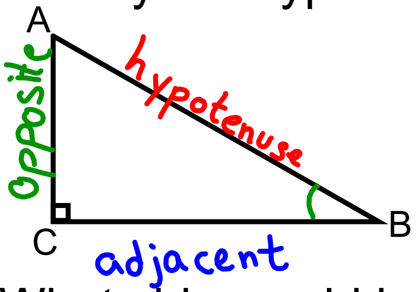
Goals For Today

SRT.6 Understand that by similarity, side ratios in right triangles are properties of the angles in the triangle, leading to definitions of trigonometric ratios for acute angles.

SRT.7 Explain and use the relationship between the sine and cosine of complementary angles.

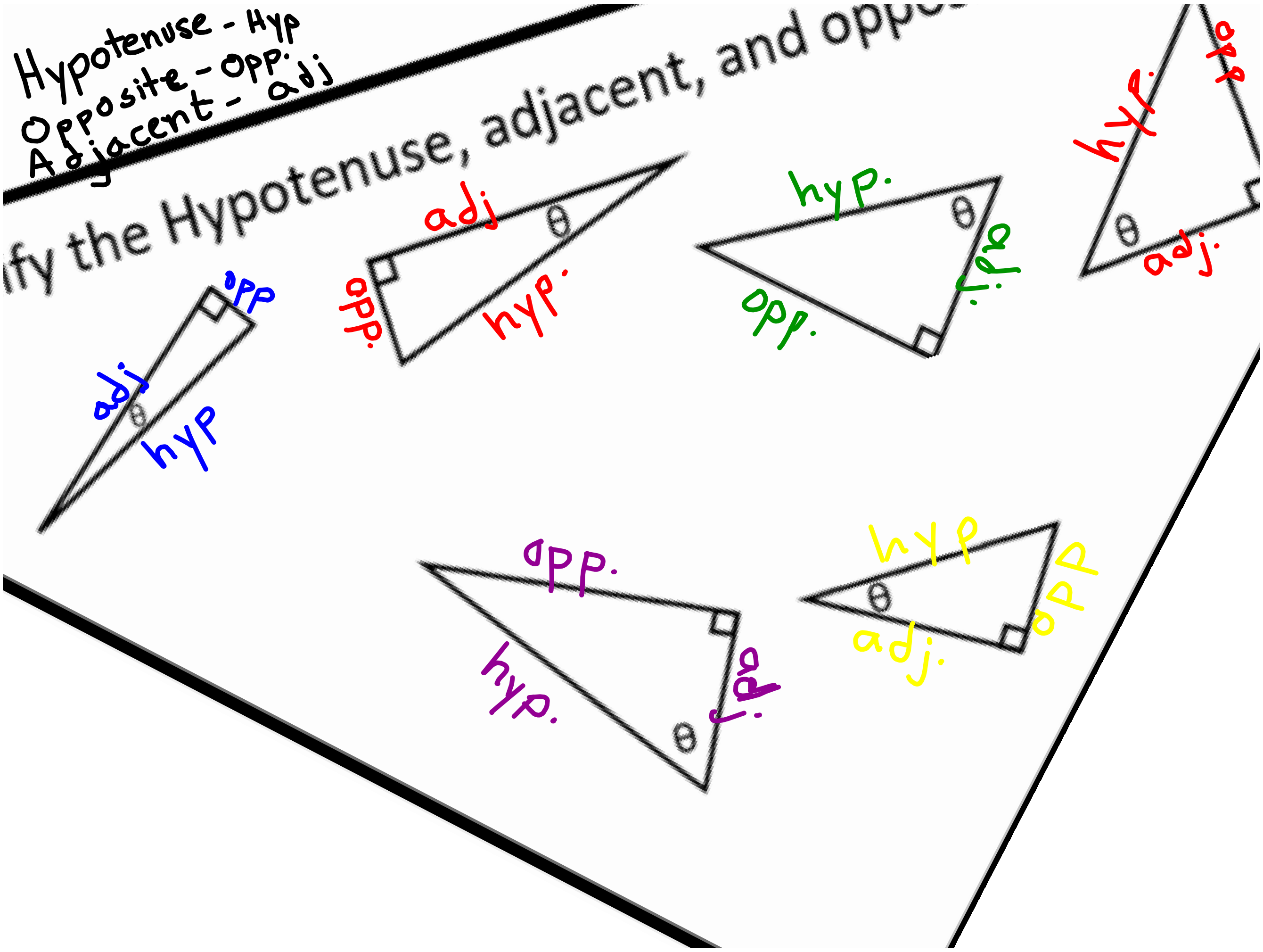
The Basics

Identify the hypotenuse of the following triangle.

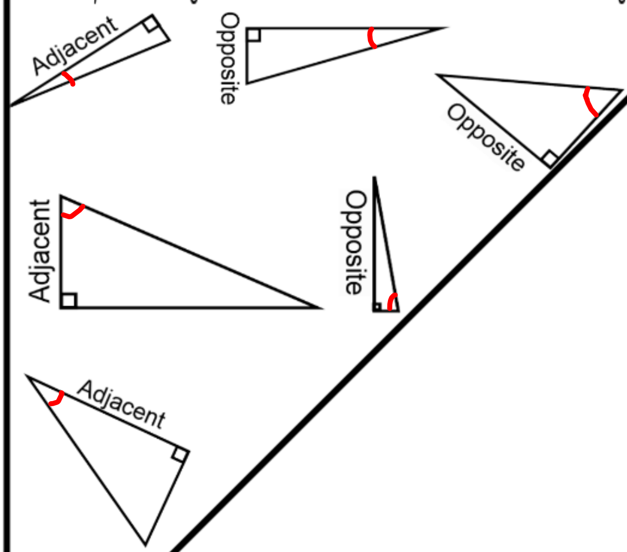


What side would be opposite to angle B in the above triangle?

What side would be adjacent to angle B in the above triangle?


Hypotenuse - Hyp
Opposite - Opp.
Adjacent - adj
the Hypotenuse, adjacent, and
opp
adj
hyp
θ
opp.
adj
