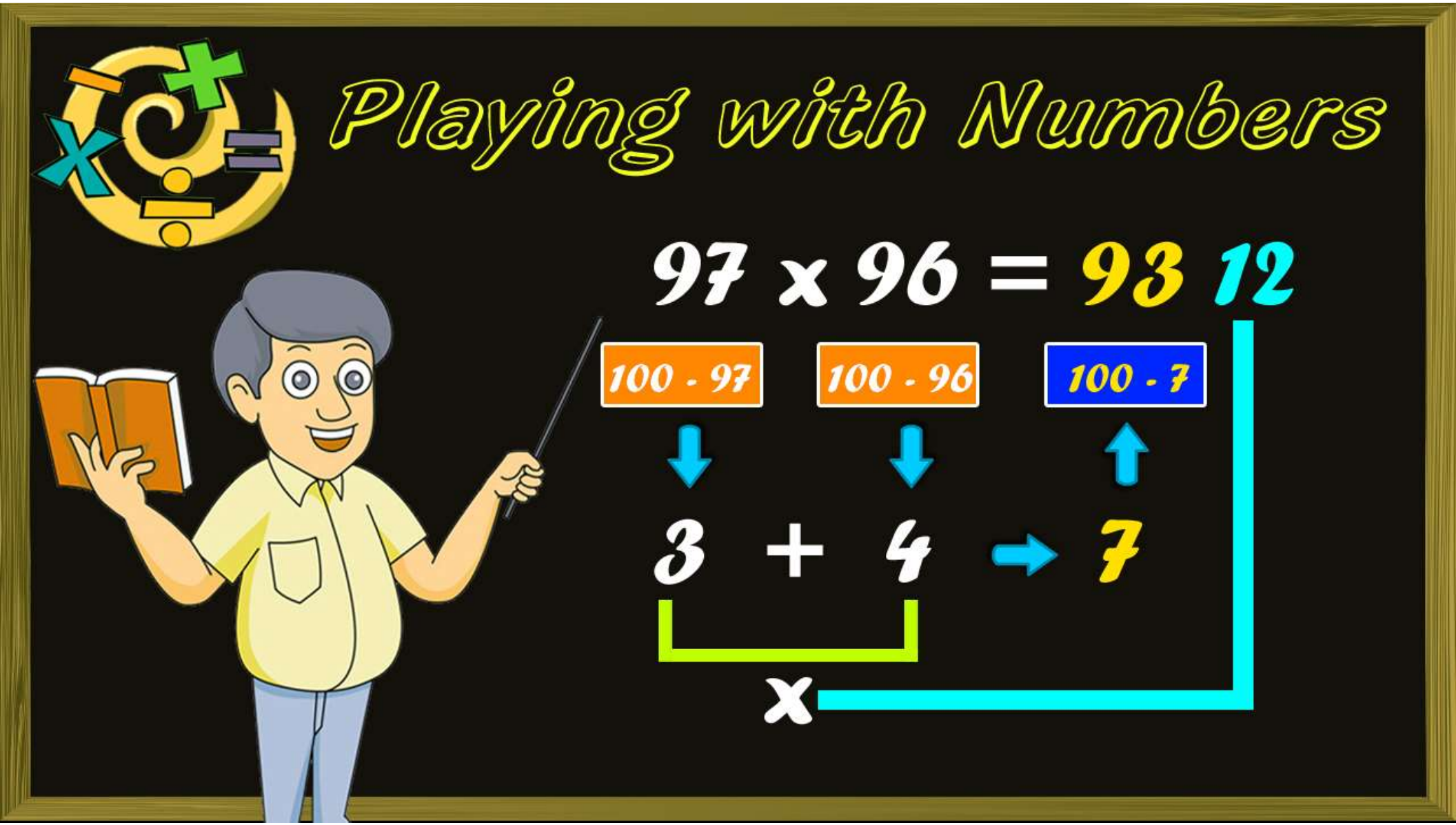

Playing with Numbers
97 x 96 = 93 12
100 - 97
100 - 96
100 - 7
3 + 4 → 7
x

Two - Digit Numbers

The smallest two digit number is

36 10 78

The largest two digit number is

99

84 10

Two - Digit Numbers

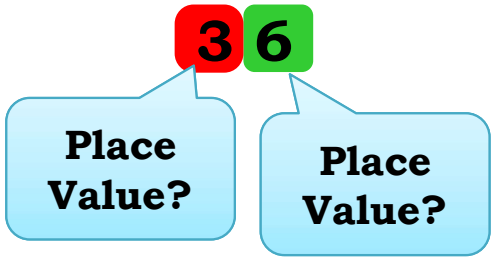
So.....

Two digit numbers are all the Natural numbers ....

10 99

Two - Digit Numbers

Example :



Generalised Form

Place value of 3 = 3 × 10 = 30

Place value of 6 = 6 × 1 = 6

30 + 6 = 36

36 = Place value of 3 + Place value of 6

Generalised Form

Two - Digit Numbers

73 = Place value of 7 + Place value of 3

59 = Place value of 5 + Place value of 9

In general.....

ab = Place value of a + Place value of b

Two - Digit Numbers

Example :

3×10

$36 = 30 + 6$

$\therefore\ 36 = 3 \times 10 + 6$

7×10

$74 = 70 + 4$

$\therefore\ 74 = 7 \times 10 + 4$

Generalised Form

$ab = a \times 10 + b$

Note : a is any whole no. from 1 to 9
b is any whole no. from 0 to 9

Three - Digit Numbers

Example :

1×1 2×10

$129 = 100 + 20 + 9$

$\therefore\ 129 = 1 \times 100 + 2 \times 10 + 9$

4×10 6×10

$465 = 400 + 60 + 5$

$\therefore\ 465 = 4 \times 100 + 6 \times 10 + 5$

Generalised Form

$abc = a \times 100 + b \times 10 + c$

On comparing abc with given examples, abc can be written as..

$a \times 100 + b \times 10 + c$

a from 1 to 9

b from 0 to 9

c from 0 to 9

Q. In a 2- digit number, the units digit is four times the tens digit and the sum of the digits is 10. Find the number.

Sol. Let the ten's digit of required number be x

Let the unit's digit of required number be y

$\therefore$ The required number $= (10x + y)$

