

# MATHEMATICS

MATHEMATICS IS NOT ONLY  
FOR SOLVING NUMBERS.  
IT'S ALSO FOR  
DIVIDING SORROW,  
SUBTRACTING SADNESS,  
ADDING HAPPINESS AND  
MULTIPLYING  
LOVE AND FORGIVENESS.

I HATE MATH....  
BUT I LOVE  
COUNTING MY  
MONEY.



Math may not  
teach me how to  
add love or  
subtract hate, but  
it gives me every  
reason to hope  
that every  
problem has a  
solution.

Quotesling.net

# MATH

## Recruiter thinks

M : Mental

A : Ability

T : To

H : Hire someone

## Student thinks

M : Mental

A : Ability

T : To

H : Harass someone

# Percentage



# What are Percentages?

The word percent means

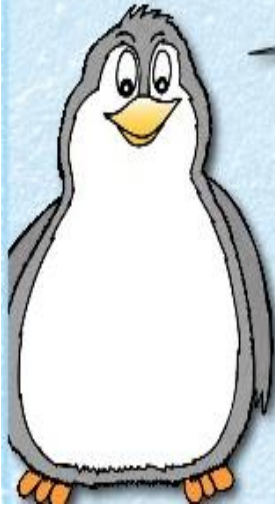
**out of 100.**

We use this sign to show percentages.  $\rightarrow \%$

So, 40% means 40 out of 100.

We can also write this as a fraction.  $\rightarrow \frac{40}{100}$

Can you think of any other words with cent in them?



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$$20\% = \frac{20}{100} = .2 = \frac{1}{5} = \frac{4}{20}$$

If ratio is same then percentage remains same.

Total quantity or number (in its own) is always 100%.

In cricket Batsman's *strike rate* is runs scored per 100 balls and per 100 means percentage.

Example: If a batsman scores 100 runs on 100 balls means his strike rate is 100(100%).

If a batsman scores 20 runs on 20 balls means his strike rate is 100(100%).

### Need of %

Suppose there are 2 friends A & B

Who is better?: A got 75 marks and B got 45

$\frac{45}{60}$		$\frac{75}{100}$
$\frac{45}{50}$		$\frac{75}{100}$
$\frac{45}{100}$		$\frac{75}{100}$

Percentage gives idea about **QUALITY** and NOT **QUANTITY**.

Percentage to Number	Number to Percentage
Divide by 100	Multiply by 100
$20\% = \frac{20}{100}$	$1.2 = 1.2 \times 100 = 120\%$

Find the value of

(i) 14.28% of 735

(ii) 9.09% of 385

# Percentage Fraction relationship

**Percentage - Fraction Table**

1	100%											
2	50%	100%										
3	33.33%	66.66%	100%									
4	25%	50%	75%	100%								
5	20%	40%	60%	80%	100%							
6	16.66%	33.33%	50%	66.66%	83.33%	100%						
7	14.28%	28.57%	42.85%	57.14%	71.42%	85.71%	100%					
8	12.50%	25.00%	37.50%	50%	62.50%	75%	87.50%	100%				
9	11.11%	22.22%	33.33%	44.44%	55.55%	66.66%	77.77%	88.88%	100%			
10	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%		
11	9.09%	18.18%	27.27%	36.36%	45.45%	54.54%	63.63%	72.72%	81.81%	90.90%	100%	
D N	1	2	3	4	5	6	7	8	9	10	11	

$$\frac{1}{7} = 14.2857\% = 0.\overline{142857},$$

$$\frac{2}{7} = 28.5714\% = 0.\overline{285714}$$

$$\frac{3}{7} = 42.8571\% = 0.\overline{428571} \text{ and so on.}$$

$\frac{1}{2} = 0.5$	$\frac{1}{5} = 0.2$
$\frac{1}{4} = 0.25$	$\frac{1}{25} = 0.04$
$\frac{1}{8} = 0.125$	$\frac{1}{125} = 0.008$

$10\% = \frac{1}{10}$	$1\% = \frac{1}{100}$
10% of 250 =	1% of 200 =
10% of 72 =	1% of 680 =
10% of 8.6 =	1% of 9.2 =



There are 3 types of questions:

$$1. A\% \text{ of } B = \frac{A \times B}{100}$$

$$30\% \text{ of } 80 =$$

$$6\% \text{ of } 400 =$$

$$42.84\% \text{ of } 196 =$$

Ans 24, 24, 84

Anant got 30% of the maximum marks and failed by 10 marks. If maximum marks are 150 then find passing marks?

