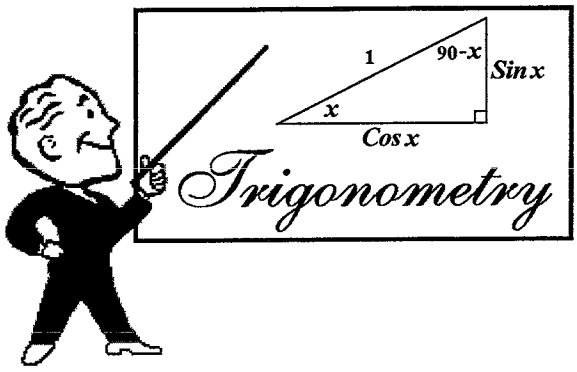


Trigonometry provides the relationship (or connection) between the sides of a right-angled triangle and its angles.

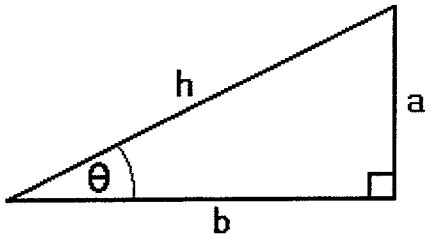
The ratio of any two sides of a right angle triangle is dependent on the acute angle at one of its vertices.

These ratios are: Tangentθ, Sineθ, and Cosineθ:

$$Tan\,\theta = \frac{a}{b}$$

$$Sin\,\theta = \frac{a}{h}$$

$$Cos\,\theta = \frac{b}{h}$$

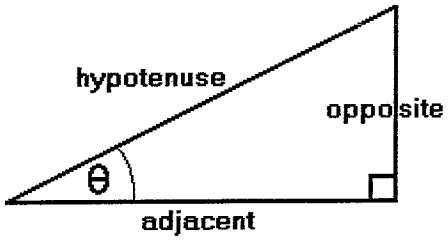


These are all fixed (constant) for a particular angle θ. So . . . .

$$Tan\,\theta = \frac{opposite}{adjacent}$$

$$Sin\,\theta = \frac{opposite}{hypotenuse}$$

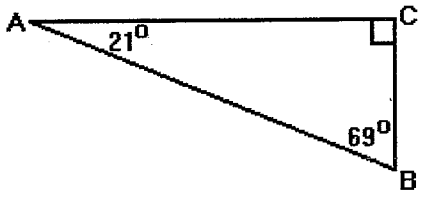
$$Cos\,\theta = \frac{adjacent}{hypotenuse}$$



EXERCISE 38 – Terminology in Trigonometry

In figure 1 , name the side which is:

Figure 1.



(a) the hypotenuse .....

(b) opposite 21° .....

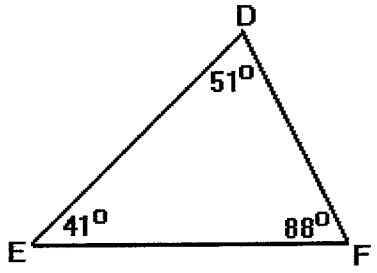
(c) adjacent to 21° .....

(d) opposite 69° .....

(e) the smallest .....

In figure 2 , name the side which is:

Figure 2.



(f) opposite 41° .....

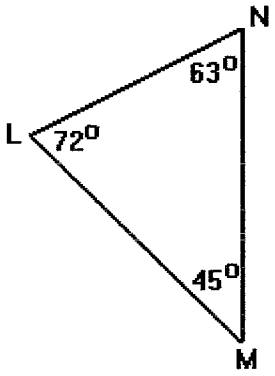
(g) opposite 51° .....

(h) adjacent to 88° .....

(i) the longest.....

In figure 3 , name the side which is:

Figure 3.



(j) opposite 63° .....

(k) opposite 45° .....