According to the given condition,

$y = 4 \times x$

$\therefore \quad x + y = 10$

$\therefore \quad x + 4x = 10$

$\therefore \quad 5x = 10$

$\therefore \quad x = 2$

$y = 4x$

$\therefore \quad y = 4 \times 2$

$\therefore \quad y = 8$

$\therefore$ The required number $= (10x + y)$

$= 10 \times 2 + 8$

$= 20 + 8$

$= 28$

The required number = 28

Q. The difference between a 2 digit number and the number obtained by interchanging its digits is 63. What is the difference between the digits of the number.

Sol. Let the ten's digit of required number be a

Let the unit's digit of required number be b

$\therefore$ The original number = $(10a + b)$

$\therefore$ The reversed number = $(10b + a)$

According to given condition,

$$(10a + b) - (10b + a) = 63$$

$$\therefore \quad 10a + b - 10b - a = 63$$

$$\therefore \quad 9a - 9b = 63$$

$$\therefore \quad a - b = 7$$

Dividing both sides by 9

Q. In a 3- digit number, the ten's digit is thrice the units digit and the hundred's digit four times the units digit. Also the sum of digits is 16. Find the number.

Sol. Let the hundred's digit be a, ten's digit be b
Unit's digit be c

$\therefore$ The required number = $(100a + 10b + c)$

According to the given condition,

$b = 3c$

$a = 4c$

$a + b + c = 16$

$\therefore \quad 4c + 3c + c = 16$

$\therefore \quad 8c = 16$

$\therefore \quad c = 2$

$a = 4c$

$= 4 \times 2$

$\therefore \quad a = 8$

$b = 3c$

$= 3 \times 2$

$\therefore \quad b = 6$

$\therefore$ The number = $(100a + 10b + c)$

$= 100 \times 8 + 10 \times 6 + 2$

$= 800 + 60 + 2$

$\therefore$ The required number = 862.

