SNS COLLEGE OF TECHNOLOGY

Coimbatore-35

An Autonomous Institution

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Approved by AICTE, New Delhi & Affiliated to Anna University, Chennai

DEPARTMENT OF MECHATRONICS ENGINEERING

19GET275 - VQAR – I

UNIT 1 – QUANTITATIVE ABILITY I

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VERBAL QUANTITATIVE APTITUDE & REASONING

UNIT 1 - QUANTITATIVE ABILITY I

- **Number theory-** Shortcuts, Divisibility rule- Unit place deduction-LCM &HCF, Square root and Cube Root, Decimal & Fraction
- Percentage, Profit, loss and discount, Simple and compound interest, Ratio & Proportions, Mixtures & Allegation, Partnership.

UNIT 2 - QUANTITATIVE ABILITY II

- Problems on **Ages**, **Average**, **Clocks** & **Calendar**.
- **Data Interpretation**- **Bar chart**- **Pie chart**- **Line chart**-**Tables chart**.

UNIT 3 - VERBAL REASONING I

- **Analytical reasoning**– Linear and circular arrangement, Blood relation, Direction Problems, Puzzles.
- **Logical reasoning** - Number and Alpha series, Odd man out, Element series and Logical series, Coding and decoding, Analogy, Classification, Logical sequence of words.

VERBAL QUANTITATIVE APTITUDE & REASONING

UNIT 4 - LINGUISTICS SKILLS I

- Parts of Speech- Noun, Verb, Participle, Articles, Pronoun, Preposition, Adverb, Conjunction. Logical sequence of words, Tense & Voice, Comparison

UNIT 5 - LINGUISTICS SKILLS II

- Comprehension - Comprehend and understand a paragraph, Paragraph writing. .

QUANTITATIVE APTITUDE & REASONING

QUANTITATIVE

"capable of being measured
or
expressed in numerical terms"

REASONING

"Thinking about
something in a logical way in order to
form a conclusion or judgment"

APTITUDE

"Skill which reflects your level of Intellect"

NUMBER THEORY

"Mathematics is the queen of the sciences, and number theory is the queen of mathematics.“

Because of the fundamental nature of the integers in mathematics.

Introduction

"Number theory is the study of properties of the integers."

An *integer* is a number that does not have a fractional part. The set of integers is,

$$\mathbb{Z} = \{\cdots -4, -3, -2, -1, 0, 1, 2, 3, 4 \ldots\}.$$

- The notation Z for the set of integers comes from the German word *Zahlen*, which means "numbers".
- Integers strictly larger than zero are **positive integers** and integers strictly less than zero are **negative integers**.

For example, 222, 676767, 000, and −13-13−13 are all integers (2 and 67 are positive integers and -13 is a negative integer).

Number Theory Cont,,

- The number theory helps discover interesting relationships between different sorts of numbers and to prove that these are true.
- Number Theory is partly experimental and partly theoretical. Experimental part leads to questions and suggests ways to answer them.
- The theoretical part tries to devise an argument which gives a conclusive answer to the questions.

Number Theory - steps to follow,

- Accumulate numerical data
- Examine the data and find the patterns and relationships.
- Formulate conjectures that explain the patterns and relationships.
- Test the conjectures by collecting additional data and check whether the new information fits or not
- Devise an argument that conjectures are correct.

All the steps are important in number theory and in mathematics. A scientific theory is an ability to predict the outcome of experiments. In mathematics one requires the step of a proof, that is, a logical sequence of assertions, starting from known facts and ending at the desired statement.

Number Theory - Tips & Tricks,

1.Sum of natural numbers from 1 to n

$$\frac{n(n+1)}{2}$$

e.g Sum of natural numbers from 1 to 40 = 40(40+1)/2 = 820

2. Sum of squares of first n natural numbers is =

$$\frac{n(n+1)(2n+1)}{6}$$

3. Sum of the squares of first n even natural numbers is

$$\frac{2}{3}n(n+1)(2n+1)$$

4. Sum of cubes of first n natural numbers is

$$\left[\frac{n(n+1)}{2}\right]^2$$

5. Any number N can be represented in the decimal system of number as

$$N = n_k 10^k + n_{k-1} 10^{k-1} + n \ldots + n_i 10 + n_0$$

DIVISIBILTY RULE

“the capacity of being evenly divided, without remainder”

Lets Discuss a Case,

"You having 25 pieces of candy to share with your 6 friends"

You divide the number of pieces of candy by the number of friends to solve the problem.

25 / 6 = 4 remainder 1

It gives each friend gets 4 and remainder 1

In other words,

25 = 6 * 4 + 1

dividend divisor quotient remainder

It states that for any integer *a* and any positive integer *b*, there exists unique integers *q* and *r* such that

***a* = *bq* + r**,

where *r* is greater than or equal to 0 and less than *b*.

DIVISIBILITY RULE

- A divisibility rule is a heuristic for determining whether a positive integer can be evenly divided by another (i.e. there is no remainder left over).
- For example, determining if a number is even is as simple as checking to see if its last digit is 2, 4, 6, 8 or 0.
- Multiple divisibility rules applied to the same number in this way can help quickly determine its prime factorization without having to guess at its prime factors.

DIVISIBILITY RULE

- A number is divisible by 2 if it is an even number.
- A number is divisible by 3 if the sum of the digits is divisible by 3.
- A number is divisible by 4 if the number formed by the last two digits is divisible by 4
- A number is divisible by 5 if the units digit is either 5 or 0.
- A number is divisible by 6 if the number is divisible by both 2 and 3
- A number is divisible by 8 if the number formed by the last three digits is divisible by 8.
- A number is divisible by 9 if the sum of the digits is divisible by 9.
- A number is divisible by 10 if the units digit is 0.
- A number is divisible by 11 if the difference of the sum of its digits at odd places and the sum of its digits at even places should be zero or a multiple of 11.
- 12 if N is divisible by both 3 and 4

DIVISIBILITY RULE - EXAMPLE

Without performing actual division, show that the number below is an integer

$$\frac{1,481,481,468}{12}.$$

- From the divisibility rules, we know that a number is divisible by 12 if it is divisible by both 3 and 4. Therefore, we just need to check that 1,481,481,468 is divisible by 3 and 4.
- Applying the divisibility test for 3, we get that 1+4+8+1+4+8+1+4+6+8=45,1+4+8+1+4+8+1+4+6+8=45,1+4+8+1+4+8+1+4+6+8=45, which is divisible by 3. Hence 1,481,481,468 is divisible by 3.
- Applying the divisibility test for 4, we get that the last two digits, 68, is divisible by 4. Hence 1,481,481,468 is also divisible by 4.
- Now, since we know that 1,481,481,468 is divisible by both 3 and 4, it is divisible by 12. Therefore it is an Integer.

DIVISIBILITY RULE

Divisibility Rule for 2

- A number is divisible by 2 if it is an even number (0, 2, 4, 6, 8).

Example: 123456, 208, 304…

Divisibility Rule for 3

- A number is divisible by 3 if the sum of the digits is divisible by 3.

Example :- 1731

1+7+3+1=12, which is exactly divisible by 3.

Divisibility Rule for 4

- A number is divisible by 4 if the number formed by the last two digits is divisible by 4

Example: 31428, 44300

DIVISIBILITY RULE

Divisibility Rule for 5

- A number is divisible by 5 if the last digit is either 5 or 0.

Example: 400, 405, 1055

Divisibility Rule for 6

- A number is divisible by 6 if the number is divisible by both 2 and 3

Example: 216

- The given number is even number, so it is divisible by 2
- And the sum of the digits is 2+1+6 =9, which is multiple of 3. – Hence, it is divisible by 6.

DIVISIBILITY RULE

Divisibility Rule for 7

Step 1: Take Last number and multiply by 2

Step 2: Product of Step 1 must be subtracted from the left over number

Step 3: If the answer is divisible by 7 (including 0), then the number is also divisible by 7. Continue this until you get a one-digit number. The result is 7, 0, or -7, if and only if the original number is a multiple of 7.

Example, 371

37 1×2 = 2

-2

35

35 is divisible by 7. The given number 371 is divisible by 7.

DIVISIBILITY RULE

Divisibility Rule for 8

- If the number formed by the last three digits is divisible by 8

Example : 312512 - 512 is 8 cube, 54240 - 240 is divisible by 8**, 352322 - 322 not divisible by 8**

Divisibility Rule for 9

- A number is divisible by 9 if the sum of the digits is divisible by 9.

Example: 172845 - 1+7+2+8+4+5 =27 which is a multiple of 9. So, the number 172845 is also divisible by 9.

Divisibility Rule for 10

- A number is divisible by 10 if the units digit is 0.

Example: 172840, 240, 350.

DIVISIBILITY RULE

Divisibility Rule for 11

- A number is divisible by 11 if the difference of the sum of its digits at odd places and the sum of its digits at even places should be zero or a multiple of 11.

Example 1: 14641

(Sum of digits at odd places) – (sum of digits at even places)

(1 + 6 + 1) - (4 + 4) = 0, The difference is 0, the number 14641 is exactly divisible by 11

Example 2: 4832718

(Sum of digits at odd places) – (sum of digits at even places)

(8 + 7 + 3 + 4) - (1 + 2 + 8) = 11 which is divisible by 11.

DIVISIBILITY RULE

Divisibility Rule for 12

- 12 if N is divisible by both 3 and 4

Example: 1752

Divisible by 3,

the sum of the digits is 1+7+5+2=15 . 15 is multiple of 3, so the number is divisible by 3.

Divisible by 4,

1752, last 2 digits 52 exactly divisible by 4, so the number is divisible by 4

- So the number 1752 is divisible by both 3 and 4, the number is divisible by 12

DIVISIBILITY RULE

Divisibility Rule for 13

- Take the last digit of the number, multiply it by 4, and
- Add the product to the rest of the number.
- If the answer is divisible by 13, then the number is also divisible by 13. Continue this until you get a two-digit number. The result is multiple of 13, if and only if the original number is a multiple of 13

Example 1: 2743 - 2743 (3x4=12)➡ 274+12 = 286 ➡ (6x4=24) ➡ 28+24=52

52 number is a multiple of 13**.**

DIVISIBILITY RULE – SAMPLE PROBLEMS

1)What is the smallest number that should be added to 27452 to make it exactly divisible by 9?

a)1 b)2 c)7 d)8 e)9

If a number is divisible by 9, then the sum of its digits must be a multiple of 9.

Here, 2+7+4+5+2=20, the next multiple of 9 is 27.

7 must be added to **27452** to make it divisible by 9.

Answer : C

DIVISIBILITY RULE – SAMPLE PROBLEMS

2)If 552x is a three-digit number with as a digit x. If the number is divisible by 6, What is the value of the digit x is?

a) 1 b) 2 c) 3 d) 4 e)6

- If a number is divisible by 6, it must be divisible by both 2 and 3
- In 552x, to this number be **divisible by 2**, the value of x must be even. So it can be 2,4 or 6 from given options
- 552x is **divisible by 3**, If the sum of its digits is a multiple of 3.
  5+5+2+x =12+x

If put x =2 , 12+2=14 not a multiple of 3
If put x =4 , 12+4=16 not a multiple of 3
If put x =6 , 12+6=18 is a multiple of 3
The value of x is 6.

Answer : E

DIVISIBILITY RULE – SAMPLE PROBLEMS

3) What is the least value of x such that 7648x is divisible by 11?

a) 1 b) 2 c) 3 d) 4 e)5

A number is **divisible by 11** when the difference between the sum of digits at even places and at odd places is 0 or multiple of 11

The given number is 7648x.