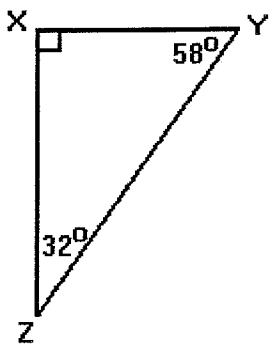
(l) adjacent to 63° and 45° .....

(m) the shortest .....

(n) the longest .....

In figure 4 , name the:

Figure 4.



(o) side opposite 32°.....

(p) side opposite 58°.....

(q) side adjacent to 58°.....

(r) hypotenuse .....

(s) the shortest side .....

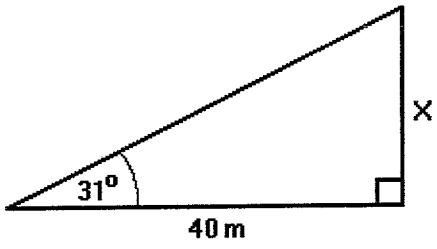
(t) ratio $\frac{XZ}{ZY}$ .....

(u) ratio $\frac{XZ}{XY}$ .....

RIGHT-ANGLE TRIGONOMETRY

Trigonometry allows us to calculate the lengths of certain sides of a right-angled triangle when we have only one side given to us, and one angle.
(Normally we would need 2 sides and use Pythagoras to find the 3rd side).

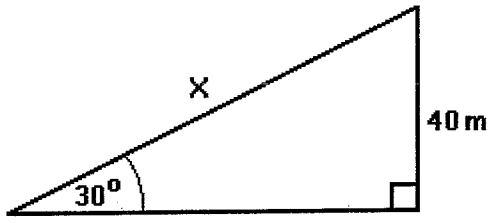
(i) If we know that the Tan $31^\circ = 0{\cdot}6$ we can find the length of the side marked 'x' in the diagram opposite:



Then: $\frac{x}{40} = 0{\cdot}6$

So . . . x = 0·6 × 40 = 24 metres.

(ii) If we know that the Sin $30^\circ = 0{\cdot}5$, we can find the length of the side marked 'x' in the diagram opposite:



Then: $\frac{40}{x} = 0{\cdot}5$

$\therefore \quad \frac{40}{0.5} = x$

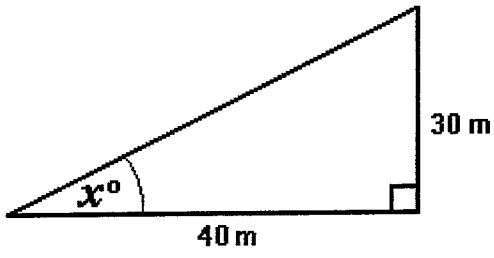
So . . . x = 40 ÷ 0·5 = 80 metres.

If we know the size of 2 sides in our right-angle triangle, Pythagoras can find the hypotenuse, but *trigonometry* can find the angles in the triangle!

(iii) The diagram shows us that:

$Tan\, x = \frac{3}{4}$ or 0·75

So $x = Tan^{-1}(0{\cdot}75)$

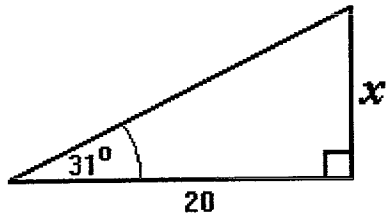


From information stored in our calculator using the [Tan $^{-1}$] button, (above the [Tan] button – use "shift") we find that $x = 36{\cdot}87^\circ$

EXERCISE 39 - Solving Right-Angle Triangles

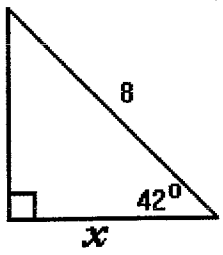
Find the value of x in each of the problems below:

1.



