

Lesson 8-4: Trig Ratios

AGENDA:

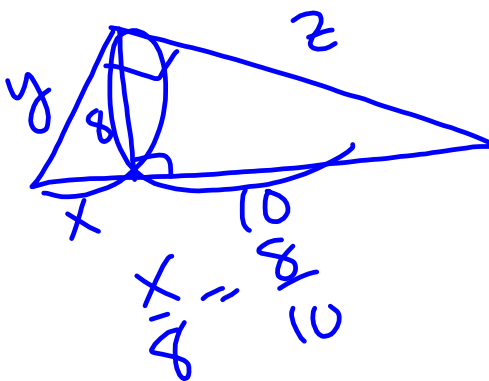
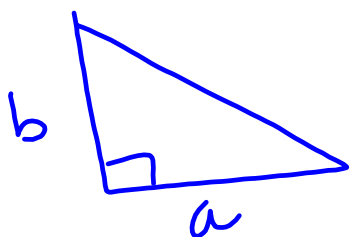
- Check HW 8.3
- Take Mini Quiz
- Notes 8.4 with Applications and Guided Practice

HOMEWORK:8-4

- Text p. 529 #22-24, 31-33, 37-42, 49, 68

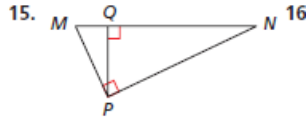
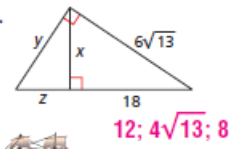
CR#7 is Due Friday ~~3/17~~

MON 3/20



HW - 8.3

13.



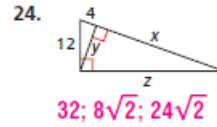
Find MQ. $MP = 10$
 $MN = 21$

29. The geometric mean of two numbers is $2\sqrt{5}$.
One of the numbers is 6. Find the other number.

$\frac{10}{3}$,
or $3\frac{1}{3}$

Use the diagram to complete each equation

Find x, y, and z.



41. **/// ERROR ANALYSIS ///** Two students were asked to find EF .
Which solution is incorrect? Explain the error.

1-3,

A

$$\frac{12}{EF} = \frac{EF}{8}, \text{ so}$$

$$(EF)^2 = (12)(8) = 96.$$

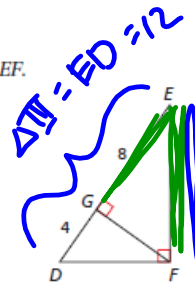
Thus $EF = \sqrt{96} =$
 $\sqrt{(16)(6)} = 4\sqrt{6}.$

B

$$\frac{8}{EF} = \frac{EF}{4}, \text{ so}$$

$$(EF)^2 = (8)(4) = 32.$$

Thus $EF = \sqrt{32} =$
 $\sqrt{(16)(2)} = 4\sqrt{2}.$



41. B; the
proportion should
be $\frac{12}{EF} = \frac{EF}{8}.$

Mini Quiz - 15 min

Take Out Lesson Summaries -

Complete Quiz

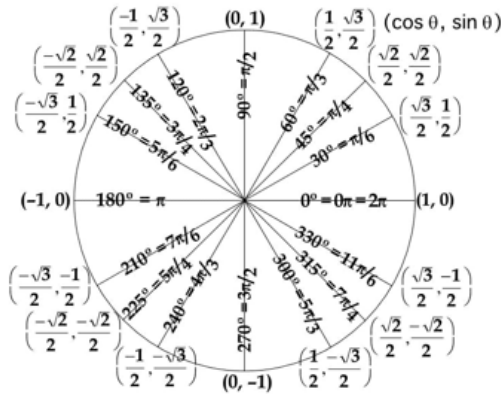
Work on CR #7 if done early

Geometry + LAB Name: _____ Date: _____ Section: _____

Lesson 8-4 Notes: Trigonometric Ratios in Right Triangles

Discovering Trigonometric Ratios

We have used similarity between right triangles in order to apply the geometric mean and the Pythagorean Theorem/triplets to solve for sides of a right triangle. What if we have a right triangle and only know 1 side length? Could we find the other side lengths? Given a unit circle centered at the origin with a radius of 1, let's look at the right triangles we can draw in. Could we find ratios among the sides in a right triangle for any given angle measure which would allow us to determine other side lengths?



