HW #2 - Due Wed. 3/15

11.1
- set I p. 431 #15,17,18 (use Theorem 49 & its corollaries for find x)
- set II p. 432 #48-51 (SAT problem)
- set III p. 433 #2-8 (Golden Ratio)

11.2
- set I p. 437 #18-25 (Pythagorean triples)
- set II p. 439 #47-50 (oil well puzzle)
- set III p. 440 #1-3 (Fermat's Last Theorem)

11.3
- set I p. 445 #30-33 (St. Peter's Cathedral & Olympic sailing competition)

11.4
- set I p. 450 #17-28 (tangent ratios in 30-60-90 and 3-4-5 triangles)

11.5
- set I p. 456 #13-22 (sine and cosine ratios in 5-12-13 triangle
- set II p 460 #56-60 (dominos)
- set III p. 460 #1-2 (Proxima Centauri)

HW #3 - Due Fri. 3/17

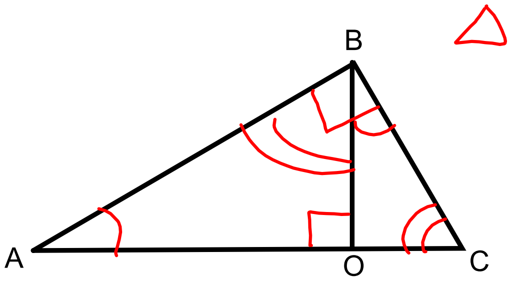
11.6
- set I p. 463 #1-8; 23-30 (slope & distance)
- set II p. 466 #52-65 (proofs w/ parallel, perpendicular lines)

11.7
- set I p. 471-472 #12-17 (law of sines, law of cosines)

Chapter 11 – The Right Triangle

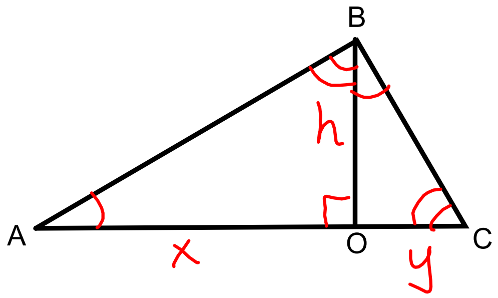
11.1 - Proportions in a Right Triangle

Theorem 49: The altitude to the hypotenuse of a right triangle forms two triangles similar to it and to each other.



$\triangle ABC \sim \triangle AOB \sim \triangle BOC$

Corollary 1 to Theorem 49:
The altitude to the hypotenuse of a right triangle is the geometric mean between the segments into which it divides the hypotenuse.



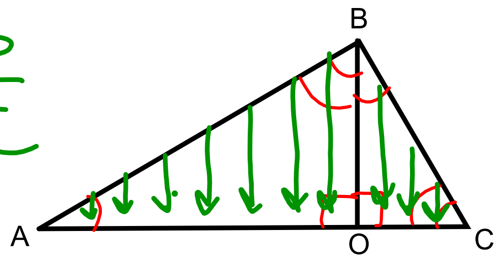
$$\frac{x}{h} = \frac{h}{y}$$

$$h^2 = xy$$

$$h = \sqrt{xy}$$

Corollary 2 to Theorem 49:
Each leg of a right triangle is the geometric mean between the hypotenuse and its projection on the hypotenuse.

$$\frac{AO}{AB} = \frac{AB}{AC}$$



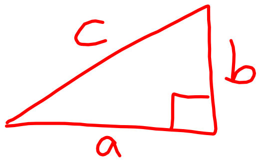
$$\frac{OC}{BC} = \frac{BC}{AC}$$

AO is the projection of AB onto AC
OC is the projection of BC onto AC

11.2 - The Pythagorean Theorem Revisited

Pythagorean Theorem: In a right triangle, the square of the hypotenuse is equal to the sum of the squares of the legs.

Pythagorean Triples



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

There are 16 primitive Pythagorean triples with $c \leq 100$:

(3, 4, 5)	(5, 12, 13)	(8, 15, 17)	(7, 24, 25)
(20, 21, 29)	(12, 35, 37)	(9, 40, 41)	(28, 45, 53)
(11, 60, 61)	(16, 63, 65)	(33, 56, 65)	(48, 55, 73)
(13, 84, 85)	(36, 77, 85)	(39, 80, 89)	(65, 72, 97)

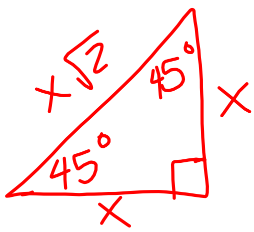
Note, for example, that (6, 8, 10) is *not* a primitive Pythagorean triple, as it is a multiple of (3, 4, 5). Each of these low

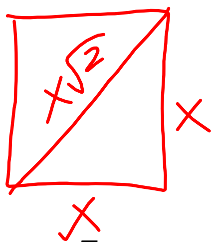
clip from https://en.wikipedia.org/wiki/Pythagorean_triple

11.3 – Isosceles and 30º-60º Right Triangles

Theorem 50 – The Isosceles Right Triangle Theorem

In an isosceles right triangle, the hypotenuse is $\sqrt{2}$ times the length of a leg.