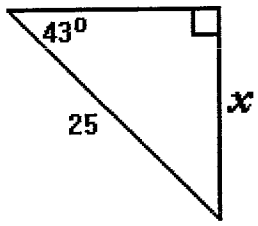
$x =$ .....

2.



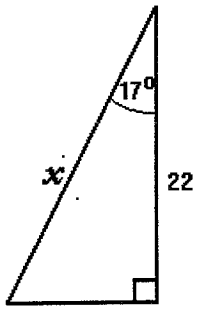
$x =$ .....

3.



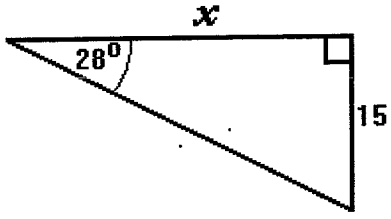
$x =$ .....

4.



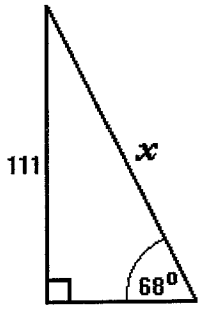
$x =$ .....

5.



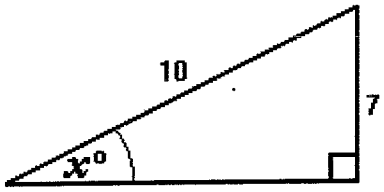
$x =$ .....

6.



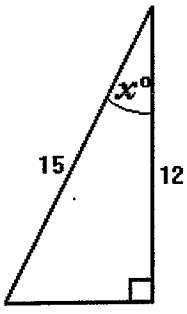
$x =$ .....

7.



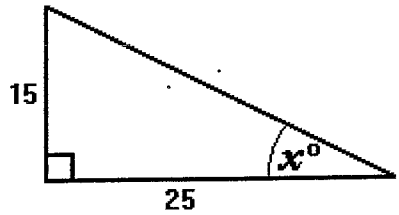
$x =$ .....

8.



$x =$ .....

9.



$x =$ .....

HOMEWORK SHEET (19)

1. Name the . . .

(a) side opposite 28° .....

(b) side opposite 62° .....

(c) side adjacent to 62° .....

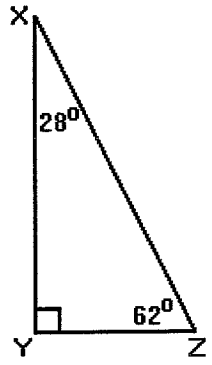
(d) hypotenuse .....

(e) the shortest side .....

(f) ratio $\frac{XY}{XZ}$ .....

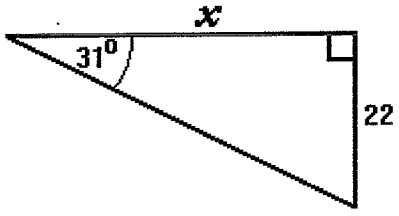
(g) ratio $\frac{XY}{YZ}$ .....

(h) ratio $\frac{YZ}{XY}$ .....



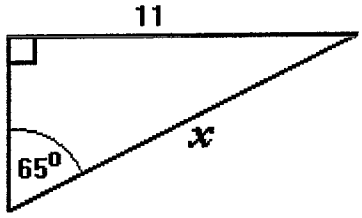
Find the value of x in each of the problems below:

1.



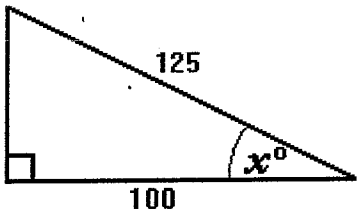
$x =$ . . . . . .

2.



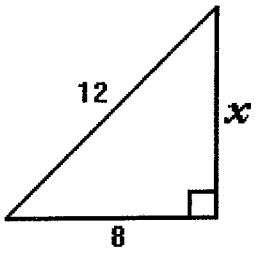
$x =$ . . . . . .