(Sum of digits at EVEN places) – (sum of digits at ODD places)=0

(6 + 8) - (X + 7 + 6) = 0

14 - (X + 13) = 0

Here the value of x must be 1.

So, the least value of x is 1.

Answer : A

DIVISIBILITY RULE – SAMPLE PROBLEMS

4) Find the least value of ‘x’ so that the number 73818x4 is divisible by 8

a)1 b) 2 c) 3 d) 4 e)6

- A number is exactly **divisible by 8**, then the last 3 digits of the numbers must be divided by 8.
- Here the last 3 digits are **8x4**.
- Put each value in given options in the place of x and check whether it is divisible by 8 or not.
- Option b, 824 which is exactly divisible by 8.

Answer : B

DIVISIBILITY RULE – SAMPLE PROBLEMS

5) If M183 is divisible by 11, find the value of the smallest natural number M?

a) 5 b) 6 c) 7 d) 9 e)8

- A number is divisible by 11 when the difference between the sum of digits at even places and at odd places is 0 or multiple of 11
- The given number is **M183.**
- (Sum of digits at EVEN places) – (sum of digits at ODD places)=0

(8 + M)- (3+1)= 0

(8 + M) - 4 = 0

Here the value of M must be 7.

Answer : C

LCM

“Least Common Multiple”

The smallest multiple that is common to

2 or more numbers.

Lets find,

LCM of 4 & 6

- List the Multiples of Both
- The smallest Number common to both Lists
- Is the **LCM**

Lets find,

LCM of 4 & 6

- Multiples of 4 : 4 8 12 16 20 24
- Multiples of 6 : 6 12 18 24

LCM of 4 & 6 is 12.

How to react with 3 Numbers,

- List the multiples of each Numbers
- **Find the Lowest value in all 3 Sets**

Lets find,

LCM of 3, 6 & 10

- Multiples of **3 :** 3 6 9 12 15 18 21 24 27 30
- Multiples of **6 :** 6 12 18 24 30
- Multiples of **10 :** 10 20 30

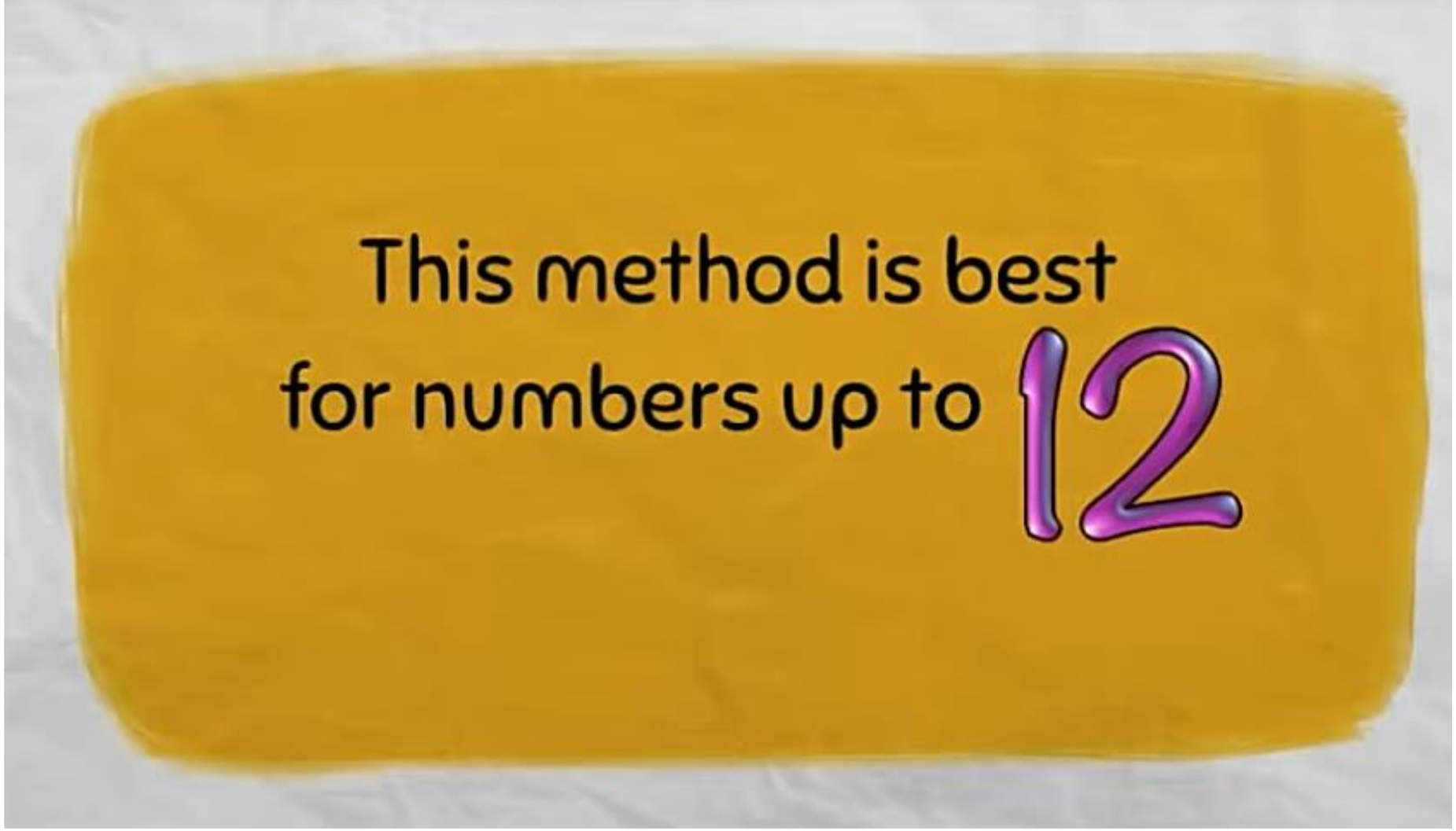
LCM of 3, 6 & 10 is 30.

Lets see one interesting thing,

LCM of 3 & 12 Where 3 is a multiple of 12.

- Multiples of 3 : 3 6 9 12
- Multiples of 12 : 12 24

LCM of 3 & 12 is 12.



Then How to Deal with Greater Number.....???

In general,

LCM of 12 & 32

- Multiples of 12 : 12 24 36 48 60 72 84 96 108
- Multiples of 32 : 32 64 96

LCM of 12 & 32 is 96.

“PRIME FACTORIZATION”

Lets see one interesting thing,

LCM of 12 & 32

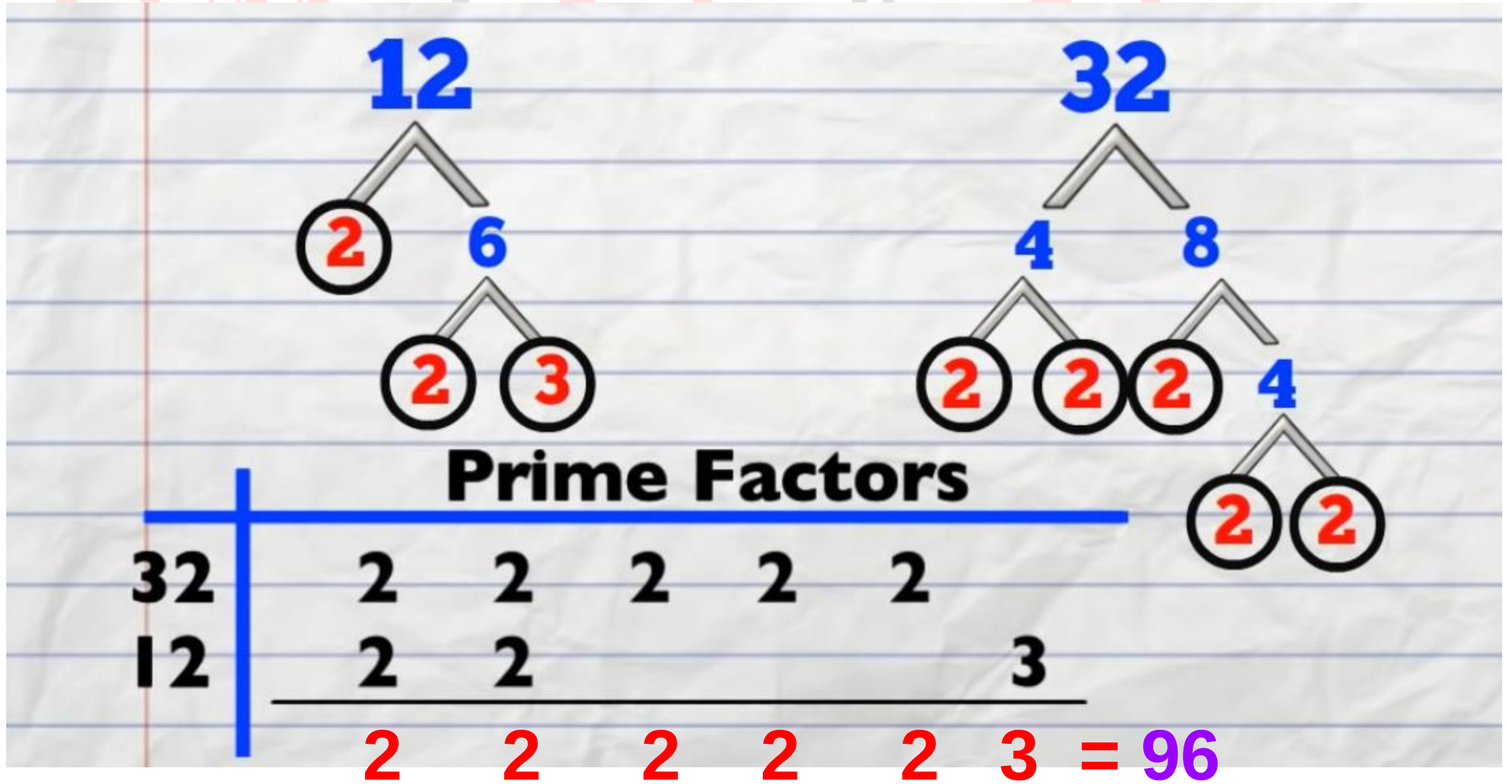
We try

"PRIME FACTORIZATION"

