Math 8 Chp 1.1

Note Title 2014-07-02

Square Numbers and Area Models

What is the difference between a square and a rectangle?

So, is a square a rectangle?
Is a rectangle a square?

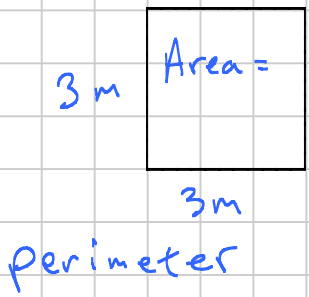
Trick

1 × 1 =
2 × 2 =
3 × 3 =
4 × 4 =
5 × 5 =
6 × 6 =
7 × 7 =
8 × 8 =
9 × 9 =
10 × 10 =

11 × 11 =
12 × 12 =
13 × 13 =
14 × 14 =
15 × 15 =
16 × 16 =
17 × 17 =
18 × 18 =
19 × 19 =
20 × 20 =

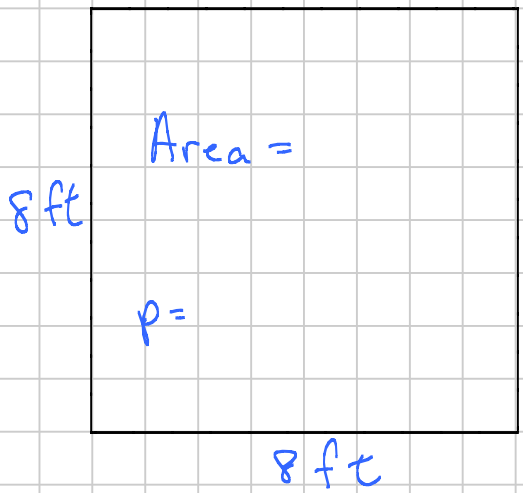
Square numbers
perfect squares

We can represent a perfect square using a diagram of a



perimeter

P



Another way to write 5×5 is
7×7 is
4×4 is

This is the reason why we have m^2 :
cm^2 :
ft^2 :
in^2 :

Review of Common Units for Lengths

Metric	Imperial
m -	yd -
cm -	ft -
mm -	in -
km -	mi -

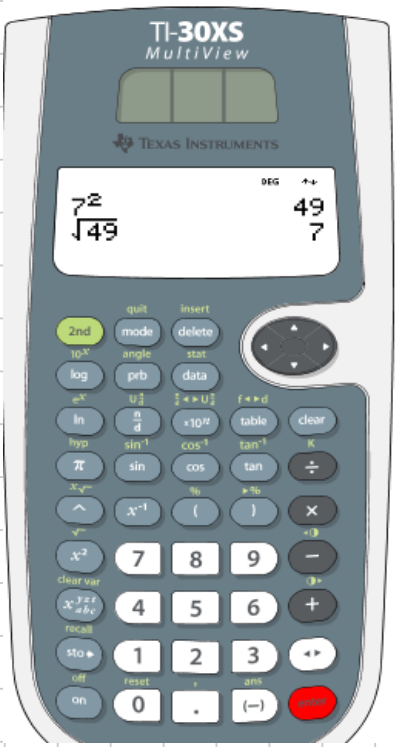
If a number is not a perfect square, then that is what we say and it must be between 2 perfect squares.

eg) 17
52
97
11

Going backwards: Finding the square root.

eg) Find the side length of a square with an area of 49 cm^2.
Use table or square root ($\sqrt{}$) on calculator.

HW: pp. 8-10: 4, 5, 8, 9, 10 (a,c), 11 (a,b), 12, 13, 15
Challenge: 14, 16, 17, 20, 21
Please answer 2 & 3 in person.



Key Press History | Large Screen

7 | $\sqrt{x^2}$ | enter | 2nd | $\sqrt{x^2}$

4 | 9 | enter

Key Press History | Large Screen

4 | 7 | $\sqrt{x^2}$ | enter | 2nd

$\sqrt{x^2}$ | 2 | 2 | reset 0 | 9

enter

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Note Title 2014-07-02

Squares and Square Roots

Where are the perfect squares?

To square a number means to multiply by itself.

Where are the square roots?