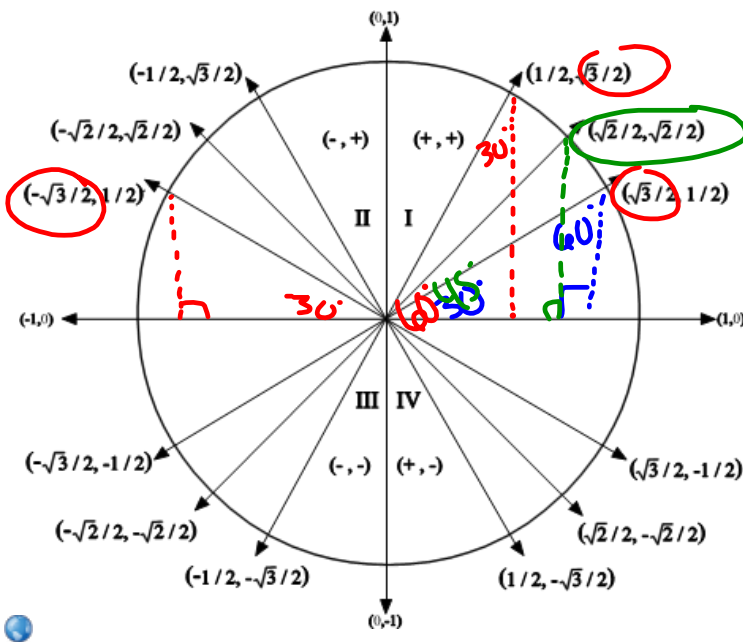
Can you see the repetition of right triangles? That places points with (x,y) coordinates on the unit circle based on a certain acute angle measure. If we used the Pythagorean Theorem, we would find consistent ratios.

Since all right triangles with a specific acute angle are similar by $AA \sim$, the ratios between the sides are functions of the angle measure and are called trigonometric ratios. They are as follows:

$$\sin \angle = \frac{\text{Opposite Leg}}{\text{Hypotenuse}}; \quad \cos \angle = \frac{\text{Adjacent Leg}}{\text{Hypotenuse}}; \quad \tan \angle = \frac{\text{Opposite Leg}}{\text{Adjacent Leg}}$$

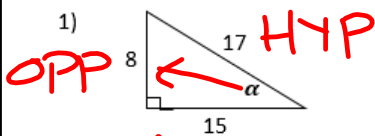
S
H C
H T
A

Why are they functions?

