

Concepts of percentage change and percentage difference

Percentage Change:

A change can be of two types – an increase or a decrease.

When a value is changed from initial value to a final value,

$\% \text{ change} = (\text{Difference between initial and final value}/\text{initial value}) \times 100$

Eg: If 20 changes to 40, what is the % increase?

Soln: $\% \text{ increase} = (40-20)/20 \times 100 = 100\%$.

Note:

1. If a value is doubled the percentage increase is 100.
2. If a value is tripled, the percentage change is 200 and so on.

Percentage Difference:

$\% \text{ Difference} = (\text{Difference between values}/\text{value compared with}) \times 100$.

Eg: By what percent is 40 more than 30?

Soln: $\% \text{ difference} = (40-30)/30 \times 100 = 33.33\%$

(Here 40 is compared with 30. So 30 is taken as denominator)

Eg: By what % is 60 more than 30?

Soln: $\% \text{ difference} = (60-30)/30 \times 100 = 100\%$.

(Here 60 is compared with 30.)

Hint: To calculate percentage difference the value that occurs after the word “than” in the question can directly be used as the denominator in the formula.

Important Points to Note:

1. When any value increases by
 1. 10%, it becomes 1.1 times of itself. (since $100+10 = 110\% = 1.1$)
 2. 20%, it becomes 1.2 times of itself.
 3. 36%, it becomes 1.36 times of itself.
 4. 4%, it becomes 1.04 times of itself.

Thus we can see the effects on the values due to various percentage increases.

1. When any value decreases by
 1. 10%, it becomes 0.9 times of itself. (Since $100-10 = 90\% = 0.9$)
 2. 20%, it becomes 0.8 times of itself
 3. 36%, it becomes 0.64 times of itself
 4. 4%, it becomes 0.96 times of itself.

Thus we can see the effects on a value due to various percentage decreases.

1. When a value is multiplied by a decimal more than 1 it will be increased and when multiplied by less than 1 it will be decreased.

2. The percentage increase or decrease depends on the decimal multiplied.

Eg: $0.7 \Rightarrow 30\% \text{ decrease}$, $0.67 \Rightarrow 33\% \text{ decrease}$, $0.956 \Rightarrow 4.4\% \text{ decrease}$ and so on.

Eg: When the actual value is x , find the value when it is 30% decreased.

Soln: $30\% \text{ decrease} \Rightarrow 0.7x$.

Eg: A value after an increase of 20% became 600. What is the value?

Soln: $1.2x = 600$ (since 20% increase)

∴ $x = 500$.

Eg: If 600 is decrease by 20%, what is the new value?

Soln: new value = $0.8 \times 600 = 480$. (Since 20% decrease)

Thus depending on the decimal we can decide the % change and vice versa.

Eg: When a value is increased by 20%, by what percent should it be reduced to get the actual value?

Soln: (It is equivalent to 1.2 reduced to 1 and we can use % decrease formula)

% decrease = $(1.2 - 1)/1.2 \times 100 = 16.66\%$.

1. When a value is subjected multiple changes, the overall effect of all the changes can be obtained by multiplying all the individual factors of the changes.

Eg: The population of a town increased by 10%, 20% and then decreased by 30%. The new population is what % of the original?

Soln: The overall effect = $1.1 \times 1.2 \times 0.7$ (Since 10%, 20% increase and 30% decrease)
 $= 0.924 = 92.4\%$.

Eg: Two successive discounts of 10% and 20% are equal to a single discount of ____

Soln: Discount is same as decrease of price.

So, decrease = $0.9 \times 0.8 = 0.72 \Rightarrow 28\%$ decrease (Since only 72% is remaining).

Why Percentages and calculation methods

Percentages

Understanding Percentages:

The word percent can be understood as follows:

Per cent \Rightarrow for every 100.

So, when percentage is calculated for any value, it means that that you calculate the value for every 100 of the reference value.

Why Percentage?

Percentage is a concept evolved so that there can be a uniform platform for comparison of various things. (Since each value is taken to a common platform of 100.)

Eg: To compare three different students depending on the marks they scored we cannot directly compare their marks until we know the maximum marks for which they took the test. But by calculating percentages they can directly be compared with one another.

Before going deeper into the concept of percentage, let u have a look at some basics and tips for faster calculations:

Calculation of Percentage:

Percentage = $(\text{Value} / \text{Total value}) \times 100$

Eg: 50 is what % of 200?

Soln: Percentage = $(50/200) \times 100 = 25\%$.

Calculation of Value:

Value = (Percentage/100) X total value

Eg: What is 20% of 200?

Soln: Value = (20/100) X 200

Note: Percentage is denoted by “%”, which means “/100”.

Eg: What is the decimal notation for 35%?

Soln: 35% = 35/100 = 0.35.

For faster calculations we can convert the percentages or decimal equivalents into their respective fraction notations.

Percentages – Fractions Conversions:

The following is a table showing the conversions of percentages and decimals into fractions:

Percentage Decimal Fraction

10%	0.1	1/10
12.5%	0.125	1/8
16.66%	0.1666	1/6
20%	0.2	1/5
25%	0.25	1/4
30%	0.3	3/10
33.33%	0.3333	1/3
40%	0.4	2/5
50%	0.5	1/2
60%	0.6	3/5
62.5%	0.625	5/8
66.66%	0.6666	2/3
70%	0.7	7/10
75%	0.75	3/4
80%	0.8	4/5
83.33%	0.8333	5/6
90%	0.9	9/10
100%	1.0	1

Similarly we can go for converting decimals more than 1 from the knowledge of the above cited conversions as follows:

We know that 12.5% = 0.125 = 1/8

Then, 1.125 = [8(1)+1]/8 = 9/8 (i.e., the denominator will add to numerator once, denominator remaining the same).

Also, 2.125 = [8(2)+1]/8 = 17/8 (here the denominator is added to numerator twice)

3.125 = [8(3)+1]/8 = 25/8 and so on.

Thus we can derive the fractions for decimals more than 1 by using those less than 1.

We will see how use of fractions will reduce the time for calculations:

Eg: What is 62.5% of 320?

Soln: Value = $(5/8) \times 320$ (since $62.5\% = 5/8$)
= 200.