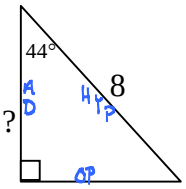
Sec 2-1 CC Geometry – Trigonometry Practice

Name:

1. Find the requested unknown side of the following triangles.

a.



HAVE: HYP, WANT: AD } SUGGESTS $\cos\theta = \frac{A}{H}$

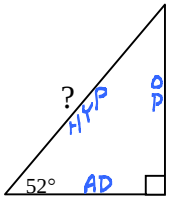
$\frac{\cos 44}{1} \times \frac{A}{8}$

$A = 8\cdot\cos 44$

```
8cos(44)
_     5.754718403
```

≈ 5.75

b.



HAVE: ADJ, WANT: HYP } SUGGESTS $\cos\theta = A/H$

$\frac{\cos 52}{1} \times \frac{7}{H}$

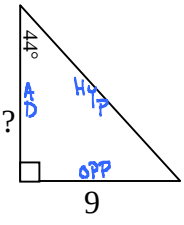
$7 = H\cdot\cos 52$

$\frac{7}{\cos 52} = \frac{H\cdot\cos 52}{\cos 52}$

```
7/cos(52)
      11.36988472
```

≈ 11.37

c.



HAVE: OPP, WANT: ADJ } SUGGESTS $\tan\theta = \frac{O}{A}$

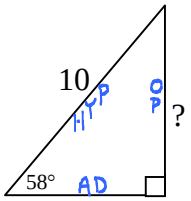
$\frac{\tan 44}{1} \times \frac{9}{A}$

$\frac{9}{\tan 44} = \frac{A\cdot\tan 44}{\tan 44}$

```
9/tan(44)
      9.319772824
```

≈ 9.32

d.



HAVE: HYP, WANT: OPP } SUGGESTS $\sin\theta = \frac{O}{H}$

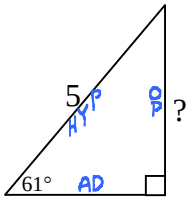
$\frac{\sin 58}{1} \times \frac{OP}{10}$

$OP = 10\cdot\sin 58$

```
10*sin(58
      8.480480962
```

≈ 8.48

e.



HAVE: HYP, WANT: OPP } SUGGESTS $\sin\theta = \frac{O}{H}$

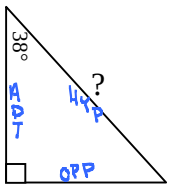
$\frac{\sin 61}{1} \times \frac{OP}{5}$

$OP = 5\cdot\sin 61$

```
5*sin(61
      4.373098536
```

≈ 4.37

f.



HAVE: ADJ, WANT: HYP } SUGGESTS $\cos\theta = A/H$

$\frac{\cos 38}{1} \times \frac{7}{H}$

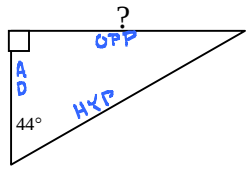
$7 = H\cdot\cos 38$

$\frac{7}{\cos 38} = \frac{H\cdot\cos 38}{\cos 38}$

```
7/cos(38)
      8.883127506
```

≈ 8.88

g.



HAVE: ADJ, WANT: OP } SUGGESTS $\tan\theta = \frac{O}{A}$

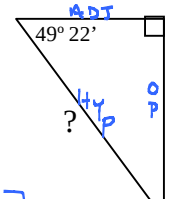
$\frac{\tan 44}{1} \times \frac{OP}{4}$

$OP = 4\cdot\tan 44$

```
4*tan(44)
      3.862755099
```

≈ 3.86

h.



HAVE: OP, WANT: HYP } SUGGESTS $\sin\theta = \frac{O}{H}$

$\theta = 49 + \frac{22}{60} = 49.3\overline{6}$

$\frac{\sin 49.3\overline{6}}{1} \times \frac{9}{H}$

$\frac{9}{\sin 49.3\overline{6}} = \frac{H\cdot\sin 49.3\overline{6}}{\sin 49.3\overline{6}}$

```
9/sin(49.3666666
)
      11.85938606
```

≈ 11.86

2. An observer is standing 7000 feet from the launch pad of the Space Shuttle Discovery. The Shuttle launches and 30 seconds later the observer sites the shuttle with an angle of elevation of 78°.

