TALENT & OLYMPIAD

Percentage

Introduction

The word percent means per hundred. It can be defined as the fraction whose denominator is 100, then the numerator of the fraction is called percent. It is denoted by the symbol '%'. If we have to find the percentage of any number we usually find the quantity per hundred of the number. It may be of two type growth or depreciation. If the value increases then it is called growth on the other hand if it decreases then it is called depreciation.

Percent can also be expressed as the ratio with its second term being 100 and the first term is equal to the given percent. In order to convert the given ratio into a percent, we have to convert the given ratio first into the fraction and then multiply the fraction by 100. Conversely if we have to convert the given percent into ratio, we first convert the percent into the fraction and then reduce it to the lowest term.

Illustrative EXAMPLE

$$x: y = \left(\frac{x}{y} \times 100\right)\%$$

Or $x\% = \frac{x}{100} = x:100$

Percent can also be expressed in the form of decimal. In order to convert the given fraction into the decimal we divide the numerator with 100 and get the required decimal form or by simply putting the decimals two digit to the left of the numerator.

Thus, r% of the quantity y is = $y \times \frac{r}{100}$

• If the price of the commodity increases by r%, then consumption must be reduced by $\left(\frac{r}{100+r} \times 100\right)\%$

so that expenditure does not increase.

- ✤ If the price of the commodity decreases by r%, then consumption must be increased by $\left(\frac{r}{100-r} \times 100\right)$ % So that expenditure does not decrease.
- ♦ If the income of one person is r% more than other then other's income is lesser than first by $\left(\frac{r}{100+r} \times 100\right)$ %
- ◆ If the income of one person is r% less than other then other's income is more than first by $\left(\frac{r}{100-r} \times 100\right)\%$
- If the value of the item increases at the rate r% / then after n interval its value is $\left(1+\frac{r}{100}\right)^n$ P and also the value of the item before n interval was $\frac{P}{\left(1+\frac{r}{100}\right)^n}$.
- If the value of the item decreases at the rate of r%, then after n intervals its value is $\left(1 \frac{r}{100}\right)^n$ and also

the value of the item before n interval was
$$\frac{1}{\left(1-\frac{r}{100}\right)^n}$$



- In a world survey 44% of the kids around the world watch television before they go to bed.
- Percent is a Latin word which means per centum which is equivalent to per 100.
- Percentage is the result obtained by multiplying a quantity by percent.
- Nearly 40% of the US currency in circulation was counterfeit by the end of the civil war.
- Close to 73% of girls in Bangladesh are married by the age of 18 years.



- Percent means per hundred.
- If the denominator of the fraction is 100 then percentage is equal to the numerator of the fraction.
- ♦ A ration with its second term 100 is also called percent.
- If we have to convert the given fraction into the percent then we multiply the fraction by 100.
- To convert decimal into the percent we shift the decimal to the two digit right of the given decimal.
- To convert the percent into the decimal we divide the given percent by 100.

Commonly Asked

SUMMARY

Smith has a diary farm in which the number of cows increases at the rate of 5% per annum which results in the increase in the production level of the milk by 10% per annum. But the demand of the milk is increasing at the rate of increase of the population of the town. If initially the farm has 16,0000 cows then the number of cows needed after 4 years to fulfill the requirement of the milk is:

(a) 204481	(b) 214481
(c) 194440	(d) 194481
(e) None of these	
Answer: (d)	
Explanation	
The number of cows after	four years = 160000 $\left(1 + \frac{5}{100}\right)^4 = 194481$

D. Bravo plans to grow trees in the piece of land in the backyard of his house. If he increases the number of trees by 10% per year in the backyard. After 2 years he finds that the number of trees in the backyard is 14641. Find the number of trees in the backyard when he started the plantation.

(a) 12,100 (b) 15,550 (c) 16,500 (d) 18,500 (e) None of these Answer: (a) Explanation The number of trees two years back is given by $= \frac{p}{\left(1 + \frac{r}{100}\right)^n} = \frac{14641}{\left(1 + \frac{10}{100}\right)^2} = 12,100$ Ļ

The two numbers M and N are such that 60% of M is equal to the 20% of N, then N = ?% of M. (a) 300 (b) 300 (c) 400 (d) 100 (e) None of these Answer: (a) Explanation According to the question, 60% M = 20% N $\frac{60}{100}M = \frac{20}{100}N$ 3M = N $\therefore N = \frac{3 \times 100}{100}M = 300\%$

Q

The population of the city is 6000 and $\frac{3}{12}$ of the population is male and rest of them are female. If the 38% of the male are married, then the percentage of married female in the city is: (a) 10% (b) 15% (c) 25% (d) 35% (e) None of these Answer: (a) Explanation Number of male in the city is $\frac{3}{12} \times 6000 = 1500$. Number of female in the city = 6000 -1500 = 4500.