Q. A two-digit number is 3 more then 4 times the sum of it's digits. If 18 is added to the required number, its digits are reversed. Find the number.

Sol. Let the ten's digit of required number be a

Let the unit's digit of required number be b

$\therefore$ The required number = $(10a + b)$

According to the 1st condition,

$$(10a + b) = 3 + 4(a + b)$$

$$\therefore \quad 10a + b = 3 + 4a + 4b$$

$$\therefore \quad 10a - 4a + b - 4b = 3$$

$$\therefore \quad 6a - 3b = 3$$

$$\therefore \quad 2a - b = 1 \quad \ldots(i)$$

Dividing both sides by 3

Q. A two-digit number is 3 more then 4 times the sum of it's digits. If 18 is added to the required number, its digits are reversed. Find the number.

Sol. Let the ten's digit of required number be a

Let the unit's digit of required number be b

$\therefore$ The required number = $(10a + b)$

$2a - b = 1 \quad ...(i)$

According to the 2nd condition,

$18 + (10a + b) = 10b + a$

$\therefore \quad 18 + 10a + b = 10b + a$

$\therefore \quad 10a - a + b - 10b = -18$

$\therefore \quad 9a - 9b = -18$

$\therefore \quad a - b = -2 \quad ...(ii)$

Dividing both sides by 9

Q. A two-digit number is 3 more then 4 times the sum of it's digits. If 18 is added to the required number, its digits are reversed. Find the number.

Sol. $2a - b = 1$ ...(i)

$a - b = -2$ ...(ii)

Subtracting (i) and (ii)

$2a - \cancel{b} = 1$

$a - \cancel{b} = -2$

(–) (+) (+)

$\therefore \quad a = 3$

Substituting $a = 3$ in equation (ii)

$a - b = -2$

$\therefore \quad 3 - b = -2$

$\therefore \quad -b = -2 - 3$

$\therefore \quad -b = -5$

$\therefore \quad b = 5$

$\therefore$ The required number $= (10a + b)$

$= 10 \times 3 + 5$

$= 30 + 5$

$= 35$

The required number is 35.

Q. Find the value of letters in each of the following and give reasons for the step involved.

(i)

$$\begin{array}{r} 1 \\ 3\ A \\ +\ 2\ 5 \\ \hline 6\ 2 \end{array}$$

2 > 5

∵ Each letter represent only one digit

1, 2, 3 ....etc.

If A + 5 = 12

A = 7 ✓

If A + 5 = 22

A = 17 ✗

∴ A + 5 = 62

∴ A = 7

1 + 3 + 2 = B

∴ B = 6

Q. Find the value of letters in each of the following and give reasons for the step involved.

(ii)

$$\begin{array}{r} {\scriptstyle 1}\ {\scriptstyle 1} \\ A\ 5 \\ +\ 9\ 8 \\ \hline 1\ C\ 3 \end{array}$$

$3 < 8$

$\therefore$ $A + 8 = 13$

$\therefore$ **A = 5**

$\because$ **Each letter represent only one digit**

If A + 8 = 13

A = 5 ✓

If A + 8 = 23

A = 15 ✗

1

$\therefore$ **The ten's digit could be any of this number 1, 2, 3 ....etc.**

$\therefore$ **C = 1**

Q. Find the value of letters in each of the following and give reasons for the step involved.

(iii)