3.



$x =$ . . . . . .

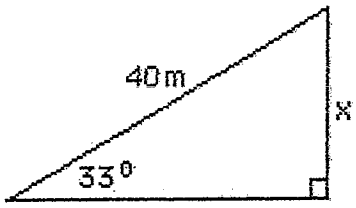
4.



$x =$ . . . . . .

TRIGONOMETRY WORKSHEET 1 - Right Angle Triangles

Examples:

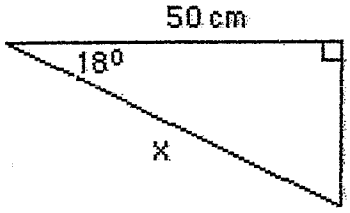


$\sin 33^0 = \frac{x}{40}$

$0.5446 = \frac{x}{40}$

$x = 0.5446 \times 40$

$x = 21.78$ (22m)

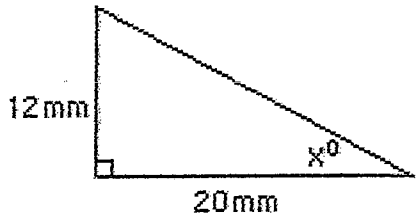


$\cos 18^0 = \frac{50}{x}$

$x = \frac{50}{\cos 18^0}$

$x = 50 \div 0.9510$

$x = 52.58$ (53 cm)



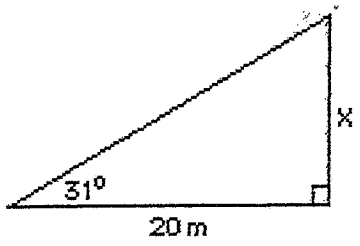
$\tan x^0 = \frac{12}{20}$

$x = \tan^{-1}(12/20)$

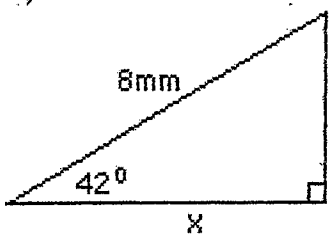
$x = 30.96^0$ (31^0)

---

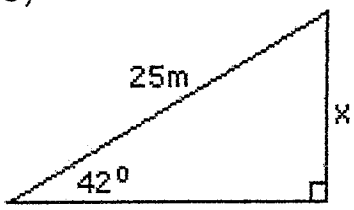
1)



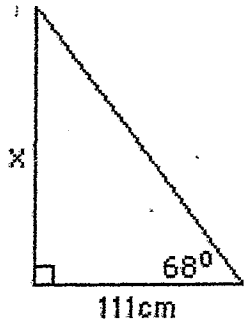
2)



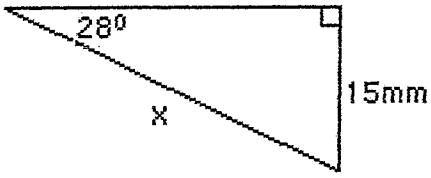
3)



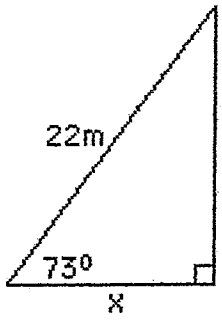
4)



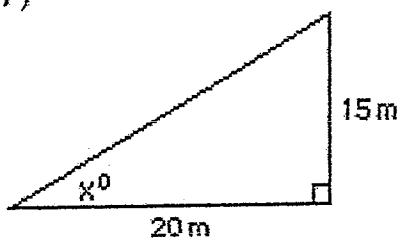
5)



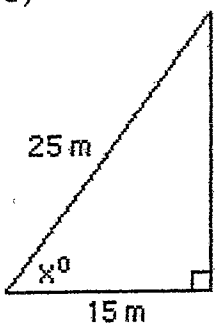
6)