It Works For Any Number

Lets see one interesting thing,

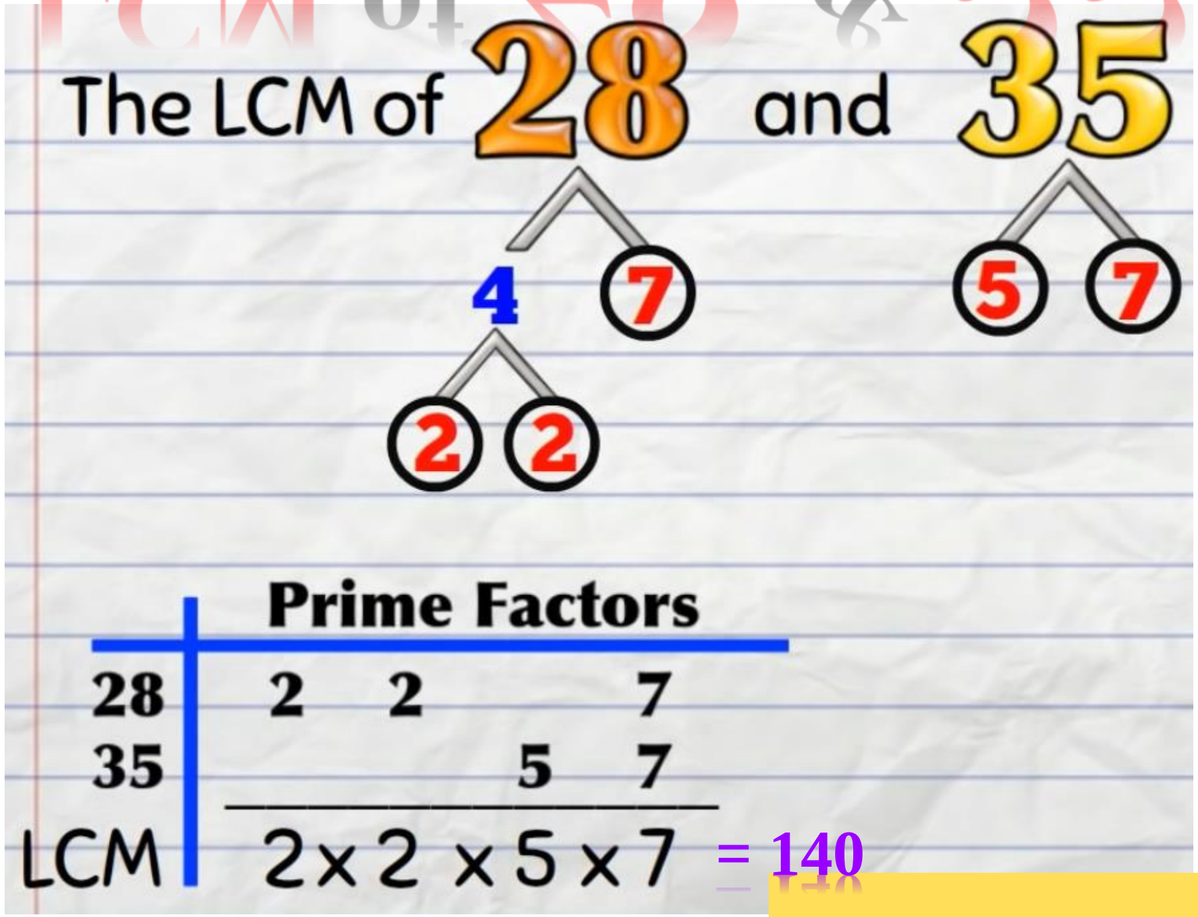
LCM of 12 & 32 is 96.



- Use One Factor from every column
- **Only One Factor from a vertical column**

Lets see one interesting thing,

LCM of 28 & 35 is 140.



- Match Factors Vertically.
- **Leave Space if No Match**

Remember...

THE MORE PRACTICE YOU DO

THE STRONGER YOUR MATH MUSCLES BECOME

SOLUTION VIDEO

GCF

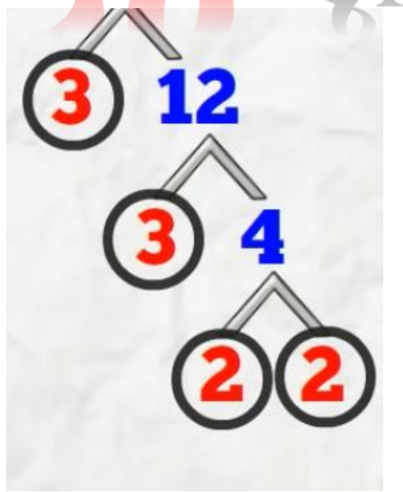
“Greatest Common Factor”

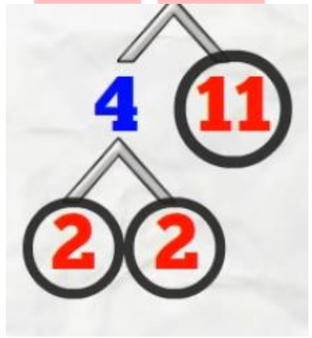
The Largest value that divides exactly

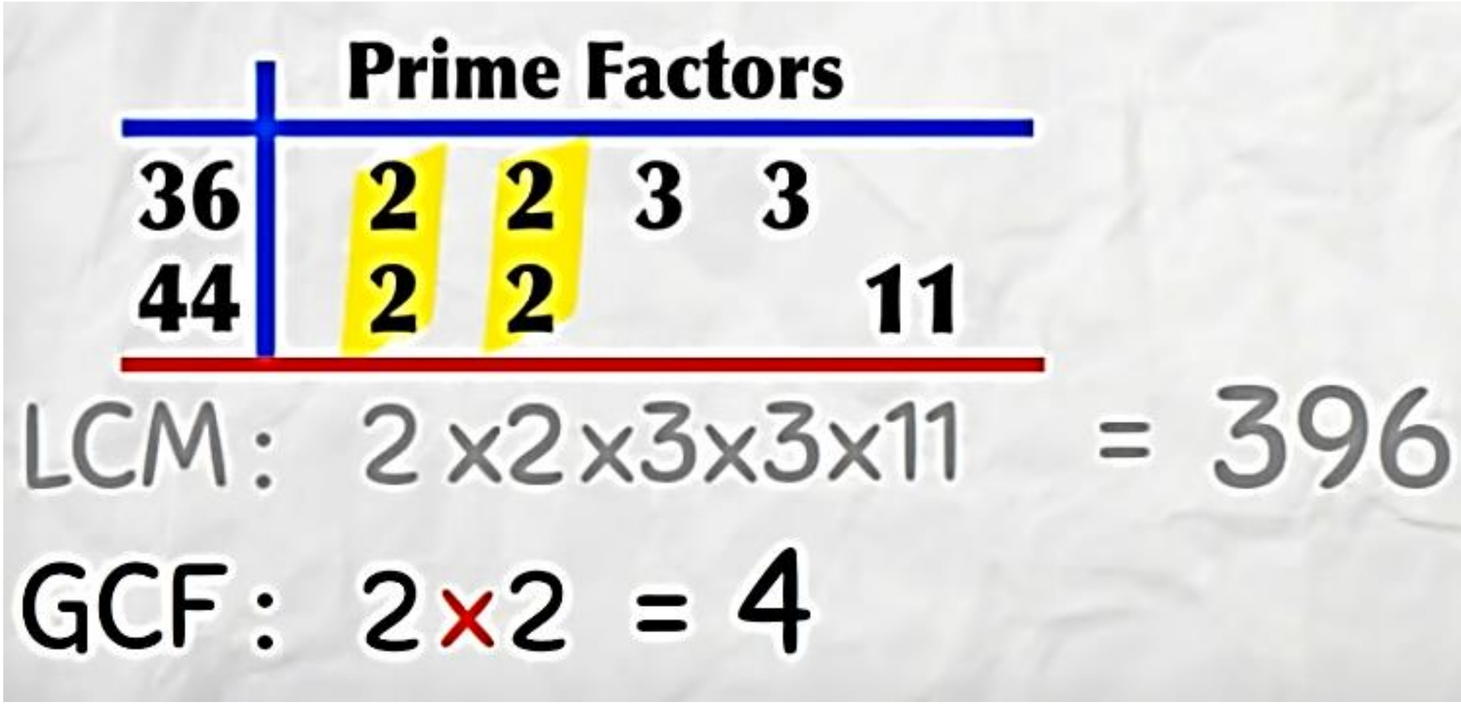
into 2 or more numbers.

Lets find LCM and GCF of

36 & 44







Lets find LCM and GCF of

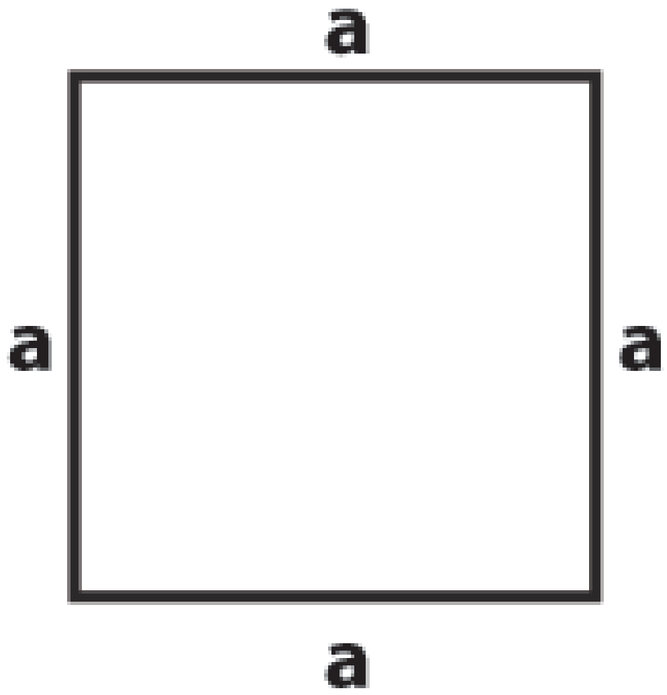
10 & 21

	Prime Factors		
10	2	5	
21		3	7

- If there is no common factor
- **GCF will be 1.**
- **Because every number has 1 as a factor.**

SQUARE

“four equal sides and four equal angles”

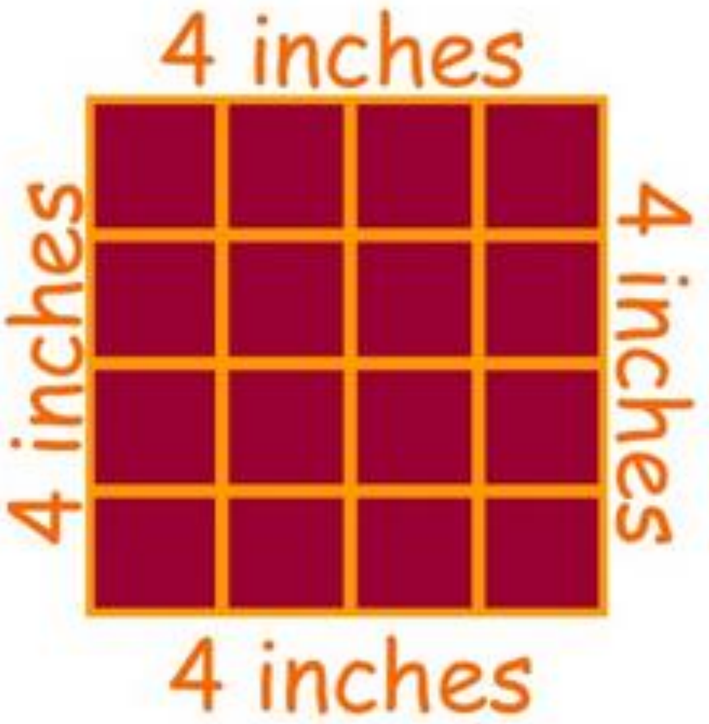


$$A = \text{base} \times \text{height}$$

If a square measures 4 inches on each side, how would you find its area?

