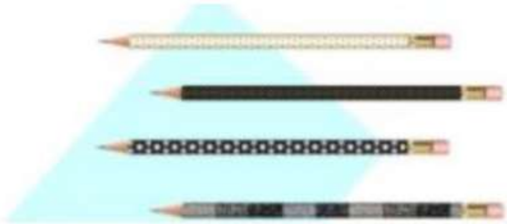
Chapter 2

Whole Number

Introduction to Whole Numbers

Introduction

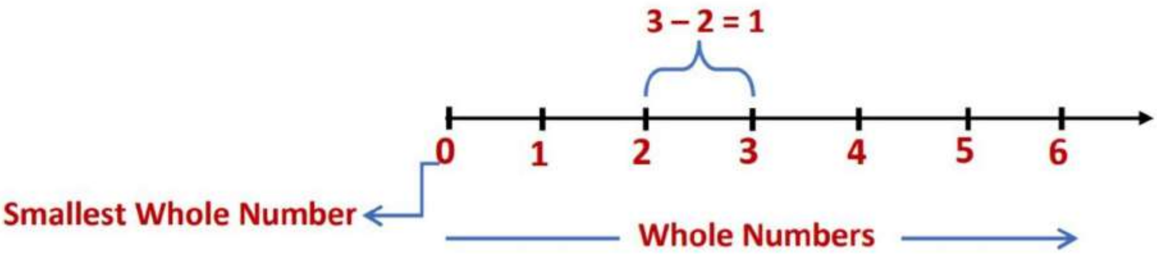
Natural numbers are those numbers by which we can count things in nature like 4 trees, 4 pencils etc.



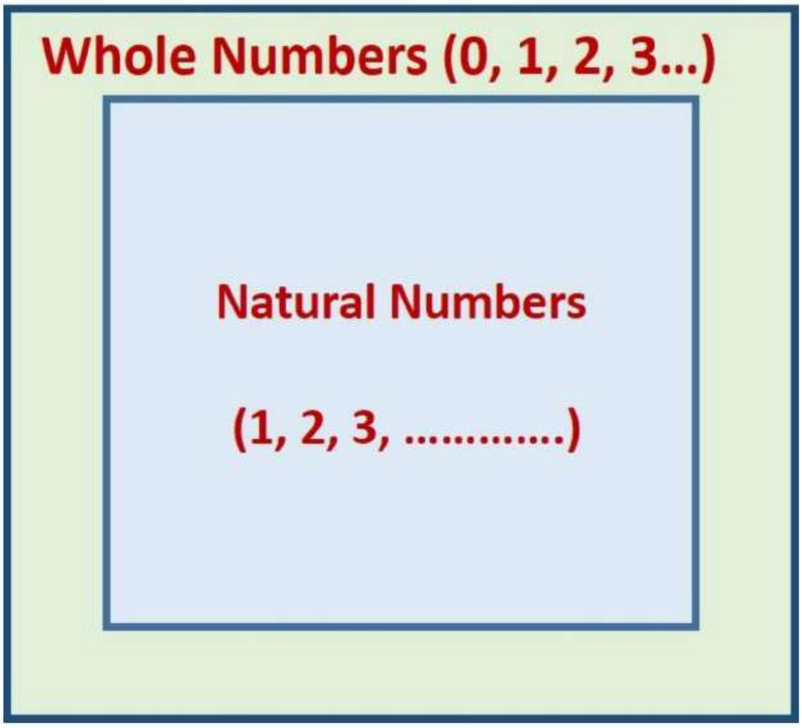
The numbers 1, 2, 3……..which we use for counting are known as natural numbers.

Suppose, there are 25 students in your class. On a holiday, how many students are present? The answer is zero. Therefore, zero represents nothing or absence of anything. For this we use symbol '0' called zero.

The natural numbers along with 0 (zero) form a collection of whole numbers. Therefore, 0, 1, 2, 3, 4…………………… are whole numbers.



- A whole number is either 0 or a natural number.
- The smallest whole number is 0.
- We cannot obtain the last and greatest whole number, as there are infinitely many whole numbers.
- The difference between two consecutive whole number is 1
- All natural numbers are whole numbers but all whole numbers are not natural numbers.



Whole Numbers on a Number Line

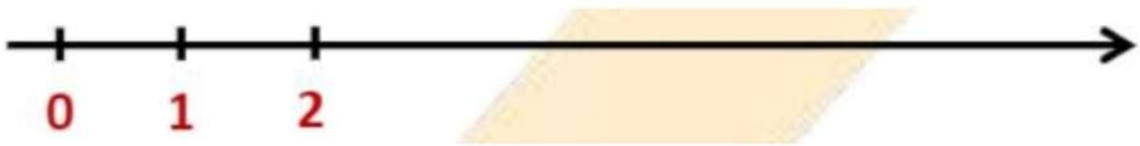
A number line is a straight line with numbers placed at equal intervals.

- Draw a line. Mark a point on it and label it 0.

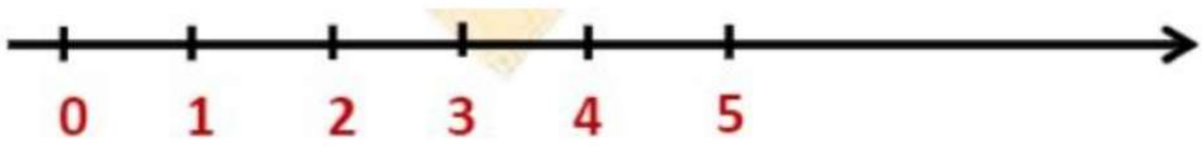
- Mark a second point to the right of 0 and label it 1.

The distance between the points labeled as 0 and 1 is called unit distance.

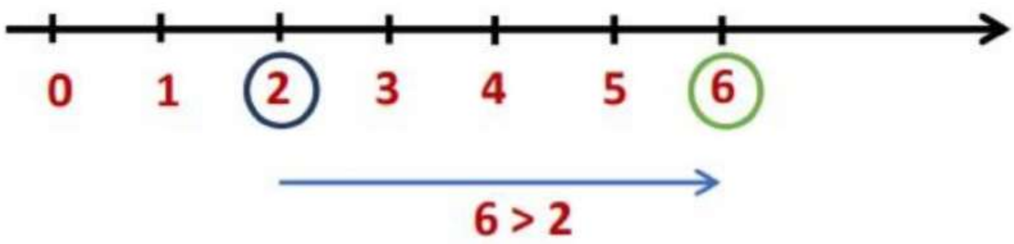
- On this line, mark a point to the right of 1 and at unit distance from 1 and label it 2.