MULTIPLICATION TABLE 1 – 20

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
2	2	4	6	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40
3	3	6	9	12	15	18	21	24	27	30	33	36	39	42	45	48	51	54	57	60
4	4	8	12	16	20	24	28	32	36	40	44	48	52	56	60	64	68	72	76	80
5	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
6	6	12	18	24	30	36	42	48	54	60	66	72	78	84	90	96	102	108	114	120
7	7	14	21	28	35	42	49	56	63	70	77	84	91	98	105	112	119	126	133	140
8	8	16	24	32	40	48	56	64	72	80	88	96	104	112	120	128	136	144	152	160
9	9	18	27	36	45	54	63	72	81	90	99	108	117	126	135	144	153	162	171	180
10	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170	180	190	200
11	11	22	33	44	55	66	77	88	99	110	121	132	143	154	165	176	187	198	209	220
12	12	24	36	48	60	72	84	96	108	120	132	144	156	168	180	192	204	216	228	240
13	13	26	39	52	65	78	91	104	117	130	143	156	169	182	195	208	221	234	247	260
14	14	28	42	56	70	84	98	112	126	140	154	168	182	196	210	224	238	252	266	280
15	15	30	45	60	75	90	105	120	135	150	165	180	195	210	225	240	255	270	285	300
16	16	32	48	64	80	96	112	128	144	160	176	192	208	224	240	256	272	288	304	320
17	17	34	51	68	85	102	119	136	153	170	187	204	221	238	255	272	289	306	323	340
18	18	36	54	72	90	108	126	144	162	180	198	216	234	252	270	288	306	324	342	360
19	19	38	57	76	95	114	133	152	171	190	209	228	247	266	285	304	323	342	361	380
20	20	40	60	80	100	120	140	160	180	200	220	240	260	280	300	320	340	360	380	400

When we can write a division statement with whole numbers and no remainder, then the divisor and quotient are called factor pairs.

eg) $72 \div 8 = 9$:

A division statement can be turned into a multiplication statement.

eg) $72 \div 8 = 9$ =>
$48 \div 12 = 4$ =>
$24 \div 3 = 8$ =>

A multiplication statement can be diagrammed with a rectangle.

eg) 2m A= 4 m

4cm A= 3 cm

3 m A= 5 m

Finding all factor pairs. Use table for smaller numbers. Use algorithm for larger numbers. We test all whole numbers up to the square root.

eg) 35: 36:

If there are only 2 factors, the number is prime.
If the number of factors is even, the number is not a perfect square.
If the number of factors is odd, the number is a perfect square.

When ordering numbers and square roots, convert them all to the same type first.

HW: pp. 14-16: 5-8, 11, 12(i, vi), 13-16, 19, 20
Challenge: 21, 22
Please solve 2 in person.

```
                Done
prgmFACTORS
N 36
{1 2 3 4 6 9 12…
NUM FACTORS
                  9
                Done
```

L1	L2	L3 1
4	4	
6	6	
9	8	
12	9	
18	12	
36	18	
	24	

L1(10) =

```
                  9
                Done
prgmISPRIME
N 36
 IS A PERFECT
 SQUARE
                Done
```

```
                Done
N 97
 IS PRIME
                Done
N 12
 IS NOT PRIME
                Done
```

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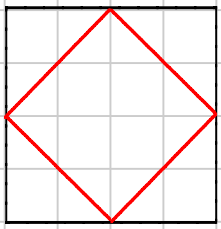
Note Title 2014-07-02

Measuring (Calculating) Line Segments

In math, the goal is to be able to figure things out without physically measuring. We use known values and rules to determine the unknown values.



What is the side length of the red square?

We can determine this using areas!

What is the area of the black square?

What is the area of one corner triangle?

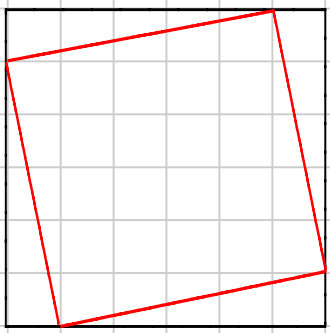
What is the area of the red square?

use BEDMAS

If area is not a perfect square, just use square root.

What is the side length of the red square?

Another approach.



Corner triangle of black is similar to corner triangle of red.

Area of blue square?

Area of red square?

Side length of red square?

In summary, we can find the side lengths of a slanted square by

- Subtracting the area of the triangular corners of a circumscribed square (easier)
- adding the area of the triangular corners to an inside square.

Then take the square root of the area.

Finding the length of a diagonal line

Complete the red square.