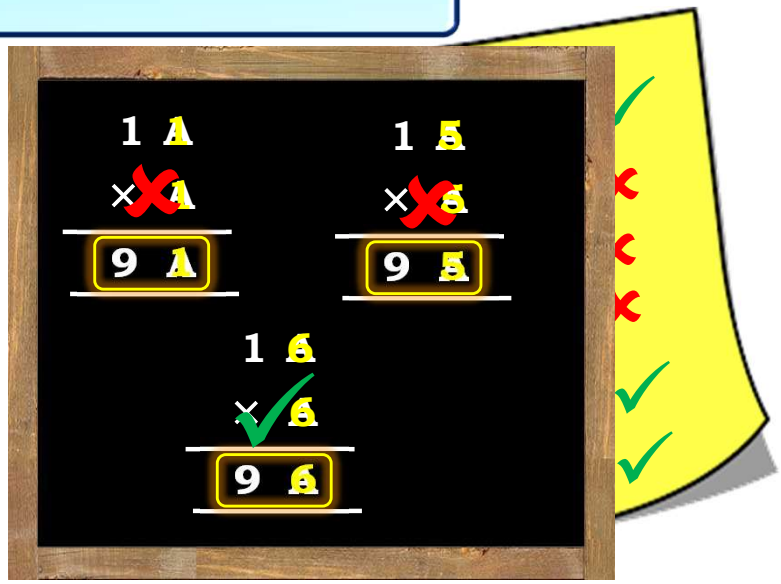
$$\begin{array}{r} 1\,A \\ \times\ A \\ \hline 9\,A \end{array}$$

A ≠ 1 or A ≠ 5 or A = 6

But, 16 × 6 = 96

∴ **A = 6**

It means, A is a digit which on multiplying with same number i.e A will give a number whose unit's digit is again A



Q. Find the value of letters in each of the following and give reasons for the step involved.

(iv)

$$\begin{array}{r} A\ B \\ +\ 3\ 7 \\ \hline 6\ A \end{array}$$

Sol.

$$\begin{array}{r} {\scriptstyle 1\ \ \ } \\ A\ B \\ +\ 3\ 7 \\ \hline 6\ A \end{array}$$

$\therefore$ **A = 2**

$\therefore$ **B = 5**

$$\begin{array}{r} {\scriptstyle 1\ \ \ } \\ 2\ B \\ +\ 3\ 7 \\ \hline 6\ 2 \end{array}$$

Now, B + 7 = 12

B = 12 – 7

$\therefore$ **B = 5**

$$\begin{array}{r} 2\ B \\ +\ 3\ 7 \\ \hline 6\ 2 \end{array}$$

A + 3 = 6

$\therefore$ A = 3

Now, B + 7 = 3

But, 7 > 3

$\therefore$ B + 7 ≠ 3

Q. Find the value of letters in each of the following and give reasons for the step involved.

(v)

$$\begin{array}{r} A\ B \\ \times\quad 3 \\ \hline C\ A\ B \end{array}$$

B = 0 or B ≠ 5

Sol.

$$\begin{array}{r} 5\ 0 \\ \times\quad 3 \\ \hline C\ 5\ 0 \end{array}$$

3 × 5 = 15

∴ If we take A = 0 then the whole solution will be the 0.

∴ again B

∴ C = 1

3 × A = CA

3 × 0 = 0 ✗

3 × 1 = 3 ✗

3 × 2 = 6 ✗

3 × 3 = 9 ✗

3 × 4 = 12 ✗

3 × 5 = 15 ✓

3 × 6 = 18 ✗

3 × 7 = 21 ✗

3 × 8 = 24 ✗

3 × 9 = 27 ✗

1 = 28 ✗

$$\begin{array}{r} 5\ 0 \\ \times\quad 3 \\ \hline C\ 5\ 0 \end{array}$$

3 × A = CA

We get (3 × A) = CA

∴ A = 5

∴ B = 5 is not correct

Q. Find the value of letters in each of the following and give reasons for the step involved.

(vi)

$$\begin{array}{r} A\ B \\ \times\quad 5 \\ \hline C\ A\ B \end{array}$$

B = 0 or B = 5

Sol.

