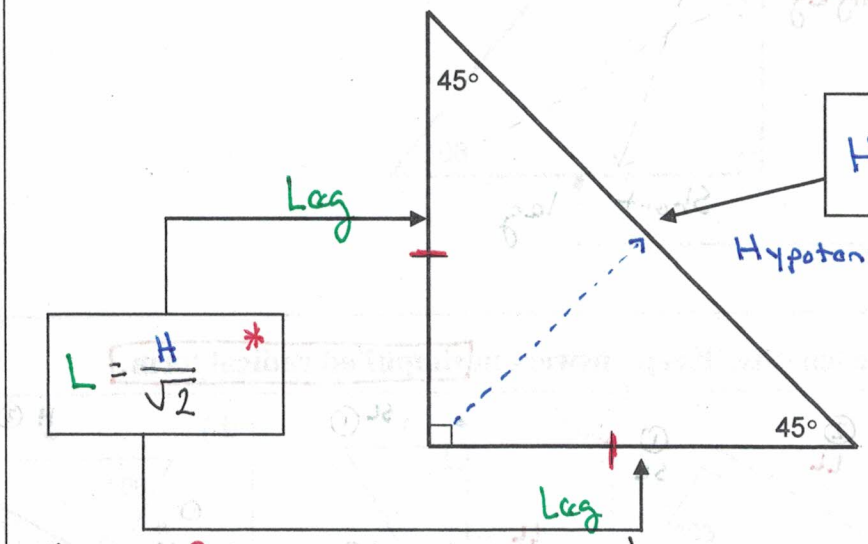
Unit 6.2 – Special Right Triangles

Important To Remember:

When using the Pythagorean Theorem, you NEED 2 sides in order to find the other third side.

There are TWO SPECIAL right triangles that allow you to find sides by ONLY knowing 1 side.

45 – 45 – 90 (Right Isosceles) Triangle Theorem



H - hypotenuse
L - Leg

FYI

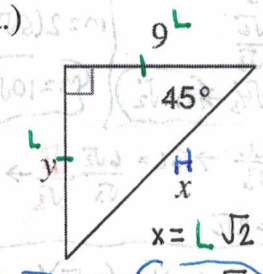
$\frac{3}{\sqrt{2}} \cdot \frac{\sqrt{2}}{\sqrt{2}}$

$\frac{3\sqrt{2}}{2}$

* You must Rationalize the denominator! No radicals in denominator!

Example 1: Find the missing side lengths. Keep answers in simplified radical form.

a.)

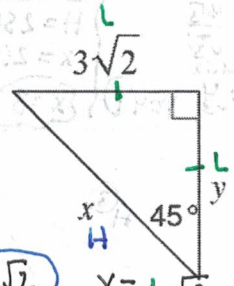


$x = L\sqrt{2}$

$y = 9$

$x = 9\sqrt{2}$

b.)



$y = 3\sqrt{2}$

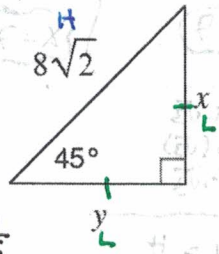
$x = L\sqrt{2}$

$x = (3\sqrt{2})\sqrt{2}$

$x = 3(2)$

$x = 6$

c.)



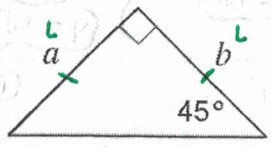
$L = \frac{H}{\sqrt{2}}$

$x = \frac{8\sqrt{2}}{\sqrt{2}}$

$x = 8$

$y = 8$

d.)



$L = \frac{H}{\sqrt{2}}$

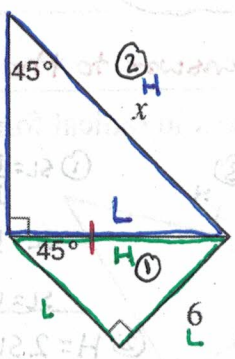
$a = \frac{10}{\sqrt{2}} \cdot \frac{\sqrt{2}}{\sqrt{2}}$

$a = \frac{10\sqrt{2}}{2}$

$b = 5\sqrt{2}$

$a = 5\sqrt{2}$

e.)



$H \cong L$

① $H = L\sqrt{2}$

$H = 6\sqrt{2}$

$H = L$

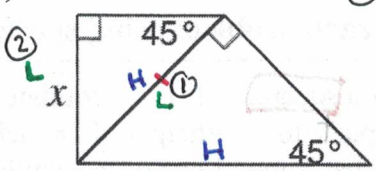
② $H = L\sqrt{2}$

$H = (6\sqrt{2})(\sqrt{2})$

$H = 6\sqrt{4}$

$H = 12$

f.)



