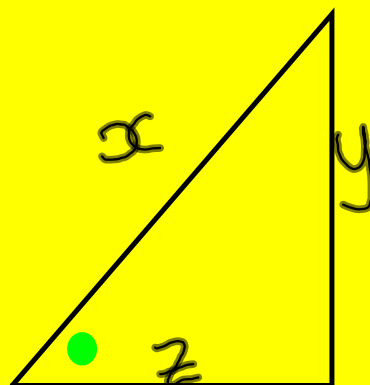
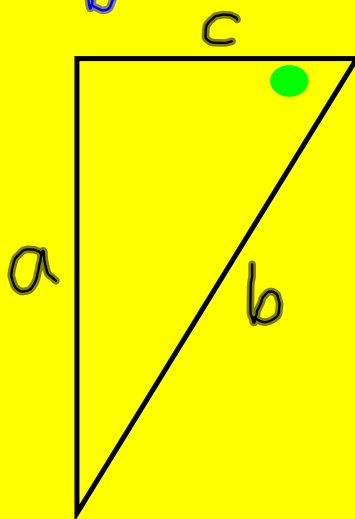
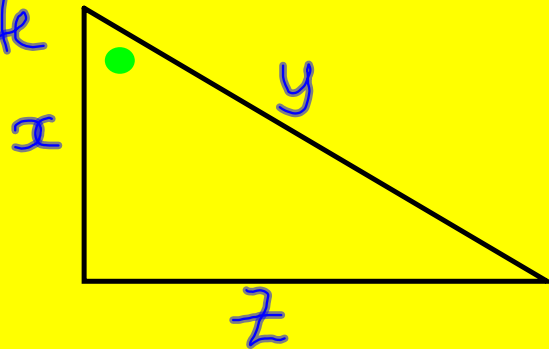
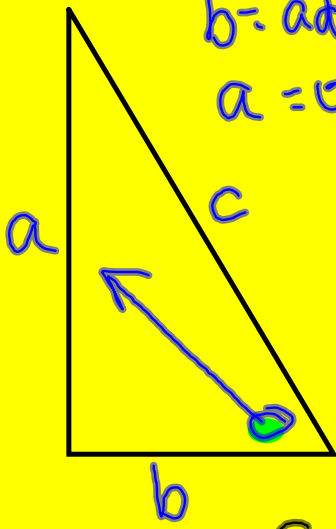
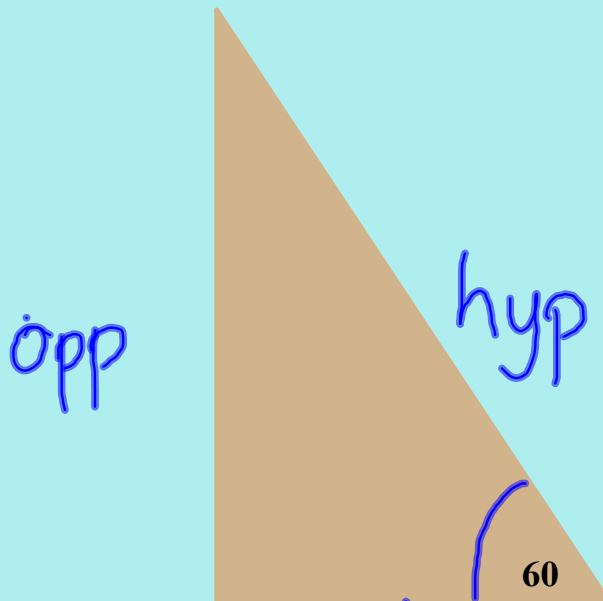


Label each side with hypotenuse, opposite or adjacent in respect of the given angle

$c$  = hypotenuse  
 $b$  = adjacent (next to)  
 $a$  = opposite



Comparing triangles



0.85      adj  
0.5      1.71

opp ÷ hyp	adj ÷ hyp	opp ÷ adj
0.85	0.5	1.69
0.88	0.51	1.72

0.86      0.52      1.6  
 0.86      0.51      1.6  
 0.84      0.54      1.6

Do the same for a right - angled triangle with angle 40 °

A little algebra to help...