$$\begin{array}{r} 5\ 0 \\ \times\quad 5 \\ \hline 2\ 5\ 0 \end{array}$$

5 × 5 = 25

∴ **B = 0**

∴ **A = 5**

∴ **C = 2**

5 × A = CA

5 × 0 = 0 ✗
5 × 1 = 5 ✗
5 × 2 = 10 ✗
5 × 3 = 15 ✗
5 × 4 = 20 ✗
5 × 5 = 25 ✓
5 × 6 = 30 ✗
5 × 7 = 35 ✗
✗
✗

It means B is a digit which on

again B

If we take A = 0 then the whole solution will be the 0.

$$\begin{array}{r} 5\ 0 \\ \times\quad 5 \\ \hline C\ 5\ 0 \end{array}$$

5 × B = B

B = 0

5 × A = CA

We get (5 × A) = CA

∴ **A = 5**

Q. Find the value of letters in each of the following and give reasons for the step involved.

(vi)

$$\begin{array}{r} A\ B \\ \times\quad 5 \\ \hline C\ A\ B \end{array}$$

B = 0 or B = 5

When B = 5, A = 2 or A = 7

Sol.

$$\begin{array}{r} 2\ 5 \\ \times\quad 5 \\ \hline C\ 2\ 5 \end{array}$$

$5 \times 2 = 12$

$$\begin{array}{r} 7\ 5 \\ \times\quad 5 \\ \hline C\ 7\ 5 \end{array}$$

$5 \times 7 = 35$

$\therefore$ **B = 5** $\quad\quad$ $\therefore$ **B = 5**

$\therefore$ **A = 2**

$\therefore$ **C = 1** $\quad\quad$ $\therefore$ **C = 3**

It means, B is a digit which on multiplying with 5 will give a number whose unit's digit is again B

$5 \times A + 2 = CA$

$5 \times 0 + 2 = 2$ ✗

$5 \times 1 + 2 = 7$ ✗

$5 \times 2 + 2 = 12$ ✓

$5 \times 3 + 2 = 17$ ✗

$5 \times 4 + 2 = 22$ ✗

$5 \times 5 + 2 = 27$ ✗

$5 \times 6 + 2 = 32$ ✗

$5 \times 7 + 2 = 37$ ✓

$5 \times 8 + 2 = 42$ ✗

$5 \times 9 + 2 = 47$ ✗

$$\begin{array}{r} 2 \\ A\ 5 \\ \times\quad 5 \\ \hline C\ A\ 5 \end{array}$$

$5 \times A + 2 = CA$

Q. Find the value of letters in each of the following a
reasons for the step involved.

(vii)

$$\begin{array}{r} AB \\ \times\ 6 \\ \hline BBB \end{array}$$

It m… multiplying with 6 will give a number whose unit's digit is again B

B = 2 ✗ or B = 4 ✓ or B = 6 ✗ or B = 8 ✓

∴ A = 7

∴ B = 4

∴ A = 14

∴ B = 8

B × 6 = B

1 × 6 = 6 ✗
2 × 6 = 12 ✓
3 × 6 = 18 ✗
4 × 6 = 24 ✓
5 × 6 = 30 ✗
6 × 6 = 36 ✓
7 × 6 = 42 ✗
8 × 6 = 48 ✓
9 × 6 = 54 ✗

$$\begin{array}{r} 3 \\ AB \\ \times\ 6 \\ \hline BBB \\ -3 \\ \hline 6\ 3 \end{array}$$

6 × 6 = 36

63 is not divisible by 6

∴ B = 6 ✗

$$\begin{array}{r} 4 \\ AB \\ \times\ 6 \\ \hline BBB \\ -4 \\ \hline 8\ 4 \end{array}$$