$A = s^2$

s is the side length



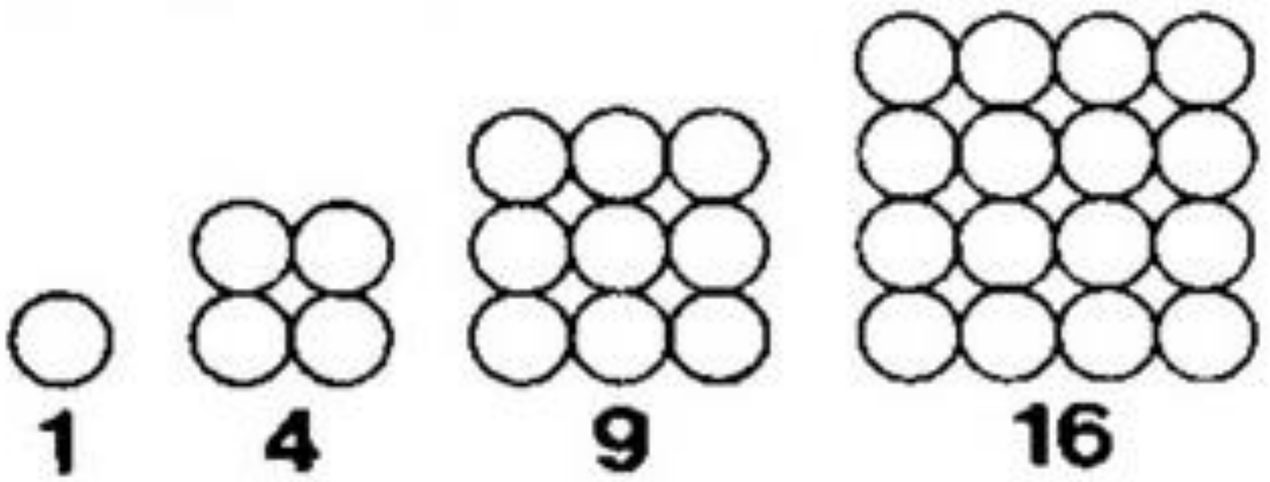
$A = l \cdot w$

$A = 4 \text{ in.} \cdot 4 \text{ in.}$

$A = 16 \text{ in.}^2$

SQUARE NUMBER

- Also called a “**perfect square**”
- A number that is the square of a whole number.
- Can be represented by arranging objects in a square.



Lets see Square Number
Multiplication Table

	1	2	3	4	5	6	7	8	9
1	1	2	3	4	5	6	7	8	9
2	2	4	6	8	10	12	14	16	18
3	3	6	9	12	15	18	21	24	27
4	4	8	12	16	20	24	28	32	36
5	5	10	15	20	25	30	35	40	45
6	6	12	18	24	30	36	42	48	54
7	7	14	21	28	35	42	49	56	63
8	8	16	24	32	40	48	56	64	72
9	9	18	27	36	45	54	63	72	81

To Square a Number means to multiply that number by itself,

“5 Square means 5x5”

There is a shorter way to write 5x5

Exponent

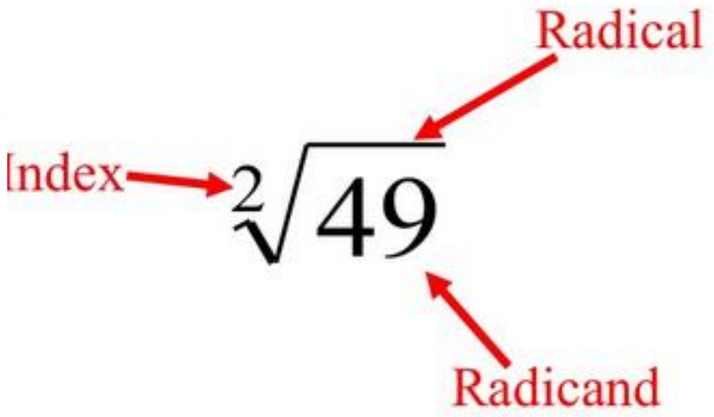
Base

SQUARE ROOT

"The square of a number is the number multiplied by itself."

The symbol used to indicate a root is the radical symbol - $\sqrt{}$

The index of a square root is always 2.



but is normally written as $\sqrt{49}$

What is a Square Root?

Say Square Root of 36 is,

$$\sqrt{36} = 6$$

Square Root is Always Non-Negative

Example:

$\sqrt{49} = 7$ because $7 \cdot 7 = 7^2 = 49$

Also

$\sqrt{49} = -7$ because $(-7)(-7) = (-7)^2 = 49$

But,

A. 49

$\sqrt{49} = 7$ *7 is a square root, since 7 • 7 = 49.*

$-\sqrt{49} = -7$ *–7 is also a square root, since –7 • –7 = 49.*

B. 100

$\sqrt{100} = 10$ *10 is a square root, since 10 • 10 = 100.*

$-\sqrt{100} = -10$ *–10 is also a square root, since –10 • –10 = 100.*

How to find the square root of not square numbers,

$\sqrt{50} = \sqrt{2}\ \sqrt{25} = 5\sqrt{2} = 7.071$

$\sqrt{36} = 6$

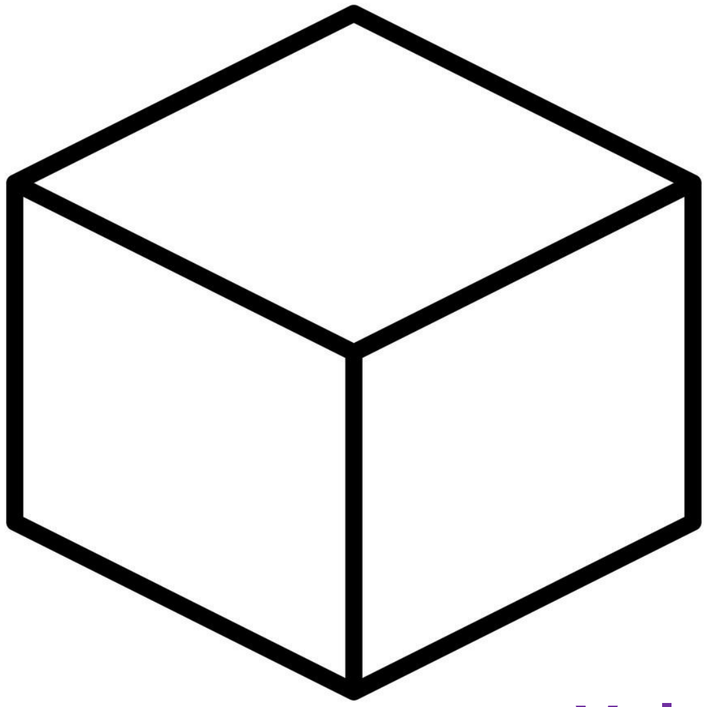
$\sqrt{70} = \sqrt{7}\ \sqrt{10} = \sqrt{7}\ \sqrt{2}\ \sqrt{5} = 8.637$

$\sqrt{24} = \sqrt{2}\ \sqrt{12} = \sqrt{2}\ \sqrt{2}\ \sqrt{6} = 2\sqrt{6} = 4.899$

$\sqrt{27} = \sqrt{3}\ \sqrt{9} = 3\sqrt{3} = 5.196$

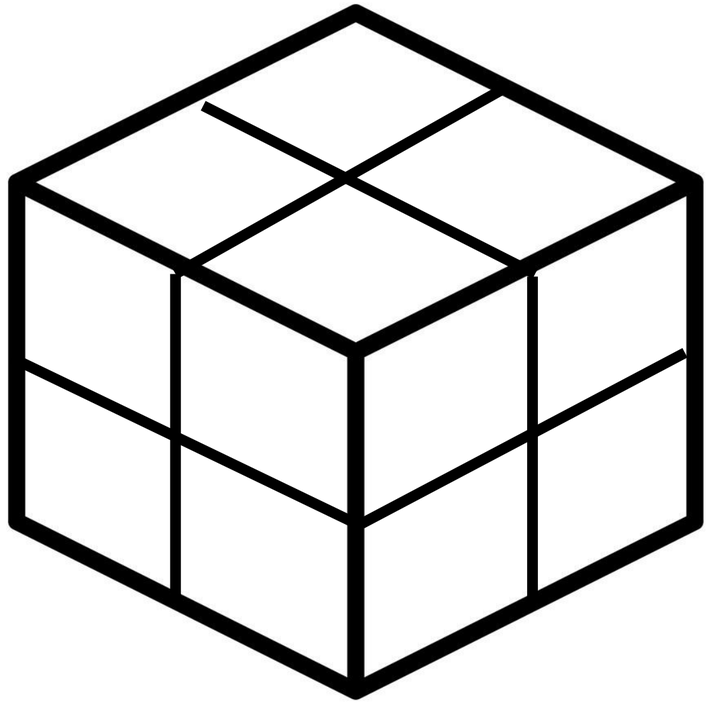
CUBE

“A cube is a three-dimensional shape with 3 Axis”



Volume = L x B x H

If a square measures 2 inches on each side, how would you find its area?



Volume = L x B x H

= 2 x 2 x 2

= 8

i.e., 2^3 or $\sqrt[3]{8}$

CUBE

- A perfect cube is a number that is the cube of an integer.
- For example, 125 is a perfect cube since $125 = 5 \times 5 \times 5 = 5^3$
- Some examples of perfect cubes are 1, 8, 27, 64, 125, 216, 343, ..

CUBE ROOT

- The opposite of cubing a number is finding the cube root.
- Since 5^3 = 125, the cube root of 125 is 5.
- The cube root of a perfect cube is an integer.
- It is possible to get the cube root of a negative number. For example, the cube root of −125 is −5.
- **i.e., -5 x -5 x -5 = -125**

CUBE ROOT

"The cube of a number is the number multiplied by itself twice. It is the number to the power of three."

The cube root of 64 equals 4,

$$\sqrt[3]{64} = 4$$

because

$$4 \cdot 4 \cdot 4 = 64$$

Perfect Cubes and Cube Roots

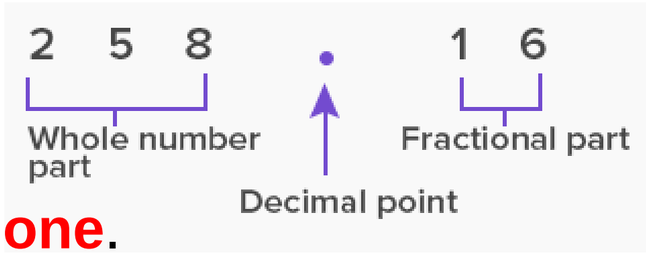
Perfect Cubes	Cube Roots	
1	$\sqrt[3]{1}=1$	$1^3=1$
8	$\sqrt[3]{8}=2$	$2^3=8$
27	$\sqrt[3]{27}=3$	$3^3=27$
64	$\sqrt[3]{64}=4$	$4^3=64$
125	$\sqrt[3]{125}=5$	$5^3=125$
216	$\sqrt[3]{216}=6$	$6^3=216$
343	$\sqrt[3]{343}=7$	$7^3=343$
512	$\sqrt[3]{512}=8$	$8^3=512$
729	$\sqrt[3]{729}=9$	$9^3=729$
1000	$\sqrt[3]{1000}=10$	$10^3=1000$

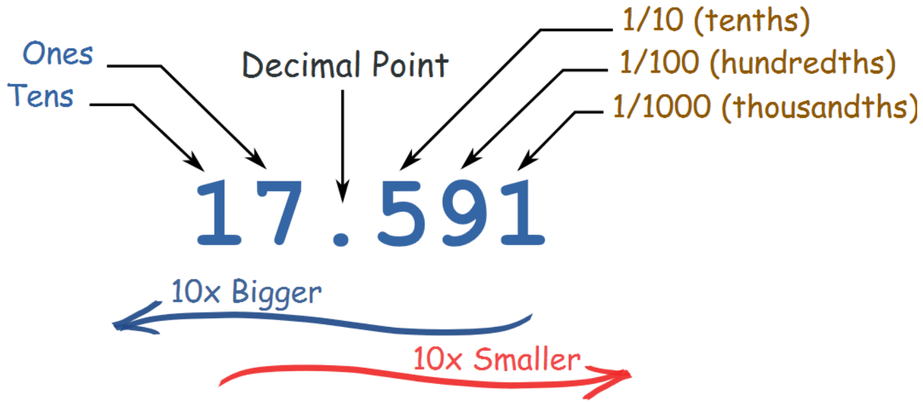
Perfect Cubes	Cube Roots	
-1	$\sqrt[3]{-1}=-1$	$(-1)^3=-1$
-8	$\sqrt[3]{-8}=-2$	$(-2)^3=-8$
-27	$\sqrt[3]{-27}=-3$	$(-3)^3=-27$
-64	$\sqrt[3]{-64}=-4$	$(-4)^3=-64$
-125	$\sqrt[3]{-125}=-5$	$(-5)^3=-125$
-216	$\sqrt[3]{-216}=-6$	$(-6)^3=-216$
-343	$\sqrt[3]{-343}=-7$	$(-7)^3=-343$
-512	$\sqrt[3]{-512}=-8$	$(-8)^3=-512$
-729	$\sqrt[3]{-729}=-9$	$(-9)^3=-729$
-1000	$\sqrt[3]{-1000}=-10$	$(-10)^3=-1000$

DECIMAL FRACTION

What is a Decimal?