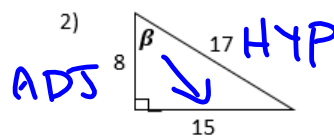


Trig Table											
Angle	Sine	Cosine	Tangent	Angle	Sine	Cosine	Tangent	Angle	Sine	Cosine	Tangent
1	0.0175	0.9998	0.0175	31	0.5150	0.8572	0.6009	61	0.8746	0.4848	1.8040
2	0.0349	0.9994	0.0349	32	0.5299	0.8480	0.6249	62	0.8829	0.4695	1.8807
3	0.0523	0.9986	0.0524	33	0.5446	0.8387	0.6494	63	0.8910	0.4540	1.9626
4	0.0698	0.9976	0.0699	34	0.5592	0.8290	0.6745	64	0.8988	0.4384	2.0503
5	0.0872	0.9962	0.0875	35	0.5736	0.8192	0.7002	65	0.9063	0.4226	2.1445
6	0.1045	0.9945	0.1051	36	0.5878	0.8090	0.7265	66	0.9135	0.4067	2.2460
7	0.1219	0.9925	0.1228	37	0.6018	0.7986	0.7536	67	0.9205	0.3907	2.3559
8	0.1392	0.9903	0.1405	38	0.6157	0.7880	0.7813	68	0.9272	0.3746	2.4751
9	0.1564	0.9877	0.1584	39	0.6293	0.7771	0.8098	69	0.9336	0.3584	2.6051
10	0.1736	0.9848	0.1763	40	0.6428	0.7660	0.8391	70	0.9397	0.3420	2.7475
11	0.1908	0.9816	0.1944	41	0.6561	0.7547	0.8693	71	0.9455	0.3256	2.9042
12	0.2079	0.9781	0.2126	42	0.6691	0.7431	0.9004	72	0.9511	0.3090	3.0777
13	0.2250	0.9744	0.2309	43	0.6820	0.7314	0.9325	73	0.9563	0.2924	3.2709
14	0.2419	0.9703	0.2493	44	0.6947	0.7193	0.9657	74	0.9613	0.2756	3.4874
15	0.2588	0.9659	0.2679	45	0.7071	0.7071	1.0000	75	0.9659	0.2588	3.7321
16	0.2756	0.9613	0.2867	46	0.7193	0.6947	1.0355	76	0.9703	0.2419	4.0108
17	0.2924	0.9563	0.3057	47	0.7314	0.6820	1.0724	77	0.9744	0.2250	4.3315
18	0.3090	0.9511	0.3249	48	0.7431	0.6691	1.1106	78	0.9781	0.2079	4.7046
19	0.3256	0.9455	0.3443	49	0.7547	0.6561	1.1504	79	0.9816	0.1908	5.1446
20	0.3420	0.9397	0.3640	50	0.7660	0.6428	1.1918	80	0.9848	0.1736	5.6713
21	0.3584	0.9336	0.3839	51	0.7771	0.6293	1.2349	81	0.9877	0.1564	6.3138
22	0.3746	0.9272	0.4040	52	0.7880	0.6157	1.2799	82	0.9903	0.1392	7.1154
23	0.3907	0.9205	0.4245	53	0.7986	0.6018	1.3270	83	0.9925	0.1219	8.1443
24	0.4067	0.9135	0.4452	54	0.8090	0.5878	1.3764	84	0.9945	0.1045	9.5144
25	0.4226	0.9063	0.4663	55	0.8192	0.5736	1.4281	85	0.9962	0.0872	11.4301
26	0.4384	0.8988	0.4877	56	0.8290	0.5592	1.4826	86	0.9976	0.0698	14.3007
27	0.4540	0.8910	0.5095	57	0.8387	0.5446	1.5399	87	0.9986	0.0523	19.0811
28	0.4695	0.8829	0.5317	58	0.8480	0.5299	1.6003	88	0.9994	0.0349	28.6363
29	0.4848	0.8746	0.5543	59	0.8572	0.5150	1.6643	89	0.9998	0.0175	57.2900
30	0.5000	0.8660	0.5774	60	0.8660	0.5000	1.7321				

How do we know which side is which in the right triangle? It all depends on the reference angle! For each triangle below, label each side of the triangle as OPP, ADJ or HYP in relation to the reference angle and write each trigonometric ratio.

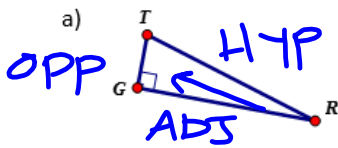


$$\begin{aligned} \text{S} &= \frac{\text{O}}{\text{H}} & \sin \alpha &= \frac{8}{17} \\ \text{C} &= \frac{\text{A}}{\text{H}} & \cos \alpha &= \frac{15}{17} \\ \text{T} &= \frac{\text{O}}{\text{A}} & \tan \alpha &= \frac{8}{15} \end{aligned}$$

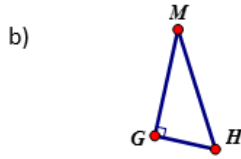


$$\begin{aligned} \text{S} &= \frac{\text{O}}{\text{H}} & \sin \beta &= \frac{15}{17} \\ \text{C} &= \frac{\text{A}}{\text{H}} & \cos \beta &= \frac{8}{17} \\ \text{T} &= \frac{\text{O}}{\text{A}} & \tan \beta &= \frac{15}{8} \end{aligned}$$

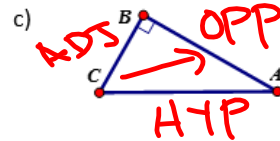
3) Determine the correct side based on the reference angle.



Reference $\angle R$
 Opposite Side GT
 Adjacent Side GR
 Hypotenuse TR



Reference $\angle M$
 Opposite Side
 Adjacent Side
 Hypotenuse



Reference $\angle C$
 Opposite Side BA
 Adjacent Side BC
 Hypotenuse CA

USING THE CALCULATOR

- Be sure your calculator is in DEGREE mode
- NEVER use your calculator until the end of the problem in order to avoid rounding errors

Calculate the each trigonometric ratio. Round to the nearest ten thousandth (typically seen).

