

MODULE 7 – AVERAGES

1. The mean of 50 numbers is 30. Later it was discovered that two entries were wrongly entered as 82 and 13 instead of 28 and 31. Find the correct mean.

- (a) 36.12 (b) 30.66 (c) 29.28 (d) 38.21

Solution:

Mean of 50 numbers = 30

Sum of 50 numbers = $30 \times 50 = 1500$

Wrongly entered are 82 and 13

Therefore, $1500 - (82 + 13) = 1500 - 95 = 1405$

Correctly entered numbers = $1405 + (28 + 31)$

$= 1405 + 59 = 1464$

Required mean = $1464/50 = 29.28$

2. The average weight of A, B and C is 40 kg. If the average weight of A and B is 35kg and that of B and C is 36 kg, then find the weight of B.

- (a) 22kg (b) 23kg (c) 28kg (d) 30 kg

Solution:

$A + B + C = 40 \times 3 = 120\text{kg} \quad (1)$

Weight of A and B = $35 \times 2 = 70\text{kg} \quad (2)$; from this we can conclude that C's weight is 50kg(Observing (1) and (2)

Weight of B and C = $36 \times 2 = 72\text{kg}$; In this 72 kg, C's weight is 50kg, then weight of B must be 22kg

3. Average weight of 10 people is 50kg. When one person is added to the group the average weight increases by 1kg. So, what is the weight of that new person?

- (a) 59 kg (b) 60kg (c) 61kg (d) 50 kg

Solution:

Let x kg be the weight of a new person. Then

Total weight = $10 \times 50 = 500$

Increased New Weight = $11 \times 51 = 561$

Weight of new person is = $561 - 500 = 61\text{kgs}$

4. Ram lives along with his wife, son and daughter-in-law. The average age of Ram's family 3 years ago was 40 years. Three years later Ram dies due to illness at the age of 53 years and at the same time his daughter in-law gave birth to Ram's grandson. If all ages are always taken as integral values, now what is the average age of Ram's family?

- (a) 24.80 years (b) 26.45 years (c) 29.75 years (d) 31.90 years

Solution:

Total age of Ram's family = $40 \times 4 = 160$ years

Three years later, the total age of Ram's family = $160 + 3 \times 4 = 172$ years

But now Ram dies at the age of 53 years while a new member is born. Hence, overall the total member remains the same but the total age of family decreased by 53 years

$$\text{New average of the family} = \frac{172 - 53}{4} = 29.75$$

5. There are twice the number of two wheelers as there are three wheelers and the number of four wheelers are equal to the number of two wheelers. The average number of wheels per vehicle is:

- (a) 2 (b) 3 (c) 4 (d) 5

Solution:

	No. of 2 wheelers	No. of 3 wheelers	No. of 4 wheelers
	2x	x	2x
No. of wheels	$2 \times 2x = 4x$	$3 \times x = 3x$	$2x \times 4 = 8x$

Therefore, average number of wheels = $\frac{4x+3x+8x}{5x} = 3$

6. Once Ajay went to the office of ROCKLINE COURIER with 4 different envelopes. The clerk in the office measured the weights in all possible pairs. The weights obtained are 59gm, 61gm, 62gm, 63gm, 64gm and 66gm. The weight of the heaviest envelope is:

- (a) 35gm (b) 36gm (c) 34gm (d) Can't be determined

Solution:

If the highest weight be 35gm, then the second highest weight will be 31gm. Again, if the second highest will be 31, then the third highest will be 33 which is inadmissible, since then $35 + 33 = 68$ which is not the greatest possible combination. Hence wrong.

Similarly 36 ((i.e., option b) is also invalid

Highest	Sec. Highest	Third Highest
36	30	34

Thus $36 + 34 = 70 > 66$, hence wrong.

The greatest possible combination cannot be greater than 66.

Now, consider option (c)

Highest	Sec. Highest	Third Highest
34	32	32 ✖ (since weights are different)
	32	31 ✖ (since 65 is not a combination)
	32	30 ✔

So, the highest weight = 34

Sec. highest weight = 32

Third highest weight = 30

Lowest weight = 29

Since, all the weights obtained give all the 6 different combinations, hence 34 is the highest possible weight of an envelope.

