

# Percentage

GENERAL APTITUDE

# Basics

- Percentage always refers to 100 as the base.
- A percentage value can be more than 100 not necessarily less than 100 always.

## Basic Formulae

(1)  $a$  % of  $b$  is calculated as  $= (a/100) * b$

(2) What % of  $a$  is  $b$ ,  $(?/100) * a = b$

$? = (b/a) * 100$  is the formula for calculation

(3) Percentage increase Calculation

If the number “ $a$ ” increases to “ $b$ ”, % increase is calculated as

$$= \{(b-a)/a\} * 100$$

**Note: The base value for calculation is always the original number which is “ $a$ ” in this case**

#### (4) Percentage decrease Calculation

If the number “a” decreases to “b” ,% decrease is calculated as =  
 $\{(a-b)/a\} * 100$

**Note the base value for calculation is always the original number which is “a” in this case.**

(5) If the number N increases by p % , the new value is calculated as  
 $= N * ( 1 + (p/100))$

(6) If the number N decreases by p %, the new value is calculated as  
 $= N * ( 1 - (p/100))$

(7) Consider two numbers a & b such that  $a > b$ .

By what % a exceeds b is calculated as  $((a-b)/b) * 100$

By what % b is less than a is calculated as  $((a-b)/b) * 100$

**Any % calculation is always with respect to a base value. A wrong choice of base will end up giving you a wrong answer.**

If 25% of (280) is equal to 7% of (x), then x is

a) 500    b) 1000    c) 700    d) 800

Solution:

- $(25/100) * 280 = (7/100) * x$
- $x = 25 \times 280 / 7 = 1000$  (choice b)

If  $A:B = 6:5$ , then by what % is A is more than B?

a) 20%    b) 30%    c) 50%    d) 10%

Solution:

Let  $A = 6k$  &  $B = 5k$ , where  $k \in \mathbb{Z}^+$

More than B, means B becomes the base for comparison,

Hence required result =  $\{(6k - 5k)/5k\} * 100$   
 $= 20\%$  (choice a)

150 is what % of 120?

a) 150%   b) 125%   c) 110%   d) 75%

Solution

- $150 = (?/100) \times 120$
- $? = 150 * 100 / 120$
- $= 125\%$  (choice b)
- Note that you can get a % value greater than 100 as your answer as specified earlier.

What % of 60 is 40?

a)  $33 \frac{1}{3}\%$       b)  $66 \frac{2}{3}\%$       c) 50      d) 80%

- Solution
- $(?/100) * 60 = 40$
- $? = (40/60) * 100$
- $= 66 \frac{2}{3}\%$  (Choice b)

Which of the following is least?

- |                |                |
|----------------|----------------|
| a) 20% of (80) | b) 30% of (60) |
| c) 35% of (50) | d) 40% of (45) |

- Solution
- a)  $20\% \text{ of } 80 = 16$
- b)  $30\% \text{ of } 60 = 18$
- c)  $35\% \text{ of } 50$  can be converted as  $50\% \text{ of } 35 = 17.5$
- d)  $40\% \text{ of } 45 = (2/5) * 45 = 18$
- Hence least is option a.



A number when decreased by 20% becomes 136. What is the number ?

- a) 160              b) 150              c) 170              d) 140

Solution

- Let the number be N.
- $N (1 - (20/100)) = 136$  (Refer to formula discussed in basics section)
- $N (1 - (1/5)) = 136$
- $N = 136 * 5/4 = 170$  (choice c)

A number when increased by 40% becomes 420. What is the number ?

a) 200      b) 300    c) 400      d) 320

- Solution
- Let the number be N.
- $N ( 1 + (40/100)) = 420$
- $N * 7/5 = 420$
- $N = 300$  (Option b)

The price of an article is first decreased by 10% & then increased by 10% successively . If the price after these changes is Rs990, the original price of the article was,  
a) 990      b) 1000      c) 1010      d) 1020

- Solution
- Let the original price =  $k$
- Price after first change =  $k ( 1 - (10/100) )$ , now this price undergoes the second change.
- Hence price after second change =  
 $k ( 1 - (10/100) ) ( 1 + (10/100) ) = \text{Rs } 990$   
 $k * 9/10 * 11/10 = 990$   
On simplifying  $k = 1000$  (choice b)

If A's income is 20% more than that of B, then by what % is B's income less than that of A?

a) 25%    b) 20%    c)  $16\frac{2}{3}\%$     d) 50%

- Solution
- If B's income is  $k$ .
- A's income =  $k(1+(20/100))= 1.2k$
- by what % is B's income less than that of A
- Recall that now the base for calculation is A's income
- Required result =  $\{(1.2k - k)/1.2k\} * 100$   
 $= (1/6) * 100 = 16\frac{2}{3}\%$  (Option c)

Also note that while A's income exceeds B's income by 20%, B's income is less than A's income by  $16\frac{2}{3}\%$ . Both these values are not equal, as percentage calculation depends on choice of base value.

The price of an ice cream is decreased by 20%, then by what % should the consumption be increased in order to maintain a constant expenditure?

- a) 20%      b) 50%      c) 25%      d) 40%

• Solution:

	Price	Consumption	Expenditure
Original	100	4	400
Revised	80	5	400

If original price = Rs 100, revised price is Rs 80/-

Choose a common multiple for 100 & 80 and fix that value as expenditure.

Work out the consumption values as shown in the table.

Consumption has increased from 4 to 5 unit's, so % increase is  $((5-4)/4) \times 100 = 25\%$ .

