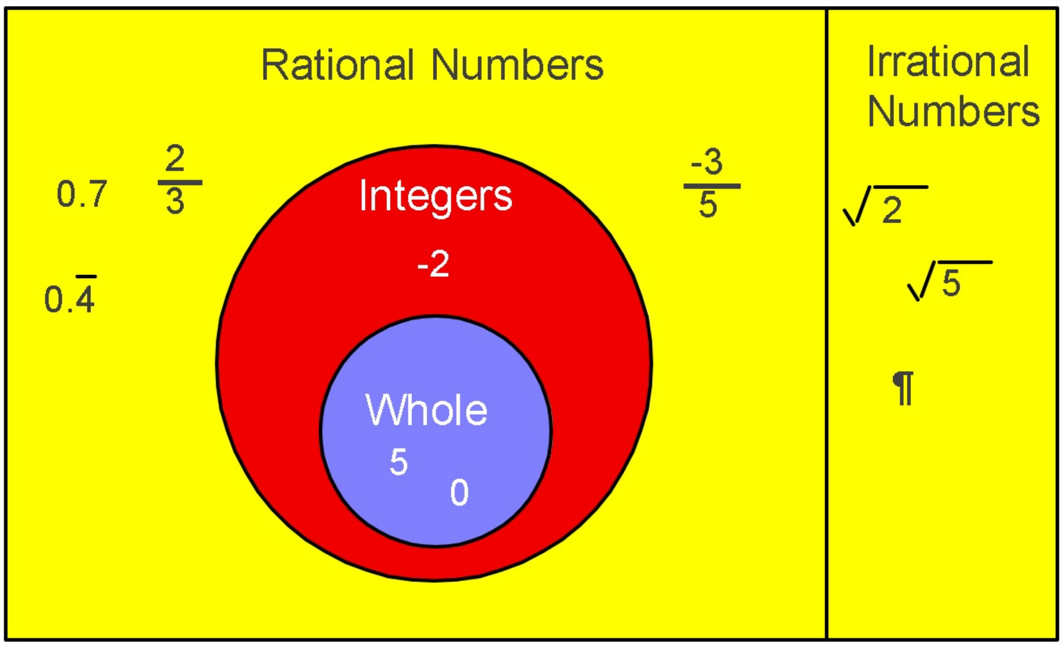
Real Numbers



Discovery of Square Roots and Real Numbers

Find the square root of the following numbers and classify them as either perfect square or non perfect square.

	Square Root	Perfect Square	Non Perfect Square
$\sqrt{49}$			
$\sqrt{11}$			
$\sqrt{122}$			
$-\sqrt{441}$			
$\sqrt{625}$			
$\sqrt{340}$			
$\sqrt{150}$			
$\sqrt{72}$			
$\sqrt{225}$			
$\sqrt{540}$			
$\sqrt{324}$			
$\sqrt{381}$			