$$12 = \frac{x}{2}$$

$$\underline{24 = x}$$

$$15 = \frac{x}{3}$$

$$\underline{45 = x}$$

$$20 = \frac{a}{4}$$

$$80 = a$$

$$2.3 = \frac{b}{5}$$

$$\underline{11.5 = b}$$

$$5.7 = \frac{c}{9}$$

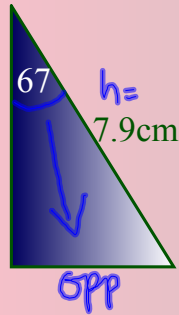
$$51.3 = c$$

## The Sine Ratio

For any RIGHT-ANGLED triangle:

$$\sin x = \frac{\text{opposite}}{\text{hypotenuse}}$$

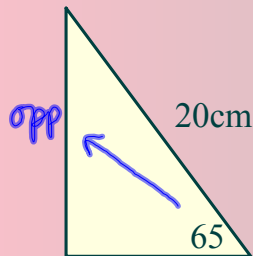
To find the length of the opposite side:



$$\sin 67^\circ = \frac{\text{opp}}{7.9}$$

$$7.9 \sin 67^\circ = \text{opp}$$

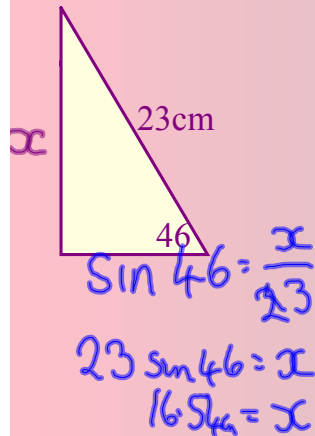
$$\underline{\underline{7.27\text{cm} = \text{opp}}}$$



$$\sin 65^\circ = \frac{\text{opp}}{20}$$

$$20 \sin 65^\circ = \text{opp}$$

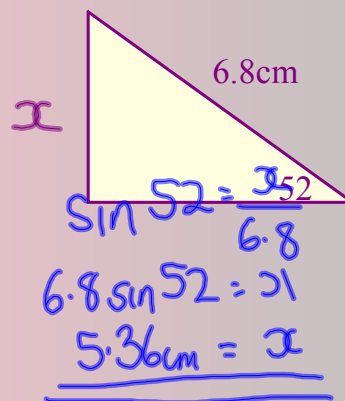
$$\underline{\underline{18.13\text{cm} = \text{opp}}}$$



$$\sin 46^\circ = \frac{x}{23}$$

$$23 \sin 46^\circ = x$$

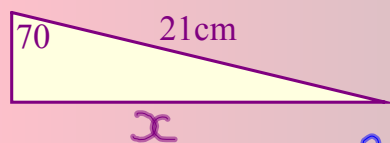
$$\underline{\underline{16.54\text{cm} = x}}$$



$$\sin 52^\circ = \frac{x}{6.8}$$

$$6.8 \sin 52^\circ = x$$

$$\underline{\underline{5.36\text{cm} = x}}$$

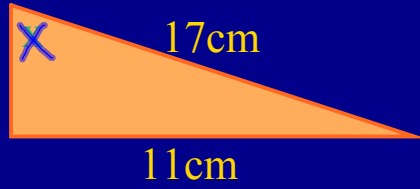


$$\sin 70^\circ = \frac{x}{21}$$

$$21 \sin 70^\circ = x$$

$$\underline{\underline{19.73\text{cm} = x}}$$

To find an angle using sine:

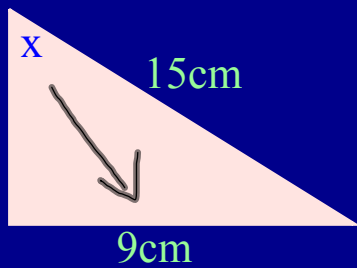


$$\sin x = \frac{11}{17}$$

$$= 0.647$$

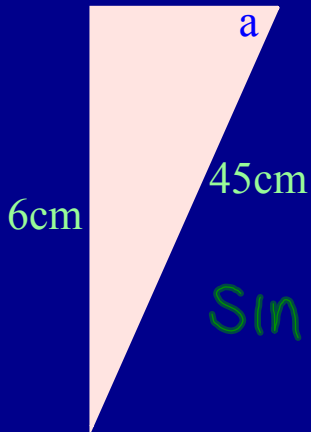
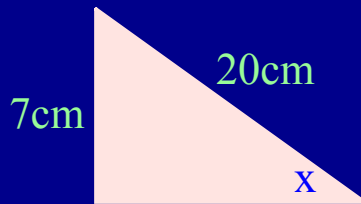
$$\text{shift sin } (0.647) =$$

$$x = 40.32$$



$$\sin x = \frac{9}{15} = 0.6$$

$$x = 37^\circ$$

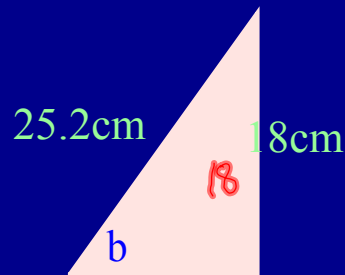


$$\sin a = \frac{6}{45}$$

$$\sin a = 0.13$$

$$\text{shift sin ans} =$$

$$a = 7.7^\circ$$



$$\sin b = \frac{18}{25.2}$$

$$= 0.71$$

$$b = 45.6^\circ$$

page 437 D4

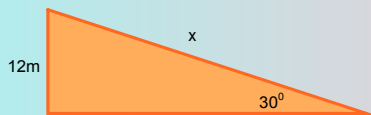
## Using sine to find the length of the hypotenuse

Algebra break:

Solve:

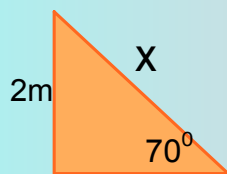
$$4 = \frac{5}{x}$$
$$4x = 5$$
$$x = \frac{5}{4} = 1.25$$

$$4.23 = \frac{5.1}{x}$$
$$4.23x = 5.1$$
$$x = \frac{5.1}{4.23} = 1.21$$

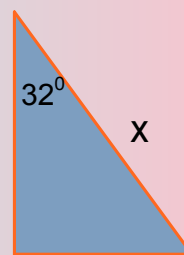


$$7 = \frac{2}{x}$$
$$7x = 2$$
$$x = \frac{2}{7} = 0.29$$

$$\text{Sine } 30 = \frac{12}{x}$$
$$x \sin 30 = 12$$
$$x = \frac{12}{\sin 30}$$
$$\underline{\underline{x = 24 \text{ m}}}$$



$$\sin 70 = \frac{2}{x}$$
$$x \sin 70 = 2$$
$$x = \frac{2}{\sin 70}$$
$$= \underline{\underline{2.1 \text{ m}}}$$



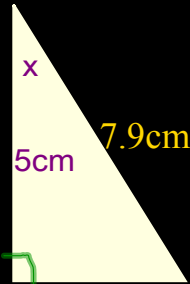
$$\sin 32 = \frac{13}{x}$$
$$x \sin 32 = 13$$
$$x = \frac{13}{\sin 32}$$
$$= \underline{\underline{24.5 \text{ cm}}}$$

Solving problems with sine p436 B7 onwards

## The Cosine Ratio

For any RIGHT-ANGLED triangle:

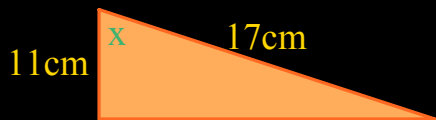
$$\cos x = \frac{\text{adjacent}}{\text{hypotenuse}}$$



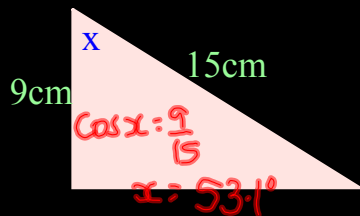
$$\begin{aligned} \cos x &= \frac{5}{7.9} \\ &= 0.633 \\ \text{shift cos ans} \\ x &= 50.3 \end{aligned}$$