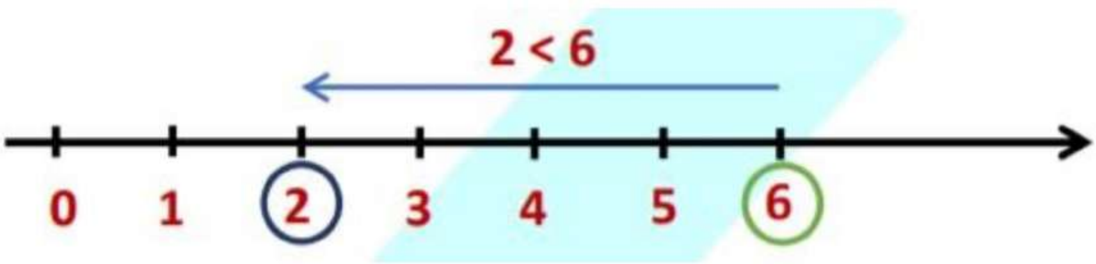
- Similarly, we can label points at unit distances as 3, 4, 5 ... on the line.



- We can also compare two whole numbers with the help of a number line.
- On the number line we see that the number 6 is on the right of 2. Therefore, 6is greater than 2, i.e. $6 > 2$.



- We can also say that whole number on left is the smaller number. For example, $2 < 6$ as 2 is on the left of 6.



- There is no whole number on the left side of 0. Therefore, 0does not have a predecessor which is a whole number
- A whole number is greater than every whole number On its left and is smaller than every whole number on Its right.
- A number line helps us to determine the greater o smaller Of the two whole number

Example: In each of the following pairs of numbers, state which whole number is on the left of the other number on the number line? Also write them with the appropriate sign (>, <) between them.

a) 440, 404 b) 280, 208

c) 98765, 56789 d) 9830417, 10023001

a) 404 is on the left side of 440. So, $440 > 404$

b) 208 is on the left of 280. So, $208 < 280$.

c) 56789 is on the left side of 98765. So, $98765 > 56789$

d) 9830417 is on the left of 1002300.

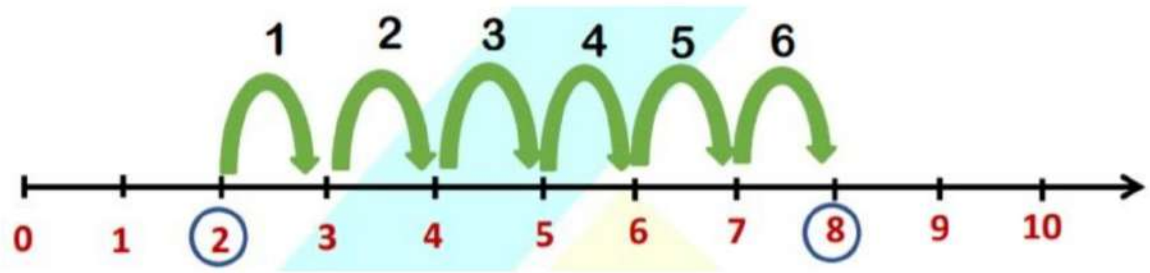
So, $9830417 < 10023001$

Operations on a Number Line

Addition on the number line

When we are adding two or more whole numbers on the number line then we should move towards the right of any one of the given numbers. Add 2 and 6, i.e. 2 + 6

Start from 2 and jump 1 unit towards right. Make 6 such jumps.



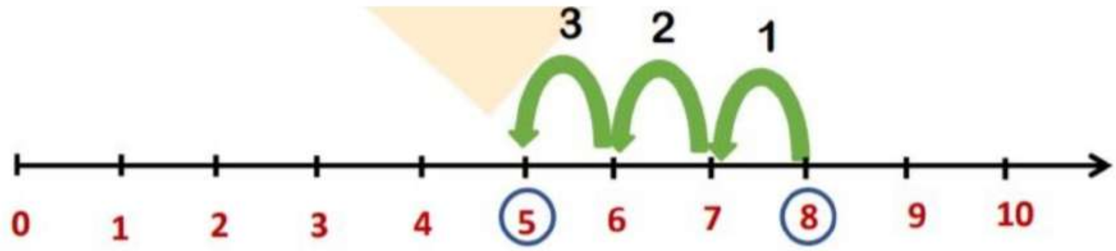
So, $2 + 6 = 8$

Subtraction on the number line

When we are subtracting two numbers on the number line then we should move towards left on the number line.

Subtract 3 from 8, i.e. 8 - 3

Start from 8 and jump 1 unit each towards left. Make 3 such jumps.

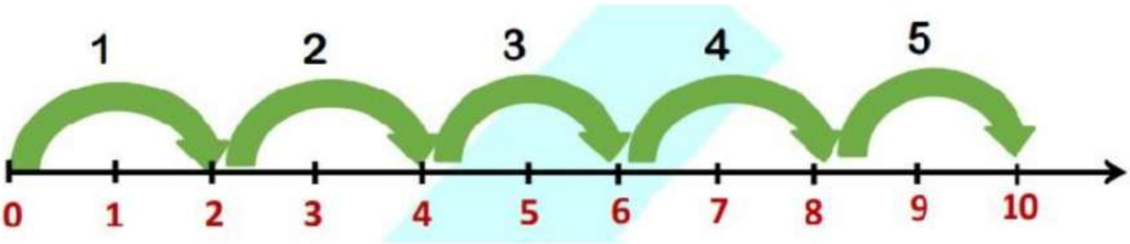


So, $8 - 3 = 5$

Multiplication on the number line

Similarly, we can multiply the whole numbers on the number line. Multiply 2 and 5

Start from 0 and jump 2 units each towards right and jump 5 times.