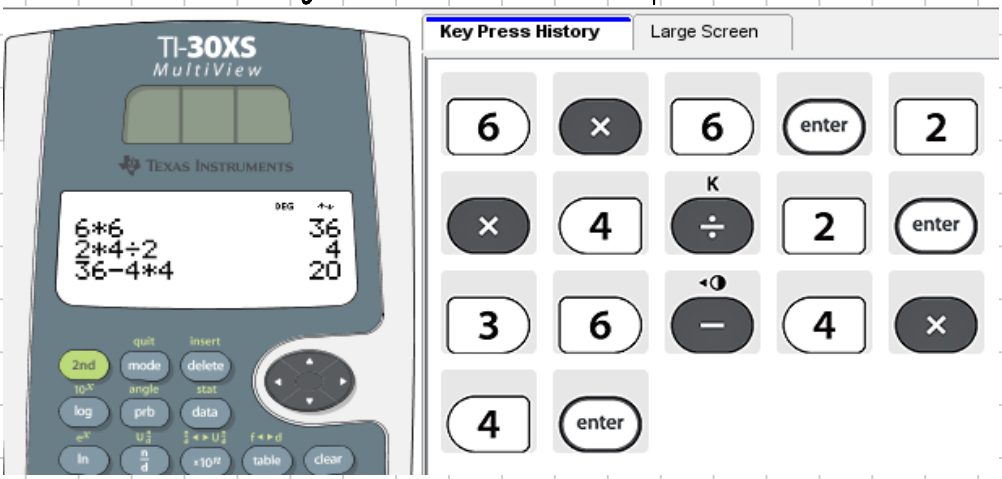
Draw a circumscribed or inside square, the calculate as before.

Area of circumscribed square?

Area of corner triangle?

Area of red square?

Side length of red square?



Hw: pp. 19-21: 3-6 (a-c), 7-10 (a)
Challenge: 11, 12c, 14.
Please solve 1 and 2 in person.

Math 8 Chp 1.4

Note Title 2014-07-02

Estimating Square Roots

Linear Interpolation: (just a fraction).
We interpolate between perfect squares.

$\sqrt{21}$ is between

Calculator answer: 4.5826

Ordering on a number line.

$\sqrt{28}, \sqrt{8}, \sqrt{3}, \sqrt{23}, \sqrt{17}$

Order radicands first

Use linear interpolation

$\sqrt{3}$ => between
$\sqrt{8}$ => between
$\sqrt{17}$ => between
$\sqrt{23}$ => between
$\sqrt{28}$ -> between

How close is linear interpolation?

Square Root	Linear Interp	Calculator	Diff
$\sqrt{3}$	1.6		
$\sqrt{8}$	2.8		
$\sqrt{17}$	$4.\overline{1}$		
$\sqrt{23}$	$4.\overline{7}$		
$\sqrt{28}$	$5.\overline{27}$		

Easy Roots: $\sqrt{14 \times 14} =$

$\sqrt{17 \times 17} =$

$\sqrt{24^2} =$

$\sqrt{421 \times 421} =$

Estimate with Calculator.

eg) Estimate $\sqrt{92}$ to 3 decimal places.

Start with lin interp.

You might need to know for a test, but this method is not useful in real-life.

HW: pp. 25-27: 4-5 (a-c), 7-11, 13-15

Challenge: 19, 20, 22, 24

Please solve 1 and 2 in person.

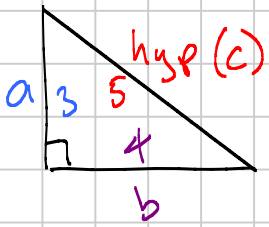
Math 8 Chp 1.5

Note Title 2014-07-02

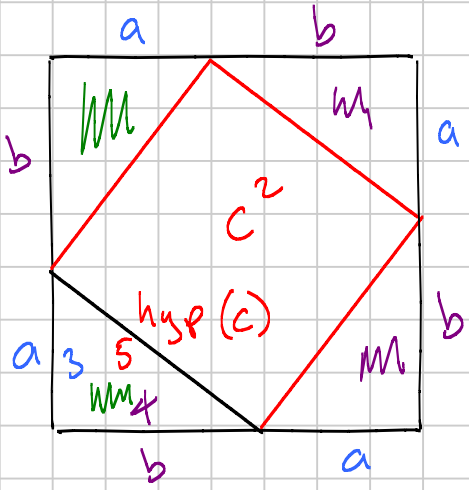
The Pythagorean Theorem

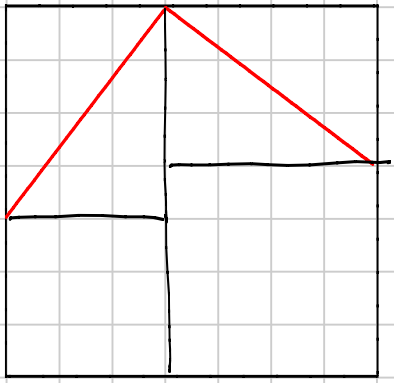
You will still be using this in post-secondary!
Pythagorean Theorem makes it so you don't have to draw squares and triangles to solve!
You can only use Pythagorean on right triangles.
Recall the hypotenuse is opposite the right angle; it is also the longest side of the right triangle.