Number of married male $=\frac{30}{100} \times 1500 = 450$ % of married female $=\frac{450}{4500} \times 100 = 10\%$

Three friends Joe, Anderson and Anthony work in the same company and obtain the certain salaries. If their combined salary is Rs. 15680 and they spend 85%, 75% and 70% of their respective salaries and their saving are 6:8:10 respectively, then their salaries are: (a) (Rs. 6258, Rs. 5249, Rs. 4173) (b) (Rs. 5954.43, Rs. 4763.54, Rs. 4962.03) (c) (Rs. 6070, Rs. 5072, Rs. 4120)

(c) (Rs. 6079, Rs. 5462, Rs. 4139)
(d) (Rs. 5884.4, Rs. 5564.2, Rs. 4231.4)
(e) None of these
Answer: (b)



An export company increases the salary of its employee by 30% a end of the financial year. But due to certain loss it has to revert back its order of increase in the salary of its employee and restore it to its or) situation. By what percent must the new salary be reduced to restore its original situation? (a) 40% (b) 25%

(a) 40%	(D) 25%	
(c) 23.07%	(d) 35.25%	(e) None of these
Answer: (c)		

The four number are such that x is 5% of y, y is 4% of z, and z is 3% of the value of x = 500, then find the value of w.

Answer: (b)	
(e) None of these	
(c) 7,333,333.3	(d) 5,333,333. <u>3</u>
(a) 10,333,333.3	(b) 8,333,333. <u>3</u>

If the medicine for acidity and stomach upset consists of 80% of alcohol,6.2% of menthe oil, 4.4% of spearmint oil, 5.2% of chloroform and rest is other find the quantity of spearmint oil in 40 ml of the pack of the medicine in the bottle.

Answer: (c)	
(e) None of these	
(c) 2.08 <i>ml</i>	(d) 5.628 <i>ml</i>
(a) 3.025 <i>ml</i>	(b) 1.02 <i>ml</i>

One of the major problems Maria faces in her house hold work is to maintain the monthly budget as the price of the articles is increasing day by. The increasing price of the articles increases her budget almost every month. Now she is not in position to increase her monthly budget any more even though the price is increasing and so she has to reduce her consumption. If in the current month the price of milk increases by 10% rice by 20% and fruits by 20%, then how much percent must Maria reduce her consumption of respective items so that her monthly expenditure remains the same?

(a) 12.6% 14.2%, 14.2%
(c) 10.1%, 8.2%, 10%
(e) None of these
Answer: (d)

(b) 9.98%, 8.26%, 8.26% (d) 9.09%, 16.6% 16.6%

In a city 30% of people like basket ball, 10% like hockey and rest like other games. If the total population of the city is 10 lakhs, then the number of people who likes other games is:

(a) 500000 (c) 300000 (e) None of these **Answer: (a)** (b) 200000 (d) 75000

Self Evaluation



1.	The population of the city increases by 8% in the first year and decreases by 8% during the next year and in the third year it again increases by 10%. Find the population of the city at the end of third year if initially it was 100000.									
	(a) 1,23,560	(b) 1,22,480								
	(c) 1,19,740	(d) 1,19,416								
	(e) None of these									
2.	There are 600 cats in a village, and 150 of them are black, 130 of them are brown, 180 of them are white and rest of them are of mixed colours. What is the percentage of mixed colour cats in the village?									
	(a) 23.3%	(b) 25.3%								
	(c) 30.3%	(d) 35.3%								
	(e) None of these									
3.	David is paid Rs. 800 for David gets Rs. 1000 as a does he work in the ent	[•] 100 hours a week as a basic pay and over time is paid 50% above the basic pay. If a salary at the end of the week including the over time, then for how many hours ire week?								
	(a) $\frac{705}{3}hrs$	(b) $\frac{700}{3}$ hrs								
	(c) $\frac{710}{3}$ hrs	(d) $\frac{712}{3}$ hrs								

(c) \$\frac{710}{3}\$ hrs
 (d) \$\frac{712}{3}\$ hrs
 (e) None of these
 4. Katrina spends 30% of her salary on fooding, 20% of remaining on house rent, 20% of the remaining on the education of the children, donates 10% of her salary to charity or temples and remaining for her savings. If her monthly saving is Rs. 6500, then her monthly salary is:

- (a) Rs. 14509(b) Rs. 14800(c) Rs. 16800(d) Rs. 17680(e) None of these(d) Rs. 17680
- 5. Astel works in a laboratory where the various tests like blood test, urine test, are carried out and for this he needs to use some dilute alcohol. If he is provided with 800 ml of 30% of alcohol and he needs solutions containing 64% of the alcohol for the test to be performed then how much pure alcohol he needs to mixed in the given solution to make it 32%?
 - (a) 550 ml (b) 4200 ml
 - (c) 755.6ml (d) 528ml
 - (e) None of these

Two neighbours work in the same factory for the different posts, so their salaries are also different. If the 6. salary of one individual is 50% more than other then by what percent others salary is of first salary? (a) $66\frac{2}{3}\%$ (b) $25\frac{1}{2}\%$ (d) $20\frac{1}{2}\%$ (c) $15\frac{1}{3}\%$ (e) None of these 7. Thomas asked Harry to think on the two numbers such that 20% of the greater number is equal to the 30% of the smaller number. If Harry said that the sum of two numbers is 75, then the greater number he thinks of is: (a) 50 (b) 24 (c) 15 (d) 45 (e) None of these 8. Four friends Robert, Thomas, Jack and Mary works in the same factory, and if their salary is as follows: Salary of Robert is 10% less than Thomas and Thomas gets 25% less than Jack and Jack gets 20% less than Mary and the salary of Robert is Rs. 3600, then find the salary received by Mary. (b) Rs. 4000 (a) Rs. 3500 (c) Rs. 4500 (d) Rs. 4800 (e) None of these 9. If the population of the city increases at the rate of 4% per annum but decreases due to immigration to the extent of 0.5%, then the increase percent after three year will be; (a) 10.87% (b) 8.5% (c) 9.2% (d) 11.2% (e) None of these 10. The number of people living in an apartment is 2500. The 20% of working people are males and rest are females. If 5% of the male are working as a grade B officers and 40% of the females working as a grade B officer, then find the percentage of people working as a grade A officers. (a) 87% (b) 85% (c) 92% (d) 67% (e) None of these

Answers – Self Evaluation Test																		
1.	D	2.	А	3.	В	4.	А	5.	С	6.	А	7.	D	8.	В	9.	А	10. D

Self Evaluation Test SOLUTIONS

1. The population of the city at the end of 3rd year is given by = $100000 \left(1 + \frac{8}{100}\right) \left(1 - \frac{8}{100}\right) \left(1 + \frac{10}{100}\right)$ = 1,19,416

2. Total number of cats of black, brown and white = 150+130+180=460. Total number of cats of other colours = 600 - 460 = 140Therefore, % of other colours cat in the village is = $\frac{140}{600} \times 100 = 23.3$

Basic rate of salary per hour = Rs. $\frac{800}{100} = Rs.8$ Rate of over time per hour = 150% of Rs. $1 = \frac{3}{2}$ Let David worked for over time = X hours. Then $800 + \frac{3}{2}x = 1000$ $x = \frac{700}{3}$ Therefore, David's total work of the week is $100 + \frac{712}{3} = \frac{700}{3}$ hours.

5. Initially, amount of alcohol = 30% of 800 ml = 240 ml. Suppose x ml of alcohol is required to be added.

Then
$$(800 + x) \times \frac{64}{100} = x + 240$$

 $x = \frac{272 \times 100}{36} = 755.6 ml$

6. Let B's salary be X. Thus A's salary $=\frac{3x}{2}$

3.

7. Let the greater number be x and smaller number be y According to the question, x + y = 75(i) And 20% of x= 30% of y Or 2x = 3y(ii) From equation (i) and (ii), we get $\frac{3y}{2} + y = 75$ 5y = 150y = 30, x = 45, Greater number is 90.

- 9. Let the population of the city be 'x' Net increase in the population of the city $= \left(4 - \frac{1}{2}\right)\% = \frac{7}{2}\%$ Population after three years $= \left(1 + \frac{7}{200}\right)^3 \times = 1.1087x$ Increase in the population = 1.1087x - x = 0.1087x \therefore Percentage of increase in population of the city $= \frac{0.1087x}{x} \times 100 = 10.87\%$
- **10.** Number of male in the society = 20% of 2500 = 500 Number of female in the society = 2500 - 500 = 2000