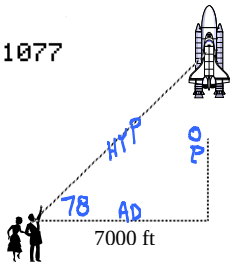
a. How high is the space shuttle?

HAVE: AD, WANT: OP } SUGGESTS $\tan\theta = \frac{O}{A}$

$\frac{\tan 78}{1} \times \frac{OP}{7000}$

$OP = 7000\cdot\tan 78 \approx 32932.4\text{ ft}$

```
7000*tan(78)
      32932.41077
```



b. How fast is the space shuttle moving in feet per second?

(Can you find the speed in miles per hour, remember there are 5280 feet in 1 mile.)

$\frac{32932.4\text{ ft}}{30\text{ sec}}$

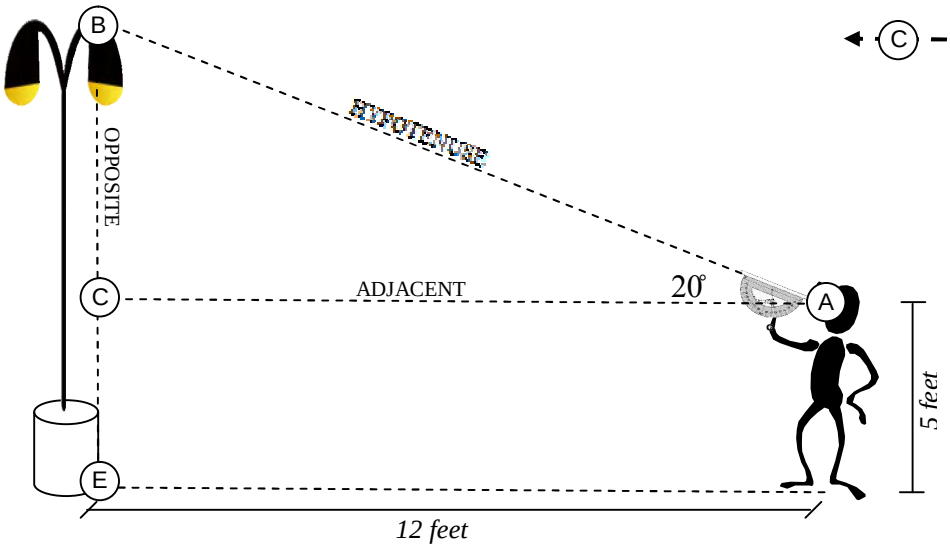
1097.7 ft/s

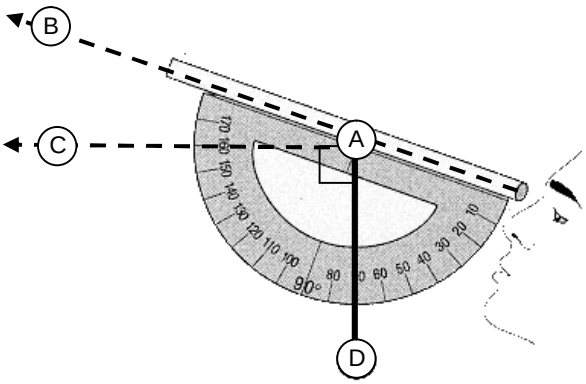
$\frac{32932.4\text{ ft}}{30\text{ sec}} \left| \frac{1\text{ mile}}{5280\text{ ft}} \right| \frac{60\text{ sec}}{1\text{ min}} \left| \frac{60\text{ min}}{1\text{ hour}} \right.$

```
(32932.4*60*60)/
(30*5280)
      748.4636364
```

748 MPH

3. Trigonometric ratios can be used to solve right triangles. They are commonly used to find measures of objects that might be inaccessible. For example, to determine the height of a light pole in the school parking lot we can use a simple **sextant** and trigonometry. A simple sextant is a device used to measure the angle of elevation.