hyp.
θ
hyp.
θ
adj.
opp.
hyp.
opp
θ
adj.
opp.
hyp.
adj.
θ
hyp
opp
θ
adj.

Identify the acute angle that would make the identified side correct in the following triangles.



What does this basic skill do for us?

It helps us find the

Right Triangle Trigonometric Ratios

They are: sine, cosine and tangent.

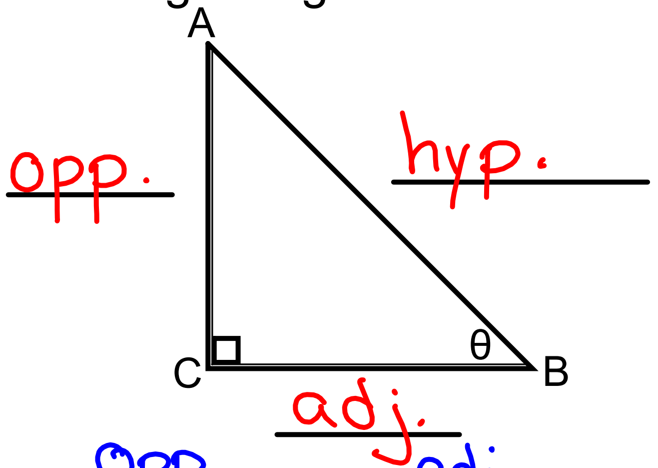
$\sin(\theta) = \frac{opp.}{hyp.}$

$\cos(\theta) = \frac{adj.}{hyp.}$

$\tan(\theta) = \frac{opp.}{adj.}$

Glue Foldable into notebook and label:

Right Triangle Trigonometric Ratios



$\sin(\theta) = \frac{\text{opp.}}{\text{hyp.}}$ $\cos(\theta) = \frac{\text{adj.}}{\text{hyp.}}$ $\tan(\theta) = \frac{\text{opp.}}{\text{adj.}}$

How can we remember this?

