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## PERCENTAGE

## Formulae:

(1) If any number is divided by 100 then it is called a percentage. It is denoted by radical $\quad$ sign $\% . \Rightarrow \mathrm{x} \%=\frac{x}{100}$
. To get the fractional or decimal equivalent to a percentage divide the given number with 100 .
(2) If a number is increased by $x \%$ then the value after increase is given by

$$
\text { New Value }(\mathrm{N} . \mathrm{V})=(100+\mathrm{x}) \% \times \text { Original Value }(\mathrm{O} . \mathrm{V})
$$

(3) If a number is successfully increased by $x \%, y \%$ and $z \%$ respectively, then the final value is given by

Final Value $(F . V)=(100+x) \% \times(100+y) \% \times(100+z) \% \times$ Initial Value (I.V)
(4) If a number is decreased or reduced by $x \%$ the value after reduction is given by New Value (N.V) $=(100-x) \% \times$ Original Value (O.V)
(5) If a number is successively decreased by $x \%, y \%$ and $z \%$ respectively then the final value (F.V) is given by

Final Value $(F . V)=(100-x) \% \times(100-y) \% \times(100-z) \% \times$ Initial Value $(I . V)$
(6) If there are two different values (one is greater and the other is smaller) then the greater
value is more than the smaller one in terms of percentage is given by

$$
\% \text { More }=\frac{\text { Difference of two values }}{\text { SmallerValue }} \times 100
$$

(7) In the above case the smaller one less than the greater one in terms of the percentage is given by

$$
\% \text { Less }=\frac{\text { Difference of two values }}{\text { GreaterValue }} \times 100
$$

## PROBLEMS

1. The sum of $18 \%$ of a number and $6 \%$ of the same number is 492 . What is $12 \%$ of that number?
1) 234
2) 242
3) 256
4) 264
5) None of these

ANSWER: 5
Sum of $18 \%$ and $6 \%=18 \%+6 \%=24 \%$
$\Rightarrow 24 \% \longrightarrow 492$ $12 \% \longrightarrow$ ? $=\frac{492 \times 12 \%}{24 \%}=246$

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2. In an examination it is required to get $65 \%$ of the aggregate marks to pass. A student gets 522 marks and is declared failed by $7 \%$ marks. What are the maximum aggregate marks a student can get?
1) 850
2) 780
3) 900
4) Can't be determined
5) None of these

ANSWER: 3
Pass marks of the examination $=65 \%$
Student failed by $7 \%$, so marks secured by student $=65 \%-7 \%=58 \%$
$\Rightarrow 58 \% \longrightarrow 522$
$\therefore 100 \% \longrightarrow$ ? $=\frac{522 \times 100 \%}{58 \%}=\frac{522 \times 100}{58}=900$
3. In a test, minimum passing percentage for girls and boys is $30 \%$ and $45 \%$ respectively. A boy scored 280 marks and failed by 80 marks. How many more marks did a girl require to pass in the test if she scored 108 marks?

1) 132
2) 140
3) 160
4) 112
5) None of these

ANSWER: 4
Boy gets 280 and fails by 80 marks.
. Pass marks of boys $=280+80=360$
$\Rightarrow 45 \% \longrightarrow 360$
$\therefore 30 \% \longrightarrow \frac{360 \times 30 \%}{45 \%}=240$
So a girl gets 108 , she fails by $240-108=112$
4. Twenty five per cent of Pranab's annual salary is equal to eighty per cent of Surya's annual salary. Surya's monthly salary is forty per cent of Dheeru's monthly salary. If Dheeru's annual salary Is ‘6 lacs. What is the Pranab's monthly salary? (At some places annual income and in some places monthly income is given.)

1) ` 7.68 lakhs
2) ` 56,000
3) ` 8.4 lakhs
4) ` 64,000
5) None of these

## ANSWER: 4

Dheeru's monthly salary $=\frac{6,00,000}{12}=50,000$
: Surya's monthly salary $=\frac{40}{100} \times 50,000=20,000$
$\Rightarrow 25 \%$ of Pranab's monthly salary $=\frac{80}{100} \times 20,000=16,000$
: Pranab's monthly salary $=\frac{16,000}{25 \%}=\frac{16,000 \times 100}{25}=64,000$
5. When $30 \%$ of one number is subtracted from another number, the second number reduces to its own four-fifth. What is the ratio between the first and the second numbers respectively?

