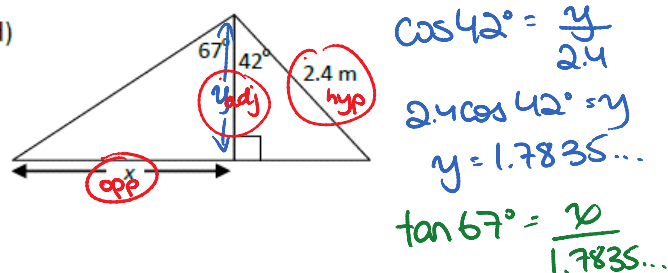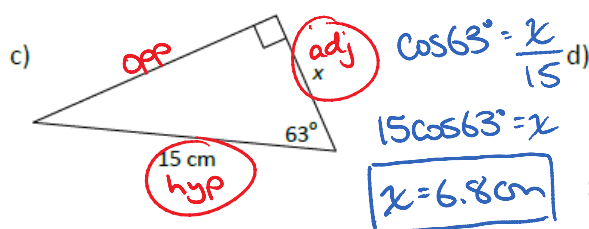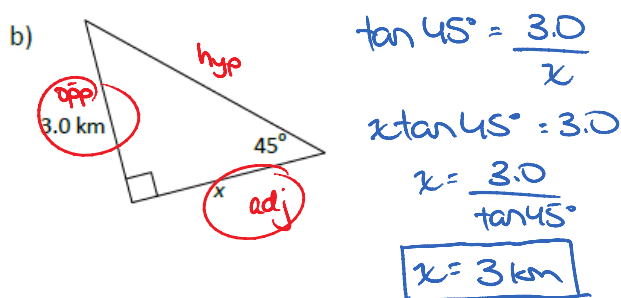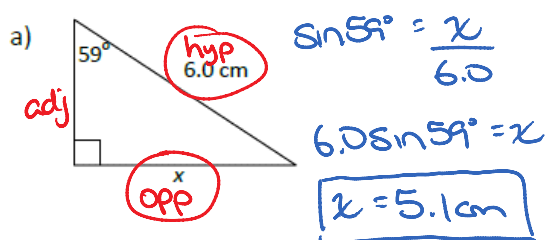## Trigonometry Review

Name: _____Key_____

Date: _____ Block:_____
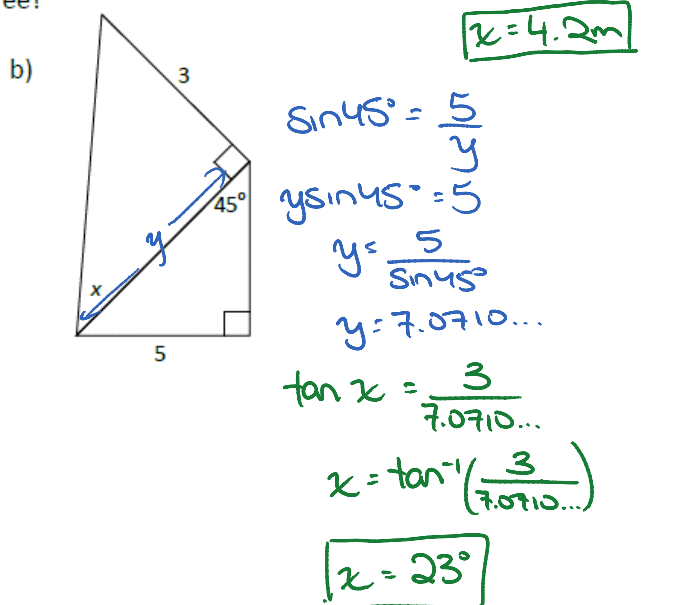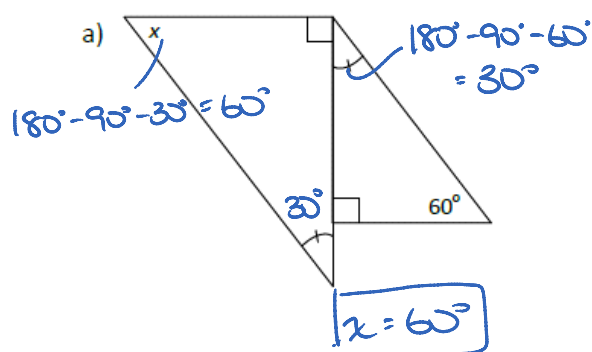
Show your work and draw a diagram for each word problem