You can build a simple sextant by taping a straw to a protractor and tying a string or weighted plum line to the center of the protractor (point A). Since gravity will pull the plumb line AD perpendicular to the ground, we know that ∠CAD must be a right angle.

So, to determine the angle of elevation, find the measure of ∠DAB using the plumb line and subtract 90°.

In this example, **<u>we know</u>** that the length of the ADJACENT and **<u>would like to determine</u>** the length of the OPPOSITE. The trigonometric ratio that relates these two sides of the triangle is **<u>TANGENT</u>**.

$$\tan(20°) = \frac{Opp.}{12}$$

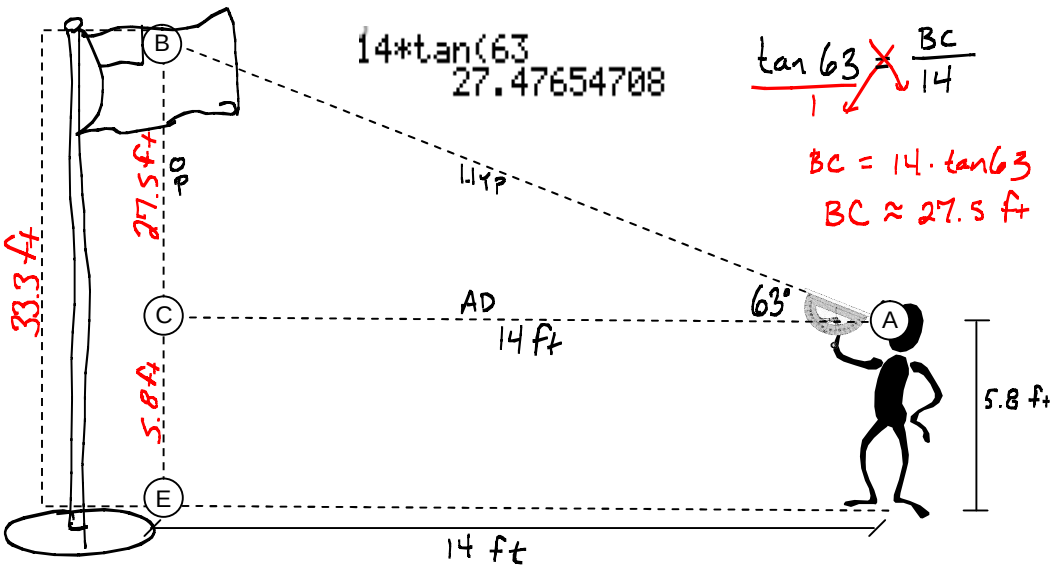
$$12 \cdot \tan(20°) = \frac{Opp.}{\cancel{12}} \cdot \cancel{12}$$

$$4.37\ ft \approx Opp.$$

$$AE \approx 4.37\ ft + 5\ ft = 9.37\ ft$$

Using a similar strategy find the height of some objects that are too tall to measure at your school. (Measure a horizontal distance of at least 12 feet away from the object.)

A.



14*tan(63
27.47654708

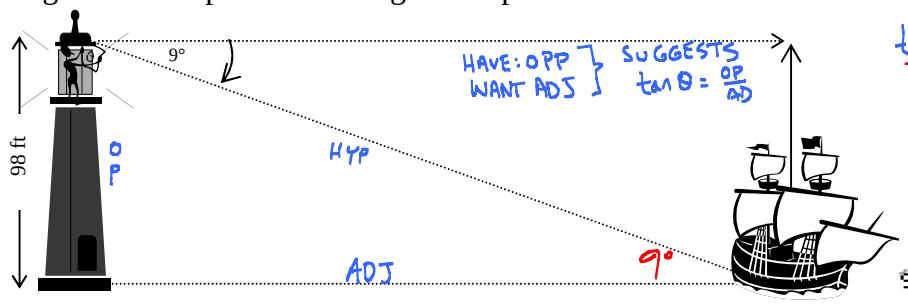
$\tan 63 = \frac{BC}{14}$

$BC = 14 \cdot \tan 63$

$BC \approx 27.5\ ft$

27.5+5.8
33.3

4. A ship has been sighted from a lighthouse. The observer is 98 feet above the ground (sea level) when he sighted the ship and at 9° angle of depression. Determine how far the ship is away from the lighthouse.