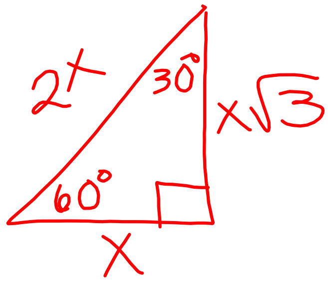




Corollary to Theorem 50 – Each diagonal of a square is $\sqrt{2}$ times the length of one side.

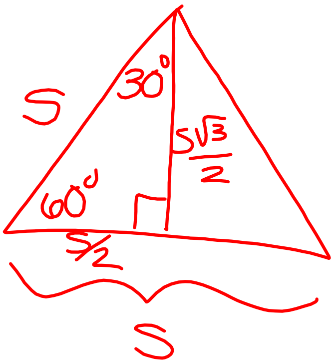
<u>Theorem 51 – The $30° - 60°$ Right Triangle Theorem</u>

In a $30° - 60°$ right triangle, the hypotenuse is twice the shorter leg and the longer leg is $\sqrt{3}$ times the shorter leg.

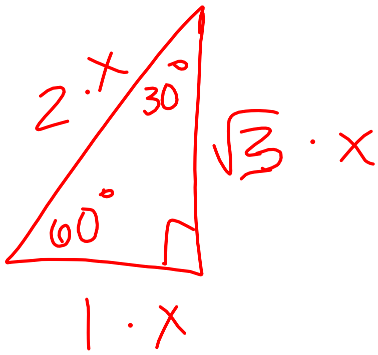


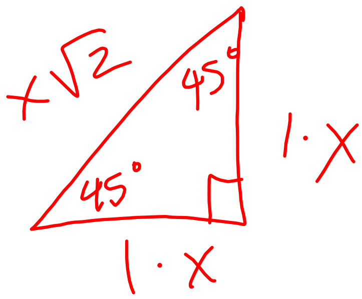
<u>Corollary to Theorem 51</u>

An altitude of an equilateral triangle having side s is $\frac{\sqrt{3}}{2}s$ and its area is $\frac{\sqrt{3}}{4}s^2$.



$$\left(\frac{s}{2}\right)\left(\frac{s\sqrt{3}}{2}\right) = \frac{\sqrt{3}}{4}s^2$$





11.6 – Slope

Theorem 52 – Two nonvertical lines are parallel iff their slopes are equal.

Theorem 53 – Two nonvertical lines are perpendicular iff the product of their slopes is -1. (negative reciprocals)

$$\text{slope } m = \frac{\Delta y}{\Delta x} = \frac{y_2 - y_1}{x_2 - x_1}$$

$$m_1 m_2 = -1 \qquad m_1 = \frac{-1}{m_2} \qquad m_2 = \frac{-1}{m_1}$$

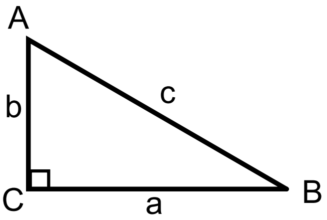
11.4 – The Tangent Ratio

Def: The tangent of an acute angle of a right triangle is the ratio of the length of the opposite leg to the length of the adjacent leg.

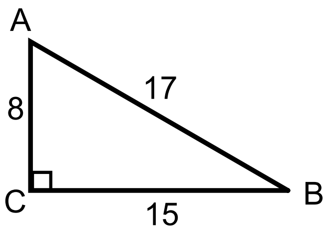
11.5 – The Sine and Cosine Ratios

Def: The sine of an acute angle of a right triangle is the ratio of the length of the opposite leg to the length of the hypotenuse.

Def: The cosine of an acute angle of a right triangle is the ratio of the length of the adjacent leg to the length of the hypotenuse.



SohCahToa



$\sin A = 15/17$ $\sin B = 8/17$

$\cos A = 8/17$ $\cos B = 15/17$

$\tan A = 15/8$ $\tan B = 8/15$