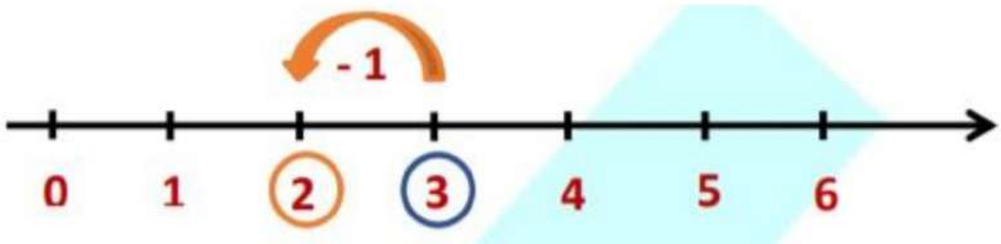


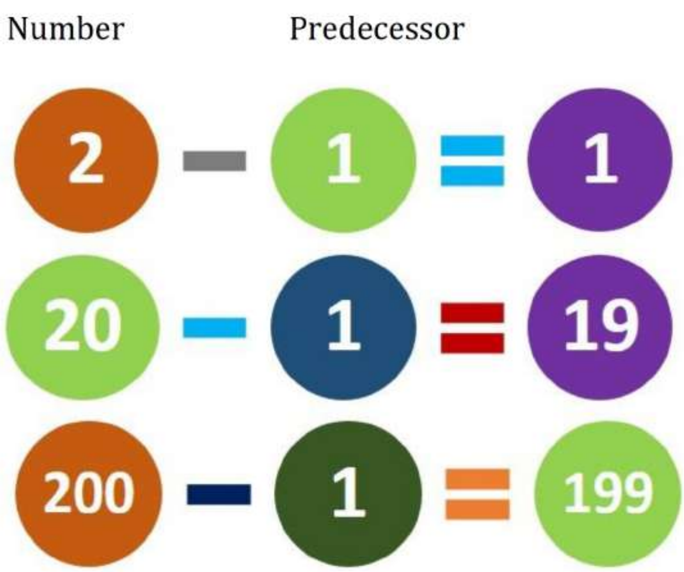
So, $2 \times 5 = 10$

Predecessor and Successor

We can obtain the predecessor of a whole number by subtracting 1 from it. Therefore, the number which comes before the given number is known as Predecessor.

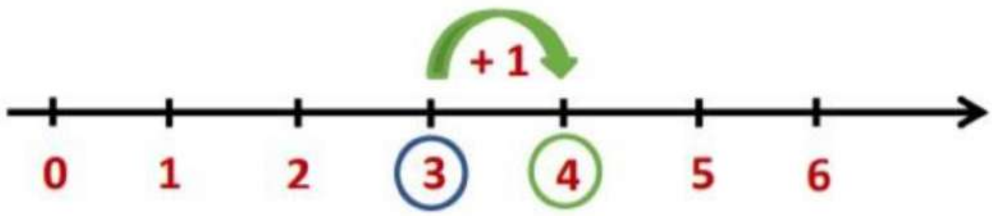
Number – 1 = Predecessor



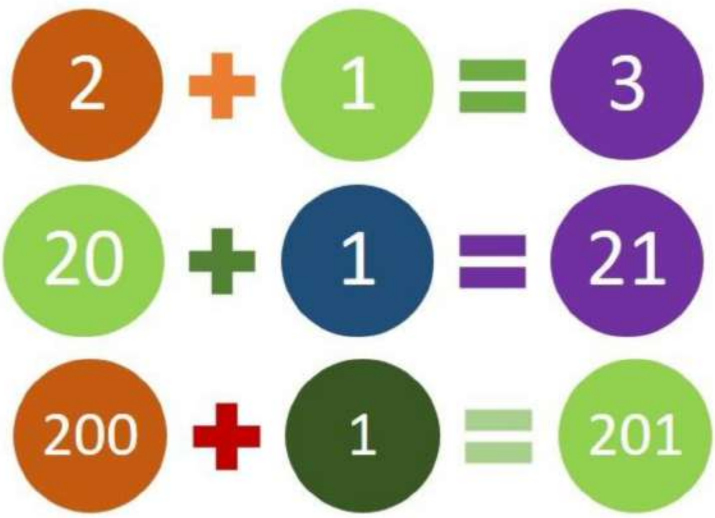


We can obtain the successor of a whole number by adding 1 to the given number. Therefore, the number which comes after the given number is known as Successor.

Number + 1 = Successor



Number Successor



Example: Write the successor of:

a) 244068 b) 100199

c) 2345670 d) 99999

Number	Successor
244068	**244068 + 1 = 244069**
100199	100199 + 1 = 100200
2345670	**2345670 + 1 =2345671**
99999	99999 + 1 = 100000

Example: Write the predecessor of:

a) 980 b) 100000

c) 30809 d) 7654321

Number	Predecessor
980	**980 - 1 = 979**
100000	100000 - 1 = 99999
30809	**30809 – 1 = 30808**
7654321	7654321 - 1 = 7654320

Example: Write the next three natural numbers after 10997.

$10997 + 1 = 10998$

$10998 + 1 = 10999$

$10999 + 1 = 11000$

Therefore, the next 3 natural numbers after 10997 are 10998, 10999 and 11000.

Whole Number - Properties of Addition

If we see various operations on numbers, we notice several properties of whole numbers. These properties help us to understand the numbers better and also make calculations under certain operations very simple.

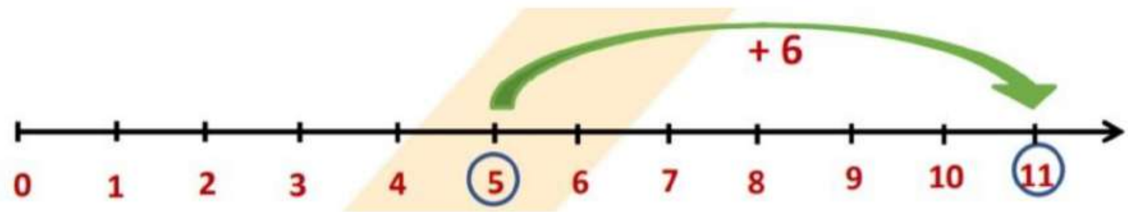
Properties of Addition

i) Closure property:

a, b **Whole Numbers** → $(a + b)$ **Whole Number**

If $\boldsymbol{a}$ and $\boldsymbol{b}$ are two whole numbers, then $\boldsymbol{a} + \boldsymbol{b}$ is always a whole number.

a	b	$a + b$
10	7	17, a whole number
5	6	11, a whole number
8	25	33, a whole number



Therefore, the sum of any two whole numbers is a whole number. This property is known as the closure property for addition of whole numbers.

ii) Commutative property:

a, b **Whole Numbers** → $a + b = b + a$

If $\boldsymbol{a}$ and $\boldsymbol{b}$ are two whole numbers, then $\boldsymbol{a} + \boldsymbol{b} = \boldsymbol{b} + \boldsymbol{a}$

a	b	$a + b$	$b + a$	Is $a + b = b + a$?
10	7	10 + 7 = 17	7 + 10 =17	Yes
5	6	5 + 6 = 11	6 + 5 = 11	Yes
8	25	8 + 25 = 33	25 + 8 = 33	Yes

Hence, we can add two whole numbers in any order. So, the sum of whole numbers remains the same even if the order of addition is changed.

Therefore, we can say that addition is commutative for whole numbers. This property is known as commutativity for addition.

iii) Associative Property:

a, b & c Whole Numbers → $(a + b) + c = a + (b + c)$

If $\boldsymbol{a}$, $\boldsymbol{b}$ & $\boldsymbol{c}$ are any three whole numbers, then

$(\boldsymbol{a} + \boldsymbol{b}) + \boldsymbol{c} = \boldsymbol{a} + (\boldsymbol{b} + \boldsymbol{c})$

a	b	c	$(a + b) + c$	$a + (b + c)$	Is $(a + b) + c = a + (b + c)$?
10	7	5	(10 + 7) + 5 = 22	10 + (7 + 5) = 22	Yes
5	6	21	(5 + 6) + 21 = 32	5 + (6 + 21) = 32	Yes
8	25	5	(8 + 25) + 5 = 38	8 8 + (25 + 5) = 38	Yes

When we are adding whole numbers, they can be grouped in any order and the result remains the same. Therefore, whole numbers are associative under addition. This property is known as associativity for addition.

