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Percentage Basics

E-Book

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PERCENTAGE BASICS

A. Percentage:

Percent is a term derived from Latin word 'per centum' which means 'per hundred' i.e. Percentages are numerators of fraction with denominator 100 and have been used in comparing results. Percentage is represented by the symbol % which means 'hundredths'. That is 1% means 1 out of a hundred or we can say one hundredth. It can be written as: $1\% =$

$$\frac{1}{100} = 0.01$$

Let's take an example for better understanding:



Shalini's Report
Total: 300/360



Shreya's Report
Total: 320/400

Now, Shreya said that she has done better as she got 320 marks whereas Shalini got only 300. Do you agree with her? Who do you think has done better?

Kajal told them that they can't decide who has performed better by just comparing their total marks scored because the maximum marks out of which these scores have been reported are not same.



So, she said that why you don't check the percentage?

Shreya's percentage was 80% and Shalini's percentage was 83.33%. So, this shows that Shalini has done better.

(i) Conversion of Fraction to Percentage: Multiply the fraction by 100 to convert it into percent.

1. Write $\frac{1}{6}$ as per cent:

Sol. We have, $\frac{1}{6} \times 100 = 16.67\%$

2. Write $\frac{3}{8}$ as per cent:

Sol. We have, $\frac{3}{8} \times 100 = 37.5\%$

(ii) Conversion of Percentage to Fraction: Reversing the earlier operation will convert a percent to a fraction i.e. divide the percent by 100.

3. Write 60% as fraction.

Sol. We have, $60\% = \frac{60}{100} = \frac{3}{5}$

4. Write 55% as fraction.

Sol. We have, $55\% = \frac{55}{100} = \frac{11}{20}$ or 0.55

Fill the following columns:

Percent	1%	10%	25%	45%	37.5%	75%
Fraction	$\frac{1}{10}$					
Decimal	0.01					



Let us now think about that how percentages can be used in real life. For this let's take some statements:

- 15% of the income is saved by Raghav. Now, by 15% means we mean 15 parts out of 100 or we write it as $15/100$.

(iii) Conversion of Percentage to "How many": Let us understand this concept by taking an example.

5. A survey of 400 people showed that 25% like to read "The Hindus" newspaper. How many people like to read "The Hindus" newspaper?

Sol. Total no. of people = 400

Out of these, 25% like to read "The Hindus" newspaper.

Now, we can do this by two methods.

Method I: Out of 100, 25 like to read "The Hindus" newspaper.

So, out of 400, number of people who like to read "The Hindus"

$$\text{newspaper} = \frac{25}{100} \times 400 = 100$$

Method II: Number of people like to read "The Hindu"

$$\text{newspaper} = 25\% \text{ of } 400 = \frac{25}{100} \times 400 = 100$$

6. In a school, there are 1000 students out of which there are 40% girls. How many of these school students are boys?

Sol. Total students = 1000

Percentage of girls = 40%, therefore percentage of boys = $100\% - 40\% = 60\%$

Thus, total number of boys = 60% of 1000 = 600

B. Increase or Decrease Percent:

When we need to know the change in a quantity (increase or decrease) in the percentage form then we need to consider the old value and the new value and observe the percentage change. For example, if the score of a student increased from 550 to 605, then the increase in score is 55 which is 10% of 550, so the score increased by 10%.

It is worth remembering here, that the increase or the decrease will always be on the original quantity. If the increase or decrease is given in absolute and the percentage increase or decrease is to be calculated, then the following formula applicable will be

$$\% \text{ increase / decrease} = \frac{\text{Quantity increase or decrease}}{\text{Original quantity}} \times 100$$

The point worth remembering is that the denominator is the **ORIGINAL QUANTITY**.

7. The number of Spanish speaking people in a city K is 90000. Due to floods, some people migrated to other cities and number of Spanish speaking people left in the city is 65000. Find the percentage decrease in the number of Spanish speaking people.

A) $18\frac{7}{9}\%$ B) $27\frac{7}{9}\%$ C) $23\frac{7}{9}\%$ D) $28\frac{7}{9}\%$

Sol. Initial number of Spanish speaking people = 90000

After floods, the number of Spanish speaking people = 65000



Decrease in the number of Spanish speaking people =
 $90000 - 65000 = 25000$

Percentage decrease is given by $= \frac{\text{final} - \text{initial}}{\text{initial}} \times 100$

Percentage decrease in number of Spanish speaking

$$\text{people} = \frac{25000}{90000} \times 100 = \frac{250}{9} = 27\frac{7}{9} \%$$

(i) To Increase a Number by x %:

Let a number is increased by 10 %, then it will become 1.1 times of itself.

Similarly, if a number is increased by 20 %, then it will become 1.2 times of itself.

On the same lines, if a number is increased by 30 %, then it will become 1.3 times of what it was.

Illustrative Ex.: Let us take the number 60, if we have to increase it by 10% then we have

$$60 + 10\% \text{ of } 60 = 66 \text{ or } 1.1 \times 60 = 66$$

(ii) To Decrease a Number by x %:

Let a number is decreased by 10 %, then it will become 0.90 times of itself.

Similarly, if a number is decreased by 20 %, then it will become 0.80 times of itself.

On the same lines, if a number is decreased by 30 %, then it will become 0.70 times of what it was.