1. Use your calculator to determine the trigonometric ratio for each angle to four decimal places.

   a) $\sin 33° =$ ___0.5446___

   b) $\tan 50° =$ ___1.1918___

   c) $\cos 3° =$ ___0.9986___

   d) $\sin 68° =$ ___0.9272___

2. Calculate the length of the missing side x.

   a)

   $\sin 59° = \dfrac{x}{6.0}$

   $6.0 \sin 59° = x$

   $\boxed{x = 5.1 \text{ cm}}$

   b)

   $\tan 45° = \dfrac{3.0}{x}$

   $x \tan 45° = 3.0$

   $x = \dfrac{3.0}{\tan 45°}$

   $\boxed{x = 3 \text{ km}}$

   c)

   $\cos 63° = \dfrac{x}{15}$

   $15 \cos 63° = x$

   $\boxed{x = 6.8 \text{ cm}}$

   d)

   $\cos 42° = \dfrac{y}{2.4}$

   $2.4 \cos 42° = y$

   $y = 1.7835...$

   $\tan 67° = \dfrac{x}{1.7835...}$

   $1.7835... \tan 67° = x$

   $\boxed{x = 4.2 \text{ m}}$

3. What is the measure of $\angle x$ to the nearest degree?

   a)

   $180° - 90° - 60° = 30°$

   $180° - 90° - 33° = 60°$

   $\boxed{x = 60°}$

   b)

   $\sin 45° = \dfrac{5}{y}$

   $y \sin 45° = 5$

   $y = \dfrac{5}{\sin 45°}$

   $y = 7.0710...$

   $\tan x = \dfrac{3}{7.0710...}$

   $x = \tan^{-1}\left(\dfrac{3}{7.0710...}\right)$

   $\boxed{x = 23°}$

4. Solve $\triangle PQR$, where $\angle Q = 90°$, $PR = 5.1$ cm and $PQ = 2.8$ cm.

P

5.1cm

2.8cm

Q x R
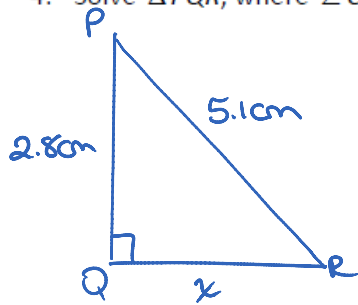
$2.8^2 + x^2 = 5.1^2$

$7.84 + x^2 = 26.01$

$x^2 = 18.17$

$x = \sqrt{18.17}$

$x = 4.3$

$\boxed{QR = 4.3 cm}$

$\cos P = \dfrac{2.8}{5.1}$

$\angle P = \cos^{-1}\left(\dfrac{2.8}{5.1}\right)$

$\boxed{\angle P = 57°}$

$\angle R = 180° - 90° - 57°$

$\boxed{\angle R = 33°}$

5. How high is a weather balloon tied to the ground if it is attached to a 15 m string, and the angle between the string and the ground is 35°?