When we are adding three or more numbers then we can group them in such a way that the calculations become easier.

Example: Find the sum of 435, 216 and 165

$435 + 216 + 165$

Now, $5 + 5 = 10$. So, we add $435 + 165$ first.

$= (435 + 165) + 216$

$= 600 + 216 = 816$

Example: Find the sum by suitable arrangement:

a) $837 + 208 + 363$

b) $1962 + 453 + 1538 + 647$

Now, $7 + 3 = 10$. So, we add $837 + 363$ first.

$= (837 + 363) + 208$

$= 1200 + 208 = 1408$

b) $1962 + 453 + 1538 + 647$

Now, $2 + 8 = 10$ .So, we make one group of $(1962 + 1538)$

$3 + 7 = 10$. Next we make another group of $(453 + 647)$

$= (1962 + 1538) + (453 + 647) =$

$3500 + 1100 = 4600$

Example: Find the sum:

a) $250 + 999$

b) $2536 + 99999$

c) $943 + 207 + 457$

d) $1359 + 101 + 461 + 99$

$= 250 + (1000 - 1)\ (\because 999 = 1000 - 1)$

$= (250 + 1000) - 1$

$= 1250 - 1 = 1249$

b) $2536 + 9999$

$= 2536 + (10000 - 1)\ (\because 9999 = 10000 - 1)$

$= (2536 + 10000) - 1$

$= 12536 - 1 = 12535$

c) $943 + 207 + 457$

Now, $3 + 7 = 10$ .So, we make one group of $(943 + 457)$

$= (943 + 457) + 207$

$= 1400 + 207 = 1607$

d) $1359 + 101 + 461 + 99$

Now, $9 + 1 = 10$ .So, we make one group of $(1359 + 461)$

and another group of $(101 + 99)$

$= (1359 + 461) + (101 + 99)$

$= 1820 + 200 = 2020$

iv) Additive Identity Property:

$$a + 0 = a$$

If $\boldsymbol{a}$ is any whole numbers, then $\boldsymbol{a} + \mathbf{0} = \boldsymbol{a} = \mathbf{0} + \boldsymbol{a}$

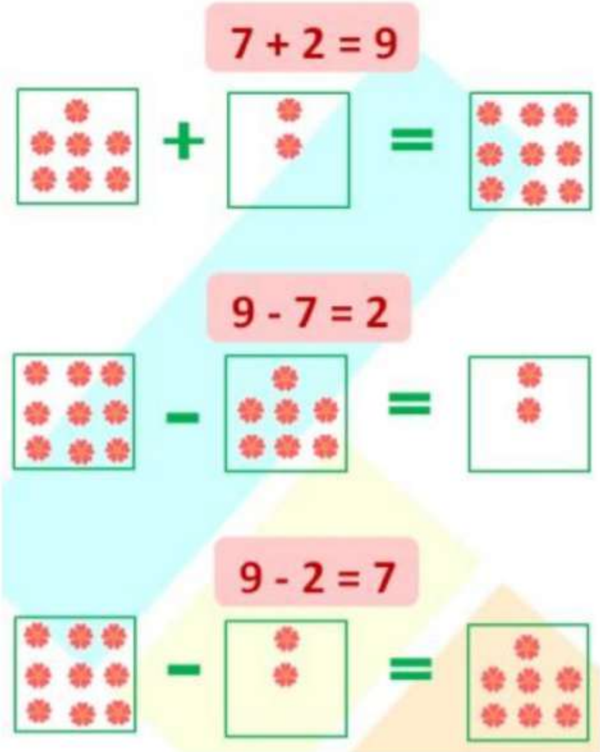
a	0	$a + 0$	Is $a + 0 = a$?
1	0	1 + 0 = 1	Yes
15	0	15 + 0 = 15	Yes
196	0	196 + 0 = 196	Yes

The number 'zero' has a special role in addition. When we add zero to any whole number the result is the same whole number again. Zero is called an identity for addition of whole numbers or additive identity for whole numbers.

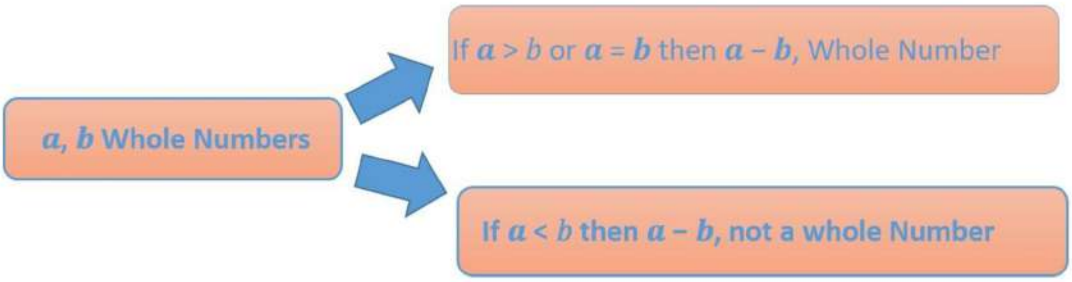
Whole Numbers - Properties of Subtraction

Subtraction is an inverse process of addition.

Example: $(7 + 2 = 9) \Rightarrow (9 - 7 = 2)$



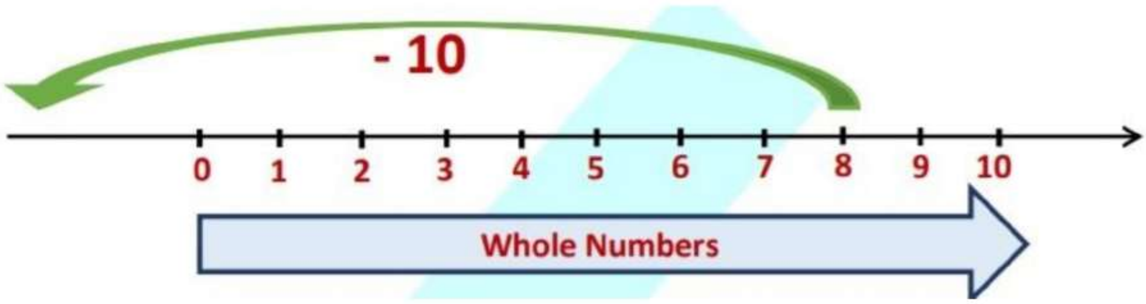
i) Closure Property:



If $\boldsymbol{a}$ and $\boldsymbol{b}$ are two whole numbers such that $\boldsymbol{a} > b$ or $\boldsymbol{a} = \boldsymbol{b}$, then $\boldsymbol{a} - \boldsymbol{b}$ is a whole number.