HAVE: OPP, WANT ADJ } SUGGESTS $\tan\theta = \frac{OP}{ADJ}$

$\tan(9) \times \frac{98}{A}$

$\frac{98}{\tan 9} = \frac{A \cdot \tan 9}{\tan 9}$

$98/\tan(9) = 618.7476484$

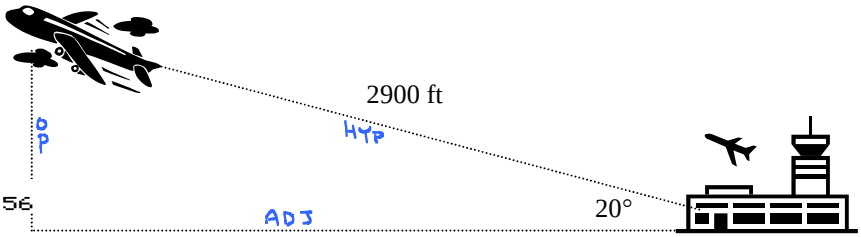
≈ 618.75 ft

5. As a plane takes off it ascends at a 20° angle of elevation. If the plane has been traveling at an average rate of 290 ft/s and continues to ascend at the same angle, then how high is the plane after 10 seconds (the plane has traveled 2900 ft).

HAVE: HYP
WANT: OPP

$\sin 20 \times \frac{OP}{2900}$

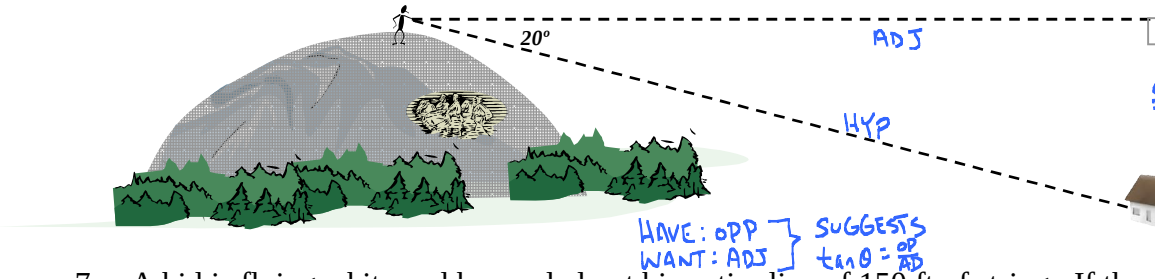
$OP = 2900 \sin 20$



$2900*\sin(20) = 991.8584156$

≈ 991.86 ft

6. Mr. GIRT noticed that he could spot his house from the top of Stone Mountain. If Mr. GIRT noticed that he had to use a 20º angle of depression to spot his house and that Stone Mountain is 825 feet above its surroundings then how far is Stone Mountain away from his house?



$\tan 20 \times \frac{825}{A}$

$\frac{825}{\tan 20} = \frac{A \cdot \tan 20}{\tan 20}$

$825/\tan(20) = 2266.668871$

≈ 2266.7 ft

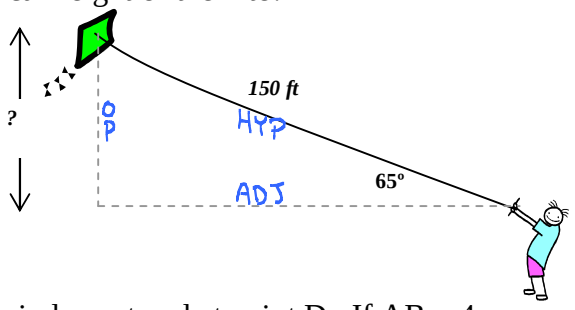
HAVE: OPP, WANT: ADJ } SUGGESTS $\tan\theta = \frac{OP}{ADJ}$

7. A kid is flying a kite and has reeled out his entire line of 150 ft of string. If the angle of elevation of the string is 65º then which expression gives the vertical height of the kite?