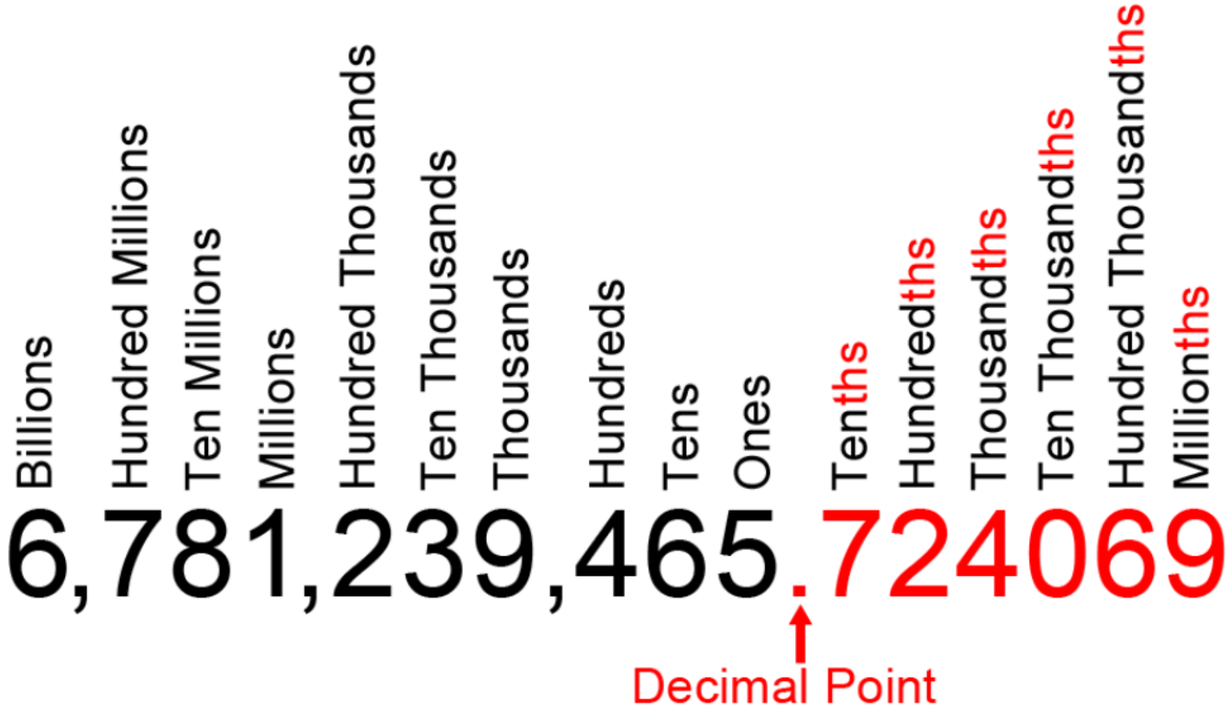
- In algebra, a decimal number can be defined as a number whose whole number part and the fractional part is separated by a decimal point.
- The dot in a decimal number is called a **decimal point**.
- The digits following the decimal point show a value smaller than **one**.



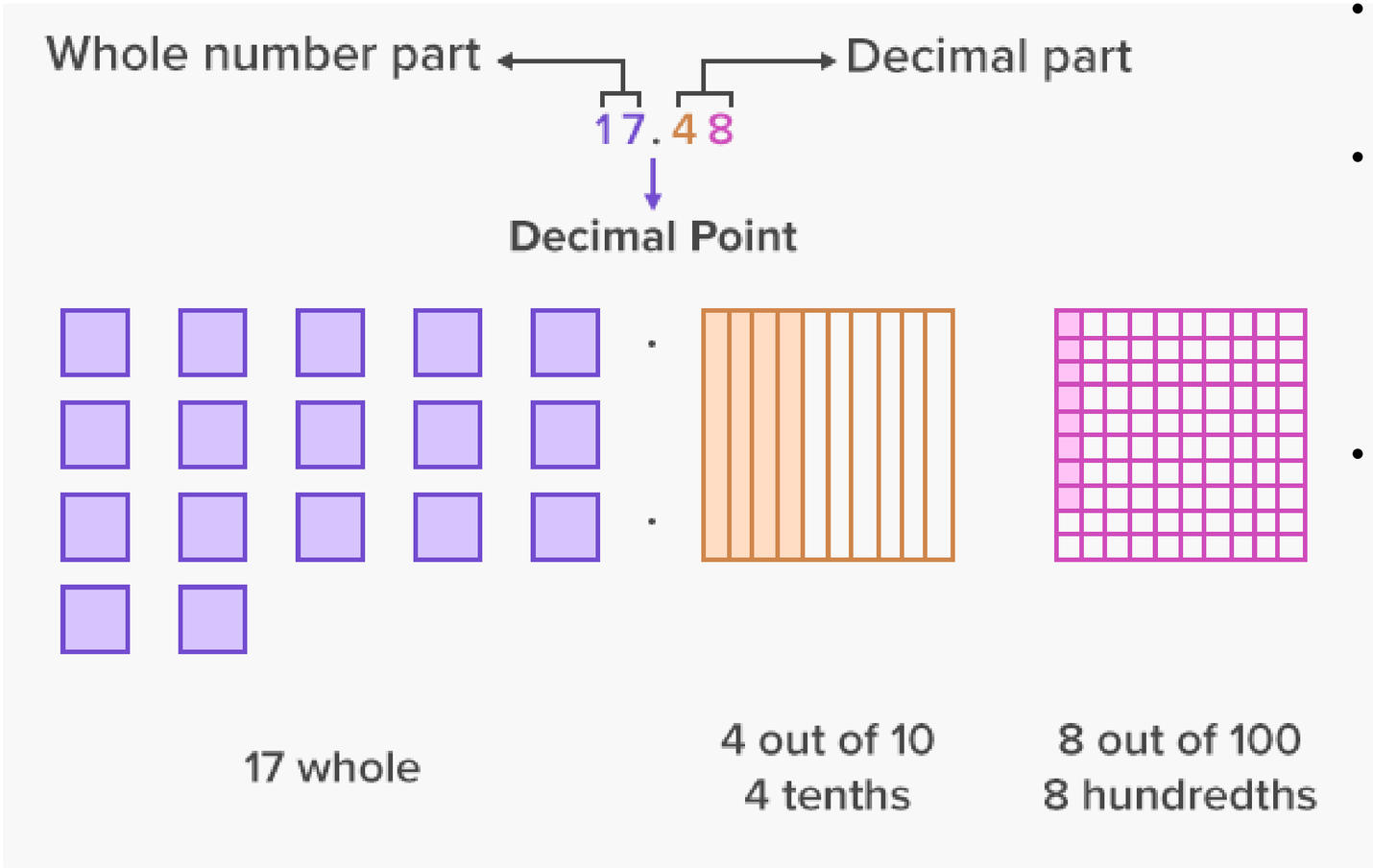


Word Decimal from,

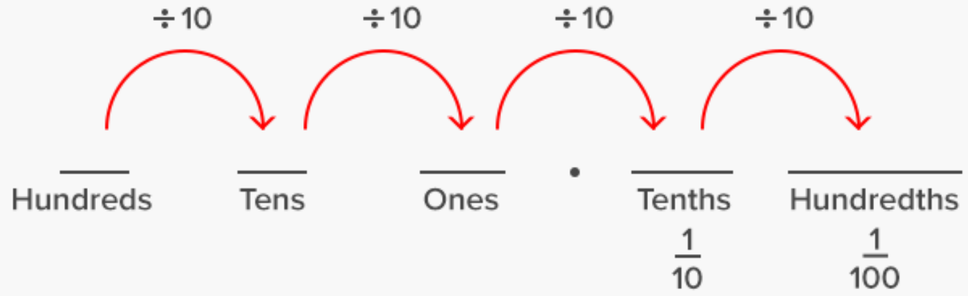
- The word "Decimal" really means "based on 10" (From Latin *decima*: *a tenth part*).



Here's an example of a decimal number 17.48, in which 17 is the whole number, while 48 is the decimal part.



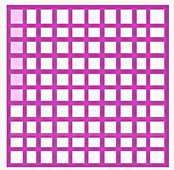
- Decimals are based on the preceding powers of 10.
- As we move from left to right, the place value of digits gets divided by 10, meaning the decimal place value determines the tenths, hundredths and thousandths.
- A tenth means one tenth or 1/10. In decimal form, it is 0.1. Hundredth means 1/100. In decimal form, it is 0.01.



Here’s an example of how the fractional part can be converted into decimals.

	Hundreds	Tens	Ones		Tenths	Hundredths	Thousandths
$25\frac{6}{10}$		2	5	•	6		
$25\frac{6}{100}$		2	5	•	0	6	
$25\frac{6}{1000}$		2	5	•	0	0	6

0.6 or $\frac{6}{10}$ or Six Tenths



0.06 or $\frac{6}{100}$ or Six Hundredths

0.006 or $\frac{6}{1000}$ or Six Thousandths

Decimals can be written both in expanded form and in words.