7. In a particular week the average number of people who visited Golkonda is 40. If we exclude the holidays, then the average increases by 16. If we also exclude the day on which the maximum number of people - 112 visited Golkonda, then the average becomes 42. The number of holidays in the week is:

(a) 1

(b) 2

(c) 3

(d) 4

Solution:

Number of days in a week = 7

Average number of visitors = 40

Total visitors = 280 (7 x 40)

Now, if n be the number of holidays in a week then

$$(7 - n) \times 56 = 280 \quad (40 + 16 = 56)$$

$$n = 2$$

The rest of the data is redundant or useless, since our problem is solved here without using it.

Alternatively

Go through options,

$$40 \times 7 = 280 = 56 \times 5 \text{ hence proved.}$$

8. Satyajit earns $\frac{3}{2}$ times in January, April, July and October than his average earning of Rs.600 per month in the rest of the months. As a result, his savings in January, April, July and October goes to $\frac{5}{4}$ times of Rs. 400, which is his savings per month in the rest of the months. What is his average expenditure per month?

(a) Rs.266.66

(b) Rs.250

(c) Rs.233.33

(d) Rs.433.33

Solution:

Earning in the 8 months = $600 \times 8 = 4800$

Earning in the 4 months = 3600

Total earning = Rs.8400

Saving in 8 months = $400 \times 8 = 3200$

Saving in 4 months = 2000

Total savings = Rs.5200

Total expenditure for 12 months = $8400 - 5200 = 3200$

Therefore, average saving per month = $3200 / 12 = 266.66$

9. A travel agency has three types of vehicles viz. 4 seater auto rickshaw, 10 seater maxi cab and 20 seater minibus. The rate for each passenger (irrespective of his age or weight or seniority) for the auto rickshaw is Rs. 12, for the maxi cab is Rs.15 and for the minibus is Rs.8 for one round. The average occupancy of the seats is 100%, 80% and 75% respectively. If the travel agency has only one vehicle of each kind, then the average earning for one round of each vehicle is:

(a) Rs.96

(b) Rs.90

(c) Rs.86

(d) Rs.70

Solution:

	Auto Rickshaw	Maxi cab	Minibus
No. of seats	4	10	20
No. of seats occupied	4	8	15
Rate per seat	12	15	8
Total Amount (in Rs.)	48	120	120

Therefore average earning = $48+120+120/3 = 96$

10. In hotel CLIFF, the rooms are numbered from 101 to 130 on the first floor. 221 to 260 on the second floor and 306 to 345 on the third floor. In the month of June 2002 the room occupancy was 60% on the first floor, 40% on the second floor and 75% on the third floor. If it is also known that the room charges are Rs. 200. Rs. 100 and Rs. 150 on each of the floors, then find the average income per room for the month of June 2002.

- (a) Rs. 151.5 (b) Rs. 78.3 (c) Rs.88.18 (d) Rs. 65.7

Solution:

Total number of rooms in first floor = $101 - 130 = 30$ rooms

Total number of rooms in second floor = $221 - 260 = 40$ rooms

Total number of rooms in third floor = $306 - 345 = 40$ rooms

In June 2002 occupancy was

1st floor ie 60% □ 18 rooms

2nd floor ie 40% □ 16 room

3rd floor ie 75% □ 30 rooms

$$\text{Average} = \frac{18*200 + 16*100 + 30*150}{64}$$

$$\text{Average} = 151.5$$

11. The average weight of 5 men is decreased by 3 kgs when one of them weighing 150 kg is replaced by another person. This new person is again replaced by another person whose weight is 30 kg lower than the person he replaced. What is the overall change in the average due to this dual change?

- (a) 6 kgs (b) 9 kgs (c) 12 kgs (d) 15 kgs

Solution:

Let's say the weight of the persons are x, y, z, w and the weight of the person replacing the person of the weight is 150 is 'a' kg. After the first change the average is decreased by 3.

