Pre-Calculus

Mathematics for Calculus

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Scientific calculators ✓
Graphing calculators X : Software accessible

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Software accessible

Ready to go:-

Calculations and Significant figures

Exact number: 1 dozen: 12 banana.

Triangle △ : 3 sides.

Approximate numbers:

Moon radius: 1074 miles

⇒ The true meaning of this is that the radius of the moon is closer to 1074 than 1073 or 1075.

but it is not exactly 1074.

Not exactly because this is something it has been measured.

Measured : Approximate

Counted / Defined : Exact

Significant figures: are the ways we communicate the precision of the approximate number.

Rule of Significant digits.

=> Left to Right.

Non zero Rule

1074

1074: 4 significant figures

1, 0, 7, 4.

1004: 4 significant figures.

1040: (3 significant figures).

Rule:-

From Start: Count first nonzero digit. to end

We need to count how many non-nero digits are ther Starting from left to right or start to end.

Testing my significant base

1. How many significant digits are there in 0.00780?

   Answer: 3

2. Which of these has two significant digits

   ⇒. 2.0

3. Write 0.0004560 in scientific notation.

   ⇒ 4.560×10^{-4}.

4.) 3.1000 → 5 sig figure most precise.

The Golden Rule

The final answer cannot be more precise than the least precise measurement eg:

122.64 (5 sig) x 37.3 (3 sig)

calculator answer: 4574

= 4570 //

This golden rule applies to calculations but it works differently for

multiplication / division

vs

Addition / Substraction.

4.56×2.3 ✓ 2sigs

3sigs

= Calculator $\Rightarrow$ 10.488

5sig's

Now, The answer is

1.0488×10^{1} //

I get paid $8 an hour

How much money do I make?

$A(B+C) = AB + AC$

$\$8(6+5) = 48+40$

$= 88\$$

Natural numbers

1 2, 3, 4, 5

Integers

Consist of natural numbers including the negatives and 0

- 4, -3, -2, -1, 0 1, 2 3 4

Rational number:

- Ratios of the integers.

$r = \frac{m}{n}$ m, n = integers

$n \neq 0$

$r = \frac{m}{n}$ | m, n = integers, $n \neq 0$ |

$\sqrt{2}$: This number cannot be expressed as a rational number

Therefore this is an irrational number.

$\sqrt{3}$ $\sqrt{5}$ $\sqrt[3]{2}$ π $\frac{3}{\pi^2}$

Rational

Irrational

$0.13 = \frac{13}{100} = \frac{3}{20}$.

$0.22 = \frac{2}{9}$ = Rational ✓.

→ All integers
All decimal
All

$\sqrt{9} = \boxed{3}$ → rational.

$\sqrt{7} = \boxed{2.6457513}$

π = irrational number.

e = irrational number.

Irrational number: repeating decimals for ever and we cant write it as ratio.

Decimal repeating: rational.

non repeating: irrational.

Algebra a+b = b+a

Properties of real numbers

Commutative Property (relating): When two numbers are added or, two numbers are multiplied order doesn't matter.

$$\begin{bmatrix} 7+3 = 3+7 \\ 3\times 5 = 5\times 3 \end{bmatrix}$$

$$\begin{bmatrix} a+b = b+a \\ ab = ba \end{bmatrix}$$

Associative Property :-

When we add three numbers. it doesn't matter which two we add first.

$$(2+4)+7 = 2+(4+7)$$

$$(3\times 7)\times 5 = 3\times(7\times 5).$$

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

$$(ab)c = a(bc)$$

Distributive Property.

$a(b+c) = ab+ac$

$(b+c)a = ba+ca$.

Example: 1

Using the distributive Property

a) $2(x+3) = 2x+6$

b) $(a+b)(x+y) = ax+bx+ay+by$

Properties of negatives

1. $(-1)a = -a$ $\quad (-1)5 = -5$

2. $-(-a) = a$ $\quad -(-5) = 5$

3. $(-a)b = a(-b) = -(ab)$ $\quad (-5)7 = -(5\cdot 7) = -35$

4. $(-a)(-b) = ab$ $\quad (-4)(-3) = 12$

5. $-(a+b) = -a-b$ $\quad -(3+5) = -3-5$

6. $-(a-b) = -a+b = b-a$ $\quad -(3+5) = -3-5 = -8$

Example 2 : Using properties of Negatives

let x, y, and z be the real numbers

a) $-(x+2) = -x - 2$

b) $-(x+y-z) = -x-y+z$

$$a \div b = a \times \frac{1}{b}$$

1. $\frac{a}{b} \times \frac{c}{d} = \frac{ac}{bd}$ $\quad \frac{2}{3} \times \frac{5}{7} = \frac{10}{21}$

2. $\frac{a}{b} \div \frac{c}{d} = \frac{a}{b} \times \frac{d}{c}$ $\quad \frac{2}{3} \div \frac{5}{7} = \frac{2}{3} \times \frac{7}{5}$

3. $\frac{a}{c} + \frac{b}{c} = \frac{a+b}{c}$ $= \frac{2}{5} + \frac{7}{5} = \frac{2+7}{5} = \frac{9}{5}$

4. $\frac{a}{b} + \frac{c}{d} = \frac{ad+bc}{bd}$ $= \frac{2}{5} + \frac{3}{7} = \frac{14+15}{35}$

$= \frac{29}{35}$

5. $\frac{ac}{bc} = \frac{a}{b}$ $\quad \frac{2 \times 5}{3 \times 5} = \frac{2}{3}$

6. If $\frac{a}{b} = \frac{c}{d}$ then

$ad = bc$

Least common Denominator (LCD).

$$\frac{5}{36} + \frac{7}{120}$$

$36 = 2 \times 2 \times 3 \times 3$

$= 2^2 \times 3^2$

$120 = 2 \times 2 \times 6 \times 3 \times 5$

$= 2^3 \times 3 \times 5$

$LCD = 2^3 \times 3^2 \times 5$

$= 360.$

$$\frac{5}{36} + \frac{7}{120} = \frac{5 \times 10}{36 \times 10} + \frac{7 \times 3}{120 \times 3}$$

$$= \frac{50}{360} + \frac{21}{360}$$

$$= \frac{71}{360} //$$

4. Inequality symbols

$<$ = "less than"

$>$ = "greater than"

$\leq$ = "less than or equal to"

$\geq$ = "greater than or equal to"

Sets and Intervals

Set is a collection of objects.