6 × 8 = 48

(6 × A) + 4 = 88

6 × A = 84

A = 14

Q. Find the value of letters in each of the following and give reasons for the step involved.

(viii)

$$\begin{array}{r} 1\ \ \\ 7\ 1 \\ +\ 1\ 9 \\ \hline 9\ 0 \end{array}$$

$0 < 1$

$\therefore$ $1 + B = 10$

$\therefore$ **B = 9**

$1 + A + 1 = 9$

$\therefore$ **A = 7**

The ten's digit could be any of this number

$\because$ **Each letter represent only one digit**

If $1 + B = 10$

B = 9 ✓

If $1 + B = 20$

B = 19 ✗

Q. Find the value of letters in each of the following and give reasons for the step involved.

(ix)

$$\begin{array}{r} 2\,A\,B \\ +\;A\,7\,1 \\ \hline B\,1\,8 \end{array}$$

1

1 < 7

∴ 1 + B = 8

∴ B = 7

The ten's digit could be

∵ Each letter represent only one digit

If A + 7 = 11

A = 4

If A + 5 = 21

A = 16

A + 7 = 11

∴ A = 4

Q. Find the value of letters in each of the following and give reasons for the step involved.

(x)

$$\begin{array}{r} {\scriptstyle 1}\\ 1\,2\,8 \\ +\;6\,8\,B \\ \hline 8\,0\,9 \end{array}$$

2 > 0

$\therefore$ 2 + A = 10

$\therefore$ A = 8

The ten's digit could be

$\because$ Each letter represent only one digit

8 + B = 9

$\therefore$ B = 1

Test Of Divisibility

Test for Divisibility by 2

EVEN NUMBER

➢ A number is divisible by 2, if the digit in its ones place is 0, 2, 4, 6 or 8.

Example :

Check whether the following numbers are divisible by 2 or not

1232, 67 and 6818

It means that a number is divisible by 2, only if the number is an even number.

Sol.

∴ The number 1232 and 6818 are divisible by 2.

∴ The number 67 is not divisible by 2.

Test Of Divisibility

Test for Divisibility by 3

➢ A number is divisible by 3, if the sum of its digits is a **multiple of 3.**

Example:

Check whether the following number is divisible by 3 or not

768, 2452

Sol. 768 ⇒ 7 + 6 + 8 = 21

∴ The number 768 is divisible by 3.

2452 ⇒ 2 + 4 + 5 + 2 = 13

∴ The number 2452 is not divisible by 3.

3 × 1 = 3
3 × 2 = 6
3 × 3 = 9
3 × 4 = 12
3 × 5 = 15
3 × 6 = 18
3 × 7 = 21
3 × 8 = 24
3 × 9 = 27
3 × 10 = 30

Test Of Divisibility

Test for Divisibility by 9

➢ A number is divisible by 9, if the sum of its digits is a **multiple of 9.**

Example:

Check whether the following number is divisible by 9 or not

963, 2468

Sol. 963 ⇒ 9 + 6 + 3 = 18

∴ **The number 963 is divisible by 9.**

2468 ⇒ 2 + 4 + 6 + 8 = 20

∴ **The number 20468 is not divisible by 9.**

9 × 1 = 9
9 × 2 = 18
9 × 3 = 27
9 × 4 = 36
9 × 5 = 45
9 × 6 = 54
9 × 7 = 63
9 × 8 = 72
9 × 9 = 81
9 × 10 = 90

Test Of Divisibility

Test for Divisibility by 5

➢ **A number is divisible by 5, if the digit in its ones place is 0 or 5.**

Example:

Check whether the following numbers are divisible by 5 or not

125, 51 and 6810

Sol. ∴ **The number 125 and 6810 are divisible by 5.**

∴ **The number 51 is not divisible by 5.**

Test Of Divisibility

Test for Divisibility by 10

➢ **A number is divisible by 10, if the digit in its ones place is 0.**

Example:

Check whether the following numbers are divisible by 10 or not

150, 81 and 7100

Sol. ∴ **The number 150 and 7100 are divisible by 10.**

∴ **The number 81 is not divisible by 10.**

Q. Which of the following numbers are divisible by 2 ?

(i) 720

Sol. ∴ 720 is divisible by 2.