The weight of the second man is 135 and that of the third is 105. Hence, the net result is a drop of 45 for 5 people. Hence, 9kg is the drop.

$$\frac{x+y+z+w+150}{5} - \frac{x+y+z+w+a}{5} = 3$$

So, $a = 135$. Now 'a' is replaced by a person of weight $(a - 30)$ kg ie 105 kg

So, Overall change is the average is, initial average – average after replacing 150 kg person by 105kg

$$\frac{x+y+z+w+150}{5} - \frac{x+y+z+w+105}{5} = \frac{45}{5} = 9$$

12. A team of miners planned to mine 1800 tons of ore during a certain number of days. Due to technical difficulties in one-third of the planned number of days, the team was able to achieve an output of 20 tons of ore less than the planned output. To make up for this, the team overachieved for the rest of the days by 20 tons. The end result was that the team completed the task one day ahead of time. How many tons of ore did the team initially plan to ore per day?

- (a) 50 tons (b) 150 tons (c) 100 tons (d) 200 tons

Solution:

The best possible method to solve this question quick is to go through the options. Here the options are

- a) 50 Tons b) 100 Tons c) 150 Tons d) 200 Tons

a) $1800/50 = 36$ Days (As it is mentioned in the question that there was a technical glitch for 1/3rd days that means the total days have to be a multiple of 3). ($36 = 12+12+12$) (50 per day planned)

b) $1800/100 = 18$ Days ($18 = 6+6+6$) (100 per day planned)

c) $1800/150 = 12$ Days ($12 = 4+4+4$) (150 per day planned)

d) $1800/200 = 9$ Days ($9 = 3+3+3$) (200 per day planned)

Between A,B,C,D applying the given equation,

a) $12 \times (50-20) + 23 (50+20)$ is not equal to 1800 so not our answer. Here we took 23 as the work was completed a day earlier.

b) $6 \times (100-20) + 11 (100+20) = 480+1320 = 1800$ (This is our answer)

13. On an average, 2 litres of milk and 1 litre of water are needed to be mixed to make 1 kg of shrikhand of type A, and 3 litres of milk and 2 litres of water are needed to be mixed to make 1 kg of shrikhand of type B. How many kilograms of each type of shrikhand was manufactured if it is known that 130 litres of milk and 80 litres of water were used?

- (a) 20 of type A and 30 of type B

- (b) 30 of type A and 20 of type B

- (c) 15 of type A and 30 of type B

- (d) 30 of type A and 15 of type B

Solution:

1 kg shrikhand(type A) contains 2 litre milk and 1 litre of water

1 kg shrikhand(type B) contains 3 litre milk and 2 litre of water

Suppose x kg shrikhand(type A) and y kg of shrikhand(type B) were manufactured

Total quantity of milk $= 2x+3y$

$$\Rightarrow 2x+3y=130...(1)$$

Total quantity of water = $x+2y$

$$\Rightarrow x+2y=80...(2)$$

$$(2) \times 2 \Rightarrow$$

$$2x+4y=160 \text{ ---}(3)$$

$$(3) - (2) \Rightarrow$$

$$(4y-3y)=(160-130)$$

$$y=30$$

Using the value of y in (2)

$$x+2 \times 30=80$$

$$x+60=80$$

$$x=20$$

i.e 20kg of shrikhand(type A) and 30kg of Shrikhand (type B) were manufactured

14. There are five boxes in a cargo hold. The weight of the first box is 200 kg and the weight of the second box is 20% higher than the weight of the third box, whose weight is 25% higher than the first box's weight. The fourth box at 350 kg is 30% lighter than the fifth box. Find the difference in the average weight of the four heaviest boxes and the four lightest boxes.