string

h
opp

15m
hyp

35°

adj
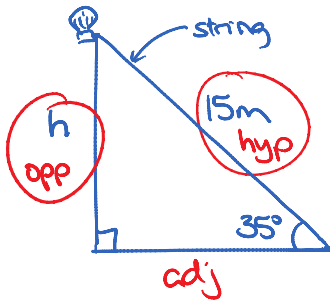
$\sin 35° = \dfrac{h}{15}$

$15 \sin 35° = h$

$\boxed{h = 8.6m}$

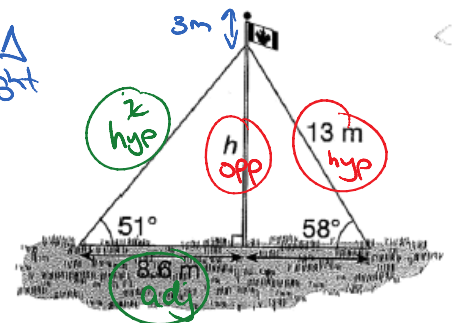6. Two guy wires of unequal lengths keep this flagpole vertical. Both wires are attached 3 m from the top of the pole.

a) What is the height of the pole, to the nearest metre? Use the $\triangle$ on the right

$\sin 58° = \dfrac{h}{13}$

$13 \sin 58° = h$

$h = 11.0m$

total height $= 11.0 + 3 = \boxed{14.0m}$

3m

x
hyp

h
opp

13 m
hyp

51°

58°

8.6 m
adj

b) The other wire is attached on the ground, 8.6 m from the pole. What is the length of this wire?
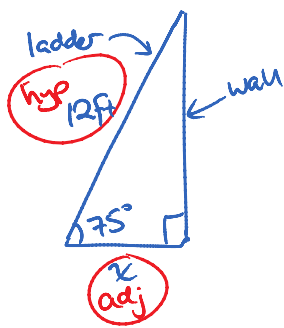
$\cos 51° = \dfrac{8.6}{x}$

$x \cos 51° = 8.6$

$x = \dfrac{8.6}{\cos 51°}$

$\boxed{x = 13.7m}$

7. Simon is training new employees on ladder safety. For safety reasons, the ladder needs to make an angle of 75° with the ground. If you set up a ladder that is 12 ft long, how far from the base of the wall should you set it up?

ladder

hyp 12ft

wall

75°

x
adj

$$\cos 75° = \frac{x}{12}$$
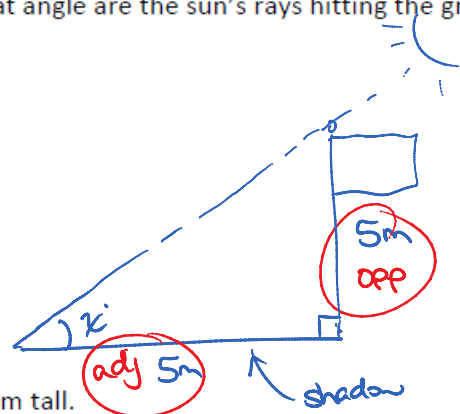
$$12\cos 75° = x$$

$$\boxed{x = 3.1 ft}$$

8. A flagpole casts a shadow that is 5 m long. Jim looks at the shadow and at the flagpole. He thinks they are about the same length. If Jim is correct, at what angle are the sun's rays hitting the ground?

$$\tan x = \frac{5}{5}$$

$$\tan x = 1$$

$$x = \tan^{-1}(1)$$
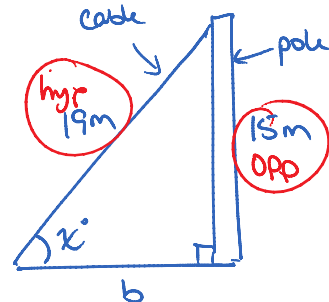
$$\boxed{x = 45°}$$

x

ady 5m

5m
opp

shadow

9. A cable is 19 m long. It supports a utility pole that is 15 m tall.

a) Determine the measure of the angle that the cable forms with the ground.

$$\sin x = \frac{15}{19}$$

$$x = \sin^{-1}\left(\frac{15}{19}\right)$$

$$\boxed{x = 52°}$$

cable

hyp 19m

pole

15m
opp

x°

b

b) Calculate the distance from the base of the pole to the point where the cable meets the ground using the Pythagorean Theorem.