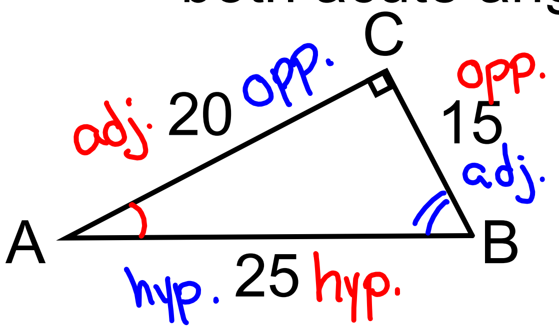
SOH – CAH – TOA

$\sin(\theta) = \frac{\text{opp.}}{\text{hyp.}}$ $\cos(\theta) = \frac{\text{adj.}}{\text{hyp.}}$ $\tan(\theta) = \frac{\text{opp.}}{\text{adj.}}$

Application

SOH - CAH - TOA

Ex. 1 Identify the sine, cosine, and tangent of both acute angles.



$\sin(A) = \frac{15}{25} = \frac{3}{5}$ $\quad\sin(B) = \frac{20}{25} = \frac{4}{5}$

$\cos(A) = \frac{20}{25} = \frac{4}{5}$ $\quad\cos(B) = \frac{15}{25} = \frac{3}{5}$

$\tan(A) = \frac{15}{20} = \frac{3}{4}$ $\quad\tan(B) = \frac{20}{15} = \frac{4}{3}$

$\sin(A) = \cos(B)$

$\cos(B) = \sin(A)$

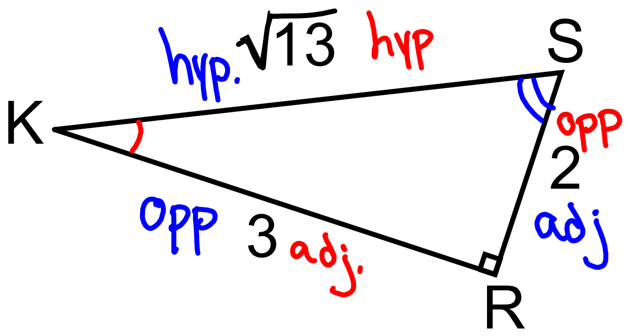
* Sine of one acute angle is equal to the cosine of its complementary angle.

$\tan(A) = \frac{3}{4}$ $\quad\tan(B) = \frac{4}{3}$

* tangent of one acute angle is the reciprocal of the tangent of its complementary angle.

Application

Ex. 2 Identify the sine, cosine, and tangent of both acute angles.



$$\sin(K) = \frac{2}{\sqrt{13}} \cdot \frac{\sqrt{13}}{\sqrt{13}} = \frac{2\sqrt{13}}{13}$$

$$\cos(K) = \frac{3}{\sqrt{13}} \cdot \frac{\sqrt{13}}{\sqrt{13}} = \frac{3\sqrt{13}}{13}$$

$$\tan(K) = \frac{2}{3}$$

$$\sin(S) = \frac{3}{\sqrt{13}} = \frac{3\sqrt{13}}{13}$$

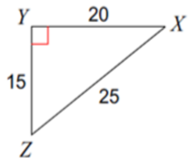
$$\cos(S) = \frac{2}{\sqrt{13}} = \frac{2\sqrt{13}}{13}$$

$$\tan(S) = \frac{3}{2}$$

You try # 1 and #3

(should have 6 trig. ratio equations for each)

1)



$\sin(z) = \frac{20}{25} = \frac{4}{5}$

$\cos(z) = \frac{15}{25} = \frac{3}{5}$

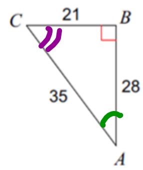
$\tan(z) = \frac{20}{15} = \frac{4}{3}$

$\sin(x) = \frac{3}{5}$

$\cos(x) = \frac{4}{5}$

$\tan(x) = \frac{3}{4}$

3)