- (a) 51.5 kg (b) 75 kg (c) 37.5 kg (d) 112.5 kg

Solution:

Weight of first box = 200 kg

Weight of second box

$$= 200 \times \frac{125}{100} \times \frac{120}{100}$$

$$= 300 \text{ kg}$$

Weight of third box

$$= 200 \times \frac{125}{100}$$

$$= 250 \text{ kg}$$

Weight of fourth box = 350 kg

Weight of fifth box

$$= 350 \times \frac{100}{70}$$

$$= 500 \text{ kg}$$

Required difference

$$= \frac{1}{4} \times (500 + 350 + 300 + 250) - \frac{1}{4} \times (200 + 250 + 300 + 350)$$

$$= \frac{1}{4} \times 1400 - \frac{1}{4} \times 1100$$

$$= 350 - 275$$

$$= 75 \text{ kg}$$

BOX2	BOX3	BOX4	BOX5
300KG	250KG	350KG	500KG
Avg. weight of 4 heavier boxes= 350KG			

BOX1	BOX2	BOX3	BOX4
200KG	300KG	250KG	350KG
Avg. weight of 4 lighter boxes=275kg			

15. A shop sold 64 kettles of two different capacities. The smaller kettle cost a rupee less than the larger one. The shop made 100 rupees from the sale of large kettles and 36 rupees from the sale of small ones. How many kettles of either capacity did the shop sell and what was the price of each kettle?

- (a) 20 kettles for 2.5 rupees each and 14 kettles for 1.5 rupees each
- (b) 40 kettles for 4.5 rupees each and 24 kettles for 2.5 rupees each
- (c) 40 kettles for 2.5 rupees each and 24 kettles for 1.5 rupees each
- (d) Either a or b

Solution:

Let "s" and "l" be the number of small & large kettles respectively.

Let x be the price of the small kettle.

Hence, large kettle's price would be = $x + 1$.

Given,

$$s + l = 64 \text{ ----- 1)}$$

$$l * (x + 1) = 100 \text{ -----2)}$$

$$s * x = 36 \text{ -----3)}$$

Solving 1), 2) & 3), we get

$$s = 24, l = 40, x = \text{Rs. } 1.5$$

Alternate solution:

By observation, we can conclude that option C) is the right answer.

HOMEWORK:

1. Find the average of all prime and composite numbers up to 100.

- (a) 51
- (b) 20
- (c) 49.5
- (d) 50.5

Solution:

Except 1 each and every number is prime or composite

$$\Rightarrow \text{The required sum} = (100 \times 101/2) - 1 = 5049$$

$$\Rightarrow \text{The average} = 5049/99$$

\therefore Required average is 51

2. Average height of 5 people is 162cm. When one person is removed, then the average height of the remaining people becomes 161cm. What is the height of the person removed?

- (a) 161 cm
- (b) 162 cm
- (c) 163 cm
- (d) 166 cm

Solution:

Let x cm be the height of the person. Then

$$\frac{5*162 - x}{4} = 161$$

$$\Rightarrow 810 - x = 644$$

$$x = 810 - 644$$

$$x = 166 \text{ cm}$$

3. The average age of 11 players of a cricket team is increased by 2 months when two of them aged 18 years and 20 years are replaced by two new players. The average age of the new players is

- (a) 19 years 1 month (b) 19 years 6 month
(c) 19 years 11 month (d) 19 years 5 month

Solution:

Total age of 2 players = $18 + 20 = 38$ years

Increased years = $2 \times 11 = 22$ months

Age of new players

= 38 years + 22 months

= 19 years 11 months

Average = 19 years 11 months = 19 years 11 months

4. The average age of 10 men increases by 3 years when one of them, whose age is 54 years, is replaced by a woman. What is the age of the woman?

- (a) 68 years (b) 82 years (c) 72 years (d) 84 years

Solution:

The woman's age would be $10 \times 3 = 30$ years more than the age of the man she replaces. Age of the woman = $54 + 3 \times 10 = 84$ years.

5. The average age of a group of people going for a movie is 20 years. 10 new people with an average age of 10 years join the group on the spot due to which the average of the group becomes 18 years. Find the number of people initially going for the movie?

- (a) 40 (b) 20 (c) 50 (d) 30

Solution:

Let the number of people initially going for the movie be x , then the sum of the ages of these people will be $20x$ (Since the definition of average says, Sum of the ages/ $x = 20$)

Similarly the sum of the ages of the 10 people, who joined later will be 100

Now the new average age will be $20x + 100 / x + 10 = 18$

Upon simplifying, we get the value of x as 40. Hence the number of people who went for the movie initially was 40.