Sine and Cosine

$sin(A)= \dfrac{opposite}{hypotenuse}$

$cos(A)= \dfrac{adjacent}{hypotenuse}$

$tan(A)= \dfrac{opposite}{adjacent}$
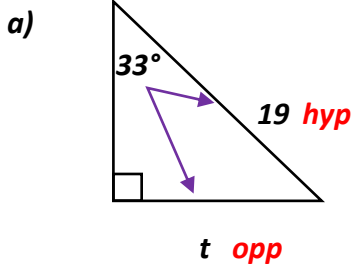
SOHCAHTOA

The ratios shown only apply for angle A
If we start at B then – the opposite and adjacent switch
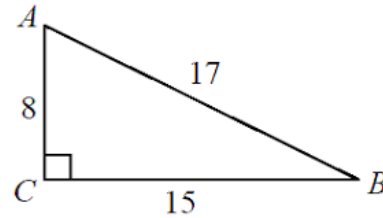
$$sin\ A = \frac{15}{17}\ but\ sin\ B = \frac{8}{17}$$

1)   Finding sides
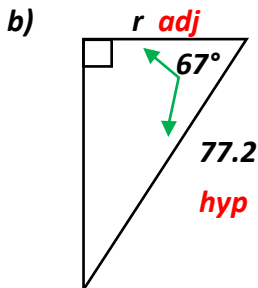
a)

33°

19 hyp

t   opp

$sin\ 33° = \dfrac{t}{19}$ 19 sin 33°= t   **t = 10.3**

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b)

r adj
67°
77.2
hyp

$cos\ 67° = \dfrac{r}{77.2}$ 77.2 cos 67°= r   **r = 30.2**

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c)

60°   i hyp
55.6   opp

$sin\ 60° = \dfrac{55.6}{i}$ $i = \dfrac{55.6}{sin\ 60°}$ **i = 64.2**

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d)

99.2 adj
57°
g
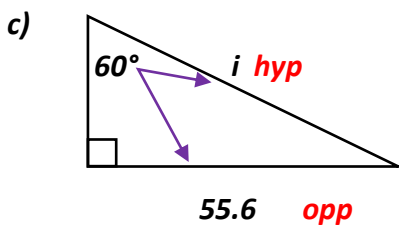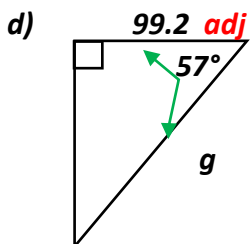
$cos\ 57° = \dfrac{99.2}{g}$ $g = \dfrac{99.2}{cos\ 57°}$ **g= 182.1**

When finding angles … we can sometimes get an error when using sine or cosine

$sin\ I = \dfrac{8}{7}$ **I = error** $Cos\ S = \dfrac{10}{3}$ **S = error** $Tan\ A = \dfrac{10}{3}$ **A = 73.3°**
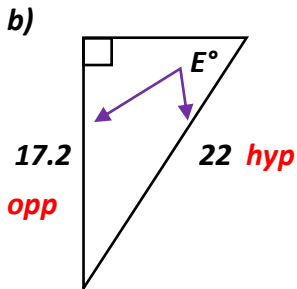
Why? **Since sine and cosine use the hypotenuse … they must be ≤ 1.**

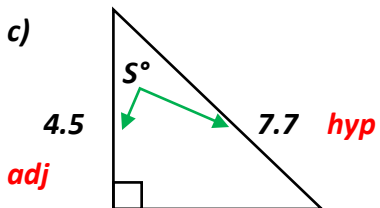**Notice the ratios shown have an opposite (or adjacent) bigger than the hypotenuse** 🙁

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2) **Finding angles**

a)

77 adj
91 hyp
W°
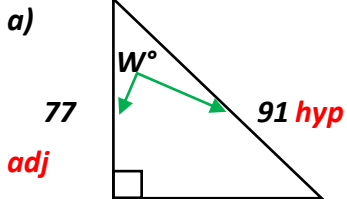
$$\cos W° = \frac{77}{91} \qquad W = 2^{nd} \cos \left(\frac{77}{91}\right) \qquad W = 32.2°$$

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b)