HAVE: HYP, WANT: OP } SUGGESTS $\sin\theta = O/H$

$\sin 65 \times \frac{OP}{150}$

$OP = 150 \cdot \sin 65$

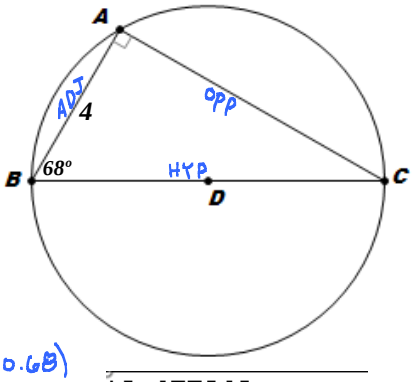


$150*\sin(65) = 135.9461681$

≈ 135.9 ft

8. Δ ABC is a right triangle and BC is a diameter of the circle centered at point D. If AB = 4 cm, and m∠ABC = 68˚, find the circumference of the circle.

HAVE: ADJ, WANT: HYP } SUGGESTS $\cos\theta = A/H$



$\cos 68 \times \frac{4}{H}$

$\frac{4}{\cos 68} = \frac{H \cdot \cos 68}{\cos 68}$

$4/\cos(68) = 10.67786865$

$10.68 \approx H$

Circum $= \pi d$

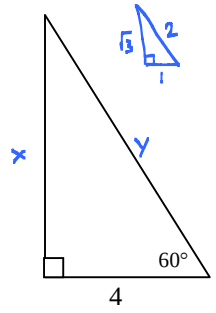
$= \pi(10.68)$

≈ 33.55

$10.677869*\pi = 33.54551481$

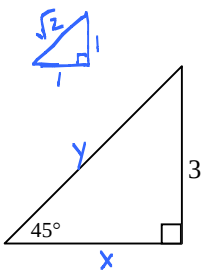
≈ 33.55

9. Find the unknown sides without using trigonometry but with special right triangles.



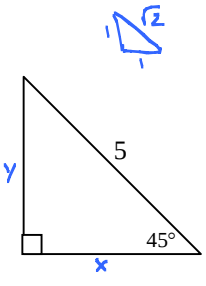
$\frac{x}{\sqrt{3}} \times \frac{4}{1}$ $\quad \frac{y}{2} \times \frac{4}{1}$

$4\sqrt{3} = x$ $\quad 8 = y$



$\frac{y}{\sqrt{2}} \times \frac{3}{1}$ $\quad \frac{x}{1} \times \frac{3}{1}$

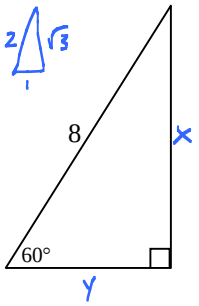
$3\sqrt{2} = y$ $\quad 3 = x$



$\frac{y}{1} = \frac{5}{\frac{\sqrt{2}}{2}}$ $\quad \frac{x}{1} = \frac{5}{\frac{\sqrt{2}}{2}}$

$y = \frac{5 \cdot \sqrt{2}}{\frac{\sqrt{2}}{2} \cdot \sqrt{2}}$ $\quad x = \frac{5}{\frac{\sqrt{2}}{2}} \cdot \frac{\sqrt{2}}{\sqrt{2}}$

