Name KEY Period

**Secondary 2 Honors** **Notes 1.5**

## Right Triangle Similarity

**Warm-up:** Write down what you know about a right triangle: Draw one if your heart desires.

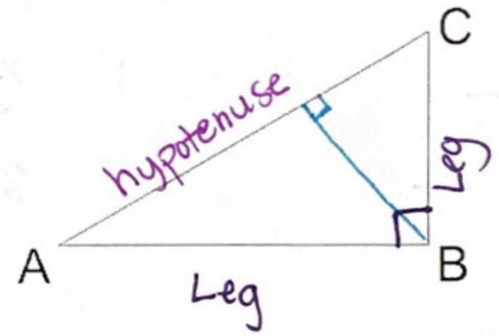
One $90^\circ$ angle. $a^2+b^2=c^2$

**Vocabulary:**

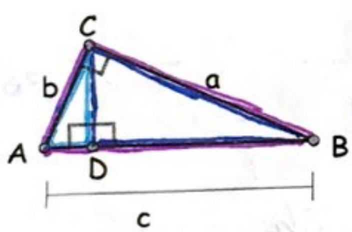
**Hypotenuse** - The longest side of a right triangle. Opposite the right < $\overline{AC}$

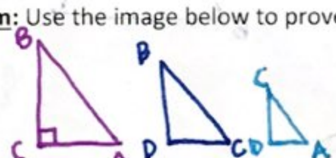
**Legs** - Two shorter sides of the triangle: $\overline{AB}$, $\overline{BC}$

**Altitude** - Line segment that passes through a vertex & meets the other side @ a $90^\circ$ angle.




**Right Triangle Similarity Theorem:** Use the image below to prove that $\triangle ABC \sim \triangle ACD \sim \triangle CBD$



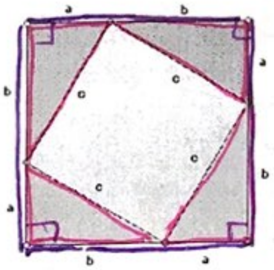

| Statement | Reason |
|---|---|
| 1. $\angle ACB \cong \angle BDC \cong \angle ADC$ | 1. Right angles |
| 2. $\angle BAC \cong \angle DAC$ | 2. Reflective (same angle) |
| 3. $\triangle ABC \sim \triangle ACD$ | 3. AA~ |
| 4. $\angle ABC \cong \angle CBD$ | 4. Reflective |
| 5. $\triangle ABC \sim \triangle CBD$ | 5. AA~ |
| 6. $\triangle ABC \sim \triangle ACD \sim \triangle CBD$ | |

In other words:

$\triangle ABC \sim \triangle ACD$
$\triangle ABC \sim \triangle CBD$
$\triangle ADC \sim \triangle CDB$

*You can use this idea to prove the Pythagorean Theorem, but you will do that in your homework.

**Another proof of the Pythagorean Theorem:**




Area: $(a+b)^2$
$= (a+b)(a+b)$
$= a^2+2ab+b^2$

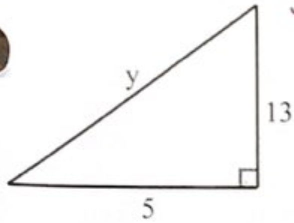
Area: $4(\frac{1}{2}ab)+c^2$
$=2ab+c^2$

$a^2+\cancel{2ab}+b^2 = \cancel{2ab}+c^2$

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

**The Pythagorean Theorem**: Find the unknown side length.

1.



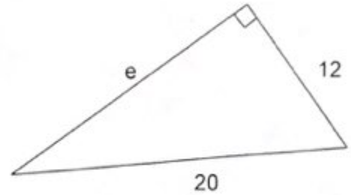

$5^2+13^2=y^2$

$25+169=y^2$

$\sqrt{194}=\sqrt{y^2}$

$\boxed{y=13.9}$

2.




$e^2+12^2=20^2$

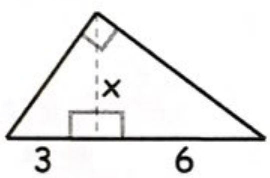
$e^2+144=400$
$\;\;\;\;-144\;\;\;-144$

$\sqrt{e^2}=\sqrt{256}$

$\boxed{e=16}$

**Examples using Right Triangle Similarity: Find the value of the variables in each right triangle. Write irrational values as simplified radicals AND as a decimal rounded to nearest tenth.**

4.

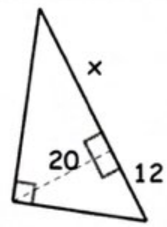



$\frac{3}{x}=\frac{x}{6}$

$\sqrt{18}=\sqrt{x^2}$

$\boxed{x=\sqrt{18}\approx 4.24}$

5.

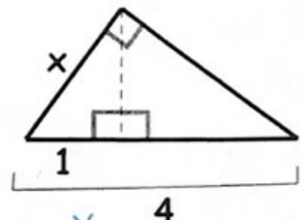



$\frac{20}{x}=\frac{12}{20}$

$\frac{400}{12}=\frac{12x}{12}$

$\boxed{x=33.\overline{3}}$

6.

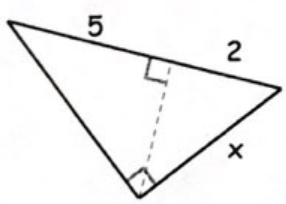



$\frac{1}{x}=\frac{x}{4}$

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

$\boxed{x=2}$

7.

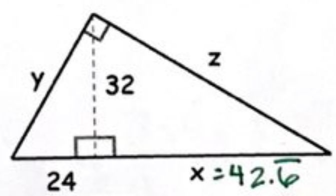



$\frac{2}{x}=\frac{x}{7}$

$\sqrt{14}=\sqrt{x^2}$

$x=\sqrt{14}\approx 3.74$

8.




$\frac{32}{24}=\frac{x}{32}$

$\frac{1024}{24}=\frac{24x}{24}$

$\boxed{x=42.\overline{6}}$

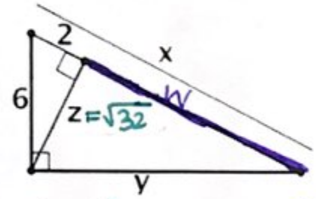
$24^2+32^2=y^2$

$\boxed{y=40}$

$32^2+42.\overline{6}^2=z^2$

$\boxed{z=53.\overline{33}}$

9.




$z^2+2^2=6^2$

$z^2+4=36$
$\;\;\;-4\;\;\;-4$

$\sqrt{z^2}=\sqrt{32}$

$\boxed{z=\sqrt{32}}$

$\frac{2}{\sqrt{32}}=\frac{\sqrt{32}}{w}$

$2w=32$

$w=16$

$\boxed{x=18}$

$6^2+y^2=18^2$

$36+y^2=324$
$-36\;\;\;\;\;\;-36$

$\sqrt{y^2}=\sqrt{288}$

$\boxed{y=16.97}$