17.2 opp
22 hyp
E°

$$Sin\ E° = \frac{17.2}{22} \qquad E = 2^{nd} \sin \left(\frac{17.2}{22}\right) \qquad E = 51.4°$$

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c)

4.5 adj
7.7 hyp
S°

$$\cos S° = \frac{4.5}{7.7} \qquad S = 2^{nd} \cos \left(\frac{4.5}{7.7}\right) \qquad S = 54.2°$$

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3) **Find the missing sides in the triangle**

75°
u hyp
50.3 adj
m opp
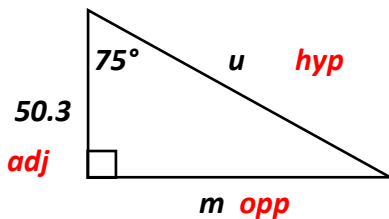
I decided to solve using 75° first … so that forces 50.3 = adjacent

$$\cos 75° = \frac{50.3}{u} \qquad u = \frac{50.3}{\cos 75} \qquad u = 194.3$$

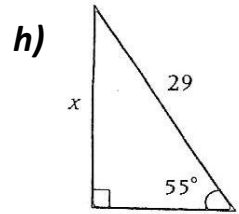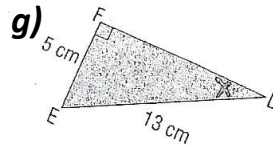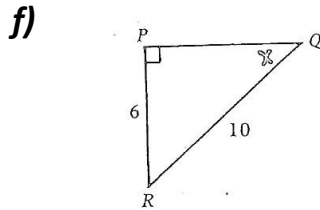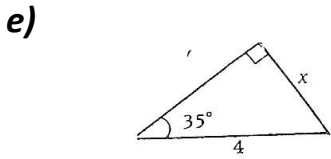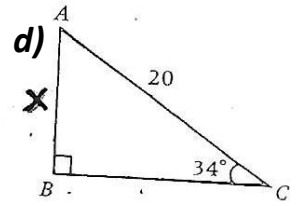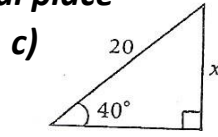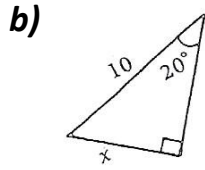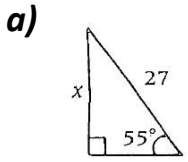*Now I could use Pythagoras but* $\qquad \tan 75° = \frac{m}{50.3}$

$$50.3 \tan 75 = m \qquad m = 187.7$$

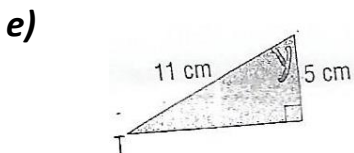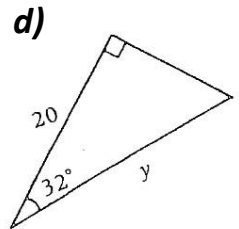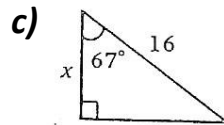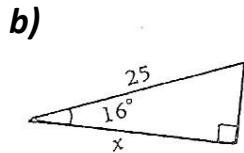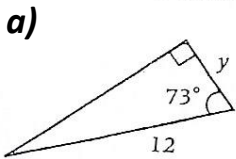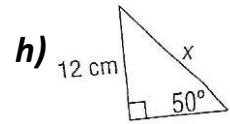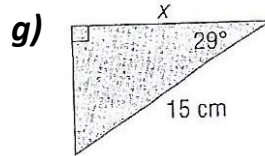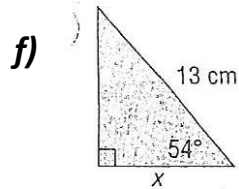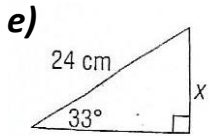**Assignment = worksheet**

The Sine and Cosine Ratio

1) Find x (or y) using sine accurate to 1 decimal place

a)

x, 27, 55°

b)

10, 20°, x

c)

20, x, 40°

d)

A, 20, ✗, 34°, B, C

e)