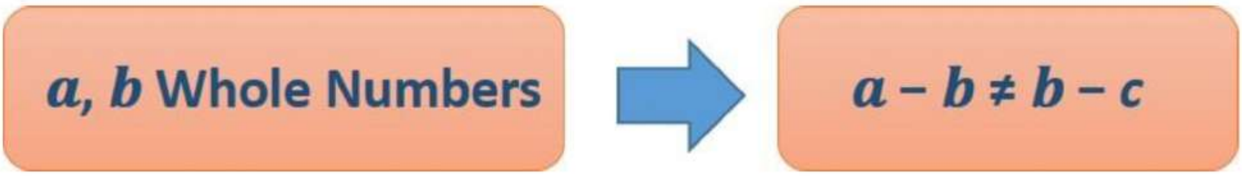
If $\boldsymbol{a} < b$, then $\boldsymbol{a} - \boldsymbol{b}$ is not a whole number.

a	b	$a - b$	Whole Number
9	7	9 – 7 = 2	Yes
8	10	8 – 10 = Not a whole number	No
10	27	10 – 27 = Not a whole number	No



The whole numbers are not closed under subtraction.

ii) Commutative Property:



If $\boldsymbol{a}$ and $\boldsymbol{b}$ are two whole numbers, then $\boldsymbol{a} - \boldsymbol{b} \neq \boldsymbol{b} - \boldsymbol{a}$

a	b	$a-b$	$b-a$	Is $a-b=b-a$?
11	7	11 - 7 = 4	7 – 11 = Not a whole number	No
18	11	18 - 11 = 7	11 - 18 = Not a whole number	No
13	25	13 – 25 = Not a whole number	25 - 13 = 12	No

iii) Associative Property:

a, b&c Whole Numbers → $(a-b)-c \neq (a-b)-c$

For any three whole numbers $\boldsymbol{a}$, $\boldsymbol{b}$ and $\boldsymbol{c}$,

$(\boldsymbol{a}-\boldsymbol{b})-\boldsymbol{c} \neq \boldsymbol{a}-(\boldsymbol{b}-\boldsymbol{c})$

a	b	c	$(a-b)-c$	$a-(b-c)$	Is $(a-b)-c$ $=a-(b-c)$?
10	7	5	(10 - 7) – 5 = Not a whole number	10 - (7 - 5) = 8	No
5	6	21	(5 - 6) – 21 = Not a whole number	5 - (6 - 21) = 20	No
8	25	5	(8 - 25) - 5 = Not a whole number	8 - (25 - 5) = Not a whole number	No

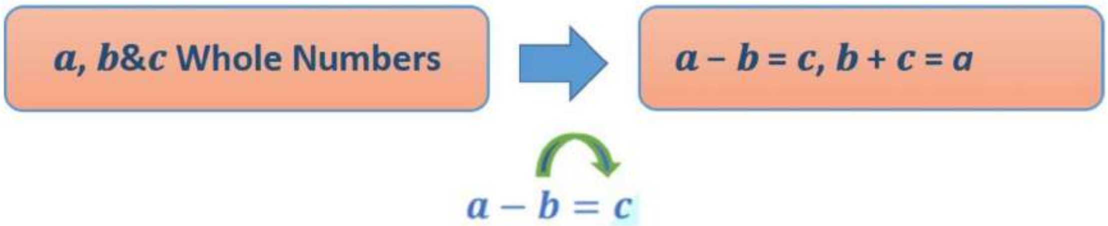
iv) If $\boldsymbol{a}$ is any whole number other than zero, then $\boldsymbol{a}-\mathbf{0}=\boldsymbol{a}$ but $\mathbf{0}-\boldsymbol{a}$ is not defined.

a is a Whole Number → $a-0=a$, $0-a$ is not defined

18 – 5 = 13 but 5 – 18 is not defined in whole numbers.

30 – 12 = 18 but 12 – 30 is not defined in whole numbers

v) If $\boldsymbol{a}$, $\boldsymbol{b}$ and $\boldsymbol{c}$ are whole numbers such that $\boldsymbol{a} - \boldsymbol{b} = \boldsymbol{c}$, then $\boldsymbol{b} + \boldsymbol{c} = \boldsymbol{a}$



Transposing $\boldsymbol{b}$ to RHS

$\boldsymbol{a} = \boldsymbol{c} + \boldsymbol{b}$ or $\boldsymbol{a} = \boldsymbol{b} + \boldsymbol{c}$

If 25 – 16 = 9 then 25 = 9 + 16,

If 46 – 8 = 38 then 46 = 38 + 8

Example: Consider two whole numbers $\boldsymbol{p}$ and $\boldsymbol{q}$ such that $\boldsymbol{p}$ is greater than $\boldsymbol{q}$.

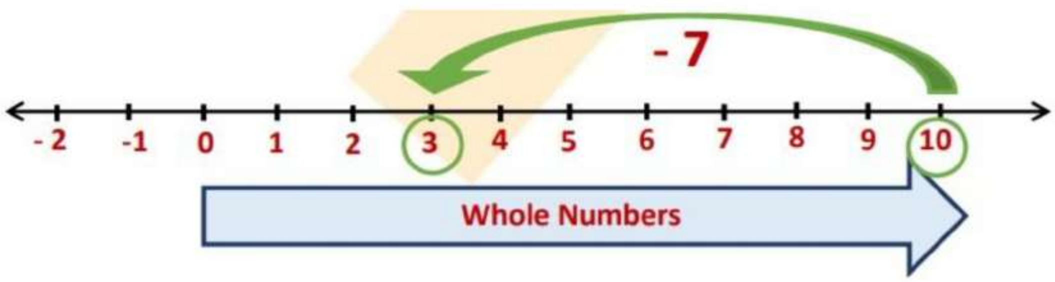
i) Is $\boldsymbol{p} - \boldsymbol{q}$ a whole number? Is the result always true?

ii) Is $\boldsymbol{q} - \boldsymbol{p}$ a whole number? Is the result always true?