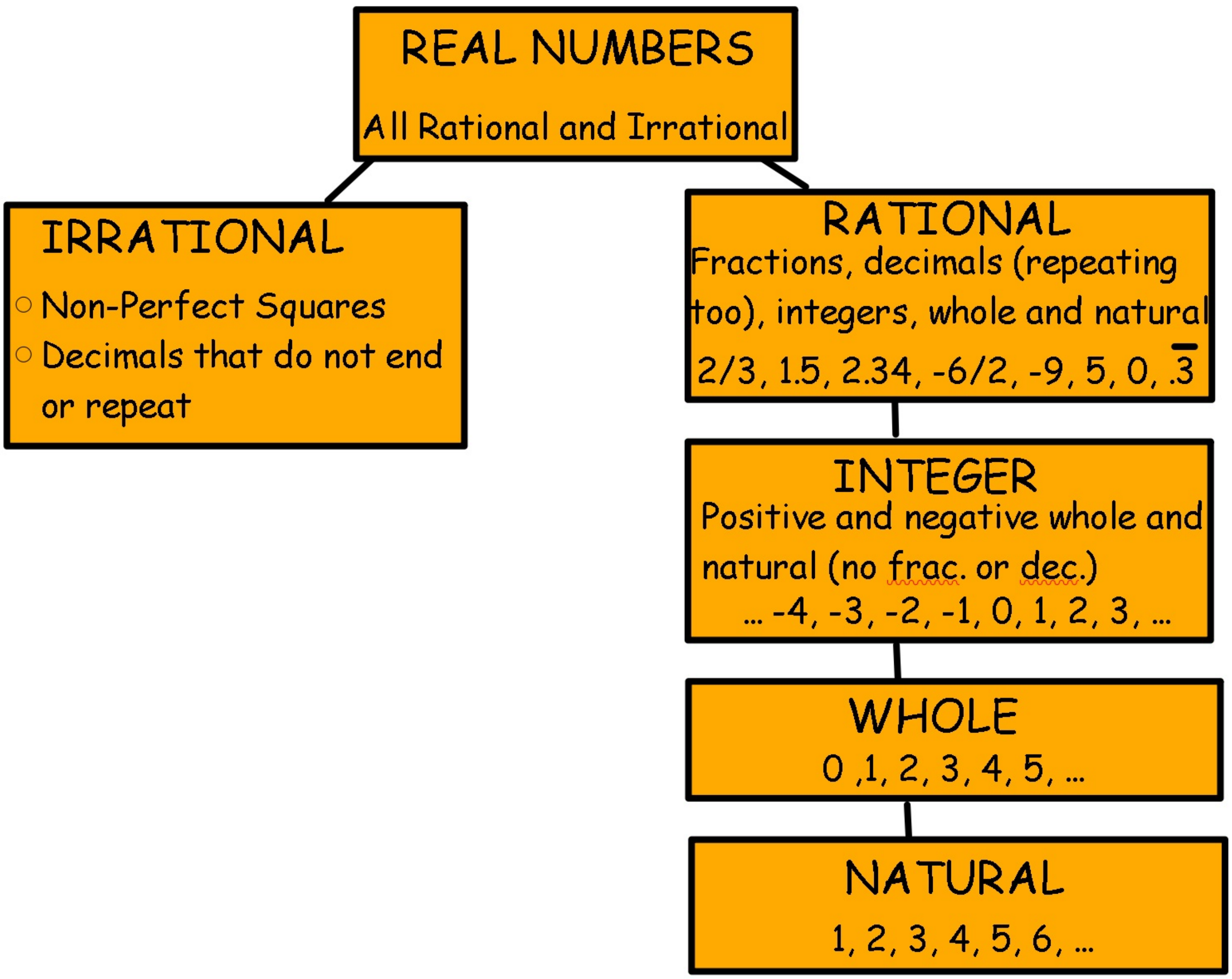
What makes a perfect square different from a nonperfect square?

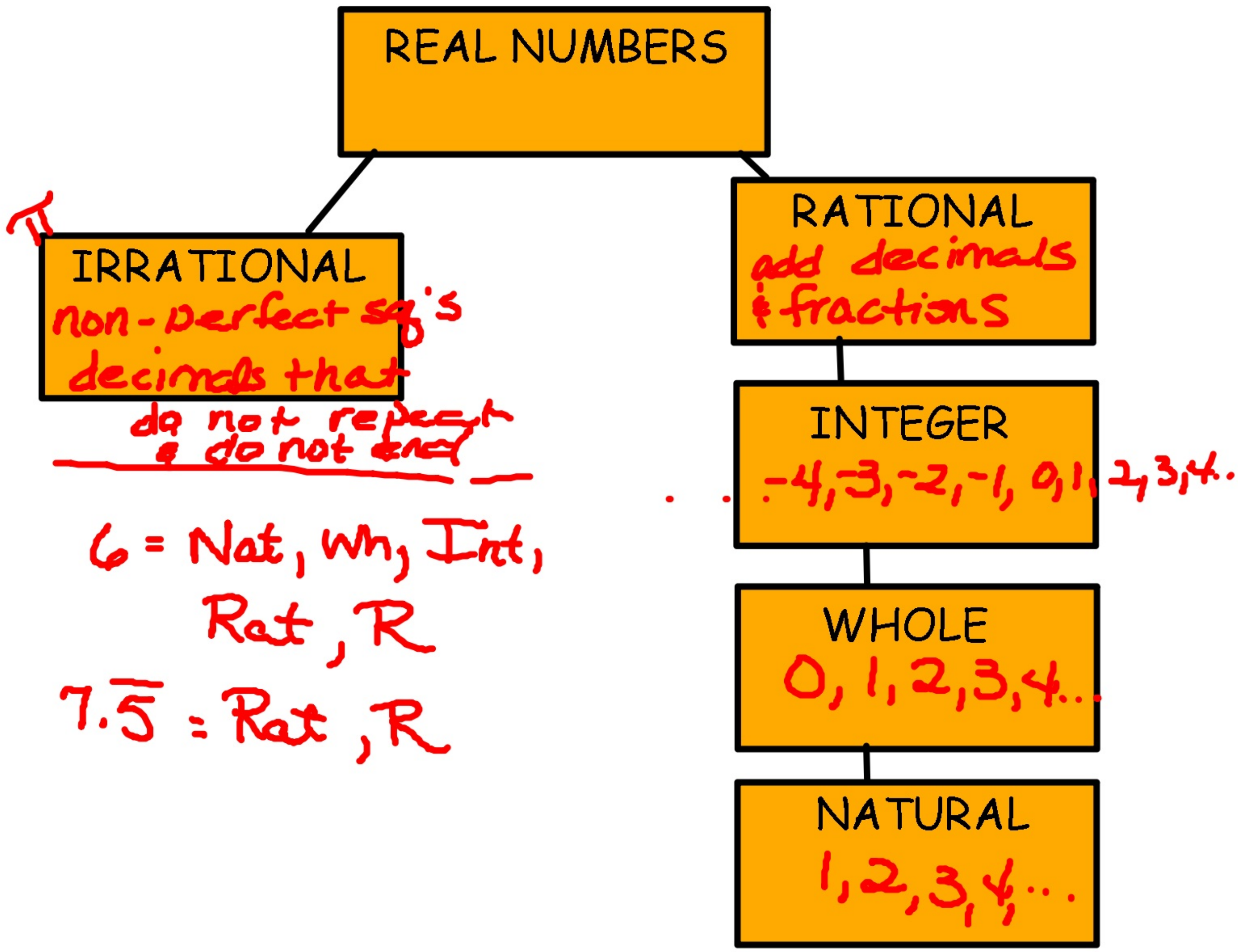
Look at the nonperfect square roots....Look at the $\sqrt{122}$. Does the decimal repeat or end?