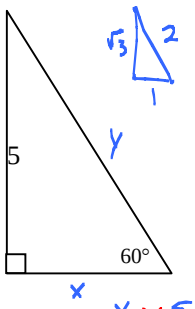
$y = \frac{5\sqrt{2}}{\frac{2}{2}}$ $\quad x = \frac{5\sqrt{2}}{2}$



$\frac{y}{1} = \frac{8}{2}$ $\quad \frac{x}{\sqrt{3}} \times \frac{8}{2}$

$y = 4$ $\quad \frac{8\sqrt{3}}{2} = \frac{2x}{2}$

$4\sqrt{3} = x$



$\frac{x}{1} = \frac{5}{\frac{\sqrt{3}}{3}}$ $\quad \frac{y}{2} \times \frac{5}{\frac{\sqrt{3}}{3}}$

$x = \frac{5}{\frac{\sqrt{3}}{3}} \cdot \frac{\sqrt{3}}{\sqrt{3}}$ $\quad \frac{10}{\frac{\sqrt{3}}{3}} = \frac{\sqrt{3}y}{\frac{\sqrt{3}}{3}}$

$x = \frac{5\sqrt{3}}{3}$ $\quad \frac{10}{\sqrt{3}} = y$

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

10. Find the reference angle for each and use the special right triangles to determine the EXACT value of the following.

$\sin\theta = \frac{O}{H}$ $\quad \csc\theta = \frac{H}{O}$

$\cos\theta = \frac{A}{H}$ $\quad \sec\theta = \frac{H}{A}$

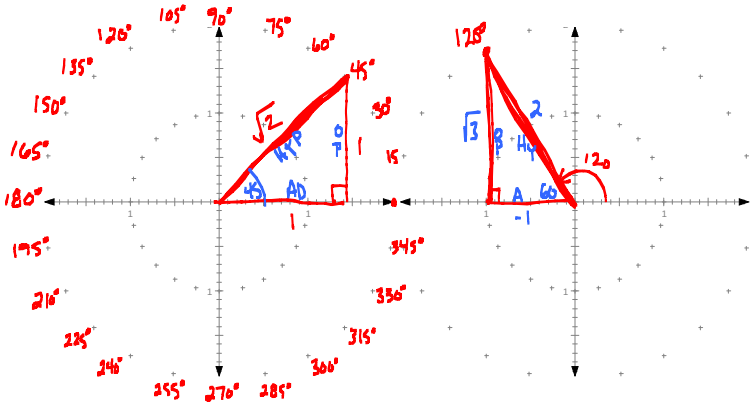
$\tan\theta = \frac{O}{A}$ $\quad \cot\theta = \frac{A}{O}$

a. $\sin(45^\circ) = \frac{O}{H} = \frac{1}{\sqrt{2}} = \frac{\sqrt{2}}{2}$ REF = 45

b. $\sin(120^\circ) = \frac{O}{H} = \frac{\sqrt{3}}{2}$ REF = 60°

c. $\cos(225^\circ) = \frac{A}{H} = \frac{-1}{\sqrt{2}} = \frac{-\sqrt{2}}{2}$ REF = 45°