Soln:  $30\% \text{ of } 150 + 10 = \text{pass marks}$

$$45 + 10 = 55$$

2. A is what % of B =  $\frac{A}{B} \times 100$

10 is what % of 40?

26 is what % of 117?

45 is what % of 120?

Price of an Iphone in a sale was \$200, which is 20% of Aman's pocket money.  
Aman's pocket Money is:

Ans: 25, 22.22, 37.5, 1000

3. % Change (More than /Less than)

$$A \text{ is what \% less or more than } B = \frac{|A-B|}{B} \times 100\%$$

$$A = 70 \qquad B = 90$$

A is what % less than B =

B is what % more than A =

Ans 22.22, 28.56

$$\text{Percentage Change} = \frac{\text{Change}}{\text{IV}} \times 100 = \frac{\text{FV}-\text{IV}}{\text{IV}} \times 100$$

In the following table number of cars sold by different companies in different years is given:

Example: In 2005 MARUTI sold 120 cars.

	2005	2006	2007
MARUTI	120	175	200
SKODA	160	250	450
TATA	140	380	200

%change in the sales of MARUTI from 2005 to 2007

Alpha earns \$8000 and Beta earns 25% more than Alpha. Find salary of Beta?

Soln:  $8000 + 25\% 8000 = 8000 + 2000 = 10000$

### MULTIPLYING FACTOR(MF)

$$MF = (1 \pm \%)$$

For increase

$$MF = (1 + \%)$$

For decrease

$$MF = (1 - \%)$$

$$MF \text{ for } +30\% =$$

$$MF \text{ for } +200\% =$$

$$MF \text{ for } +5\% =$$

$$MF \text{ for } -67\% =$$

$$MF \text{ for } -7\% =$$

$$MF \text{ for } -98\% =$$

$$MF \text{ for } +340\% =$$

Percentage	MF
+30%	$1+0.3 = 1.3$
+200%	$1+2 = 3$
+340%	$1+3.4 = 4.4$
-98%	$1-0.98 = 0.02$
-7%	$1-0.07 = 0.93$
-67%	$1-0.67 = 0.33$
+5%	$1+0.05 = 1.05$
+800%	$1+8 = 9$
-59%	$1-0.59 = 0.41$
+126%	$1+1.26=2.26$

When a positive number  $x$  is multiplied by the same number then resulting number is what percent more than the original number.

- (A)  $(x-1) \%$     (B)  $(x-1) \times 100\%$     (C)  $(x+1) \%$     (D)  $(x+1) \times 100\%$

$$\text{Soln IV} = x, \text{FV} = x^2$$

$$\text{MF} = \frac{\text{FV}}{\text{IV}} = \frac{x^2}{x} = x = \{1+(x-1)\}$$

$$\text{Percentage increase} = (x-1)100\%$$

Price of an Article is \$50 in January. In the month of February it becomes 1.2 times of itself. Find percentage Increase?

Soln:  $FV = IV \times 1.2$

Here,  $MF = 1.2 = 1 + .2$ , implies 20% increase.

Salary of A becomes  $\frac{9}{8}$  times of his previous salary. By how much percent his salary has been increased?

Soln:  $FV = IV \times \frac{9}{8}$

Here,  $MF = \frac{9}{8} = 1 + \frac{1}{8}$

Therefore, increase is 12.5%.

## Successive Percentage

If radius of a circle increases by 40% then what is the % change in the Circumference and area of the circle?

Soln (i) Circumference =  $2\pi r$

Therefore, 40%

(ii). AREA =  $\pi R^2 = \pi \times R \times R = \pi \times 1.4 \times 1.4 = 1.96\pi$

MF = 1.96 = 1+.96, implies 96% increase.



Q. The rate of inflation in country is 100 % p.a.. Cost of an Article is 6\$ now then what will be the cost of the article two year from now?  
(Inflation means general increase in Price level)

Soln:  $IV \times MF_1 \times MF_2 = FV$

$$FV = 6 \times (1+1) \times (1+1) = 24$$

## Quant Comparison

Q.

Quantity A

x% of y% of z

Quantity B

y% of z% of x

Soln:

$$\text{Quantity A} = \frac{x}{100} \times \frac{y}{100} \times z \quad \text{and} \quad \text{Quantity B} = \frac{y}{100} \times \frac{z}{100} \times x$$

Ans C

Q.

Quantity A

19.9% of 85

Quantity B

17

Solution: 20% of 85 =  $2 \times 8.5 = 17$

Ans B

If the price of petrol decreases by 25%, then by how much percent a user cut down his consumption so that his expenditure on petrol remains constant?

