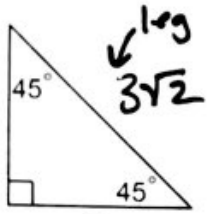
8.4 Special Right Triangles

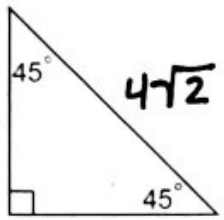
Use the Pythagorean Theorem to find the length of the hypotenuse for each right triangle. Express your answers in simplest radical form.

a)



leg, leg, $3\sqrt{2}$ hypotenuse

b)

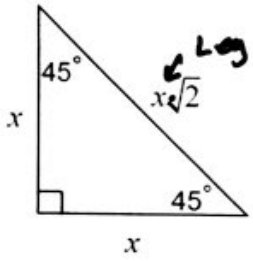


leg, leg, $4\sqrt{2}$ hypotenuse

Pattern

45°-45°-90° Right Triangles:

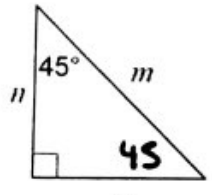
- **Legs are the same length**
- **Hypotenuse = Leg $\times\sqrt{2}$**



leg, leg, $x\sqrt{2}$ hypotenuse

Examples: Find the value of each variable.

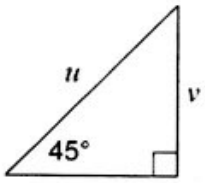
a)



$n = 7$

$m = 7\sqrt{2}$

b)

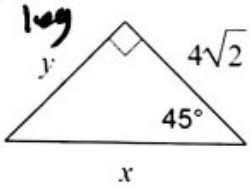


leg, leg

$v = 6$

$u = 6\sqrt{2}$

c)



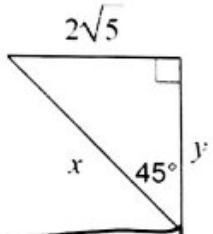
leg, leg

$y = 4\sqrt{2}$

$x = 4\sqrt{2} \cdot \sqrt{2}$

$x = 8$ $\quad 4\sqrt{4}$ $\quad 4 \cdot 2$

d)

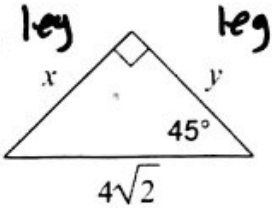


$y = 2\sqrt{5}$

$x = 2\sqrt{5} \cdot \sqrt{2}$

$x = 2\sqrt{10}$

e)

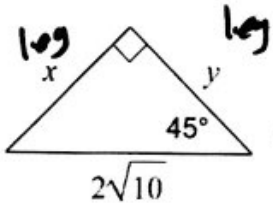


leg, leg

$x + y = \frac{4\sqrt{2}}{\sqrt{2}}$

$x + y = 4$

f)

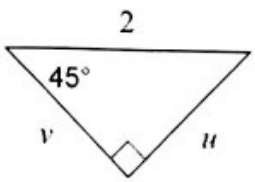


leg, leg

$x + y = \frac{2\sqrt{10}5}{\sqrt{2}1} \cdot \frac{2\sqrt{5}}{1}$

$x + y = 2\sqrt{5}$

g)

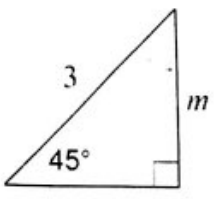


$v + u = \frac{2}{\sqrt{2}} \cdot \frac{\sqrt{2}}{\sqrt{2}}$

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

$v + u = \sqrt{2}$

h)



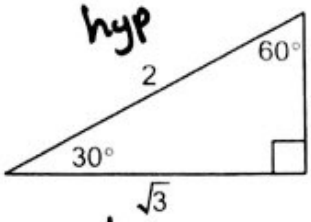
$m + n = \frac{3}{\sqrt{2}} \frac{\sqrt{2}}{\sqrt{2}}$

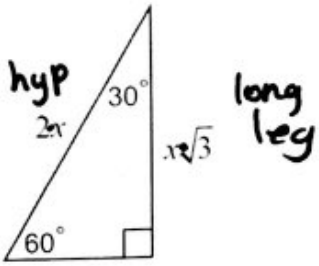
$m + n = \frac{3\sqrt{2}}{2}$

30°-60°-90° Right Triangles:

- Hypotenuse = 2 × Short Leg
- Long Leg = Short Leg × $\sqrt{3}$

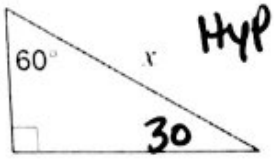
*short leg always opposite 30°





Examples: Find the value of each variable.

a)



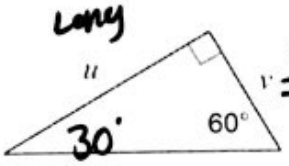
S.L. 5

L.L $y = 5\sqrt{3}$

$x = 5 \cdot 2$

$x = 10$

b)

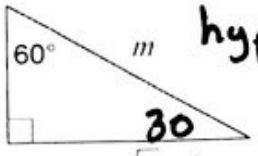


$v = 6 \div 2 = 3$

$v = 3$

$u = 3\sqrt{3}$

c)

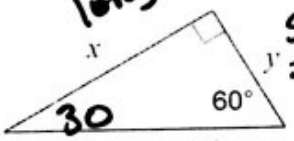


$n = \frac{5\sqrt{3}}{\sqrt{3}}$

$n = 5$

$m = 10$

d)

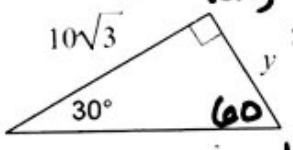


$y = \frac{14}{2} = 7$

$y = 7$

$x = 7 \cdot \sqrt{3}$

e)



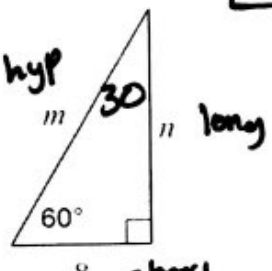
$y = \frac{10\sqrt{3}}{\sqrt{3}} = 10$

$y = 10$

$x = 10 \cdot 2$

$x = 20$

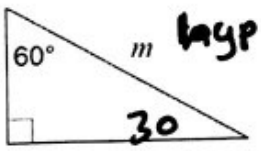
f)



$n = 8\sqrt{3}$

$m = 16$

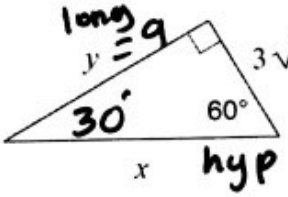
g)



$n = \frac{10\sqrt{3}}{\sqrt{3}\sqrt{3}} = \frac{10\sqrt{3}}{3} = n$

$m = \frac{10\sqrt{3}}{3} \cdot \frac{2}{1} = \frac{20\sqrt{3}}{3} = m$

h)

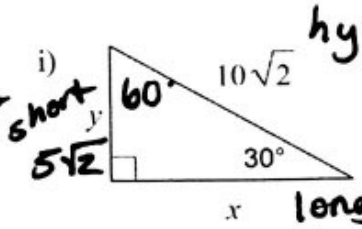


$y = 3\sqrt{3} \cdot \sqrt{3} = 3 \cdot 3$

$y = 9$

$x = 3\sqrt{3} \cdot 2 = 6\sqrt{3}$

i)



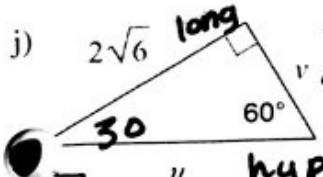
$y = \frac{5\sqrt{2}\sqrt{2}}{\sqrt{2}} = 5\sqrt{2}$

$x = 5\sqrt{2} \cdot \sqrt{3} = 5\sqrt{6}$

$y = 5\sqrt{2}$

$x = 5\sqrt{6}$

j)