35°, x, 4

f)
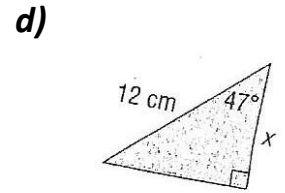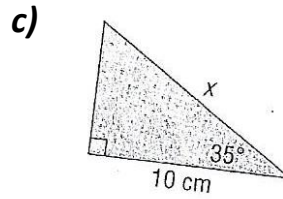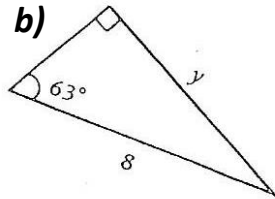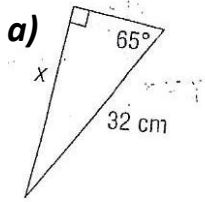
P, Q, %, 6, 10, R

g)

F, 5 cm, E, 13 cm, D

h)

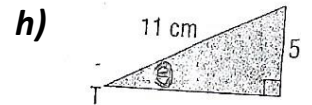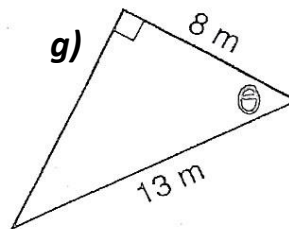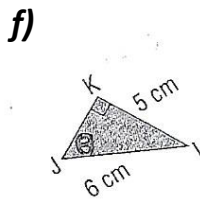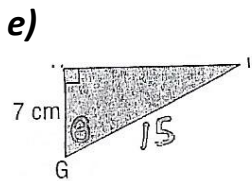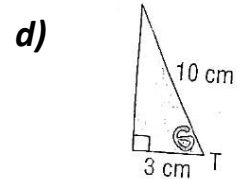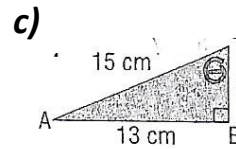x, 29, 55°

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2) Find x (or y) using cosine accurate to 1 decimal place

a)

y, 73°, 12

b)

25, 16°, x

c)

x, 67°, 16

d)

20, 32°, y

e)

11 cm, 5 cm, T

f)

y, 60°, 15

g)

2 m, $\sqrt{3}$ m

h)

14, 22°, y
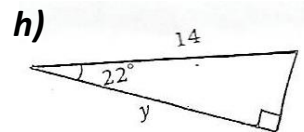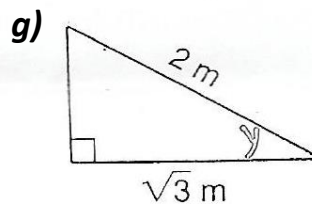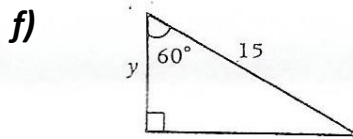
3) Solve accurate to at least 1 decimal place

a) Right triangle with 65° angle, x side, 32 cm

b) Right triangle with 63° angle, y side, 8

c) Right triangle with x, 35°, 10 cm

d) Triangle with 12 cm, 47°, x

e) Right triangle with 24 cm, 33°, x

f) Right triangle with 13 cm, 54°, x

g) Right triangle with x, 29°, 15 cm

h) Right triangle with 12 cm, x, 50°

4) Find θ accurate to at least 1 decimal place

a) Right triangle with 1 cm, 2 cm, T

b) Triangle W, X, Y with 25 cm, 54 cm

c) Triangle A, B with 15 cm, 13 cm

d) Right triangle with 10 cm, 3 cm, T

e) Triangle G with 7 cm, 15

f) Triangle K, J, I with 5 cm, 6 cm

g) Right triangle with 8 m, 13 m

h) Triangle T with 11 cm, 5

5)
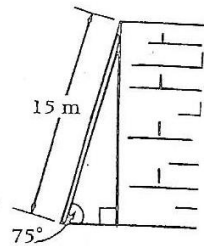How far from a wall must the foot of a 15 m ladder be placed to make a safe angle of 75° with the ground?

15 m, 75°

6)
A support cable 40 m long runs from the top of a tower to the ground. The cable makes an angle of 59° with the ground. Calculate the height of the tower.

Cable, 59°, Ground