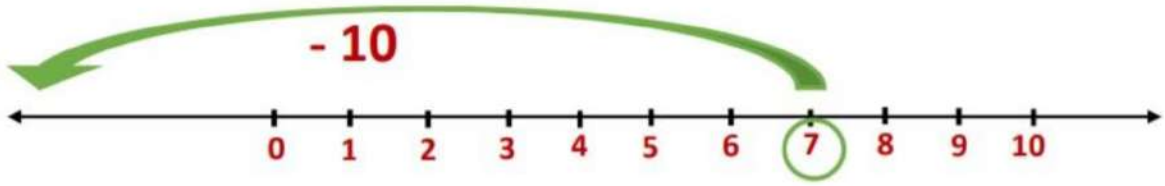
i) Yes, $\boldsymbol{p} - \boldsymbol{q}$ is a whole number is always true for $\boldsymbol{p} > q$.

ii) No, $\boldsymbol{q} - \boldsymbol{p}$ is not a whole number is always true for $\boldsymbol{p} > q$.

Let the value of $\boldsymbol{p}$ and $\boldsymbol{q}$ be 10 and 7 respectively.



$\boldsymbol{p} - \boldsymbol{q}$ = 10 – 7 = 3, a whole number



$\boldsymbol{q} - \boldsymbol{p} = 7 - 10$ not a whole number

Example: Solve the following,

i) 367 – 99

367 – 99

$= 367 + (-100 + 1)$

$= 367 - 100 + 1$

$= (367 + 1) - 100$

$= 368 - 100 = 268$

ii) 5689 – 99

5689 – 99

$= 5689 + (-100 + 1)$

$= 5689 - 100 + 1$

$= (5689 + 1) - 100$

$= 5690 - 100 = 5590$

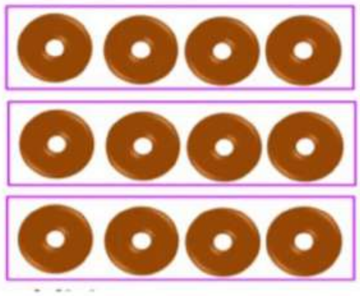
Whole Number - Properties of Multiplication

Let us consider 3 packets, each consisting of 4 doughnuts.

Total number of doughnuts = 4 + 4 + 4 = 12

We can also write:

Total number of doughnuts = 3 × 4 = 12



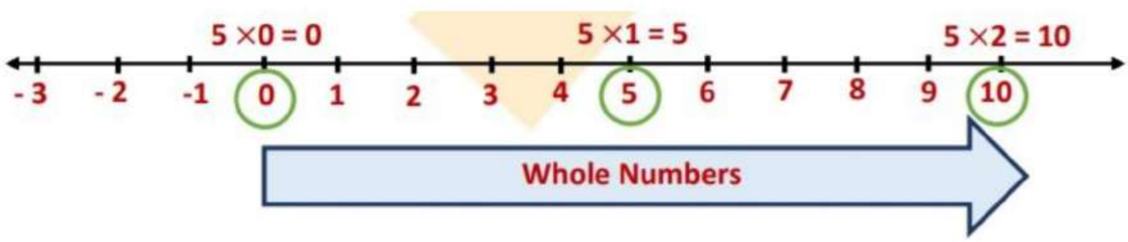
Therefore, we can say that multiplication is repeated addition.

i) Closure Property:

***a*, *b* Whole Numbers** → ***a* × *b*, Whole Number**

If $\boldsymbol{a}$ and $\boldsymbol{b}$ are two whole numbers, then $\boldsymbol{a} \times \boldsymbol{b}$ is always a whole number.

a	*b*	*a* × *b*	Whole Number
9	7	9 × 7 = 63	Yes
5	11	5 × 11 = 55	Yes
10	27	10 × 27 = 270	Yes



When we multiply two whole numbers, the product is also a whole number.

ii) Commutative Property:

***a*, *b* Whole Numbers** → $a \times b = b \times a$

If $\boldsymbol{a}$ and $\boldsymbol{b}$ are two whole numbers, then $\boldsymbol{a} \times \boldsymbol{b} = \boldsymbol{b} \times \boldsymbol{a}$

a	b	$a \times b$	$b \times a$	Is $a \times b = b \times a$?
1	7	$1 \times 7 = 7$	$1 \times 7 = 7$	Yes
8	11	$8 \times 11 = 88$	$11 \times 8 = 88$	Yes
3	100	$3 \times 100 = 300$	$100 \times 3 = 300$	Yes

The value of the product does not change even when the order of multiplication is changed.

iii) Associative Property:

***a*, *b*&*c* Whole Numbers** → $(a \times b) \times c = a \times (b \times c)$

If $\boldsymbol{a}$, $\boldsymbol{b}$&$\boldsymbol{c}$ are any three whole numbers, then $(\boldsymbol{a} \times \boldsymbol{b}) \times \boldsymbol{c} = \boldsymbol{a} \times (\boldsymbol{b} \times \boldsymbol{c})$

a	b	c	$(a \times b) \times c$	$a \times (b \times c)$	Is $(a \times b) \times c = a \times (b \times c)$?
1	7	5	$(1 \times 7) \times 5 = 35$	$1 \times (7 \times 5) = 35$	Yes
5	6	10	$(5 \times 6) \times 10 = 300$	$5 \times (6 \times 10) = 300$	Yes
8	2	5	$(8 \times 2) \times 5 = 80$	$8 \times (2 \times 5) = 80$	Yes

When we multiply three or more whole numbers, the value of the product remains the same even if they are grouped in any manner.

iv) Multiplicative Identity Property:

$$a \times 1 = a = 1 \times a$$

If $\boldsymbol{a}$ is any whole number, then $\boldsymbol{a} \times \mathbf{1} = \boldsymbol{a} = \mathbf{1} \times \boldsymbol{a}$

a	1	$a \times 0$	Is $a \times 1 = a$?
1	1	$1 \times 1 = 1$	Yes
15	1	$15 \times 1 = 15$	Yes
196	1	$196 \times 1 = 196$	Yes

Multiplicative identity is any number which when multiplied by any whole number, then the value remains the same.

So, 1 is the multiplicative identity of whole numbers.

v) Distributivity of Multiplication over Addition:

$$a \times (b + c) = a \times b + a \times c$$

If $\boldsymbol{a}$, $\boldsymbol{b}$&$\boldsymbol{c}$ are any three whole numbers, then $\boldsymbol{a} \times (\boldsymbol{b} + \boldsymbol{c}) = \boldsymbol{a} \times \boldsymbol{b} + \boldsymbol{a} \times \boldsymbol{c}$

a	b	c	$a \times (b + c)$	$a \times b + a \times c$	Is $a \times (b + c)$ $= a \times b + a \times c$?
2	3	5	5 $2 \times (3 + 5) = 16$	6 $2 \times 3 + 2 \times 5 = 16$	Yes
1	4	7	$1\times (4 + 7) = 11$	$1\times 4+1 \times 7 = 11$	Yes
3	5	8	$3\times (5 + 8) = 39$	$3\times5 + 3 \times 8 = 39$	Yes

v) If $\boldsymbol{a}$ is any whole number other than zero, then $\boldsymbol{a} \times \mathbf{0} = \mathbf{0}$

$$a \times 0 = 0$$

$15 \times 0 = 0$; $100 \times 0 = 0$

Example: Find the product by suitable rearrangement:

i) $4 \times 1768 \times 25$ ii) $2 \times 166 \times 50$

iii) $285 \times 4 \times 75$ iv) $625 \times 279 \times 16$

i) $4 \times 1768 \times 25$

$= (4 \times 25) \times 1768$ (by commutative property)

