

PROBLEMS ON AVERAGE

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FORMULAS AND QUICK TRICKS FOR AVERAGE PROBLEMS


- Average = Sum of quantities / Number of quantities
- Sum of quantities = Average * Number of quantities
- The average of first n natural numbers is $(n + 1) / 2$
- The average of the squares of first n natural numbers is $(n + 1)(2n + 1) / 6$
- The average of cubes of first n natural numbers is $n(n + 1)^2 / 4$
- The average of first n odd numbers is given by $(\text{last odd number} + 1) / 2$
- The average of first n even numbers is given by $(\text{last even number} + 2) / 2$
- The average of squares of first n consecutive even numbers is $2(n + 1)(2n + 1) / 3$
- The average of squares of consecutive even numbers till n is $(n + 1)(n + 2) / 3$
- The average of squares of consecutive odd numbers till n is $n(n + 2) / 3$
- If the average of n consecutive numbers is m , then the difference between the smallest and the largest number is $2(m - 1)$
- If the number of quantities in two groups be n_1 and n_2 and their average is x and y respectively, the combined average is $(n_1x + n_2y) / (n_1 + n_2)$
- The average of n quantities is equal to x . When a quantity is removed, the average becomes y . The value of the removed quantity is $n(x - y) + y$
- The average of n quantities is equal to x . When a quantity is added, the average becomes y . The value of the new quantity is $n(y - x) + y$

PROBLEMS

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- **Solution**

- Run rate in the first 10 overs is 3.2
- Total runs scored in the first 10 overs is 32
- Total runs in 50 overs is 282 
- Total runs needed to score in the last 40 overs is $282 - 32 = 250$
- Run rate needed is $\frac{250}{40} = 6.25$

- A family consists of two grandparents, two parents and three grandchildren. The average age of the grandparents is 67 years, that of the parents is 35 years and that of the grandchildren is 6 years. What is the average age of the family?

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- **Solution**

- Average age of 2 grandparents is 67
- Hence their total age = $2 \times 67 = 134$
- Average age of 2 parents is 35
- Their total age = $2 \times 35 = 70$
- Average age of 3 grandchildren is 6
- Their total age = $3 \times 6 = 18$
- Total age of the family = $134 + 70 + 18 = 222$
- Average age is $\frac{222}{7} = 31\frac{5}{7}$



- A grocer has a sale of Rs. 6435, Rs. 6927, Rs. 6855, Rs. 7230 and Rs. 6562 for 5 consecutive months. How much sale must he have in the sixth month so that he gets an average sale of Rs. 6500?

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- **Solution**

- Total sale for 5 months = Rs. $(6435 + 6927 + 6855 + 7230 + 6562) = \text{Rs. } 34009$.

- Required sale = Rs. $[(6500 \times 6) - 34009]$

- = Rs. $(39000 - 34009)$

- = Rs. 4991.

- The average of 20 numbers is zero. Of them, at the most, how many may be greater than zero?

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- **Explanation:**

- Average of 20 numbers = 0.



- Sum of 20 numbers $(0 \times 20) = 0$.

- It is quite possible that 19 of these numbers may be positive and if their sum is a then 20th number is $(-a)$.

- The average weight of A, B and C is 45 kg. If the average weight of A and B be 40 kg and that of B and C be 43 kg, then the weight of B is:

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- **Explanation:**

- Let A, B, C represent their respective weights. Then, we have:
- $A + B + C = (45 \times 3) = 135 \dots (i)$
- $A + B = (40 \times 2) = 80 \dots (ii)$
- $B + C = (43 \times 2) = 86 \dots (iii)$
- Adding (ii) and (iii), we get: $A + 2B + C = 166 \dots (iv)$
- Subtracting (i) from (iv), we get : $B = 31$.
- B's weight = 31 kg.



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A library has an average of 510 visitors on Sundays and 240 on other days. The average number of visitors per day in a month of 30 days beginning with a Sunday is:

- **Explanation:**
- Since the month begins with a Sunday, there will be five Sundays in the month.

• Required average

$$\begin{aligned} &= \frac{510 \times 5 + 240 \times 25}{30} \\ &= \frac{8550}{30} \\ &= 285 \end{aligned}$$

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A pupil's marks were wrongly entered as 83 instead of 63. Due to that the average marks for the class got increased by half ($1/2$). The number of pupils in the class is:

- **Explanation:**

- Let there be x pupils in the class. Let the average be 1

- Hence total mark is x

- Total increase in marks $= x/2$



- *ie* $83 - 63 = \frac{x}{2}$, *ie* $20 = \frac{x}{2}$, *ie* $x = 40$

- The captain of a cricket team of 11 members is 26 years old and the wicket keeper is 3 years older. If the ages of these two are excluded, the average age of the remaining players is one year less than the average age of the whole team. What is the average age of the team?

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• **Explanation:**

• Let the average age of the whole team by x years.

• $11x - (26 + 29) = 9(x - 1)$

• $11x - 9x = 46$

• $2x = 46$

• $x = 23.$

• So, average age of the team is 23 years.