$\sin(A) = \frac{21}{35} = \frac{3}{5}$

$\cos(A) = \frac{28}{35} = \frac{4}{5}$

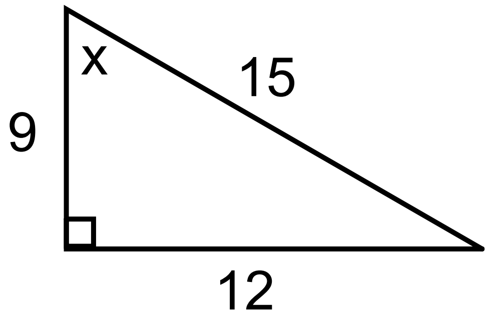
$\tan(A) = \frac{21}{28} = \frac{3}{4}$

$\sin(C) = \frac{28}{35} = \frac{4}{5}$

$\cos(C) = \frac{21}{35} = \frac{3}{5}$

$\tan(C) = \frac{28}{21} = \frac{4}{3}$

Review and think



What is the sin(x)?

$\sin(x) = \frac{12}{15} = \frac{4}{5}$

What is the cos(x)?

$\cos(x) = \frac{9}{15} = \frac{3}{5}$

What is the sin(90-x)?

↳ The other acute angle

$\sin(90-x) = \cos(x)$

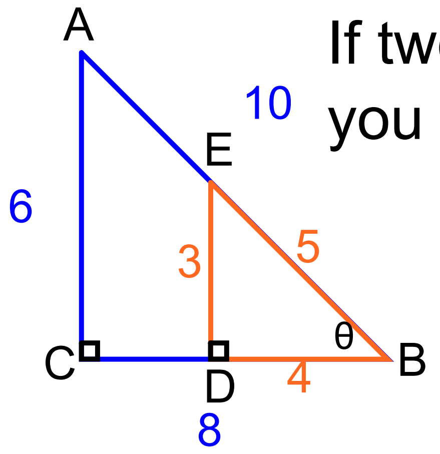
so

$\sin(90-x) = \frac{3}{5}$

How did mathematicians come up with these Trigonometric Ratios?

Let's SEE!

They used the concept of similarity.

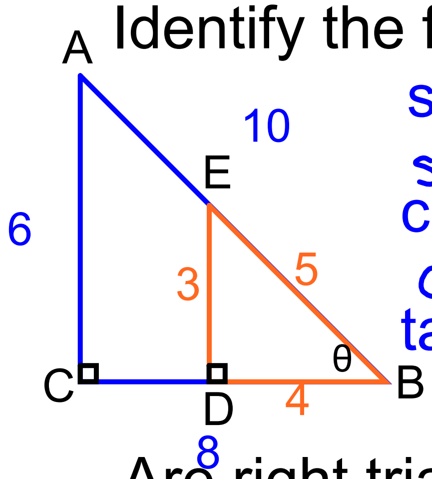


If two triangles are similar, what do you know about the sides? Angles?

Sides are proportional

angles are congruent

Identify the following for the similar triangles.



sin(θ) in ΔABC?

$\sin(\theta) = \frac{6}{10} = \frac{3}{5}$

cos(θ) in ΔABC?

$\cos(\theta) = \frac{8}{10} = \frac{4}{5}$

tan(θ) in ΔABC?

$\tan(\theta) = \frac{6}{8} = \frac{3}{4}$

sin(θ) in ΔEBD?

$\sin(\theta) = \frac{3}{5}$

cos(θ) in ΔEBD?

$\cos(\theta) = \frac{4}{5}$

tan(θ) in ΔEBD?

$\tan(\theta) = \frac{3}{4}$

Are right triangle trig. ratios the same for similar triangles? If so, why?

Yes, because the corresponding sides are proportional.

Key take away!

The __acute__ __angles__ _θ_ are __equal__, so the trig. functions' (_sine_, _cosine_, _tangent_) _ratios_ are also _equal_.

Quizlet

Writing Right Triangle Trigonometry Equations