12}{8} = m + \frac{3}{2}$$

$\therefore$ Required difference $= m + \frac{3}{2} - m = \frac{3}{2} = 1.5$

29. (c) Total weight of $A + B + C = 84 \times 3 = 252$ kg

Total weight of $A + B + C + D = 80 \times 4 = 320$ kg

$\therefore$ Weight of $D = 320 - 252 = 68$ kg

Given, $E = D + 3 = (68 + 3)$ kg $= 71$ kg

Total weight of $B + C + D + E = (79 \times 4)$ kg $= 316$ kg

$\therefore$ Weight of $B + C = 316$ kg $- 71$ kg $- 68$ kg $= 177$ kg

Weight of A only $= 320$ kg $- 177$ kg $- 68$ kg $= 75$ kg

30. (c) Let the lowest score in one innings be x. Then,

Highest score in an innings $= x + 172$

Total runs in 40 innings $= 40 \times 50 = 2000$

Total runs in 38 innings $= 38 \times 48 = 1824$

Given, $2000 - \{x + (x + 172)\} = 1824$

$\Rightarrow\ 1828 - 2x = 1824 \ \Rightarrow\ 2x = 4 \ \Rightarrow\ x = 2$

$\therefore$ Highest score $= 172 + 2 = 174$.

Self Assessment Sheet–17

1. The average age of a husband and a wife, who were married 4 years ago, was 25 years at the time of their marriage. The average age of the family consisting of husband, wife and a child born during that interval is 20 years today. The age of the child is

(a) 1 year (b) 2 years

(c) 2.5 years (d) 3 years

2. The average of marks obtained by 120 condidates was 35. If the average of the passed candidates was 39 and that of the failed candidates was 15, then the number of those candidates who passed the examination was

(a) 100 (b) 110

(c) 120 (d) 150

3. In a competitive examination, the average marks obtained was 45. It was later discovered that there was some error in computerisation and the marks of 90 candidates had to be changed from 80 to 50 and the average came down to 40 marks. The total number of candidates who appeared in examination is

(a) 520 (b) 550

(c) 540 (d) 560

4. The average of marks of 28 students in Mathematics was 50. Eight students left the school and then this average increased by 5. What is the average of marks obtained by the students who left the school?

(a) 37.5 (b) 42.5

(c) 45 (d) 50.5

5. The average of five consecutive natural numbers is m. If the next three natural numbers are also included, how much more than m will the average of these 8 numbers be ?

(a) 1 (b) 1.5

(c) 1.4 (d) 2

6. The weight of a body, calculated as the average of seven different experiments is 53.735 g. The average of the first three experiments is 54.005 g. The fourth was greater than the fifth by 0.004 g and the average of sixth and seventh was 0.010 g less than the average of the first three. Find the weight of the body in the third experiment.

(a) 52.071 g (b) 53.072g

(c) 51.450 g (d) 53.005 g

7. The average weight of A, B and C is x kg. A and C lose y kg each after dieting and B puts on $y/2$ kg. After this their average weight decreases by 1 kg. Find y.

(a) 1.5 kg (b) 3 kg

(c) 2 kg (d) 3.5 kg

8. A goods train in five successive minutes from its starts runs 68 metres, 127 metres, 208 metres, 312 metres and 535 metres and for the next 5 minutes maintains an average speed of 33 km/hr. Find the average speed of the train in km/hr in covering this total distance.

(a) 20 km/hr (b) 30 km/hr

(c) 28 km/hr (d) 24 km/hr

9. The age of the captain of a cricket team if 11 players is 25 years and the wicket keeper is 3 years older than the captain. If the ages of these two are excluded, the average age of the remaining players of the team becomes 1 year less than the average age of the whole team. What is the average age of the whole team?

(a) 18 years (b) 22 years

(c) 25 years (d) 23 years

10. There are four natural numbers. The average of any three numbers is added in the fourth number and in this way the number 29, 23, 21 and 17 are obtained. One of the number is

(a) 11 (b) 24

(c) 21 (d) 10

Answers

1. (b)	**2.** (a)	**3.** (c)	**4.** (a)	**5.** (b)	**6.** (b)	**7.** (c)	**8.** (d)	**9.** (b)	**10.** (c)