Soln: Expenditure = Quantity  $\times$  Rate

Let initial price = p, then final price =  $\left(1 - \frac{1}{4}\right)p = \frac{3}{4}p$

Let initial rate = r, then final r should be  $\frac{4}{3}r$

$$\frac{4}{3} \times \frac{3}{4} = 1$$

$$MF = \frac{4}{3} = 1 + \frac{1}{3}$$

$$\frac{1}{3} = 33.33\% \text{ increase}$$

Q.12% is what % less than 16%?

Percentage points: Difference between 2 percentage values.

16% is 4% points more than 12%.

**Note:** When a number is increased by  $x\%$  and then decreased by  $x\%$  then

$$\text{overall} = \frac{x^2}{100} \% \text{decrease}$$

In a cricket match India beat Australia by 2 runs. If Sachin scores  $22\frac{2}{9}\%$  of the total score of India then which of the following **can be** the score of India ?(Mark all the correct answers)

(A) 306 (B) 308 (C) 317 (D) 328 (E) 351 (F) 389

Soln: Sachin scored  $22\frac{2}{9}\%$  runs  $= \frac{2}{9} \times \text{Total runs}$

Total runs should be multiple of 9. Answer : (A) and (E)

1. What % is 1.25 of 10?
2. Alpha earns \$8000 and Beta earns 25% more than Alpha. Find salary of Beta?
3. Salary of Lisa, in the year 2020 is \$10000. Next year, it will increase by 200%. What will be her salary in 2021.
4. Price of an Iphone in a sale was \$200, which was 20% Of your pocket money. What is your pocket Money?
5. In a Class, there were 200 students. In 3rd lecture, 48 students moved to conference hall. What % of students are still in the class?
6. Anant got 30% of the maximum marks and failed by 10 marks. If maximum marks are 150 then find passing marks?
7. In a class 40% are boys and remaining are girls. Among boys 20% passed the exam and among girls 40% passed the exam. What is the pass percentage of entire class?
8. Price of an Article is \$50 in January. In the month of February it becomes 1.2 times of itself. Find percentage Increase?
9. Stock value of Prakash is 0.92 times of Hiren then stock value of Prakash is what percent less than that of Hiren?
10. Salary of A becomes  $\frac{9}{8}$  times of his previous salary. By how much percent his salary has been increased?
11. When someone increases salary of Hitesh by 83.33 % then it becomes 121k then find the original salary of Hitesh?

**12.** Donut company increases his production each month by 100 count. In the Month of January 2020, the production was 800k. In which month of the year 2020, percentage increase in production will be lowest?

**13.** 12% is what % less than 16%?

**14.** Akshay and Anand have their salary in the ratio of 5:8 then Anand's salary is what percent more than that of Akshay?

**15.** Amit has 12.5% share value less than Bhavesh, then Bhavesh's share value is what percent more than that of Amit?

**16.** If the price of petrol increases by 25%, then by how much percent a user cut down his consumption so that his expenditure on petrol remains constant?

**17.** From 1998 to 1999 the percentage increase in male population was 20% and from 1999 to 2000 it decreases by 10% and Male population of a city in year 2000 is 1.08 million. Then what was the male population of the city in 1998?

**18.** The rate of inflation in country is 100 % p.a.. Cost of an Article is 6\$ now then what will be the cost of the article two year from now?  
(Inflation means general increase in Price level)

**19.** If radius of a circle increases by 40% then what is the % change in the Circumference and area of the circle?

**20.** In a car showroom 20% of the cars are red, 25% of the remaining are blue and the rest are black. If there are 720 black car in the showroom then find the total number of cars in the showroom?

**21.** When a positive number  $x$  is multiplied by the same number then resulting number is what percent more than the original number.

(A)  $(x-1) \%$  (B)  $(x-1) * 100\%$  (C)  $(x+1) \%$  (D)  $(x+1) * 100\%$

**22.** If 400 is increased by 20%, and then reduced by  $y\%$ , yielding 432 then find  $y$ ?

**23.** In a cricket match India beat Australia by 2 runs. If Sachin scores

$22\frac{2}{9}\%$  of the total score of India then which of the following can be the score of India?(Mark all the correct answers)

(A) 306 (B) 308 (C) 317 (D) 328 (E) 351 (F) 389

**24.** Quantity A

Quantity B

$x\%$  of  $y\%$  of  $z$

$y\%$  of  $z\%$  of  $x$

**25.** Quantity A

Quantity B

19.9% of 85

17

### Class Sheet (Answer Key)

#### Percentages

12.5	10K	30K	1000	76
55	32	20	8	12.5
66K	December	25	60	14.28
20	1mn	24	40%; 96%	1200
B	10	A, E	C	B