(Option c)

The price of sugar increased by 50%, then by what % does the consumption of sugar be reduced so that the total expenditure on sugar increased by 20%?

- a) 20%                      b) 25%                      c) 40%                      d) 10%

• Solution:

	Price	Consumption	Expenditure
Original	100	1	100
Revised	150	120/150	120

Expenditure increases by 20 % , original consumption is one unit, revised is  $120/150 = 4/5 = 0.8$  units.

Hence % reduction in consumption =  $((1-0.8)/1) \times 100$   
= 20% (Option A)

The price of tea increased by 20%, then by what % should the consumption be decreased so that the total expenditure is decreased by 10%?

- a) 20%                      b) 25%                      c) 40%                      d) 10%

• Solution:

	Price	Consumption	Expenditure
Original	100	1	100
Revised	120	90/120	90

Expenditure reduced by 10 %,original consumption = 1 unit.

Revised consumption is  $90/120 = \frac{3}{4}$  units = 0.75.

% reduction in consumption =  $((1-0.75)/1) \times 100 = 25\%$   
(option b)

The length of a rectangle increased by 25% and the breadth decreased by 10%. What is the increased % in its area?

- a) 10%      b) 35%    c) 15%      d) 12.5%

• Solution:

	Length	Breadth	Area
Original	L	B	LB
Revised	$L (1 + (25/100))$ $= 1.25 L$ $= 1.125LB$	$B (1 - ((10/100)))$ $= 0.9 B$	$1.25L \times 0.9B$

$$\begin{aligned}\% \text{ increase in area} &= \{ (1.125LB - LB) / LB \} \times 100 \\ &= 12.5\% \text{ (Option d)}\end{aligned}$$



A spends 60% of his salary and saves the remaining. His salary is increased by 25% and he increased his expenditure by 20%. By what % does his saving increase?

a) 30%    b) 32.5%    c) 35%    d) 40%

- Solution:

	Salary	Expenditure	Saving
• Original	100k	60k	40k
• Revised	125K	72k (60 x 1.2)	53k

- $\% \text{ increase in saving} = ((53k - 40k)/40k) \times 100$
- $= 32.5\% \text{ (Option b)}$

In an examination 65% of the students passed. If the number of failures is 420, find the total number of students?

a) 1000      b) 900      c) 1200      d) 1500

- Solution:
- If 65 % students passed, failure is 35 % of total students.
- Let total students = T
- 35% of T = 420 given
- $T = 420 \times (100/35) = 1200$  (option c)

In an election between 2 candidates, a candidate secured 62% of the votes and is elected by a majority of 144 votes. Find the total number of votes polled?

- a) 400                      b) 600              c) 800              d) 1000

- Solution:
- Let total votes polled be  $100k$ .
- One candidate secured 62% of total votes =  $62k$ .
- The other candidate would have bagged  $100k - 62k = 38k$  votes.
- Given  $62k - 38k = 144$ ,  $k=6$
- So  $100k = 100 \times 6 = 600$  which is the total number of votes.(Option b)

The value of a machine depreciates 10% annually .If its present value is Rs.4000, its value after 2 yrs in rupees will be,

- a) 3200                      b) 2000                      c) 3000                      d) 3240

- Solution:
- Depreciation means reduction in the book value.
- We can visualize the problem as follows
- Present value  $\xrightarrow{\text{Reduced value}}$  after first year  $\xrightarrow{\text{Reduced value}}$  after second year.

4000 (reduction by 10%)

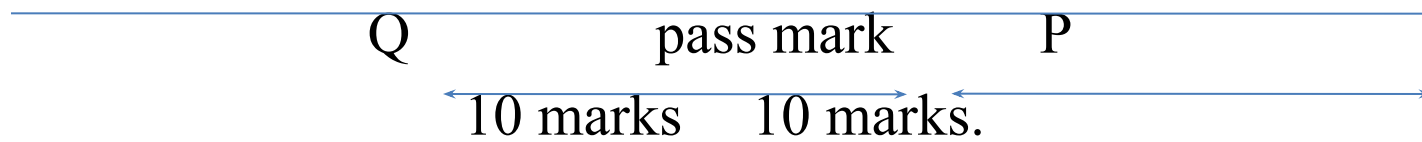
$4000(1 - (10/100)) = 3600$  ( reduction by 10 %)

$= 3600 ((1 - 10/100)) = 3240$  (Option d)

In a test P got 40% of the maximum marks and got 10 marks more than the pass mark. Q got 30% of maximum marks and failed by 10 marks. Find the pass mark?

a) 60      b) 70      c) 80      d) 90

- Solution:
- We visualize a mark spread as indicated below.



P's mark = 40 % of maximum

Q's mark is 30% of maximum.

Difference between their marks =  $10 + 10 = 20$  (See figure above).

Implies 40 % of maximum – 30% of maximum = 20

So maximum marks is 200.

P's score = 40 % of 200 = 80 ,which is 10 marks more than pass mark.

So pass mark =  $80 - 10 = 70$  (choice b)

In a group of persons 70% of the persons are male and 30% of the persons are married. If  $\frac{2}{7}$  of the males are married, what fraction of the females is single?

a)  $\frac{2}{7}$       b)  $\frac{1}{3}$       c)  $\frac{3}{7}$       d)  $\frac{2}{3}$

- Solution:
- The excel sheet below shows the complete working.

	Married	Unmarried	Total
Males	20k	50k	70k
Females	10k	20k	30k
Total	30k	70k	100k

- Based on the above table 20 k females are unmarried out of a total of 30k females Hence required result is  $\frac{2}{3}$  (option d).