A number is divisible by 2, if the digit in its ones place is 0, 2, 4, 6, 8.

EVEN NUMBERS

(ii) 917

Sol. ∴ 917 is not divisible by 2.

Q. Which of the following numbers are divisible by 2 ?

(iii) 579321

Sol. ∴ **579321 is not divisible by 2.**

A number is divisible by 2, if the digit in its ones place is 0, 2, 4, 6, 8.

EVEN NUMBERS

(iv) 379514

Sol. ∴ **379514 is divisible by 2.**

Q. Which of the following numbers are divisible by 5 ?

(i) 270

Sol. ∴ **270 is divisible by 5.**

A number is divisible by 5, if the digit in its one's place is 0 or 5

(ii) 856

Sol. ∴ **856 is not divisible by 5.**

Q. Which of the following numbers are divisible by 5 ?

(iii) 6550753

Sol. ∴ **6550753 is not divisible by 5.**

A number is divisible by 5, if the digit in its one's place is 0 or 5

(iv) 876945

Sol. ∴ **876945 is not divisible by 5.**

Q. Which of the following numbers are divisible by 10 ?

A number is divisible by 10, if the digit in its one's place is 0

(i) 90

Sol. ∴ **90 is divisible by 10.**

(ii) 1174

Sol. ∴ **1174 is not divisible by 10.**

Q. Which of the following numbers are divisible by 10 ?

A number is divisible by 10, if the digit in its one's place is 0

(iii) 20345

Sol. ∴ **20345 is not divisible by 10.**

(iv) 3759210

Sol. ∴ **3759210 is divisible by 10.**

Q. Which of the following numbers are divisible by 3 ?

(i) 474 $\Rightarrow$ 4 + 7 + 4 = 15

Sol. $\therefore$ **474 is divisible by 3.**

A number is divisible by 3, if the sum of its digits is a multiple of 3.

(ii) 1693 $\Rightarrow$ 1 + 6 + 9 + 3 = 19

Sol. $\therefore$ **1693 is not divisible by 3.**

Q. Which of the following numbers are divisible by 3 ?

(iii) 372416 $\Rightarrow$ 3 + 7 + 2 + 4 + 1 + 6 = 23

Sol. $\therefore$ **372416 is not divisible by 3.**

A number is divisible by 3, if the sum of its digits is a multiple of 3.

(iv) 9412503 $\Rightarrow$ 9 + 4 + 1 + 2 + 5 + 0 + 3 = 24

Sol. $\therefore$ **9412503 is divisible by 3.**

Q. Which of the following numbers are divisible by 9 ?

A number is divisible by 9, if the sum of its digits is a multiple of 9

(i) 306 $\Rightarrow$ 3 + 0 + 6 = 9

Sol. $\therefore$ **306 is divisible by 9.**

(ii) 1526 $\Rightarrow$ 1 + 5 + 2 + 6 = 14

Sol. $\therefore$ **1526 is not divisible by 9.**

Q. Which of the following numbers are divisible by 9 ?

A number is divisible by 9, if the sum of its digits is a multiple of 9

(iii) 966333 $\Rightarrow$ 9 + 6 + 6 + 3 + 3 + 3 = 30

Sol. $\therefore$ **966333 is not divisible by 9.**

(iv) 1257777 $\Rightarrow$ 1 + 2 + 5 + 7 + 7 + 7 + 7 = 36

Sol. $\therefore$ **1257777 is divisible by 9.**

Q. If $21y5$ is multiple of 9, where y is a digit, what is the value of y ?

0, 1, 2, 3....9

Sol. $21y5 \Rightarrow 2 + 1 + y + 5 = 8 + y$

$\therefore$ $(8 + y)$ should be ~~8~~, 9, 18, 27... etc

$\therefore$ If $8 + y = 0$, then $y = -8$

If $8 + y = 9$, then $y = 1$

If $8 + y = 18$, then $y = 10$

$\therefore$ The only possible value of y is 1.