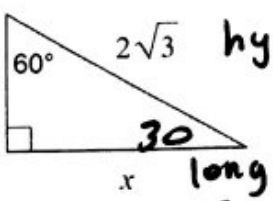


$v = \frac{2\sqrt{6}^2}{\sqrt{3}\sqrt{2}} = 2\sqrt{2}$

$u = 2\sqrt{2} \cdot 2 = 4\sqrt{2}$

$v = 2\sqrt{2}$

$u = 4\sqrt{2}$

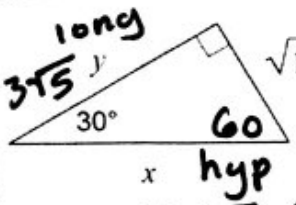


$y = \frac{2\sqrt{3}}{2} = \sqrt{3}$

$x = \sqrt{3} \cdot \sqrt{3} = 3$

$y = \sqrt{3}$

$x = 3$

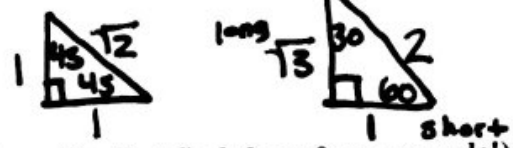


$y = \sqrt{15} \cdot \sqrt{3} = \sqrt{45}$ (3·3·5)

$y = 3\sqrt{5}$

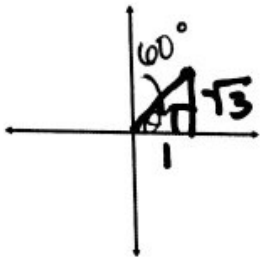
$x = 2\sqrt{15} = \sqrt{2\sqrt{15}} = x$

8.4 Special Right Triangles (continued)



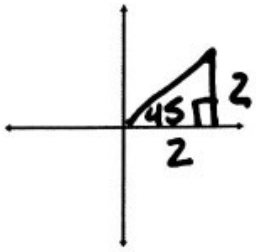
Find the measurement of the STANDARD ANGLE (you will need to first find the reference angle!) that is ...ted by the coordinate point. Draw a picture. Use special right triangles to solve for the angle. NO ...CIMAL ANSWERS ALLOWED!

A. $(1, \sqrt{3})$



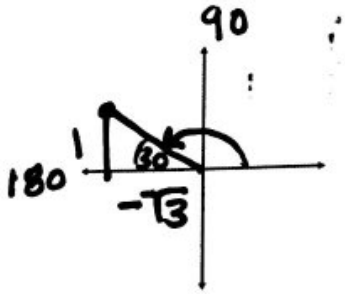
$\theta =$ 60°

B. $(2,2)$



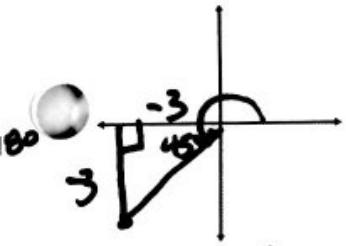
$\theta =$ 45°

C. $(-\sqrt{3}, 1)$



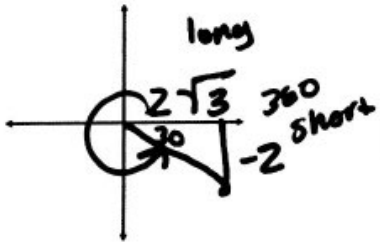
$\theta =$ 150°
180 − 30

D. $(-3, -3)$



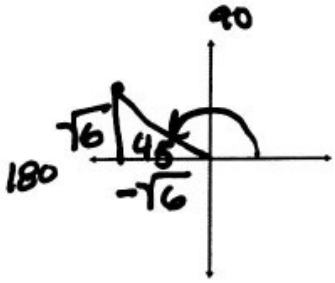
$\theta =$ 225°
180 + 45

E. $(2\sqrt{3}, -2)$



$\theta =$ 330°
360 − 30

F. $(-\sqrt{6}, \sqrt{6})$



$\theta =$ 135°
180 − 45

A six-meter-long ladder leans against a building. If the ladder makes an angle of 60° with the ground, how far up the wall does the ladder reach? How far from the wall is the base of the ladder?

short = $\frac{6}{2} = 3$

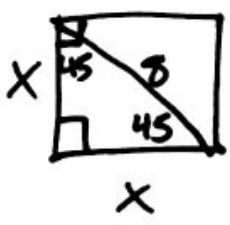
$\frac{\sin 60}{1} = \frac{x}{6}$

$x = 6 \sin 60$

$x = 5.2$

$3\sqrt{3}$ meters

A square has a diagonal of length 8 cm. Find the length of each side.



45-45-90 △

$x = \frac{8}{\sqrt{2}} \frac{\sqrt{2}}{\sqrt{2}} = \frac{8\sqrt{2}}{2} = 4\sqrt{2}$