$= 100 \times 1768 = 176800$

ii) $2 \times 166 \times 50$

$= (2 \times 50) \times 166$ (by commutative property)

$= 100 \times 166 = 16600$

iii) $285 \times 4 \times 75$

$= 285 \times (4 \times 75)$ (by commutative property)

$= 285 \times 300 = 85500$

iv) $625 \times 279 \times 16$

$= (625 \times 16) \times 279$ (by commutative property)

$= 10000 \times 279 = 2790000$

Example: Find the value of the following:

i) $297 \times 16 + 297 \times 4$

ii) $54279 \times 91 + 7 \times 54279$

iii) $3845 \times 5 \times 762 + 769 \times 25 \times 238$

iv) $81265 \times 269 - 81265 \times 169$

i) $297 \times 16 + 297 \times$

$4 = 297 \times (16 + 4)$

$= 297 \times 20 = 5940$

ii) $54279 \times 91 + 7 \times 54279$

$= 54279\ (91 + 7) = 54279 \times 100 = 5427900$

iii) $3845 \times 5 \times 762 + 769 \times 25 \times 238$

$= 3845 \times 5 \times 762 + 769 \times 5 \times 5 \times 238$

$= 3845 \times 5 \times 762 + 3845 \times 5 \times 238$

$= 3845 \times 5 \times (762 + 238)$

$= 19925 \times 1000 = 19925000$

iv) $81265 \times 269 - 81265 \times 169$

$= 81265 \times (269 - 169)$

$= 81265 \times 100$

$= 8126500$

Example: Find the product using suitable properties

i) 738×103 ii) 854×102

iii) 258×1008 iv) 1005×168

i) 738×103

$= 738 \times (100 + 3)$

$= 738 \times 100 + 738 \times 3$

(By Distributivity of Multiplication over Addition)

$= 73800 + 2214 = 76014$

ii) 854×102

$= 854 \times (100 + 2)$

$= 854 \times 100 + 854 \times 2$

(By Distributivity of Multiplication over Addition)

$= 85400 + 1708 = 87108$

iii) 258×1008

$= 258 \times (1000 + 8)$

$= 258 \times 1000 + 258 \times 8$

(By Distributivity of Multiplication over Addition)

$= 258000 + 2064 = 2582064$

iv) 1005×168

$= (1000 + 5) \times 168$

$= 1000 \times 168 + 168 \times 5$

(By Distributivity of Multiplication over Addition)

$= 168000 + 840 = 168840$

Example: A taxi driver filled his car petrol tank with 40 liters of petrol on Monday. The next day, he filled the tank with 60 liters of petrol. If the petrol costs Rs 45 per liter, how much did he spend in all on petrol?

Petrol filled on Monday = 40 liters

Petrol filled on Tuesday = 60 liters

Total petrol filled = (40 + 60) liters

Cost of 1 liter of petrol = Rs 45

Cost of 90 liters of petrol = Rs 454× (40 + 60)

= Rs 45 × (40 + 60) = Rs 45 × 100

= Rs 4500

Example: A vendor supplies 30 liters of milk to a hotel in the morning and 70 liters of milk in the evening. If the milk costs Rs 25 per liter, how much money is due to the vendor per day?

Milk supplied in the morning = 30 liters

Milk supplied in the evening = 70 liters

Total supply of milk to the hotel = (30 + 70) liters

Cost of 1 liter of milk = Rs 25

Cost of 100 liters of milk = Rs 25 ×(30 + 70)

= Rs 25 × 100 = Rs 2500

Money due to the vendor = Rs 2500

Whole Number - Properties of Division

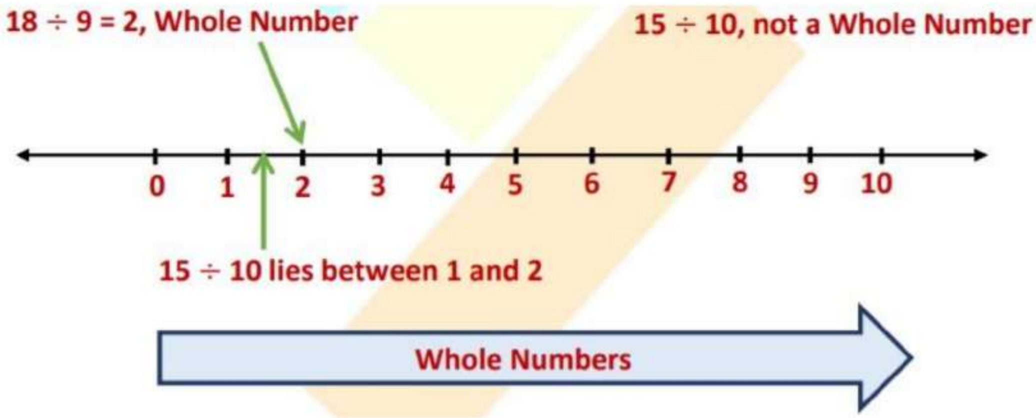
i) Closure Property

a, b Whole Number → **$a \div b$ not always a Whole Number**

If a and b are two whole numbers, then a ÷ b is not always a whole number.

a	*b*	*a* ÷ *b*	Whole Number
18	9	18 ÷ 9 = 2	Yes
15	10	15÷ 10 = Not a whole number	No
10	27	10÷27 = Not a whole number	No

So, whole numbers are not closed under division.



ii) Commutative Property

$$a \div b \neq b \div a$$

If a and b are two whole numbers, a ÷ b ≠ b ÷ a

a	*b*	*a* ÷ *b*	*b* ÷ *a*	Is *a* ÷ *b* = *b* ÷ *a* ?
20	4	20 ÷ 4 = 5	4 ÷ 20 = Not a whole Number	No
18	9	18 ÷ 9 = 2	9 ÷ 18 = Not a whole Number	No
25	5	25÷ 5 = 5	5÷ 25 = Not a whole Number	No

iii) Associative Property

$$(a \div b) \div c \neq a \div (b \div c)$$

For any 3 whole numbers a, b and c, (a ÷ b) ÷ c ≠ a ÷ (b ÷ c)

a	b	c	$(a \div b) \div c$	$a \div (b \div c)$	Is $(a \div b) \div c = a \div (b \div c)$?
24	4	2	(24÷ 4) ÷ 2 = 3	24÷ (4÷2) = 12	No
40	10	2	(40÷ 10)÷ 2 = 2	40÷ (10÷ 2) = 8	No
48	12	4	(48÷12)÷4 = 1	48÷ (12÷ 4) = 16	No