$\therefore$ The required number is 2115.

For $21y5$, y is a single digit number
$\therefore$ it should not be more than 9.

A number is divisible by 9, if the sum of its digits is a divisible by 9

$9 \times 0 = 0$
$9 \times 1 = 9$
$9 \times 2 = 18$
$9 \times 3 = 27$
$\vdots$
$\vdots$
$9 \times 10 = 90$

Q. If $31z5$ is multiple of 9, where z is a digit, what is the value of z ?

0, 1, 2, 3....9

Sol. $31z5 \Rightarrow 3 + 1 + z + 5 = 9 + z$

$\therefore$ $(9 + z)$ should be ~~0~~, 9, 18, 27... etc

$\therefore$ If $9 + z = 0$, then $z = -9$

If $9 + z = 9$, then $z = 0$

If $9 + z = 18$, then $z = 9$

If $9 + z = 27$, then $z = 18$

$\therefore$ Possible values of z are 0, 9

$\therefore$ The required numbers are 3105 or 3195.

For $31z5$, z is a single digit number
$\therefore$ it should not be more than 9.

A number is divisible by 9, if the sum of its digits is a divisible by 9

$9 \times 0 = 0$
$9 \times 1 = 9$
$9 \times 2 = 18$
$9 \times 3 = 27$
$\vdots$
$9 \times 10 = 90$

Q. If $24x$ is a multiple of 3, where x is a digit, what is the value of x ?

0, 1, 2, 3....9

Sol. $24x \Rightarrow 2 + 4 + x = 6 + x$

$\therefore$ $(6 + x)$ should be ~~3~~, ~~x~~, 6, 9, 12, 15, 18... etc

$\therefore$ If $6 + x = 0$, then $x = -6$

If $6 + x = 3$, then $x = -3$

If $6 + x = 6$, then $x = 0$

If $6 + x = 9$, then $x = 3$

If $6 + x = 12$, then $x = 6$

If $6 + x = 15$, then $x = 9$

If $6 + x = 18$, then $x = 12$

$\therefore$ Possible values of x are 0, 3, 6, 9

$\therefore$ The required numbers are 240, 243, 246, 249.

A number is divisible by 3, if the sum of its digits is a divisible by 3

For $24x$, x is a single digit number
$\therefore$ it should not be more than 9.

$3 \times 0 = 0$
$3 \times 1 = 3$
$3 \times 2 = 6$
$3 \times 3 = 9$
$3 \times 4 = 12$
$3 \times 5 = 15$
$\vdots$
$3 \times 10 = 30$

Q. If 31z5 is multiple of 3. where z is a digit, what might be the value of z?

0, 1, 2, 3....9

Sol. $31z5 \Rightarrow 3 + 1 + z + 5 = 9 + z$

$\therefore$ $(9 + z)$ should be ~~3~~, ~~6~~, ~~8~~, 9, 12, 15, 18, ~~21~~... etc

A number is divisible by 3, if the sum of its digits is a divisible by 3.

$\therefore$ If $9 + z = 0$, then $z = -9$

If $9 + z = 3$, then $z = -6$

If $9 + z = 6$, then $z = -3$

If $9 + z = 9$, then $z = 0$

If $9 + z = 12$, then $z = 3$

If $9 + z = 15$, then $z = 6$

If $9 + z = 18$, then $z = 9$

If $9 + z = 21$, then $z = 12$

For 31z5, z is a single digit number
$\therefore$ it should not be more than 9.

$3 \times 1 = 3$
$3 \times 2 = 6$
$3 \times 3 = 9$
$3 \times 4 = 12$
⋮
⋮
$3 \times 10 = 30$

$\therefore$ Possible values of x are 0, 3, 6, 9

$\therefore$ The required numbers are 3105, 3135, 3165, 3195.