Look at the perfect squares, their roots are integers.

Integers - whole numbers and their opposites (...-3, -2, -1, 0, 1, 2, 3...)

Nonperfect squares - their roots are not integers, the decimals do not repeat or end. They are irrational numbers.


REAL NUMBERS
All Rational and Irrational
IRRATIONAL
Non-Perfect Squares
Decimals that do not end or repeat
RATIONAL
Fractions, decimals (repeating too), integers, whole and natural
2/3, 1.5, 2.34, -6/2, -9, 5, 0, $.\overline{3}$
INTEGER
Positive and negative whole and natural (no frac. or dec.)
… -4, -3, -2, -1, 0, 1, 2, 3, …
WHOLE
0 ,1, 2, 3, 4, 5, …
NATURAL
1, 2, 3, 4, 5, 6, …


REAL NUMBERS
IRRATIONAL
non-perfect sq's
decimals that do not repeat & do not end
π
RATIONAL
add decimals & fractions
INTEGER
... -4, -3, -2, -1, 0, 1, 2, 3, 4...
WHOLE
0, 1, 2, 3, 4...
NATURAL
1, 2, 3, 4, ...
6 = Nat, Wh, Int, Rat, R
$7.\overline{5}$ = Rat, R

Rational	Irrational
Principle Perfect Square Roots	Principle Non-Perfect Square Roots
Negative Perfect Square Roots	Negative Non-Perfect Square Roots
Ex. $\sqrt{64}$	Ex. $\sqrt{72}$
$\sqrt{36}$	$\sqrt{115}$
$-\sqrt{289}$	$-\sqrt{249}$

real numbers - the set of irrational and rational numbers

rational numbers - a number that **can** be expressed as the quotient of two integers (as a fraction)

irrational numbers - a number that **cannot** be expressed as the quotient of two integers (as a fraction)

0.333333...

2.449489743...

-12

$\sqrt{144}$

$\sqrt{58}$

never both (Rational / Irrational) — all (Real)

	Natural	Whole	Integer	Rational	Irrational	Real
$\sqrt{4}$ = 2	✓	✓	✓	✓		✓
-4			✓	✓		✓
4.5				✓		✓
$4.\overline{5}$				✓		✓
4.5672589... (crazy)					✓	✓
$\sqrt{5}$ (crazy)					✓	✓
$\sqrt{16}$ = 4	✓	✓	✓	✓		✓
12 1/2				✓		✓

	Natural	Whole	Integer	Rational	Irrational	Real
$\sqrt{3}$						
-7						
2.3						
$8.\overline{6}$						
1.23456...						
$\sqrt{12}$						
$\sqrt{25}$						
1 3/4						

<u>Hint: work backwards</u> – all of our numbers are real, numbers are either rational or irrational (never both) and rational numbers might be integers, whole, or natural.

Discovery of Square Roots and Real Numbers

Find the square root of the following numbers and classify them as either perfect square or non perfect square.

	Square Root	Perfect Square	Non Perfect Square
√49	7	✓	
√11	3.317		✓
√122	11.045		✓
-√441	-21	✓	
√625	25	✓	
√340	18.439		✓
√150	12.247		✓
√72	8.485		✓
√225	15	✓	
√540	23.238		✓
√324	18	✓	
√381	19.519		✓

What makes a perfect square different from a nonperfect square?

Perfect = integers Nonperfect = decimal

Look at the nonperfect square roots....Look at the √122. Does the decimal repeat or end?

non ending decimals

Look at the perfect squares, their roots are integers.

Integers - whole numbers and their opposites (...-3, -2, -1, 0, 1, 2, 3...)

Nonperfect squares - their roots are not integers, the decimals do not repeat or end. They are irrational numbers.