14.258

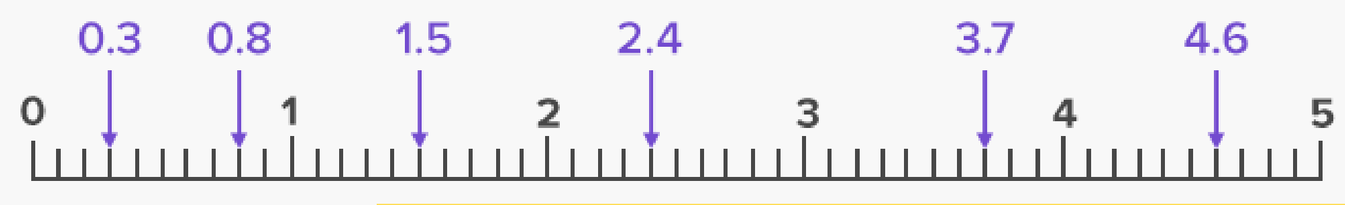
Expanded form : $10 + 4 + \frac{2}{10} + \frac{5}{100} + \frac{8}{1000}$

Decimal in words : Fourteen and two hundred fifty-eight thousandth

OR

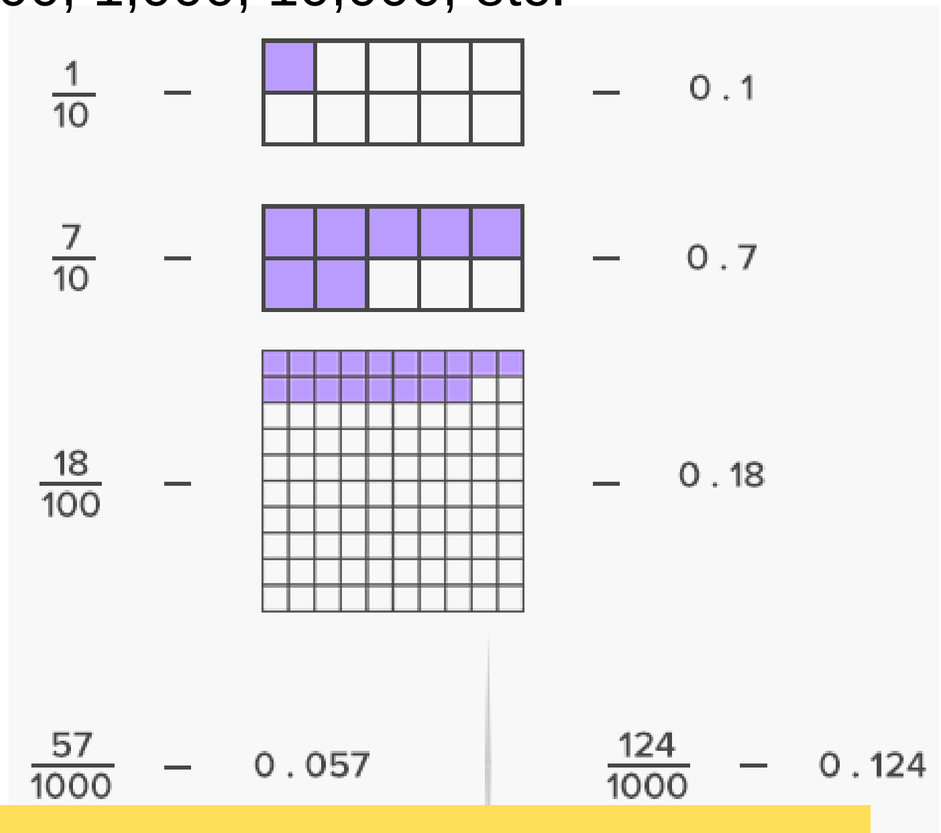
Fourteen point two five eight

- Tenths, hundredths, and thousandths can be represented on a number line.
- To represent tenths, the distance between each whole number on a number line is partitioned into 10 equal parts where each part represents a tenth.



What is a Decimal fraction?

- In algebra, a decimal fraction is a fraction whose denominator is 10 or a multiple of 10 like 100, 1,000, 10,000, etc.



Ways to think about Decimal Numbers ...

... as a Whole Number Plus Tenths, Hundredths, etc

We can think of a decimal number as a whole number plus tenths, hundredths, etc:

Example 1: What is 2.3 ?

•On the left side is "2", that is the whole number part.

•The 3 is in the "tenths" position, meaning "3 tenths", or 3/10

•So, 2.3 is "2 and 3 tenths"

Example 2: What is 13.76 ?

•On the left side is "13", that is the whole number part.

•There are two digits on the right side, the 7 is in the "tenths" position, and the 6 is the "hundredths" position

•So, 13.76 is "13 and 7 tenths and 6 hundredths"

Cont.,

... as a Decimal Fraction

- A Decimal Fraction is a fraction where the denominator (the bottom number) is a number such as 10, 100, 1000, etc (in other words a power of ten)

So "2.3" looks like: $\frac{23}{10}$

And "13.76" looks like: $\frac{1376}{100}$

... as a Whole Number and Decimal Fraction

- Or we can think of a decimal number as a Whole Number plus a Decimal Fraction.

So "2.3" looks like: $2 \text{ and } \frac{3}{10}$

And "13.76" looks like: $13 \text{ and } \frac{76}{100}$

Converting a decimal number into a fraction....

- In the denominator part, place 1 under decimal point and suffix with as many zeroes as is the total number of digits after decimal point.
- Remove the decimal point and reduce the fraction to its lowest term.

.56 = 56/100 = 14/25

.0024 = 24/10000 = 3/1250

Suffixing zeroes to the right of a decimal fraction does not change its value. Thus 0.6 = 0.60 = 0.600 etc.

- If numerator and denominator contains same number of decimal places, we can remove decimal signs from each number.

2.71/3.41 = 271/341

14.4/15.6 = 144/156 = 12/13

Adding decimals

- Place each number under each other in such a way that decimal points lies in same column.

```
21.3 + .213 + 3.21 + .021 + 2.0031 = ?
21.3
  .213
 3.21
  .021
 2.0031
--------
26.7471
--------
```

Subtracting decimals

- Place each number under each other in such a way that decimal points lies in same column.

```
  23.004
-16.5628
---------
   6.4412
---------
```

Multiplying decimals

- Multiply given numbers without considering decimal point. In product, mark the decimal point as many places of decimals as is the sum of number of decimal places in the given numbers.

```
2.3 x 0.12 = ?
23 x 12 = 276
Sum of decimal places = 1 + 2 = 3
∴ 2.3 x 0.12 = 0.276
```

Dividing decimals by number

- Divide given decimal number without considering decimal point. In quotient, mark the decimal point as many places of decimals as is the sum of number of decimal places in the given dividend.

```
0.63 / 9 = ?
63 / 9 = 7
Decimal places in dividend = 2
∴ 0.63 / 9 = 0.07
```

Dividing decimals by decimals

- Multiply both dividend and divisor by such multiple of 10 so that divisor becomes a whole number.
- Divide dividend without considering decimal point.
- In quotient, mark the decimal point as many places of decimals as is the sum of number of decimal places in the given dividend.

```
0.00042/ 0.06 = ?
0.00042/ 0.06 = (0.00042 x 100 )/ (0.06 x 100)
= 0.042 / 6

Now 42/6 = 7
Decimal places in dividend = 3
∴ 0.00042 / 0.06 = 0.007
```

Recurring Decimals

- A decimal fraction in which all figures after decimal point are repeated is called a pure recurring decimals. For example,

  0.5555, 0.323232

Converting pure recurring decimal to fraction

- Put the repeating figure only once in the numerator and put as many nines in the denominator as in number of repeating figures.

```
Express 0.33333 in fraction.
0.3333 = 3/9 = 1/3

Express 0.2727 in fraction.
0.2727 = 27/99 = 3/11
```

Mixed recurring decimals

- A decimal fraction in which some figures are not repeating whereas some of them are repeating, is called as mixed recurring decimals. For example, 0.534242, 0.078888.

Converting mixed recurring decimal to fraction

- Put the difference of numbers formed by digits after decimal point taking repeated digits once and that formed by non-repeating number,
- In the numerator and put as many nines in the denominator as in number of repeating figures and annex them with as many zeroes as in the non-repeating digits.

```
Express 0.266666 in fraction.
0.26666 = (26-2)/90 = 24/90 = 4/15

Express 0.326868 in fraction.
0.326868 = (3268 - 32)/9900 = 3236/9900 = 809/2475
```

Lets Strengthen Our Brain Muscles.,

Q 1 - Which is the following is fraction for 0.36?

A - 9/25

B - 51/25

C - 3/400

D - 2081/250

Answer - A

Explanation

```
0.36 = 36/100 = 9/25
```

Q 2 - Which is the following is fraction for 2.04?

A - 9/25

B - 51/25

C - 3/400

D - 2081/250

Answer - B

Explanation

```
2.04 = 204/100 = 51/25
```

Lets Strengthen Our Brain Muscles.,

Q 3 - Which is the following is fraction for .0075?

A - 9/25

B - 51/25

C - 3/400

D - 2081/250

Answer - C

Explanation

```
.0075 = 75/10000 = 3/400
```

Q 4 - Which is the following is fraction for 8.324?

A - 9/25

B - 51/25

C - 3/400

D - 2081/250

Answer - D

Explanation

```
8.324 = 8324/1000 = 2081/250.
```

Remember...

THE MORE PRACTICE YOU DO

THE STRONGER YOUR MATH MUSCLES BECOME

SOLUTION VIDEO


50% OFF
Clearing out our entire stock!
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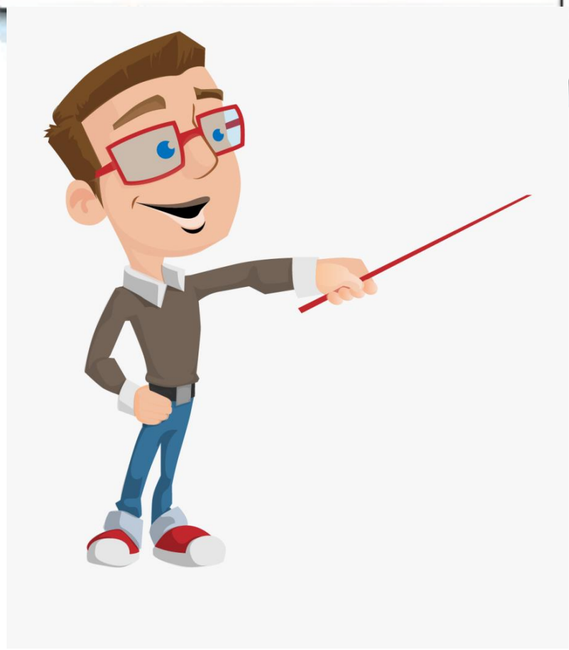
Percentage, Profit, Loss And Discount

Why we need to know about it?

PERCENTAGE 'per 100 pieces' of anything

The word percent means **out of 100**.

We use this sign to show percentages. → %



So, 40% means 40 out of 100.

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

Word percentage derived from Latin that means per centum ("by a hundred") is a number or ratio expressed as a fraction of 100.