eg)



Visual Proof

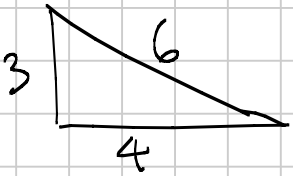




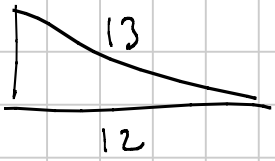
$a^2 + b^2 = c^2$

If $a^2 + b^2 \neq c^2$, then the triangle IS NOT a right triangle!
If $a^2 + b^2 = c^2$, then the triangle IS a right triangle!

eg) Is



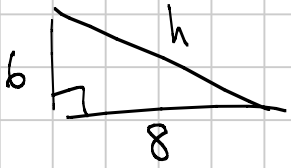
a right triangle?

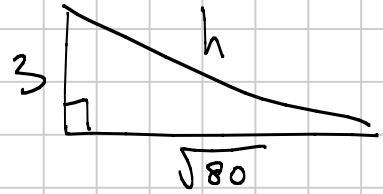
eg) Is 

a right triangle?

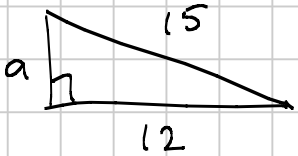
Find the length of the hypotenuse. $c = \sqrt{a^2 + b^2}$

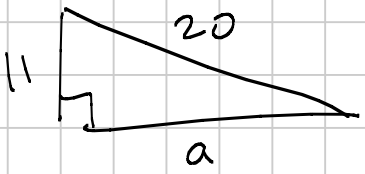
Don't let letters throw you off! Just decide if you are looking for the hypotenuse or a side.