To find an angle:

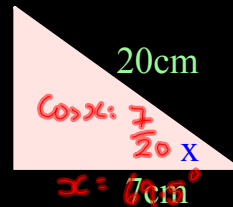
Remember to use shift cos for an angle



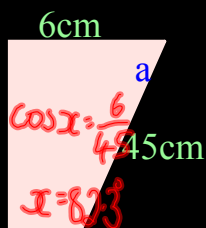
$$\begin{aligned} \cos x &= \frac{11}{17} \\ &= 0.647 \\ \text{shift cos ans: } x &= 49.7 \end{aligned}$$



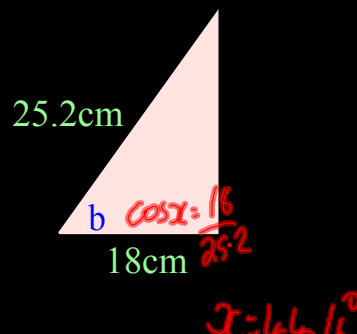
$$\begin{aligned} \cos x &= \frac{9}{15} \\ x &= 53.1^\circ \end{aligned}$$



$$\begin{aligned} \cos x &= \frac{7}{20} \\ x &= 70^\circ \end{aligned}$$





$$\begin{aligned} \cos x &= \frac{6}{4.45} \\ x &= 82.3 \end{aligned}$$

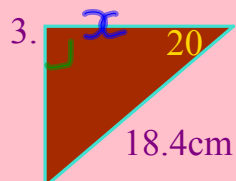


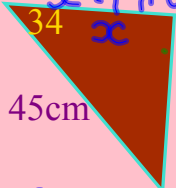
$$\begin{aligned} \cos x &= \frac{18}{25.2} \\ x &= 46.6^\circ \end{aligned}$$

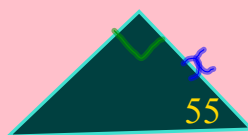
To find the adjacent side using cosine

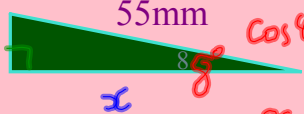
1.   $\cos 40 = \frac{x}{34}$   
 $34 \times \cos 40 = x$   
 $x = \underline{\underline{26.05 \text{ cm}}}$

2. 

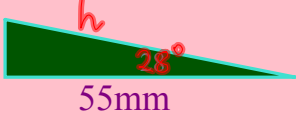
3.   $\cos 20 = \frac{x}{18.4}$   
 $x = 17.3 \text{ cm}$

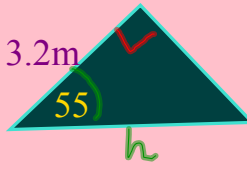
4.   $\cos 34 = \frac{x}{45}$   
 $x = 19.05 \text{ cm}$


5.   $\cos 55 = \frac{x}{3.2}$   
 $x = 1.8 \text{ cm}$

6.   $\cos 8 = \frac{x}{55}$   
 $x = 54.5^\circ$

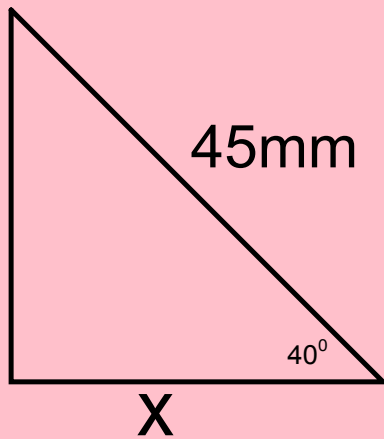
To find the hypotenuse using cosine

1.   $\cos 28 = \frac{55}{h}$   
 $h = \frac{55}{\cos 28}$   
 $h = 62.3 \text{ mm}$

2.   $\cos 55 = \frac{3.2}{h}$   
 $h = \frac{3.2}{\cos 55}$   
 $= 5.6 \text{ m}$

