25 Oct '24 :

Distributive property — two types
- left distributive
- right distributive

→ On 'Q', $a * (b+c) = (a*b)+(a*c)$

$a * (b+c+d+e+f) = (a*b)+(a*c)+(a*d)+(a*e)+(a*f)$

Multiplication is left-distributive over addition.

⟶ $(b+c)*a = (b*a)+(c*a)$

$(b+c+d+e+f)*a = (b*a)+(c*a)+(d*a)+(e*a)+(f*a)$

Multiplication is right-distributive over addition.

→ * is both left & right distributive over +
(because * is commutative)

→ * is distributive over + on $\mathbb{Q}$ as it is both left & right distributive

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→ Division on $\mathbb{Q}$:

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

$(a+b+c+d+e)/f = (a/f)+(b/f)+(c/f)+(d/f)+(e/f)$

Division is right distributive over '+'.

→ $c/(a+b) \neq \frac{c}{a} + \frac{c}{b}$

$9/(1+2)$ $\quad \frac{9}{1} + \frac{9}{2}$

$3 \neq 9 + 4.5$

Division is not left distributive over '+'

→ Division is only right distributive but not left distributive over '+' on Q.
(because '/' is not commutative)

→ Division is not 'distributive' over '+'
(as it is not both left & right distributive)

→ Because subtraction is the same as addition of -ve (negative) numbers,
* is distributive over -
/ is only right distributive over -
(same as for addition)

→ Examples : (Expansion of terms in +|- using distributive laws)

→ $3+(4+2) = (3+4)+2$

So, you can simply write it as

$3+4+2$

→ $3+(4-2) = 3+1*(4-2)$

$= 3+4-2$

→ $(3+5-2+6)\times 2$

$= (3+5+(-2)+6)\times 2$

$= 3\times 2+5\times 2+(-2)\times 2)+(6\times 2)$

$= (3\times 2)+(5\times 2)-(2\times 2)+(6\times 2)$

→ $4 - 2 * (3 - 5 + 6)$

$= 4 + (-2) * (3 - 5 + 6)$

$= 4 + (-2) * 3 + (-2) * (-5) + (-2) * 6$

$= 4 - 2 \times 3 + 2 \times 5 - 2 \times 6$

→ $(3 - 5 + 6) / 2 + 5 * (3 - 5)$

$= \frac{3}{2} - \frac{5}{2} + \frac{6}{2} + 5 \times 3 - 5 \times 5$

HW: Expand these +, − using distributive laws and verify the sums with & without expansion.

(Eg) $3+(4-5)*3$

Without expansion: $3+(-1)*3 = 3-3 = 0$

With expansion: $3+4\times3-5\times3$

$= 3+12-15 = 0$

Do this for the following

(1) $(15-2+4)\times3 - 5\times(6+4-3)$

(2) $(32-16+4)/4 - 18/(1+2+3)$

(3) $15*(16+2-5) - 17*(5-2) - (17+1)/2$

For next class: Manual computations of +, -, /, * ops

$\longleftarrow \longrightarrow$ 2.2×3.5

$= \frac{22}{10} \times \frac{35}{10}$

22

$\times 35$

110

66

770

$15 \times 100 = 1500$

$15 / 100 = 0015.0000 / 100 = 00.1500$

$= 0.15$

$\frac{a}{b} \times \frac{c}{d} \times \frac{e}{f} = \frac{a \times c \times e}{b \times d \times f}$

$2.2 \times 3.5 = \frac{22}{10} \times \frac{35}{10} = \frac{22 \times 35}{10 \times 10} = \frac{770}{100} = 7.7$

HW: Revise decimals, & powers of 10