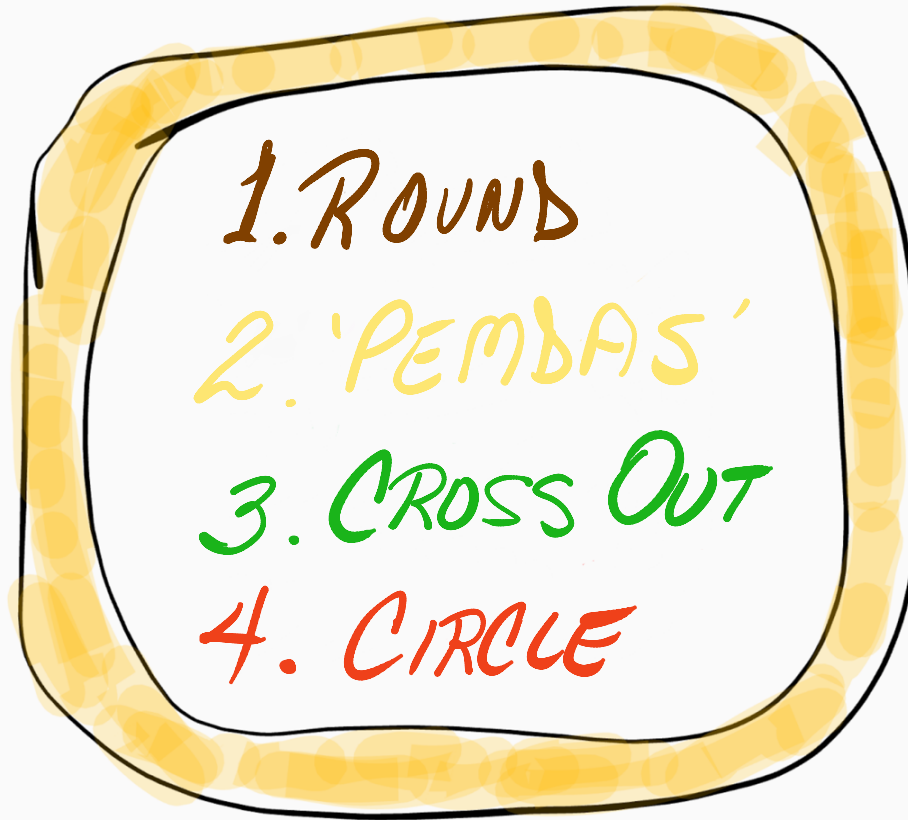


RULES FOR ESTIMATION



Below is a sample ...

Take a quick view of Dimensional Analysis. Here you can estimate *how many minutes are in a year!*

Now, don't worry if it looks difficult ... instead, get ready to get excited! You will be able to do amazing things, once I show you *Estimations* and *Dimensional Analysis!!*

$$\frac{60 \text{ min}}{1 \text{ hr}} \times \frac{25 \text{ hrs}}{1 \text{ day}} \times \frac{100 \text{ days}}{365 \text{ days}} \times \frac{400 \text{ days}}{1 \text{ yr}} = \frac{6 \times 10^5 \text{ min}}{1 \text{ yr}}$$

1. ROUNDS

Rounding means simplifying a number. For now, simplify each number to have a single digit at the left and all zeroes to the right. If the second digit is 4 or less, **round down**. If the second digit is 5 or more **round up**. 12 **rounds down** to 10 (because the 2 is 4 or less) and 365 **rounds up** to 400 (because the 6 is 5 or more).

Practice.

$$11 = \quad 13 =$$

$$19 = \quad 15 =$$

$$741 = \quad 8,986,003 =$$

$$11,999,999 = \quad 343 =$$

$$\frac{34}{80} = \quad \frac{53}{60} =$$

$$\frac{6}{5} = \quad \frac{855}{400} =$$

2. 'PEMDAS'

$$6 - (3 + 1) \div 2^2 \cdot 5 =$$

First, the "P" in "PEMDAS" is for **parenthesis**. Do the arithmetic inside the parenthesis.

$$6 - 4 \div 2^2 \cdot 5 =$$

Next, "E" is for **exponents**. Do this.

$$6 - 4 \div 4 \cdot 5 = 6 - 1 \cdot 5 =$$

Now, do "M" and "D" for **multiplication** and **division** (from left to right).

$$6 - 5 = 1$$

And finally, do "A" and "S" for **addition** and **subtraction**.

3. CROSS OUT & 4. CIRCLE

Cross Out whatever does not make it to the answer, **Circle** whatever makes it to the answer.

For instance,

- Cross Out **numbers** that get **rounded**.
- Cross Out **numbers** that get **cancelled**.
- Cross Out **dimensions** that get **cancelled**.
- Cross Out **numbers** that get **combined** with others.
- Circle **numbers** that **make it to the answer** ... because they didn't get rounded or cancelled or combined.
- Circle **dimensions** that **make it to the answer** ... because they didn't get cancelled.

$$\frac{\cancel{60} \text{ min}}{\cancel{1} \text{ hr}} \times \frac{\overset{25}{\cancel{24}} \text{ hrs}}{\cancel{1} \text{ day}} \times \frac{\overset{100}{\cancel{365}} \text{ days}}{\cancel{1} \text{ yr}} = \frac{6 \times 10^5 \text{ min}}{1 \text{ yr}}$$

(Did you notice that I rounded the 24 to 25? By the rules of rounding, I should have rounded 24 to 20. But when I saw that 4 in 400, I knew the 4 would multiply the rounded 24. So, I made the 24 a 25, so that 4 x 25 would make a nice, round 100.)