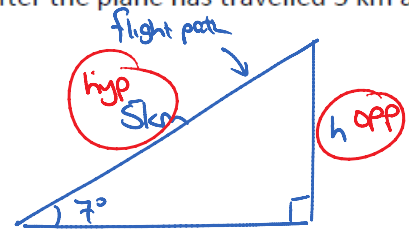$$15^2 + b^2 = 19^2$$

$$225 + b^2 = 361$$

$$b^2 = 136$$

$$\boxed{b = 11.7m}$$

10. Upon takeoff, an airplane climbs at a 7° angle of elevation. After the plane has travelled 5 km along its flight path, how high is the plane?
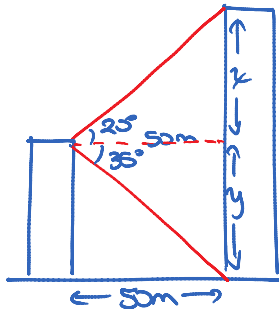
$$\sin 7° = \frac{h}{5}$$

$$5\sin 7° = h$$

$$\boxed{h = 0.6 \text{ km}}$$

flight path

hyp
5 km

h opp

7°

11. Two office towers are 50 m apart. From the top of the shorter tower, the angle of elevation to the top of the taller tower is 20°. The angle of depression to the base of the taller tower is 35°. Determine the height of each tower.

25°
50m
35°

50m

$$\tan 20° = \frac{x}{50}$$

$$50\tan 20° = x$$

$$x = 18.1985...$$

$$\tan 35° = \frac{y}{50}$$

$$50\tan 35° = y$$

$$y = 35.0103...$$

shorter building: $y = \boxed{35.0 \text{ m}}$

taller building: $x + y = 18.1985... + 35.0103... = \boxed{53.2 \text{ m}}$

12. A ship travels due west for 550 km then travels on a bearing of 40° until it is directly north of its starting point. What is the total distance the ship has travelled?

hyp
x
N
40°
50°
550 km   start
opp
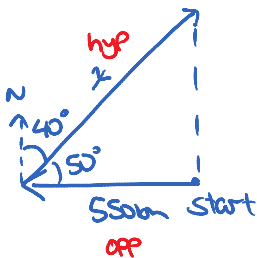
$$\cos 50° = \frac{550}{x}$$

$$x\cos 50° = 550$$

$$x = \frac{550}{\cos 50°}$$

$$x = 855.6 \text{ km}$$

Total dist = 550 + 855.6

$$= \boxed{1405.6 \text{ km}}$$

13. A popular tourist attraction in Ottawa is the Peace Tower, which rises from the centre block of the Parliament Buildings. A mast stands on top of the tower. From a point 25 m away from the base of the tower, the angle of elevation to the top of the tower is 74.8°. From the same point, the angle of elevation to the top of the mast is 76.3°. Find the height of the mast.

x   t

76.3°
74.8°
← 25m →
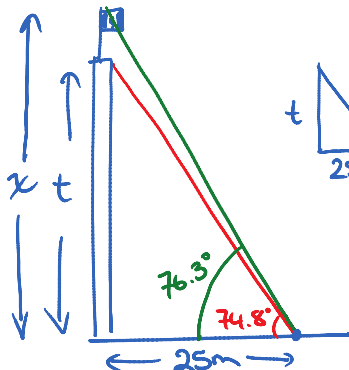
Find t (height of tower)

74.8°
t
25

$$\tan 74.8° = \frac{t}{25}$$

$$25\tan 74.8° = t$$

$$t = 92.0152...$$

Find x (height of tower + mast)

76.3°
x
25

$$\tan 76.3° = \frac{x}{25}$$

$$25\tan 76.3° = x$$

$$x = 102.5541...$$

height of mast = $x - t$
$= 102.5541... - 92.0152...$
$= \boxed{10.5 \text{ m}}$