3.   $\cos 20 = \frac{18.4}{h}$   
 $h = \frac{18.4}{\cos 20}$   
 $h = \underline{\underline{19.6 \text{ m}}}$

## The Cosine ratio



$$\cos x = \frac{\text{adj}}{\text{hyp}}$$

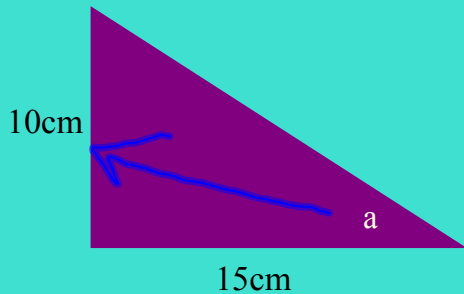
$$\cos 40 = \frac{x}{45}$$

$$45 \times \cos 40 = x$$

$$\underline{\underline{34.5\text{mm} = x}}$$

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## The Tangent Ratio

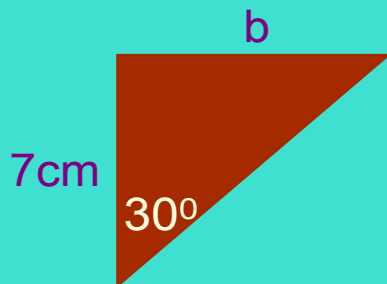


$$\tan x = \frac{\text{opp}}{\text{adj}}$$

$$\tan a = \frac{10}{15} = 0.67$$

$$\text{shift } \tan(0.666) = 33.7^\circ$$

$$\underline{\underline{x = 33.7^\circ}}$$



$$\tan x = \frac{\text{opp}}{\text{adj}}$$

$$\tan 30 = \frac{b}{7}$$

$$7 \times \tan 30^\circ = b$$

$$\underline{\underline{b = 4.0 \text{ cm}}}$$

page 370 D1-D13 (not D7)

$$\text{D1f) } \tan x = \frac{\text{opp}}{\text{adj}}$$

$$\tan 28 = \frac{9.4}{x}$$

$$x \tan 28 = 9.4$$

$$x = \frac{9.4}{\tan 28} = 17.7^\circ$$

A little algebra to start..

$$15 = \frac{5}{x}$$

$$15x = 5$$
$$x = \frac{5}{15} = \frac{1}{3}$$

$$21 = \frac{13}{x}$$

$$21x = 13$$
$$x = \frac{13}{21}$$

$$\tan 15 = \frac{6.5}{a}$$

$$a \tan 15 = 6.5$$

$$a = \frac{6.5}{\tan 15} = 24.3$$

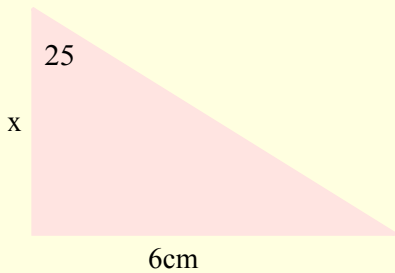
$$12 = \frac{5}{a}$$

$$12a = 5$$
$$a = \frac{5}{12}$$

$$\sin 34 = \frac{8}{h}$$

$$h \sin 34 = 8$$

$$h = \frac{8}{\sin 34} = 14.3$$



Find the length o

page 215

Tomorrow's Lesson

You are going to measure the height of a building or tree or some other high object.

You need to think about :

- what you are going to measure
- how you will do it
- what equipment you will need
- what you could do to improve accuracy
- how you want to display your findings.

Now you need to make notes on the above.

## Trigonometry

In summary:

For any right angled triangle

$$\sin x = \frac{\text{opp}}{\text{hyp}}$$

$$\cos x = \frac{\text{adj}}{\text{hyp}}$$

$$\tan x = \frac{\text{opp}}{\text{adj}}$$

SOHCAHTOA  
i p y o d h a l d  
n p p s j y n p j  
e p p s j y n p j

When you are finding an angle remember to use...

Shift      cos  
              tan  
              sine

## Attachments

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trig.ppt