Math 8

Square Roots VIDEO NOTES

Name: ______________________________ Date: ____________________

<u>VIDEO: What is a perfect square?</u>
<u>VIDEO: What is a square number?</u>

Perfect squares refer to the shape ____________________

Draw the first three (counting number) perfect squares:

To find a perfect square take the first counting number 1 and multiply it by itself: 1 x 1 = 1. Complete the following:

1 x 1 = ________	6 x 6 = ________	11 x 11 = ________
2 x 2 = ________	7 x 7 = ________	12 x 12 = ________
3 x 3 = ________	8 x 8 = ________	13 x 13 = ________
4 x 4 = ________	9 x 9 = ________	14 x 14 = ________
5 x 5 = ________	10 x 10 = ________	15 x 15 = ________

Perfect Squares are very useful because they have perfect roots. A square root is the opposite of finding a square. Take for example the perfect square 9, if we take the square root of 9 (written like $\sqrt{9}$) the answer is 3. In other words what number times itself equals 9? Complete the following square roots:

$\sqrt{1}$ = ________	$\sqrt{36}$ = ________	$\sqrt{121}$ = ________
$\sqrt{4}$ = ________	$\sqrt{49}$ = ________	$\sqrt{144}$ = ________
$\sqrt{9}$ = ________	$\sqrt{64}$ = ________	$\sqrt{169}$ = ________
$\sqrt{16}$ = ________	$\sqrt{81}$ = ________	$\sqrt{196}$ = ________
$\sqrt{25}$ =________	$\sqrt{100}$ = ________	$\sqrt{225}$ = ________

★ Memorize the first 15 perfect squares and their roots. This should be easy if you already have your multiplication tables memorized.

VIDEO: REVIEW: Dividend, Divisor and Quoetient

$$\frac{Dividend}{Divisor} = Quotient$$

The dividend is the number you are dividing.
The divisor is the number you are dividing by.
The quotient is the answer to a division problem.

VIDEO: REVIEW: Exponents

Another important term when dealing with square roots is exponents (aka indices or indexes). An exponent (aka index) is the small number written to the right of a bigger number, for example 3^2 in this case the 2 is the exponent and the 3 is called the base. What does an exponent mean? When you see a base number with an exponent, this means to multiply the base by itself the number of times that the exponent indicates. For example 3^2 means to multiply 3 by itself twice: 3 x 3, which we know of course equals the perfect square 9. Complete the following:

Power	Base	Exponent	Written Out	Language
2^4	2	4	2 x 2 x 2 x 2	Two to the power four.
3^5				
	7	4		
			6 x 6 x 6 x 6 x 6	
				Eight to the power of six.
				Five squared.
				Nine cubed.

VIDEO: Roots

The inverse operation of exponents is called ___________________.

	Exponent	Root
Operation Statement	$4^2 =$ _______	$\sqrt[2]{16} =$ _______
Written Statement	What do we get if we multiply the number 4 (base) by itself 2 (exponent) times?	What number could we multiply 2 times itself to get 16?
Answer	$4^2 = 16$	$\sqrt[2]{16} = 4$

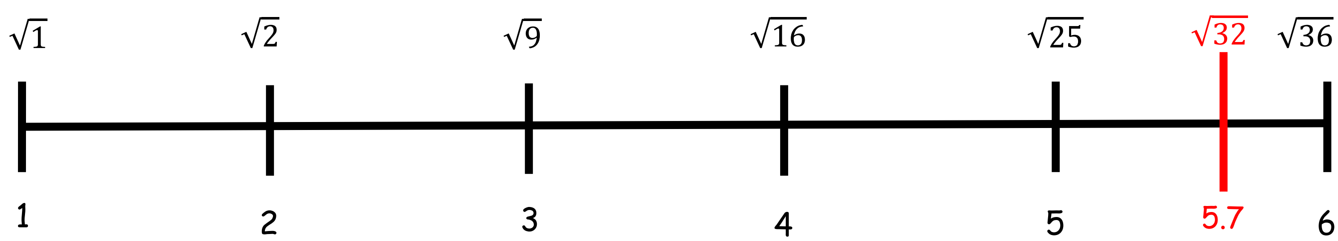
The number 3 is NOT a perfect square. One reason that the number 3 is not a perfect square is because you cannot build a perfect square with three blocks. Secondly, when we try to take the square root of three we end up with an irrational decimal number (a decimal number that goes on and on forever). Let's take a look: $\sqrt{3}$ = 1.73205080757…… Now if we were to take this answer (ie. the root of 3) we would have to round it, for example 1.7, now if we were to multiply 1.7 by itself (remember this is how we found the perfect square before) we will get the answer 1.7 x 1.7 = 2.89 WHAT? Shouldn't 1.7 x 1.7 = 3?? But it doesn't and this is why the number 3 is NOT a perfect square.

Complete the following table:

Root	Radicand	Exponent	Language
$\sqrt[2]{16}$	16	2	Square root of sixteen.
$\sqrt[3]{8}$			Cubed root of eight.
$\sqrt{81}$			
	81	4	Fourth root of eighty-one.
$\sqrt[5]{32}$			
	128	7	
			Fifth root of two hundred forty-three

<u>VIDEO: Estimating Square Roots</u>

Estimating the square root of a non-perfect square is a useful tool. Using the number line below let's estimate $\sqrt{32}$. The first step is to figure out what two perfect squares $\sqrt{32}$ lies between. We can see that $\sqrt{32}$ lies somewhere on the number line between $\sqrt{25}$ and $\sqrt{36}$. This means that the square root of 32 will be 5 decimal something. This is the part that we can estimate, think about where $\sqrt{32}$ fits in between $\sqrt{25}$ and $\sqrt{36}$. Is it closer to $\sqrt{25}$ or $\sqrt{36}$? In this case $\sqrt{32}$ is closer to $\sqrt{36}$ and lies somewhere at about 5.7. Now you try placing $\sqrt{6}$ and $\sqrt{20}$ on the number line and estimating their roots.



<u>VIDEO: ADVANCED: Negative Square Roots</u>

The principal square root is also known as the positive square root.
What do you get when you multiply the following?

3 x 3 = _______?   -3 x -3 = _______?

What do you get when you take the $\sqrt{9}$ = ___________ OR ____________. Why does the square root of a number have more than one answer?