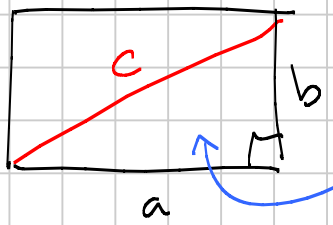


Find the length of a side. $a = \sqrt{c^2 - b^2}$



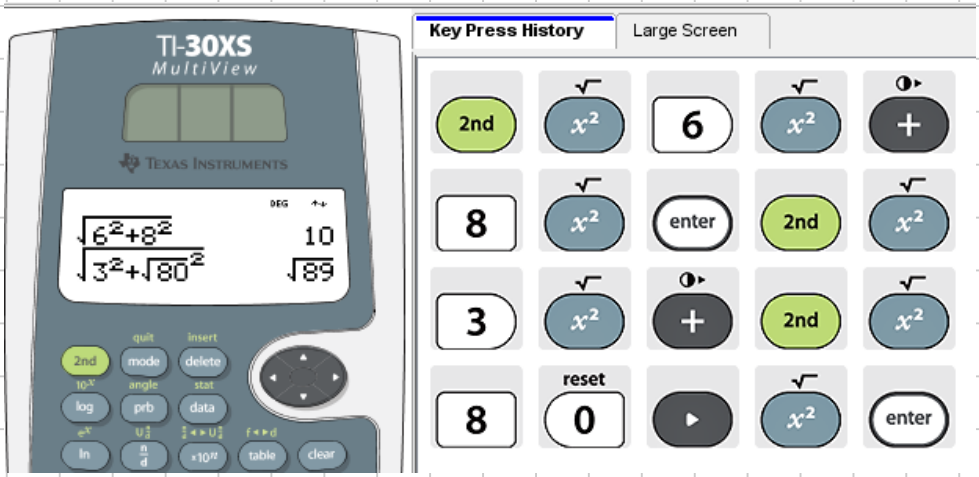


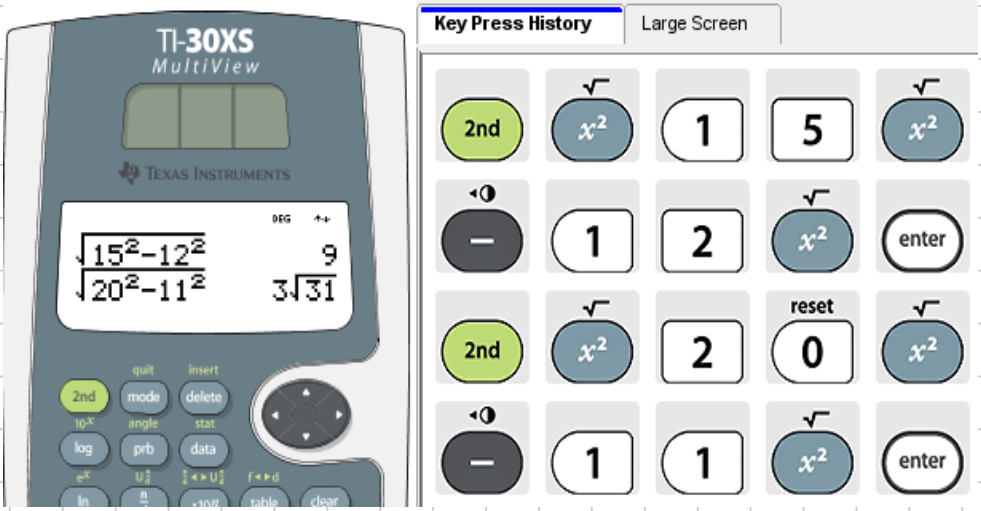
Finding the length of a diagonal of a rectangle



right triangle, use Pythagorean.

HW: pp. 33 - 36: 3, 4, 5 - 8(a), 13
Challenge: 9, 14, 16, 18a
Please solve 1 and 2 in person.


TI-30XS
MultiView
Texas Instruments
DEG
$\sqrt{6^2+8^2}$ 10
$\sqrt{3^2+\sqrt{80}^2}$ $\sqrt{89}$
quit insert
2nd mode delete
angle stat
log prb data
ln table clear
Key Press History
Large Screen
2nd x^2 6 x^2 +
8 x^2 enter 2nd x^2
3 x^2 + 2nd x^2
8 reset 0 x^2 enter


TI-30XS
MultiView
Texas Instruments
DEG
$\sqrt{15^2-12^2}$ 9
$\sqrt{20^2-11^2}$ $3\sqrt{31}$
quit insert
2nd mode delete
angle stat
log prb data
ln table clear
Key Press History
Large Screen
2nd x^2 1 5 x^2
− 1 2 x^2 enter
2nd x^2 2 reset 0 x^2
− 1 1 x^2 enter

Math 8 Chp 1.6

Note Title 2014-07-02

Exploring the Pythagorean Theorem

Recall:

If $a^2 + b^2 = c^2$, then the triangle IS a right triangle!

If $a^2 + b^2 \neq c^2$, then the triangle IS NOT a right triangle!

But we can determine more.

If $a^2 + b^2 > c^2$, then the triangle is acute.

If $a^2 + b^2 < c^2$, then the triangle is obtuse.

Recall that c is the longest side.

---

eg) What kind of triangle has side lengths 3, 5, 6?

eg) What kind of triangle has side lengths 5, 7, 8?

eg) What kind of triangle has side lengths 9, 12, 15?

Pythagorean Triples - is a set of 3 whole numbers that satisfy the Pythagorean Theorem.

This is no different to what you have been doing, we are just adding a name to it!

eg) Is 12, 35, 37 a Pyth Triple?

eg) Is 11, 33, 34 a Pyth Triple?

Make sure you check the order!

eg) Is $\sqrt{13}, 7, 6$ a Pyth Triple?

eg) Is 30, 18, 24 a Pyth Triple?

Coming up with Pythagorean Triplets.
If you have a triplet, you can find more by multiplying all numbers by a constant.

eg) Find more triplets of 3, 4, 5.

eg) Find 3 more triplets of 5, 12, 13.

HW: pp. 42-45: 3, 4, 6 (a-c), 7 (a-c), 8, 9, 10
Challenge: 12, 17
Please solve 5 in person.

Math 8 Chp 1.7

Note Title 2014-07-02

Applying the Pythagorean Theorem (Word Problems)

Read carefully and identify keywords.
Identify shape: square, triangle, rectangle.
Draw a diagram.
- Label known quantities (measurements)
- Label desired quantity.
- Label longest side or hypotenuse
- Label right angles

Read question to make sure your answer matches.

eg) Jim is setting up the bases for a softball game. The bases are 60 feet apart. Jim measures the distance from first base to third base as 84.85 feet. Do the bases form a square diamond?

eg) Katy is building a zip line between 2 poles on level ground. One pole is 4m high. The second pole is 2m high. The poles are 5m apart. She has a wire that is 5.25m long. Can Katy build her zip line?

eg) Draw a square with an area of 30 m^2.

eg) Kim and Sandy are standing at the corner of the block. Kim runs north at 6 m/s and Sandy runs west at 5 m/s. They both run for 4 seconds. What is the distance between them?

HW: pp. 48 - 51: 6, 7, 9-11, 13, 17, 18
Challenge: 14, 16, 20, 21
Please answer 1-3 in person.