So, division of whole numbers is not Associative.

iv) Division by 1

$$a \div 1 = a$$

If a is a whole number, then$a \div 1 = a$

a	1	$a \div 1$	Is $a \div 1 = a$?
5	1	5 ÷ 1 = 1	Yes
15	1	15 ÷ 1 = 15	Yes
150	1	150 ÷ 1 = 150	Yes

v) Division of 0 by any whole number

$$0 \div a = 0$$

If a is any whole number other than zero, then 0 ÷ a = 0

a	0	$0 \div a$
5	0	0 ÷ 5 = 0
7	0	0 ÷ 7 = 0
12	0	0 ÷ 12 = 0

If we divide 0 by any whole number, the result is always 0.

vi) Division of any whole number by 0

a ÷ 0 = Not Defined

To divide any number, say 6 by 0, we first have to find out a whole number which when multiplied by 0 gives us 6. This is not possible. Therefore, division by 0 is not defined.

Example: Solve the following
i) 636 ÷ 1 ii) 0 ÷ 253
iii) 246 – (121 ÷ 121) iv) (45÷ 5) – (9÷ 3)
i) 636 ÷ 1 = 636 (∵ a ÷1 = a)
ii) 0 ÷ 253 = 0 (∵ 0 ÷ a = 0)
iii) 246 – (121 ÷ 121)
= 246 – (1)
= 246 – 1
= 245
iv)(45÷ 5) – (9 ÷ 3)
= 9 – 3 = 6

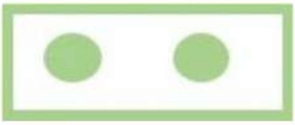
Patterns in Whole Numbers
A pattern is an arrangement of numbers, shapes, pictures etc.
Now, we will arrange numbers in elementary shapes made up of dots. Every number can only be arranged in one of these shapes,
1) A line

2) A rectangle

3) A square

4) A triangle

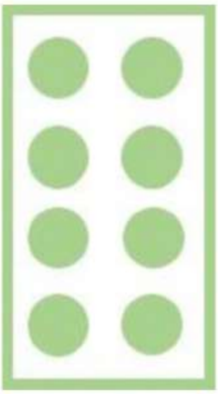
1) Every number can be arranged as a line,
Number 2 is shown as



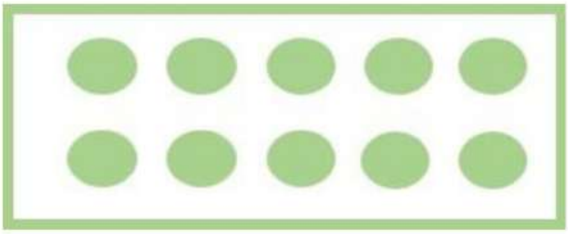
Number 3 is shown as

2) Some numbers can be arranged as a rectangle
Number 6 is shown as

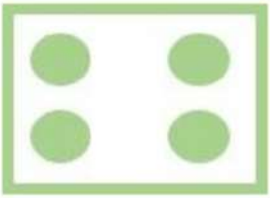
Number 8 is shown as



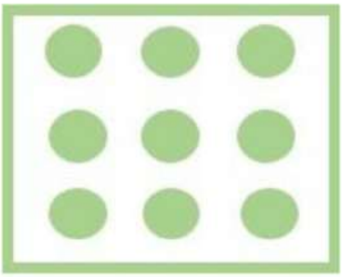
Number 10 is shown as



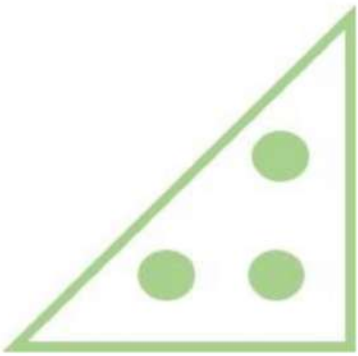
3) Some numbers can be arranged as a rectangle
Number 4 is shown as



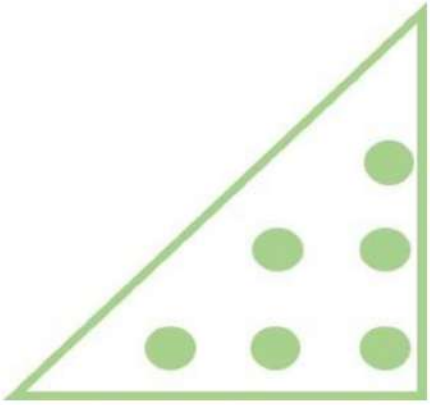
Number 9 is shown as



4) Some numbers can also be arranged as triangles.
Number 3 is shown as



Number 6 is shown as



Patterns Observation
This type of pattern helps in adding or subtracting with numbers of the form 9, 99, 999.....

Example: Study the pattern
$1 \times 8 + 1 = 9$
$12 \times 8 + 2 = 98$
$123 \times 8 + 3 = 987$
$1234 \times 8 + 4 = 9876$
$12345 \times 8 + 5 = 98765$
Write the next two steps. Can you say how the pattern works?

Next two steps are:
$123456 \times 8 + 6 = 987654$
$1234567 \times 8 + 7 = 9876543$
Patterns works like this
$1 \times 8 + 1 = 9$
$12 \times 8 + 2 = 98$
$123 \times 8 + 3 = 987$
$1234 \times 8 + 4 = 9876$
$12345 \times 8 + 5 = 98765$
$123456 \times 8 + 6 = 987654$
$1234567 \times 8 + 7 = 9876543$

- $135 + 9$
  $= 135 + (10 - 1)$
  $= (135 + 10) - 1$
  $= 145 - 1 = 144$
- $135 - 9$
  $= 135 + (-10 + 1)$
  $= 135 - 10 + 1$

$= (135 - 10) + 1$
$= 125 + 1 = 126$

- $135 + 99$
  $= 135 + (100 - 1)$
  $= (135 + 100) - 1$
  $= 235 - 1 = 234$
- $135 - 99$
  $= 135 + (-100 + 1)$
  $= 135 - 100 + 1$
  $= (135 - 100) + 1$
  $= 35 + 1 = 36$
- 86×9
  $= 86 \times (10 - 1)$
  $= 86 \times 10 - 86 \times 1$
  $= 860 - 86 = 774$
- 86×99
  $= 86 \times (100 - 1)$
  $= 86 \times 100 - 86 \times 1$
  $= 8600 - 86 = 8514$
- 86×999

  $= 86 \times (1000 - 1)$

  $= 86 \times 1000 - 86 \times 1 = 86000 - 86 = 85914$