d. $\cos(300^\circ) = \frac{A}{H} = \frac{1}{2}$ REF = 60

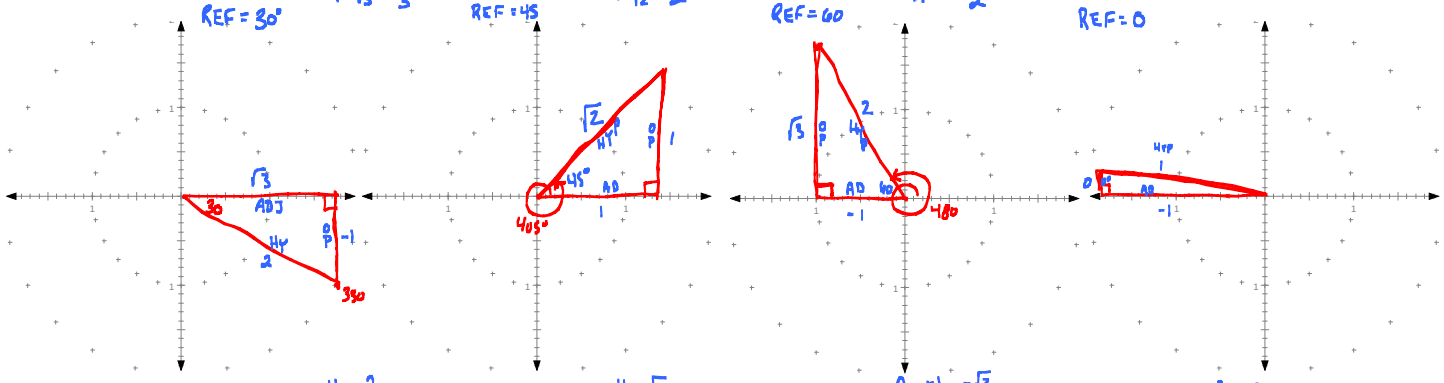


e. $\tan(330^\circ) = \frac{O}{A} = \frac{-1}{\sqrt{3}} = \frac{-\sqrt{3}}{3}$ REF = 30°

f. $\sin(405^\circ) = \frac{O}{H} = \frac{1}{\sqrt{2}} = \frac{\sqrt{2}}{2}$ REF = 45

g. $\cos(480^\circ) = \frac{A}{H} = \frac{-1}{2}$ REF = 60

h. $\sin(180^\circ) = \frac{OP}{HY} = \frac{0}{1} = 0$ REF = 0



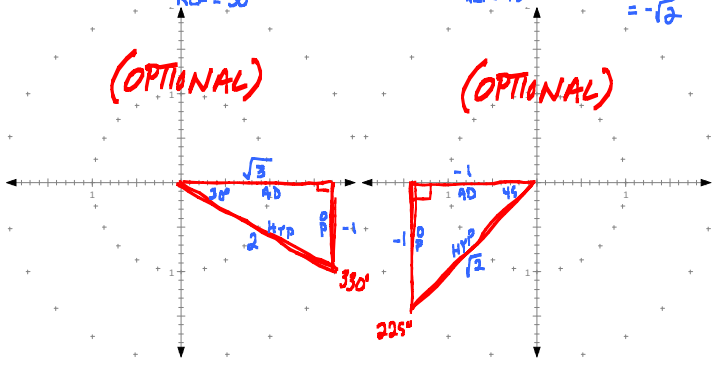
g. $\csc(330^\circ) = \frac{H}{O} = \frac{2}{-1} = -2$ REF = 30

h. $\sec(225^\circ) = \frac{H}{A} = \frac{\sqrt{2}}{-1} = -\sqrt{2}$ REF = 45°

i. $\cot(840^\circ) = \frac{A}{O} = \frac{-1}{\sqrt{3}} = \frac{-\sqrt{3}}{3}$

j. $\cos(-450^\circ) = \frac{A}{H} = \frac{0}{1} = 0$ REF = 90

(OPTIONAL)



840-360

Ans=360

480

120

-450+360

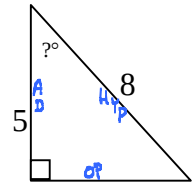
Ans+360

-90

270

11. Find the requested unknown angles of the following triangles using a calculator.

a.



HAVE: ADJ, HAVE: HYP } SUGGESTS $\cos\theta = A/H$

$\cos\theta = \frac{5}{8}$

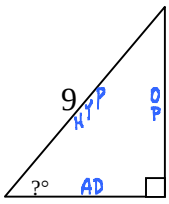
$\cos^{-1}(\cos\theta) = \cos^{-1}(\frac{5}{8})$

$\theta = \cos^{-1}(\frac{5}{8})$

cos⁻¹(5÷8) 51.31781255

$\theta \approx 51.3°$

b.



