

### Rounding versus Approximation

☞ The photos on my phone used a memory around 2GB, to be exact 1.9GB.

☞ To build this wall you need approximately 125 bricks, to have enough.

#### ➤ Rounding:

❖ Eg: Round the following numbers:

a)  $2.6197 = \dots\dots\dots$

c)  $3.51 = \dots\dots\dots$

e)  $2.345 = \dots\dots$  to the nearest  $10^{\text{th}}$ .

b)  $13.412 = \dots\dots\dots$

d)  $19.93 = \dots\dots\dots$

f)  $4.731 = \dots\dots$  to the nearest  $100^{\text{th}}$ .

☆ How to round decimal numbers?

✓ Detect to which decimal you are asked to round.

✓ If the next decimal place value is:

5 or more, then increase the value in the last retained decimal place by 1.	Strictly less than 5 then cut just after the last retained decimal place.
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#### ➤ Approximation:

Approximation involves two cases:  $\left\{ \begin{array}{l} - \text{By default.} \\ - \text{By excess.} \end{array} \right.$

✓ **By default:** to approximate any number by default do the following steps:

☆ Write number in **decimal form**.

☆ Check to which **nearest digit** the approximation is required.

☆ Then **cancel** what follows this digit.

❖ Eg<sub>1</sub>: Approximate 2.753421 to the nearest one unit by default

☞ Soln:

☆ Determination of the digit:  $2.\overset{\textcircled{2}}{7}53421$

Unit digit

☆ Cancel what follows it:  $2.\overleftarrow{7}53421$

☆ Therefore the answer is 2.

❖ Eg<sub>2</sub>: Approximate 2.753421 to the nearest 0.1 or  $10^{-1}$  (or nearest tenth) by default

☞ Soln:

☆ Determination of the digit:  $2.\overset{\textcircled{7}}{7}53421$

Tenth digit

☆ Cancel what follows it:  $2.7\overleftarrow{5}3421$

☆ Therefore the answer is 2.7.

- ❖ Eg<sub>3</sub>: Approximate 2.753421 to the nearest 0.01 or  $10^{-2}$  (nearest **hundredth** or **cm**) by default

☞ Soln:

☆ Determination of the digit: 2.7(5)3421

☆ Cancel what follows it: 2.75~~3421~~

☆ Therefore the answer is 2.75.

Hundredth digit



- ✓ **By excess:** to approximate any number by excess check the following

- ☆ Is the number in decimal form?
- ☆ To which nearest digit the approximation is required?
- ☆ Add to it one.
- ☆ Then cancel what follows this digit.

- ❖ Eg<sub>4</sub>: Approximate 2.75342 to the nearest 0.001 or  $10^{-3}$  (nearest **thousandth** or **mm**) by excess

☞ Soln:

☆ Determination of the digit: 2.75(3)421

☆ Add to this digit 1: 2.75 4 421

☆ Cancel what follows it: 2.754 ~~421~~

☆ Therefore the answer is: 2.754.

Thousandth digit



Ex<sub>1</sub>: By using the calculator, approximate each of the following to the nearest cm by default:

- $\sqrt{75} - 2\sqrt{3} = \dots\dots\dots$
- $3\pi + 1 = \dots\dots\dots$

Ex<sub>2</sub>: By using the calculator, approximate each of the following to the nearest mm by excess:

- $\sqrt{(2\pi + 1)^2} = \dots\dots\dots$
- $\sqrt{(\pi - 5)^2} = \dots\dots\dots$

☞ Note that:

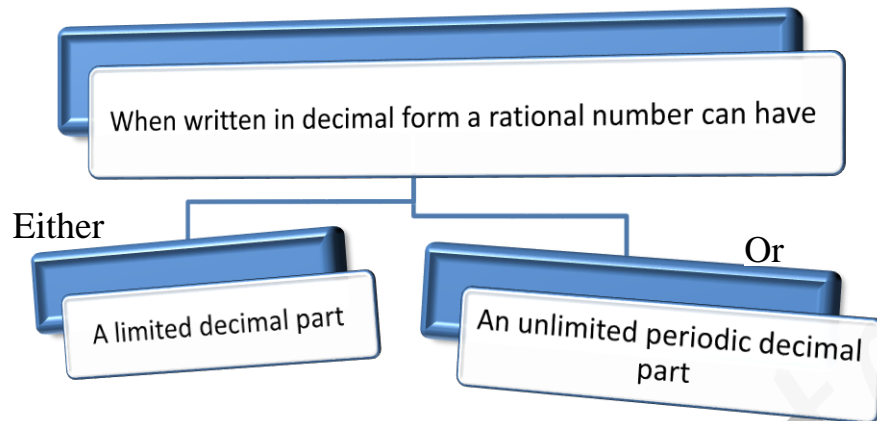


In rounding **you decide** whether to add or cut.



In approximation the **question leads** whether to add or cut.

# Addition of rational numbers



➤ Adding a rational number with limited decimal part is an easy task.

 **Put** decimal points below each other.

 **Add.**

❖ *Ex1:*  $13.25 + 6.1 = 19.35$

$$\begin{array}{r} 13.25 \\ + 6.1 \\ \hline 19.35 \end{array}$$

 **BUT PAY ATTENTION!**

➤ Adding a rational number with unlimited decimal part can be **Tricky!!!**  
**Have NO FEAR!!!**

**TO make it easy:**

 **Change** number into a fraction again.

 **Make** common denominator if needed.

 **Add.**

❖ *Ex2:*  $2.\bar{5} + 3.\bar{1} = \frac{51}{9}$

*Ya Sami keef?*

*Shouf keef?*

$$\begin{array}{l} 2.\bar{5} = 2 + \frac{5}{9} \\ = \frac{23}{9} \end{array}$$

$$\begin{array}{l} 3.\bar{1} = 3 + \frac{1}{9} \\ = \frac{28}{9} \end{array}$$

$$\begin{array}{l} \frac{23}{9} + \frac{28}{9} \\ = \frac{51}{9} \end{array}$$