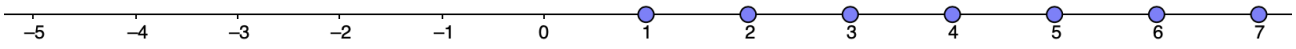
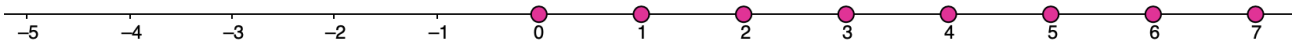
Irrational Numbers - AN2 II

Number Systems On A Number Line

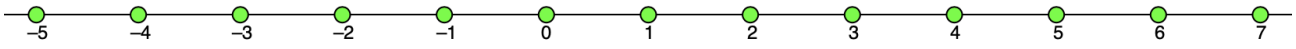
- Natural numbers are the collection of all *Positive*, *Whole* numbers. Arranging all of the **Natural Numbers** on a number Line:



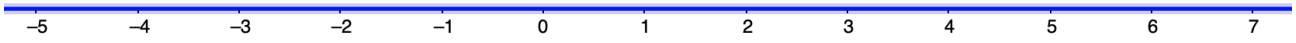
- Whole numbers are the collection of all *Positive*, *Whole* numbers **and** zero. Arranging all of the **Whole Numbers** on a number line:



- Integers are the collection of all *Positive* and *Negative Whole* numbers, **and** zero. Arranging all of the **Integers** on a number line:



- The real numbers contain all **Rational** and **Irrational Numbers.** Arranging all of the **Real Numbers** on a number line:



- As there is an **infinite** amount of both **Rational** and **Irrational** numbers on any given interval, it is difficit to arrange them on a number line. However we can arrange them in order based on their value.

Ordering Irrational Numbers On A Number Line

Next, given a set of irrational numbers, can you order them on a number line?

- $\sqrt{26}$
- π
- $2\sqrt{5}$
- $2\sqrt{14}$
- $5\sqrt{2}$

Practice: Order each of the following numbers from least to greatest:

i. • $\sqrt{2}$ • π • $5\sqrt{2}$ • $2\sqrt{5}$ • $\sqrt{7}$

ii. • $\sqrt{21}$ • $2\sqrt{11}$ • $3\sqrt{8}$ • $9\sqrt{2}$ • $4\sqrt{3}$

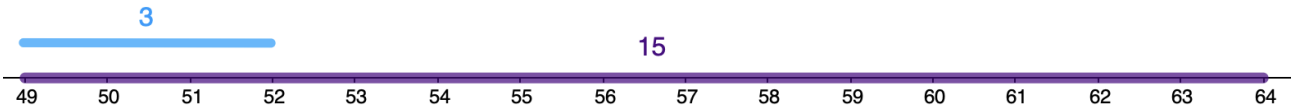
iii. • $\sqrt{20}$ • π • $3\sqrt{3}$ • $4\sqrt{5}$ • $\sqrt{48}$

iv. • $\sqrt{15}$ • $2\sqrt{8}$ • $\sqrt{5}$ • $3\sqrt{3}$ • $5\sqrt{2}$

Approximating An Irrational Number To The Nearest 10^{th}

Example: Consider $\sqrt{52}$

- First find two squares that 52 lies between: $\sqrt{49} < \sqrt{52} < \sqrt{64}$
- So the answer lies between 7 and 8.: $7 < \sqrt{52} < 8$
- Next we know there is a total distance of 15 between 49 and 64: $64 - 49 = 15$
- We also know that there is a total distance of 3 between 49 and 52: $52 - 49 = 3$.
- So $\sqrt{52}$ is approximately $\frac{3}{15}$ above $\sqrt{49}$



- So: $\sqrt{52} \approx \sqrt{49} + \frac{3}{15}$
- Simplifying: $\sqrt{52} \approx 7 + \frac{1}{5}$
- $\sqrt{52} \approx 7.2$

Examples:

Approximate Each Of The Following Numbers To The Nearest 10^{th}:

i. $\sqrt{20}$

iii. $\sqrt{41}$

ii. $\sqrt{34}$

iv. $\sqrt{121}$