

30 Sep' 24

Integer +, - :

$$11 - 3 = 11 + (-3) = (-3) + 11$$

$$-11 + 23 - 46 + 435 - 637 = (-11) + 23 + (-46) + 435 + (-637)$$

$$-11 - 3 = -(11 + 3)$$

I have '-3' apples = I have to give away +3 apples
 $-3 = -(+3) = +(-3)$

$11 - 3 = 8$ (I am giving 3 apples away out of 11, so 8 are remaining)

$$11 - (-3) = \text{I am giving away } (-3) \text{ apples out of 11, so I will have 14 apples}$$

$$= 11 + 3 = 14$$

$$-(-3) = +3 ; +(-3) = -(+3) = -3 ;$$

$$-(3+4+5) = -3-4-5$$

$$+(3+4+5) = +3+4+5$$

$$-(3-4+5) = -3+4-5$$

$$+(3-4-5) = +3-4-5$$

$$-(+) = -$$

$$-(-) = +$$

$$+(+) = +$$

$$+(-) = -$$

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$$-(-) = +$$

Eg:

<u>Krishna</u>		<u>Virat</u>		Together
10 apples		10 apples		$= 10 + 10 = 20$

→ Krishna gives '3' apples to Virat

$$10 - 3 = 7 \text{ apples}$$

$$10 + 3 = 13 \text{ apples}$$

$$7 + 13 = 20$$

→ Krishna gives '-2' apples to Virat

$$7 - (-2) = 9 \text{ apples}$$

$$13 + (-2) = 11 \text{ apples}$$

$$9 + 11 = 20$$

Integer $\ast, /$

$$(+) \ast (+) = +$$

$$(-) \ast (+) = -$$

$$(+) \ast (-) = -$$

$$(-) \ast (-) = +$$

$$(+) / (+) = +$$

$$(+) / (-) = -$$

$$(-) / (+) = -$$

$$(-) / (-) = +$$

(laws, rules)
Properties of Integers

Closure, Associative, Distributive,
Commutative properties

Closure property:

If a, b are integers, then
 $a+b$ is also integer.

$a-b$ " " "

$a*b$ " " "

a/b may not be integer

This is written as

If $a, b \in \mathbb{Z}$
(belong to) (integers), then

$a+b \in \mathbb{Z}$

$a-b \in \mathbb{Z}$

$a*b \in \mathbb{Z}$

/ a/b may or
may not
 $\in \mathbb{Z}$

$+$, $-$, $*$ satisfy closure property on ' \mathbb{Z} '.

Associative property:

$$\underline{a, b, c \in \mathbb{Z}}$$

$$(a+b)+c = a+(b+c) \quad | \quad (3+2)+4 = 3+(2+4)$$

$$(a*b)*c = a*(b*c) \quad | \quad (3*2)*4 = 3*(2*4)$$

$+$, $*$ satisfy associative property on ' \mathbb{Z} '.

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

$$(a/b)/c = \frac{a}{(b*c)}$$

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

$$(a-b)-c = a-b-c = a-(b+c)$$

$-$, $/$ do not satisfy associative property on \mathbb{Z} .

Distributive property

$$\underline{a, b, c \in \mathbb{Z}}$$

$$a * (b + c) = (a * b) + (a * c)$$

$$a * (b - c) = a * b - a * c$$

$$4 * (3 + 2) =$$

$$(4 * 3) + (4 * 2)$$

$$4 * (3 - 2)$$

$$= (4 * 3) - (4 * 2)$$

Commutative property:
 $a, b \in \mathbb{Z}$

$$a + b = \checkmark b + a ; a * b = \checkmark b * a$$

$$a - b \neq b - a ; a / b \neq b / a$$

$+$, $*$ are commutative on (\mathbb{Z})
but $-$, $/$ are not.

HW: (1) Give two examples each for

$+$, $-$, $*$, $/$ to show if they satisfy
closure, associative, distributive, commutative
on (\mathbb{Z}) . laws

HW: (2) Do the same on ' \mathbb{Q} '
(rational / floating
point numbers)

(Symbol ' \mathbb{R} ' is for
real numbers)