1) $4: 7$
2) $3: 2$
3) $2: 5$
4) Cannot be determined
5) None of these

ANSWER: 5

Let $x$ and $y$ be the two numbers then

$$
\begin{aligned}
& \mathrm{y}-30 \% x=\frac{4}{5} \mathrm{y} \\
& \Rightarrow \mathrm{y}-\frac{4}{5} \mathrm{y}=30 \% x \\
& \therefore \frac{y}{5}=\frac{30 x}{100} \\
& \therefore \frac{x}{y}=\frac{100}{5 \times 30}=\frac{2}{3} \\
& \Rightarrow x: \mathrm{y}=2: 3
\end{aligned}
$$

6. In a school there are 800 students out of whom 45 per cent are girls. Monthly fee of each boy is ` 600 and monthly fee of each girl is 30 per cent less than each boy. What is the total monthly fee of girls and boys together?
1) ` $4,25,400$
2) ` $4,14,600$
3) ` $4,19,600$
4) $` 4,23,400$
5) None of these

ANSWER: 5
Number of girls $=\frac{45}{100} \times 800=360$
$\therefore$ Number of boys $=800-360=440$
Monthly fee of each boy $=600$
Monthly fee of each girl $=\left(\frac{100-30}{100}\right) \times 600=420$
Total fee of boys and girls $=360 \times 420+440 \times 600$

$$
\begin{aligned}
& =151200+26400 \\
& =415200
\end{aligned}
$$

7. Ajay spends 25 per cent of his salary on house rent, 5 per cent on food, 15 per cent on travel, 10 per cent on clothes and the remaining amount of ` 27,000 is saved. What is Ajay's income?
1) ${ }^{`} 60,000$
2) ${ }^{`} 80,500$
3) ` 60,700
4) ` 70,500
5) None of
these
ANSWER: 1
Ajay's total income be $100 \%$

$$
\text { His total expenditure }=25 \%+5 \%+15 \%+10 \%=55 \%
$$

$$
\Rightarrow \text { Savings }=100 \%-55 \%=45 \%
$$

$$
\therefore 45 \% \longrightarrow 27,000
$$

$$
100 \% \longrightarrow ?=\frac{27000 \times 100}{45}=60,000
$$

8. If the numerator of a fraction is increased by $200 \%$ and the denominator of the fraction is increased by $120 \%$, the resultant fraction is $\frac{9}{11}$. What is the original fraction?
1) $\frac{2}{5}$
2) $\frac{4}{5}$
3) $\frac{1}{5}$
4) $\frac{3}{5}$
5) None of these

ANSWER: 4
Let $\frac{p}{q}$ be the original fraction.
If numerator is increased by $200 \%$ then its value $=(100+200) \% \times p=300 \% \mathrm{p}$ If denominator is increased by $120 \%$ then its value $=(100+120) \% \times q=220 \% q$
$\therefore \frac{300 \% p}{220 \% q}=\frac{9}{11}$
$\Rightarrow \frac{p}{q}=\frac{9}{11} \times \frac{220}{300}=\frac{9}{15}=\frac{3}{5}$
9. When the price of eggs is reduced by $20 \%$, it enables a man to buy 20 more eggs for ` 40 . The reduced price per egg is:

1) 35 paise
2) 40 paise
3) 50 paise
4) 56 paise
5) None of these

ANSWER: 2
Saving due to reduction $=\frac{20}{100} \times 40=8$
So the sum of ' 8 enables the man to purchase 20 more eggs at the reduced price (R.P)
$\therefore$ Reduced price per egg $=\frac{8}{20}={ }^{`} 0.4=40$ paise
10. The price of sugar is increased by $25 \%$. If a family wants to keep its expenses on sugar unaltered, then the family will have to reduce the consumption of sugar by:

1) $20 \%$
2) $21 \%$
3) $22 \%$
4) $25 \%$
5) None of these

## ANSWER: 1

Initial price be `100 and consumption be 100 kg \(\therefore\) Total expense \(=100 \times 100=10,000\) New price \(=100+25=125\) But new expenditure \(=10,000\) : New consumption \(=\frac{10,000}{125}=80\) So consumption of sugar reduced by \(100-80=20 \%\) 11. The salary of a man increases by \(20 \%\) every year in the month of January. His salary was` 5,000 in the month of February in year 2009. What will be his salary in the month of February in the year 2011?

1) ` 7,200
2) ` 6,200
3) ` 7,800
4) ` 6,800
5) None of these

## ANSWER: 1

From February 2009 to February 2011 the salary increases two times in January 2010 and in January 2011 respectively.

Salary in Feb 2009 = 5000
$\therefore$ Salary in Feb $2011=5000 \times\left(\frac{100+20}{100}\right) \times\left(\frac{100+20}{100}\right)$

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$$
=5000 \times \frac{120}{100} \times \frac{120}{100}=7200
$$

12. In a group of students, $70 \%$ can speak English and $65 \%$ can speak Hindi. If $27 \%$ of the students can speak none of the two languages, then what per cent of the group can speak both the languages?
1) $38 \%$
2) $62 \%$
3) $28 \%$
4) $23 \%$
5) None of these

ANSWER: 2
27\% students speak neither of the languages.
$\Rightarrow$ Number of students speaking either of the languages $=100 \%-22 \%=73 \%$
$\therefore \mathrm{n}(\mathrm{E} \cup \mathrm{H})=73 \% \quad \mathrm{n}(\mathrm{E})=70 \%$
$n(H)=65 \%$
$\mathrm{n}(\mathrm{E} \cap \mathrm{H})=$ ?

But $n(E \cup H)=n(E)+n(H)-n(E \cap H)$
$73=70+65-\mathrm{n}(\mathrm{E} \cap \mathrm{H})$
$\Rightarrow \mathrm{n}(\mathrm{E} \cap \mathrm{H})=135-73=62$