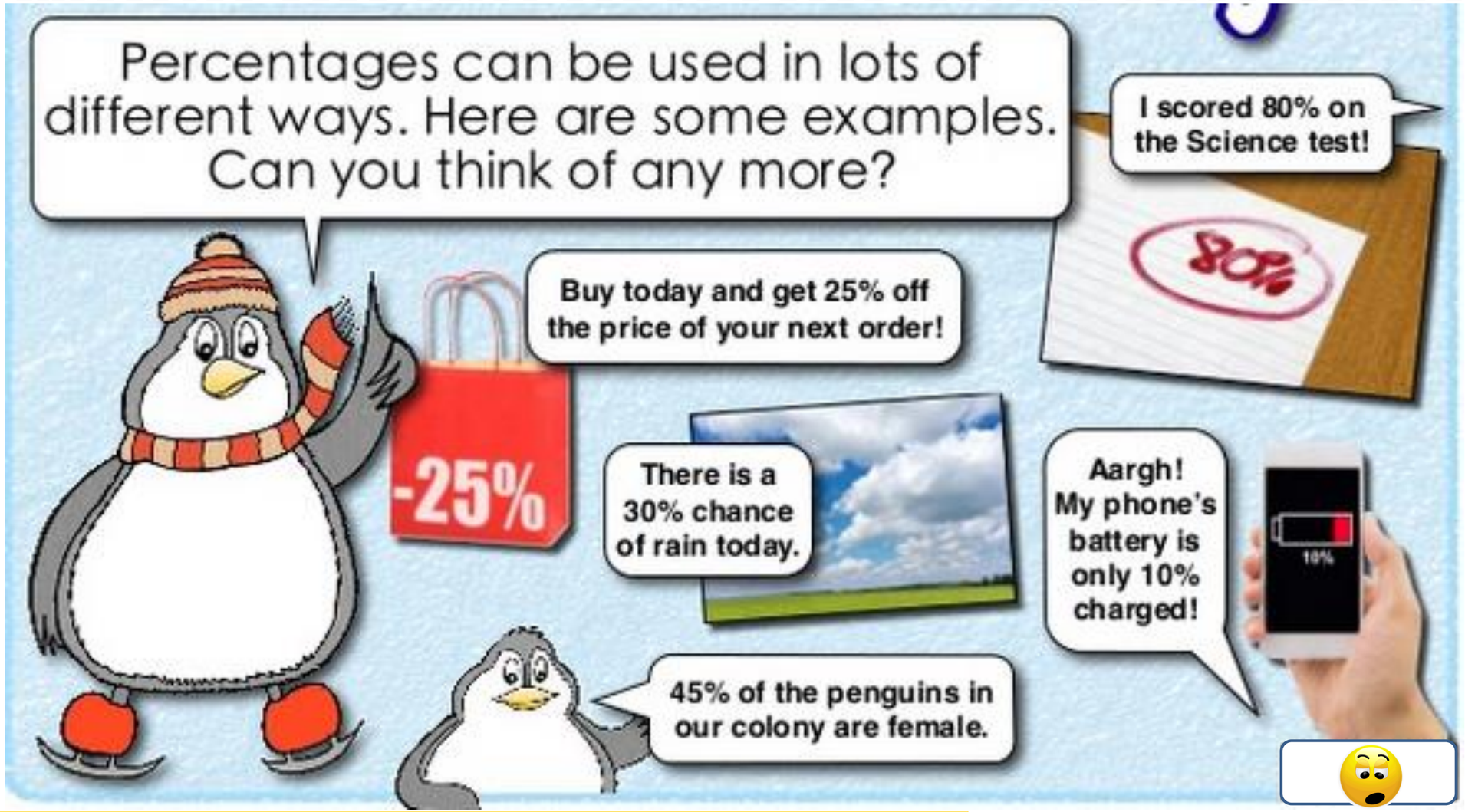
Profit, Loss And Discount

- **a financial gain**, especially the difference between the amount earned and the amount spent in buying, operating, or producing something.

Losing something

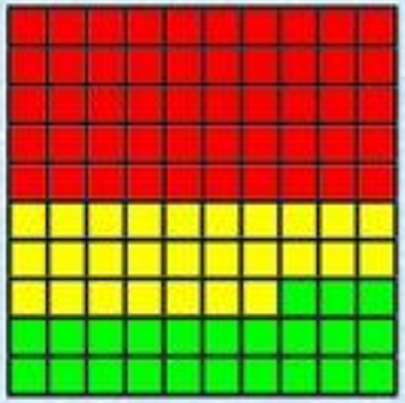
A deduction from the usual cost of something.

When do we use this percentage?



Estimating Percentages

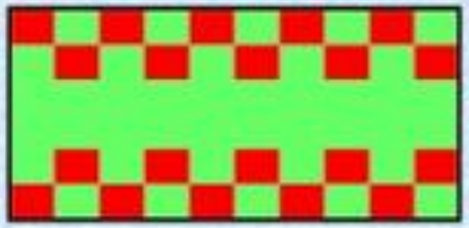
Sometimes, you can work out percentages easily. At other times, you may have to estimate.



There are 100 squares in this grid.

50% are Red
27% are Yellow
23% are Green

Can you estimate the percentage of each shape that is red?



Changing Percentages and Decimals

To change a percentage into a decimal, divide it by 100.

÷ 100

23% = 0.23

(23 ÷ 100 = 0.23)

5% = 0.05

(5 ÷ 100 = 0.05)

To change a decimal into a percentage, multiply it by 100.

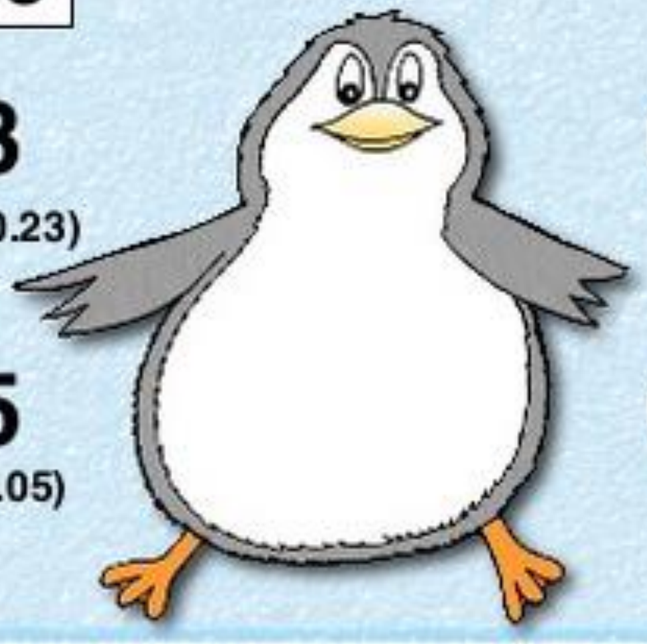
x 100

0.35 = 35%

(0.35 x 100 = 35)

0.03 = 3%

(0.03 x 100 = 3)



Percentages Tricks!

There are some quicker methods to help you find different percentages of amounts:

To find 50% of a number, divide it by 2...

50% of 40 = 20

To find 25% of a number, divide it by 4...

25% of 40 = 10

To find 75% of a number, find 25% and then multiply that by 3...

75% of 40 = 30

To find 1% of a number, divide it by 100...

1% of 300 = 3

To find 10% of a number, divide it by 10...

10% of 500 = 50

If the percentage is a multiple of 10, use the method above to help you.

20% of 500 = 100
30% of 500 = 150
40% of 500 = 200

Practice these to make yourself mastered in percentage

Lets discuss a case,

A store selling a T-Shirt with a 25% Off.

With a purchase price of 500 Rupees.

How much will you save, if you buy this?

500 x 25% or (0.25) = 125 Rupees

Final Cost of T-Shirt is 500 – 125 = 375

Lets discuss another case,

Let's say I have a basket of fruits. Out of a total of 20 fruits, 5 are apples, 10 are oranges and 5 are pineapples. Lets calculate the percentage of all three fruits in the basket.

- First determine the 'part' and the 'whole'. Here the 'Whole' is the fruit basket containing 20 fruits and the parts are 5 apples, 10 oranges and 5 pineapples.
- Secondly, you must determine the fraction of fruits in basket, that are apples, oranges and pineapples. That is, you must establish the fractions. Here the fractions are:

Fraction of the Apples in Basket = 5/20 =1/4

Fraction of Oranges in Basket = 10/20 =1/2

Fraction of Pineapples in Basket = 5/20 =1/4

So, one can now say that **one-fourth of the fruits are apples**, **half are oranges** and **another one-fourth are pineapples**.

Cont.,

- Once the fraction has been established, calculating percentages is extremely simple.
- The percentage of apples in the basket is calculated using following formula.

Percentage (%) = (Part/Whole) x 100

Therefore,

Percentage of Apples = 5/20 x 100 = ¼ x 100 = 25%

Percentage of Oranges = 10/20 x 100 = 1/2 x 100 = 50%

Percentage of Pineapples = 5/20 x 100 = ¼ x 100 = 25%

Profit, Loss And Discount

- **a financial gain**, especially the difference between the amount earned and the amount spent in buying, operating, or producing something.

Losing something

A deduction from the usual cost of something.

Before getting in we need to know about,

Cost Price

- When we buy something we pay the cost of that thing.
- The price for which an article is purchased is called the cost price or cost of that article.

Example,

Ramesh bought a cupboard for Rs 560 and sold it for Rs 667.

- Cost Price — Rs 560
- Selling Price — Rs 667

Selling Price

- The price at which an article is sold is called the *selling price* of that article.

Cont.,

Selling Price > Cost Price

=

Profit

Profit=Selling Price - Cost

Cost Price> Selling Price

=

Loss

Loss = Cost Price - Selling Price

Example,

Karan bought a fan for Rs 300 and sold it for Rs 350.

What is the profit he earned?

Cost Price= Rs300

Selling Price = Rs350

Therefore,

Selling Price > Cost Price

Profit = Selling Price - Cost

Price Profit = Rs350 - Rs300.

Profit = Rs50

Example,

Sam bought a table for Rs600 and sold it for Rs400.

Cost Price=Rs600

Selling Price =Rs400

Therefore,

Cost Price > Selling Price

Loss = Cost Price-Selling Price

Loss = Rs600-Rs400.

Loss = Rs200

DO YOU KNOW?

2 and 5 are the only primes that end in 2 or 5.

Lets Strengthen Our Brain Muscles.,

1. A batsman scored 110 runs which included 3 boundaries and 8 sixes. What percent of his total score did he make by running between the wickets?

A. 45%

B. $45\frac{5}{11}\%$

C. $54\frac{6}{11}\%$

D. 55%

Answer:

Explanation:

Lets Strengthen Our Brain Muscles.,

2. Alfred buys an old scooter for Rs. 4700 and spends Rs. 800 on its repairs. If he sells the scooter for Rs. 5800, his gain percent is:

A. $4\frac{4}{7}\%$

B. $5\frac{5}{11}\%$

C. 10%

D. 12%

Answer:

Explanation:

Lets Have a Small WarmUp

If you invested Rs.2000 in an account that paid Simple Interest of 4%, find the interest earned after One and Half Years.

SI = P x R x T

SI = (2000) X (4/100) X (1.5)

SI = 120

If you invested Rs.300 in an account that paid Simple Interest, find how long you'd need to leave it in at 3% interest to make Rs.15.

SI = P x R x T

15 = (300) X (3/100) X T

15 = 9T

T = 15/9 = 5/3

T = 1.6 Yeras


SUGAR

MIXTURES & ALLIGATION

MIXTURES

When two or more elements are mixed in a certain ratio, its called **Mixture**.

ALLIGATION

The rule which is used to find the ratio in which two or mor
elements are mixed together is called **Alligation**.

Cont.,

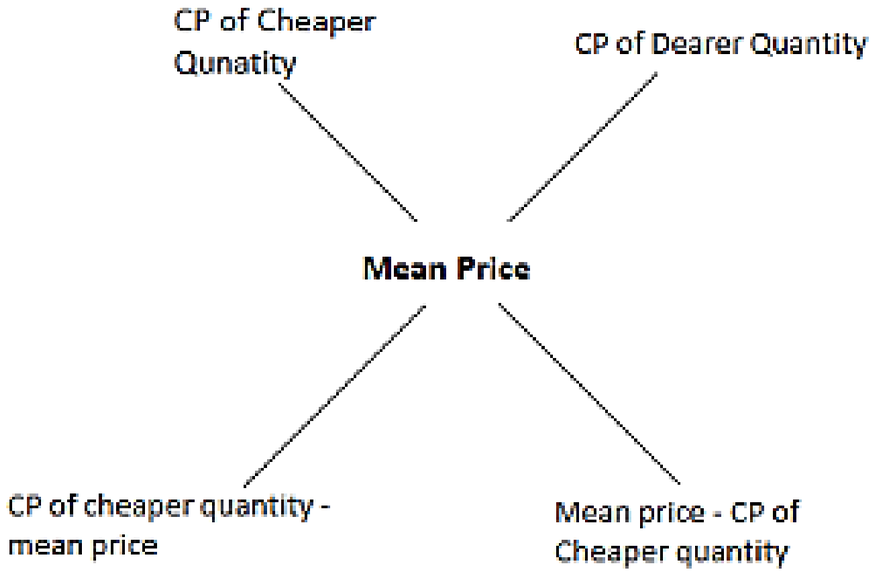
- To solve mixture and alligation questions,
- We must know that alligation is used to find the mean value of a mixture.
- When the ratio and amount of the ingredients mixed are different and also to find the proportion in which the elements are mixed.