A) $\cos 76^\circ \approx 0.2419$ B) $\sin 8^\circ \approx 0.1392$ C) $\tan 82^\circ \approx$

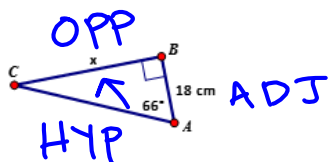
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SOLVING FOR A MISSING SIDE LENGTH

1. Label the sides of the triangle as OPP, ADJ, HYP in relation to the reference angle.
2. Set up the trigonometric ratio as an equation.
3. Solve for the variable in terms of the trig ratio.
4. Calculate.
5. Round as necessary.

⊕

a)



~~S~~/~~H~~C ~~A~~/~~H~~T ~~O~~/~~A~~

$$\text{TAN } 66^\circ = \frac{x}{18}$$

$$18(\text{TAN } 66^\circ) = x$$

$$40.4286\dots = x$$

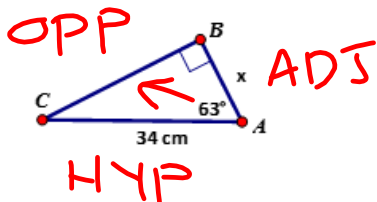
$$\boxed{40.4 \text{ cm}}$$

SOLVING FOR A MISSING SIDE LENGTH

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3. Solve for the variable in terms of the trig ratio.
4. Calculate.
5. Round as necessary.

~~S~~/~~H~~C ~~A~~/~~H~~T ~~O~~/~~A~~

b)



$$\text{COS } 63^\circ = \frac{x}{34}$$

$$34(\text{COS } 63^\circ) = x$$

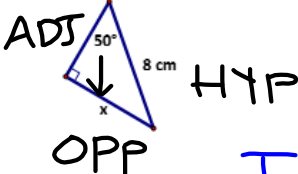
$$15.4356\dots$$

$$\boxed{\approx 15.4 \text{ cm}}$$

SOLVING FOR A MISSING SIDE LENGTH

1. Label the sides of the triangle as OPP, ADJ, HYP in relation to the reference angle.
2. Set up the trigonometric ratio as an equation.
3. Solve for the variable in terms of the trig ratio.
4. Calculate.
5. Round as necessary.

c)



~~S~~/~~H~~ ~~C~~/~~H~~ T/A

$$\tan 50^\circ = \frac{x}{8}$$

$$8(\tan 50^\circ) = x$$

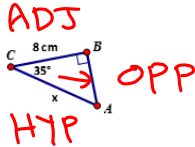
$$9.5340$$

9.5 cm

SOLVING FOR A MISSING SIDE LENGTH

1. Label the sides of the triangle as OPP, ADJ, HYP in relation to the reference angle.
2. Set up the trigonometric ratio as an equation.
3. Solve for the variable in terms of the trig ratio.
4. Calculate.
5. Round as necessary.

d)



~~S~~/~~H~~ ~~C~~/~~H~~ ~~T~~/~~A~~

$$\cos 35^\circ = \frac{8}{x}$$

$$x(\cos 35^\circ) = 8$$

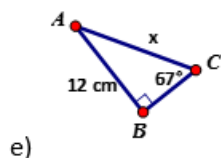
$$x = \frac{8}{\cos 35^\circ}$$

$$9.7661\dots$$

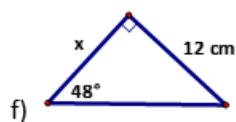
9.8 cm

SOLVING FOR A MISSING SIDE LENGTH

1. Label the sides of the triangle as OPP, ADJ, HYP in relation to the reference angle.
2. Set up the trigonometric ratio as an equation.
3. Solve for the variable in terms of the trig ratio.
4. Calculate.
5. Round as necessary.

**SOLVING FOR A MISSING SIDE LENGTH**

1. Label the sides of the triangle as OPP, ADJ, HYP in relation to the reference angle.
2. Set up the trigonometric ratio as an equation.
3. Solve for the variable in terms of the trig ratio.
4. Calculate.
5. Round as necessary.



Attachments

Bridge to 8.docx