HAVE: ADJ, HAVE: HYP } SUGGESTS $\cos\theta = A/H$

$\cos\theta = \frac{3}{9}$

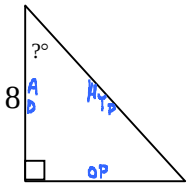
$\cos^{-1}(\cos\theta) = \cos^{-1}(\frac{3}{9})$

$\theta = \cos^{-1}(\frac{3}{9})$

cos⁻¹(3÷9) 70.52877937

$\theta \approx 70.5°$

c.



HAVE: OP, HAVE: AD } SUGGESTS $\tan\theta = O/A$

$\tan\theta = \frac{5}{8}$

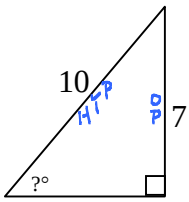
$\tan^{-1}(\tan\theta) = \tan^{-1}(\frac{5}{8})$

$\theta = \tan^{-1}(\frac{5}{8})$

tan⁻¹(5÷8) 32.00538321

$\theta \approx 32°$

d.



HAVE: OP, HAVE: HY } SUGGESTS $\sin\theta = O/H$

$\sin\theta = \frac{7}{10}$

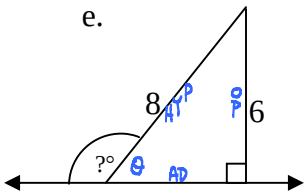
$\sin^{-1}(\sin\theta) = \sin^{-1}(\frac{7}{10})$

$\theta = \sin^{-1}(\frac{7}{10})$

sin⁻¹(7÷10) 44.427004

$\theta \approx 44.4°$

e.



HAVE: HYP, HAVE: OPP } SUGGESTS $\sin\theta = O/H$

$\sin\theta = \frac{6}{8}$

$\sin^{-1}(\sin\theta) = \sin^{-1}(\frac{6}{8})$

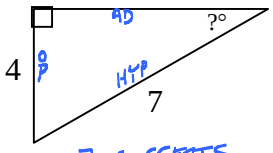
$\theta = \sin^{-1}(\frac{6}{8})$

sin⁻¹(6÷8) 48.59037789

180 − 48.6 = ?

$? \approx 131.4°$

f.



HAVE: HYP, HAVE: OPP } SUGGESTS $\sin\theta = O/H$

$\sin\theta = \frac{4}{7}$

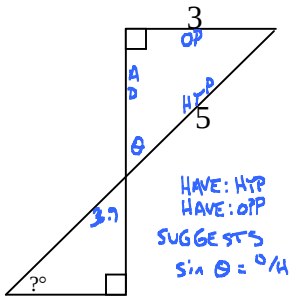
$\sin^{-1}(\sin\theta) = \sin^{-1}(\frac{4}{7})$

$\theta = \sin^{-1}(\frac{4}{7})$

sin⁻¹(4÷7) 34.84990458

$\theta \approx 34.8°$

g.



HAVE: HYP, HAVE: OPP SUGGESTS $\sin\theta = O/H$

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

$\sin^{-1}(\sin\theta) = \sin^{-1}(\frac{3}{5})$

$\theta = \sin^{-1}(\frac{3}{5})$

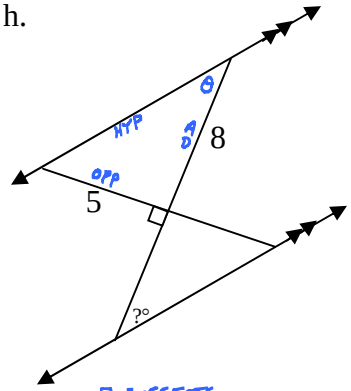
sin⁻¹(3÷5) 36.86989765

$\theta \approx 36.9°$

180 − 90 − 36.9

$? \approx 53.1°$

h.



HAVE: ADJ, HAVE: OPP } SUGGESTS $\tan\theta = O/A$

$\tan\theta = \frac{5}{8}$

$\theta = \tan^{-1}(\frac{5}{8})$

$\theta \approx 32°$

ALT ∠ ≅

$? \approx 32°$

12. Angle Puzzle.