Cont.,

The basic formula which is used to find the ratio in which the ingredients are mixed is,

$$\frac{\text{Quantity of Cheaper}}{\text{Qunatity of Dearer}} = \frac{\text{CP of Dearer - Mean Price}}{\text{Mean Price - CP of Cheaper}}$$

It is also called the rule of alligation and can also be represented as,



Lets Have a Small WarmUp

Cost of two types of pulses is Rs.15 and Rs, 20 per kg, respectively. If both the pulses are mixed together in the ratio 2:3, then what should be the price of mixed variety pulses per kg?

Let the cost of mixed variety of pulse be

Rs. x

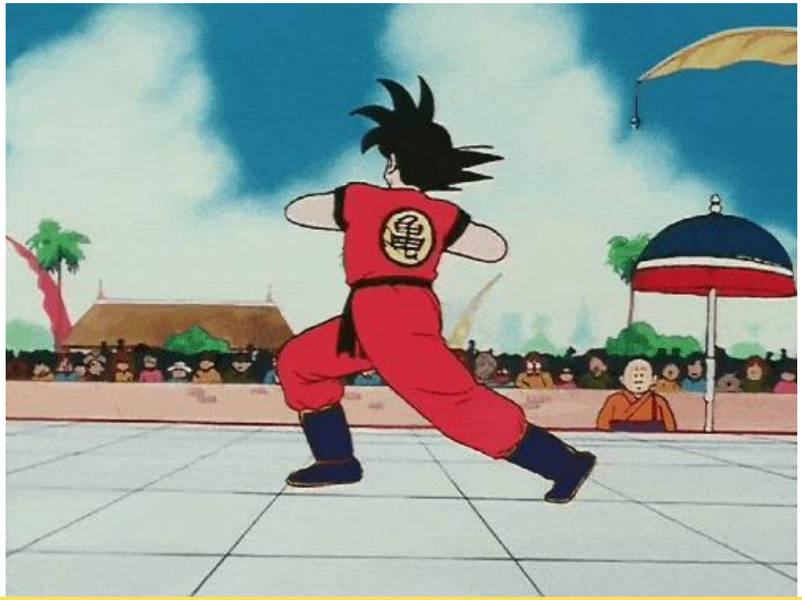
As per the alligation rule,

2:3 = (20-x) : (x-15)

⇒ 2x+3x = 60+30

⇒ 5x = 90

⇒ x = 18



Sita and Geeta started a business by investing Rs. 120000 and Rs.135000 respectively. Find the share of each out of an annual profit of Rs. 35700.

sita Gita

Ratio of their share = 120000:135000 =8:9

sum of the parts of the ratio = 8+9 =17

Sita's share = 35700 x 8/17 = Rs.16800

Gita' share = 35700 x 9/17 = Rs.18900

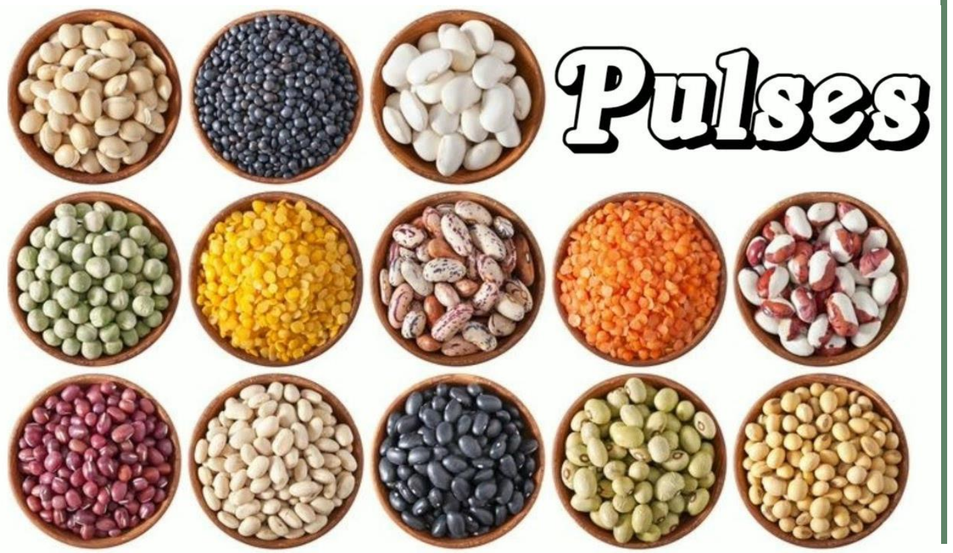
Lets discuss a case,

A grocer wishes to sell a mixture of two variety of pulses worth Rs.16 per kg. In what ratio must he mix the pulses to reach this selling price, when cost of one variety of pulses is Rs.14 per kg and the other is Rs.24 per kg?

$$\frac{\text{Quantity of Cheaper}}{\text{Qunatity of Dearer}} = \frac{\text{CP of Dearer - Mean Price}}{\text{Mean Price - CP of Cheaper}}$$

Solution:

Using the rule of alligation,



Lets discuss a case,

When a sugar costing Rs.9 per kg is mixed with sugar costing Rs. 27 per kg, what is the ratio in which the shopkeeper must mix the two varieties of sugar so as to sell it at Rs.10 per kg, gaining 20% profit?

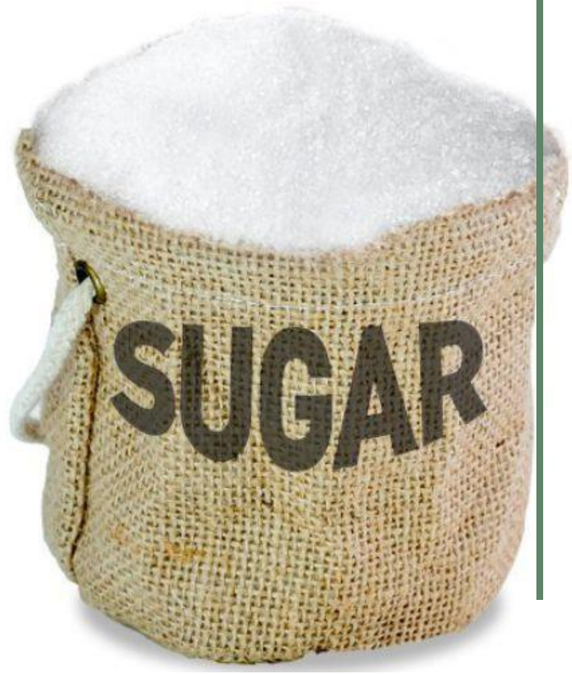
Selling Price of 1kg mixed varied of sugar = Rs.10

Cost Price of the same sugar = 20% of 10 = Rs.2 = So, 10+2 = Rs. 12

Using the rule of alligation,

Quantity of Dearer: Quantity of Cheaper = (27-12) : (12-9)

⇒ Quantity of Dearer: Quantity of Cheaper = 15: 3 = 5:1



Lets discuss a case,

Cost of two types of pulses is Rs.15 and Rs, 20 per kg, respectively. If both the pulses are mixed together in the ratio 2:3, then what should be the price of mixed variety pulses per kg?

Let the cost of mixed variety of pulse be Rs. x

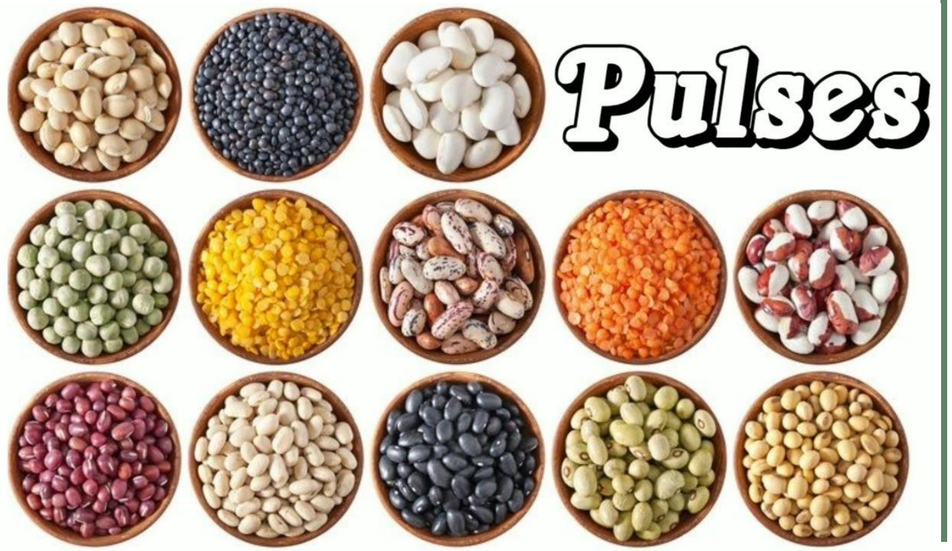
As per the alligation rule,

2:3 = (20-x) : (x-15)

⇒ 2x+3x = 60+30

⇒ 5x = 90

⇒ x = 18



Lets discuss a case,

A dealer has 1000 kg sugar and he sells a part of it at 8% profit and the rest of it at 18% profit. The overall profit he earns is 14%. What is the quantity which is sold at 18% profit?

As per the rule of alligation,

Quantity of Dearer: Quantity of Cheaper = (18-14) : (14-8) = 4:6 = 2:3

Quantity of sugar sold at 18% profit = 2/3 × 1000 = 666kg

Lets discuss a case,

How much coffee of variety A, costing Rs. 5 a kg should be added to 20 kg of Type B coffee at Rs. 12 a kg so that the cost of the two coffee variety mixture be worth Rs. 7 a kg?

As per the rule of alligation,

Quantity of Dearer: Quantity of Cheaper = (12-7) : (7-5) = 5:2

Quantity of Variety A coffee that needs to be mixed ⇒ 5:2 = x:20

⇒ x =50 kg

PARTNERSHIP

- IBPS

PARTNERSHIP

- When two or more people joins hands with a common goal to attain profits.
- Every partner invests either time, money or his patents to help partnership firm to reap profits.

Lets discuss a case,

Raj invested Rs 76000 in a business. After few months Monty joined him and invests Rs 57000. At the end of year both of them share the profits at the ratio of 2:1. After how many months Monty joined Raj ?

Solution - We can simply compute per month investment of both partnership

Raj invested Rs 76,000 for 12 months and Monty invested Rs 57,000 for x months.

Now 76000 × 12 / 57000 × x = 2 :1

⇒ 76 × 12 / 2 = 57x

⇒ x = 8

So Monty invested his money for 8 months and he joined after 4 months.

Lets discuss a case,

A and B started a business by investing money in ratio of 5:6. C joined them after 6 months by sharing an amount equal to B's share. At the end of year 20% profit was earned which was equal equal to Rs 98,000. How much money was invested by C ?

Solution -

= First of all we will calculate the weighted ratios

⇒ A = 5 × 12 = 60

⇒ B = 6 × 12 = 72

⇒ C = 6 × 6 = 36

Total investment at the end of year = 98000 × 100/20 = Rs 4,90,000

⇒ Investment by C = 490000 × 36 / 168 × 2 = Rs 210000

Lets discuss a case,

Sita and Geeta started a business by investing Rs. 120000 and Rs.135000 respectively. Find the share of each out of an annual profit of Rs. 35700.

DO YOU KNOW?

The Institute of Banking Personnel Selection is a recruitment body that was started with an aim to encourage the recruitment and placement of young graduates in public sector banks in India.

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