Illustrative Ex.: Let us take the number 60, if we have to decrease it by 10% then we have $60 - 10\% \text{ of } 60 = 60 - 6 = 54$ or $0.9 \times 60 = 54$

C. Increase and Decrease by the same % age:

If a number happens to be first increased by R %, then this number is later decreased by R %, then in the net effect, total there would be a final decrease of $\frac{R^2}{100}$ %.

D. Increase and Decrease by different% age:

If a number happens to be first increased by a given percentage say, X %, then it is again increased by another given percentage say, Y %. Then the total net increase in this number will be $[X+Y+\frac{XY}{100}]$ %.

This formula is very important. It can be applied in so many other questions. In case instead of increase, there is a decrease, simply put a negative value in place of variable. You will get the right answer, even when both the decreases are mentioned. What you obtain after solving the formula, in case it is positive, there is an increase, and if it is negative, there is a decrease.



E. Equivalent Percentages of some commonly used Fractions:

Fraction	%age	Fraction	%age
1	100%	1/9	11.11%
1/2	50%	1/10	10%
1/3	33.33%	1/11	9.09%
1/4	25%	1/12	8.33%
1/5	20%	1/14	7.14%
1/6	16.67%	1/15	6.67%
1/7	14.28%	1/16	6.25%
1/8	12.5%	1/20	5%

F. Solved Examples:

1. What is 15% of 80?

Sol. $\frac{15}{100} \times 80 = 12$

2. What percentage is Rs 16 of Rs 128?

Sol. $\frac{16}{128} \times 100 = 12.5\%$

3. A student obtained 87.5 % marks in a certain examination. If the maximum marks is 1600, find the total marks obtained by her.

Sol. $\frac{87.5}{100} \times 1600 = 1400$

4. 25 % of a certain sum of money is Rs. 400. Find the sum.

Sol. $\frac{25}{100}$ of a sum = Rs. 400 \Rightarrow The sum = $400 \times \frac{100}{25} = \text{Rs.} 1600$



5. A's income is 40 % less than B's. How much is B's income more than A's?

Sol. Apply the formula $\frac{100 \times R}{(100 - R)}$ (\because income is R% less)

$$\text{B's income is more by } \frac{100 \times 40}{(60)} = 66.67\%$$

6. In an examination, Anil obtains 25% marks and fails by 45 marks while Sunil obtains 46% marks and passed by 15% marks. What are the passing marks?

Sol. As Sunil obtained 46% marks and he got 15% more than the passing marks, therefore the passing marks are $46 - 15 = 31\%$ of total marks.

Now Anil got 25% marks which are 6% less than the pass marks and he got 45 marks less than the pass marks, therefore, 6% of total marks = 45 \Rightarrow Total marks = $\frac{45}{6} \times 100 = 750$.

7. Ketan has some amount out of which he lost 20%, 12% he gave to his brother, 50% of remainder is spent for household items and rest Rs. 272 gave to his sister. What was his initial amount?

Sol. Let initially he had Rs 100

Amount of money lost and given to brother = $12 + 20 = \text{Rs } 32$

Remaining money = Rs 68



Amount spent on household items = 50% of 68 = Rs 34

Amount left = 68 – 34 = Rs 34

Now if money left is Rs 34, total money = Rs 100

If the money left is Rs 272, total money =

$$\frac{100}{34} \times 272 = \text{Rs } 800$$

8. 245 toffees were distributed equally among children in such a way that the number of toffees received by each child is 20% of total number of children. How many toffees did each child get?

Sol. Let the total children = x Toffees received by each child = $x/5$

$$\text{We have } x \times x/5 = 245 \Rightarrow x^2 = 1225 \Rightarrow x = 35$$

Therefore, toffees received by each child = 20% of total number of children = 20% of 35 = 7.

9. A, B, C shared Rs. 22200 so that A received 25% more than B and B received 20% more than C then what amount did A receive?

Sol. Let the Amount received by C = Rs x.

Therefore, amount received by B = 1.2x.

Amount received by A = $1.25 \times 1.2x = 1.5x$.

Total amount = $1.5x + 1.2x + x = 3.7x$.

$$\text{Now } 3.7x = 22200 \Rightarrow x = \frac{22200}{3.7} = 6000$$

$$\text{Now } 1.5x = \frac{22200}{3.7} \times 1.5 = \text{Rs. } 9000$$



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- 10.** I bought 5 pens, 7 pencils and 4 erasers. Rajan bought 6 pens, 8 erasers and 14 pencils for an amount which was half more what I had paid. What percent of the total amount paid by me was paid for the pens?
- A) 37.5% B) 62.5%
- C) 50% D) None of these

Sol. Let us look at the two equations.

Let $(5 \text{ pens} + 7 \text{ pencils} + 4 \text{ erasers})$ cost Rs. x .

Hence, (6 pens + 14 pencils + 8 erasers) will cost Rs. 1.5x.

Had, in the second case, Rajan decided to buy 10 pens instead of 6, the quantity of each one of them would have doubled over the first case and hence it would have cost me Rs. 2x.

So $(10 \text{ pens} + 14 \text{ pencils} + 8 \text{ erasers}) = \text{Rs. } 2x$.

Now subtracting the second equation from the third, we get 4 pens cost Rs. 0.5x.

Since 4 pens cost Re 0.5x, 5 of them will cost Re 0.625x

This is the amount that I spent on pens.

Hence, fraction of the total amount paid = $0.625 = 62.5\%$.