$10\sqrt{6}$

$x = 5\sqrt{6}$

① $L = \frac{H}{\sqrt{2}}$

$L = \frac{10\sqrt{6}}{\sqrt{2}}$

$L = 10\sqrt{6/2}$

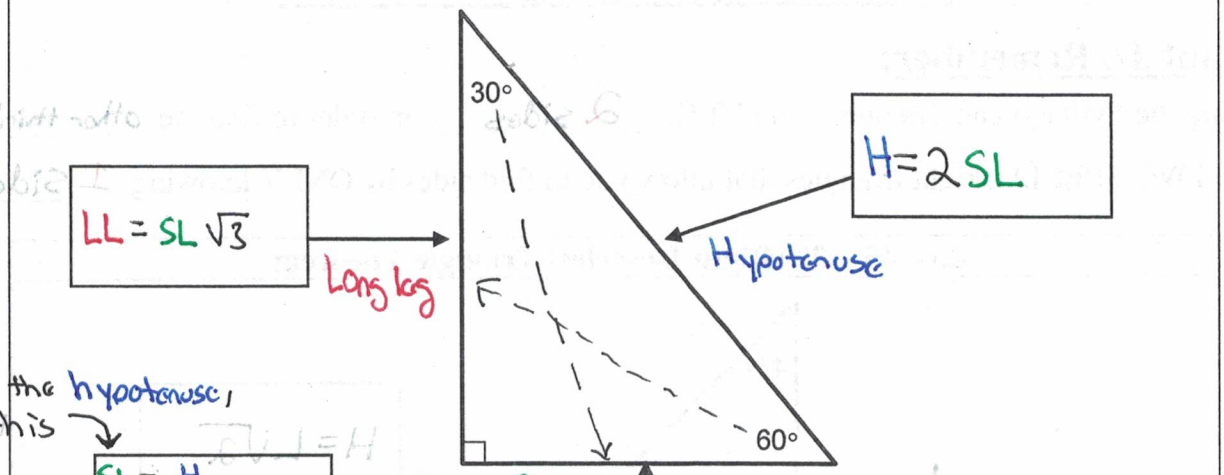
$L = 10\sqrt{3}$

② $L = \frac{H}{\sqrt{2}}$

$x = \frac{10\sqrt{3}}{\sqrt{2}} \cdot \frac{\sqrt{2}}{\sqrt{2}}$

$x = \frac{10\sqrt{6}}{2}$

30 – 60 – 90 Triangle Theorem



Example 2: Find the missing side lengths. Keep answers in simplified radical form.

a.) SL 8, 60°, x H
x / H = 2SL
x = 2(8)
x = 16

y LL / Y
LL = SL√3
y = 8(√3)
y = 8√3

b.) ② LL x, ① SL y, 60°, 14 H
① SL = H/2
y = 14/2
y = 7

② LL = SL√3
x = 7(√3)
x = 7√3

c.) y SL ①, LL 4√3, 30°, x H ②
① Y / SL = LL/√3
y = 4√3/√3
y = 4

② x / H = 2SL
x = 2(4)
x = 8

d.) H m ②, ① n, SL, 60°, 5√6 LL
① n / SL = LL/√3
n = 5√6/√3
n = 5√2

② m / H = 2SL
m = 2(5√2)
m = 10√2

e.) SL 6, 60°, LL ①, H, 60°, ② SL x
① LL = SL√3
LL = 6(√3)
LL = 6√3

② SL = H/2
SL = 6√3/2
x = 3√3

f.) ③ H x, ① SL, 60°, 60°, ② SL, 6√2 LL
① SL = LL/√3 → SL = 6√2/√3 · √3/√3 → 6√6/3
SL = 2√6

② H = 2SL → H = 2(2√6)
H = 4√6

③ H = 2SL → H = 2(4√6)
H = 8√6

Example 3: Complete each problem using special right triangles. Round final answer to the tenths!

a.) A softball diamond is a square. The distance from home plate to second base is 80 feet. What is the distance between the bases?

2nd, 45°, H, L, 3rd, 80ft, 1st, L, 1, 1, Home, 45°

L = H/√2
L = 80/√2 · √2/√2
L = 80√2/2
L = 40√2

Distance is 56.6 ft

b.) An equilateral triangle has a height of 18 inches. How long is one of the equilateral triangle's sides?

30°, 60, H, 18ft, LL, 60, H, 60, SL

SL = LL/√3
SL = 18/√3 · √3/√3
SL = 18√3/3
SL = 6√3

H = 2SL
H = 2(6√3)
H = 12√3 (≈ 20.8 in)

c.) Find side x in radical form.

③ x H, 45°, 60°, ① SL, L, H ②, LL, 10√3

① SL = LL/√3
SL = 10√3/√3
SL = 10

② H = 2SL
H = 2(10)
H = 20

45-45-90
③ H = L√2
H = 20√2

30 • 60 • 90