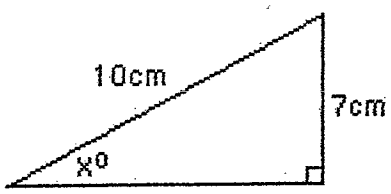
7)



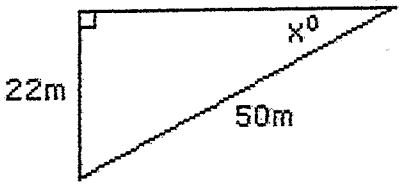
8)



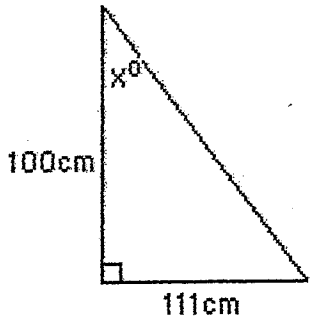
9)



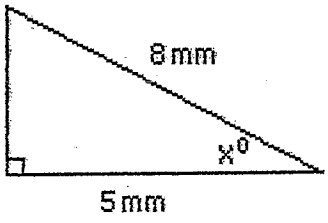
10)



11)



12)



Answers:

(1) 12.0 m (2) 5.9 mm (3) 16.7 m (4) 274.7 cm (5) 31.9 mm

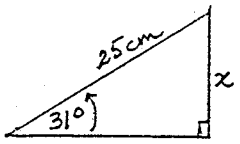
(6) 6.4 m (7) 36.9° (8) 53.1° (9) 44.4° (10) 26.1°

(11) 47.9° (12) 51.3°

HOMEWORK SHEET (15) – P1

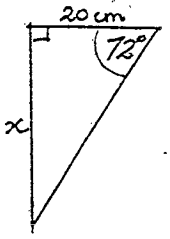
HW3

① FIND x



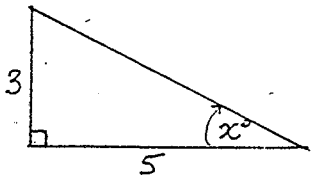
12·8

② FIND x



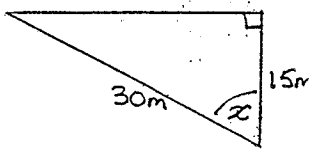
61·6

③ FIND x



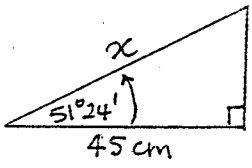
31°

④ FIND x



60°

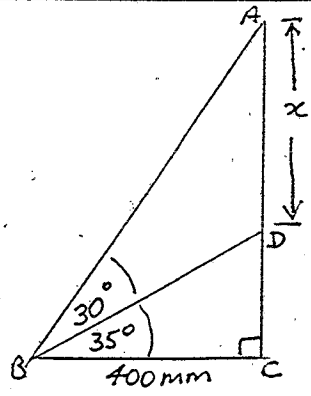
⑤ FIND x



72·1 cm

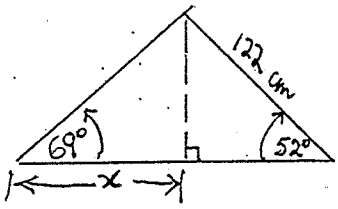
⑥ FIND x

[HINT: AC = ? DC = ?]



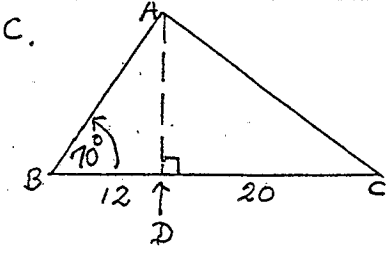
578mm

⑦ FIND x:



36·8 cm

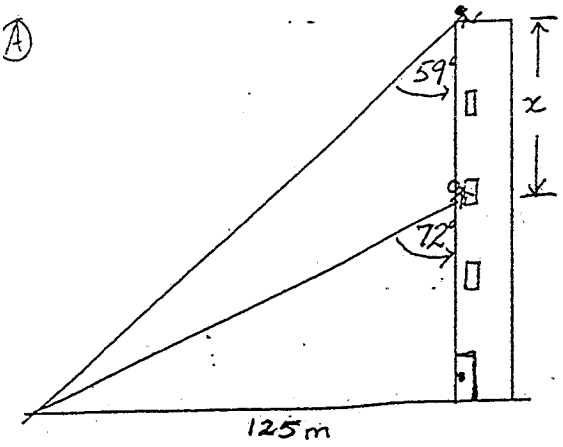
⑧ FIND the area of $\triangle ABC$.



528 u²

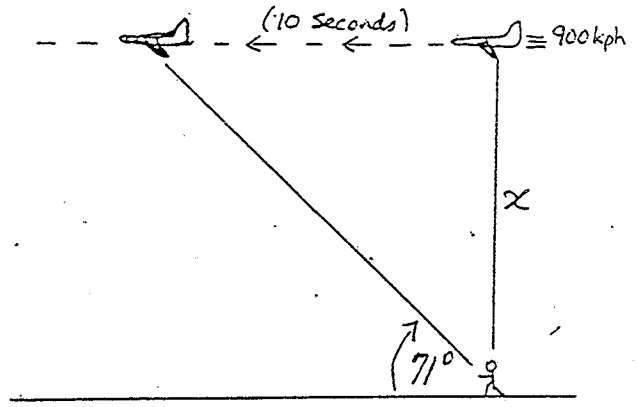
TRIG. PROBLEMS

(A)



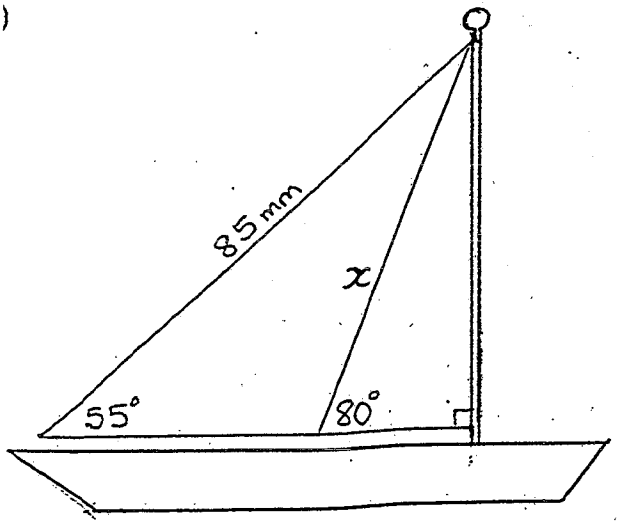
34.5m

(B)



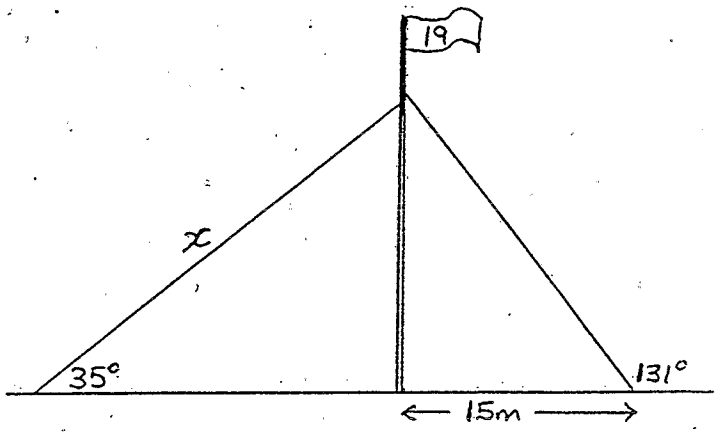
7260m

(C)

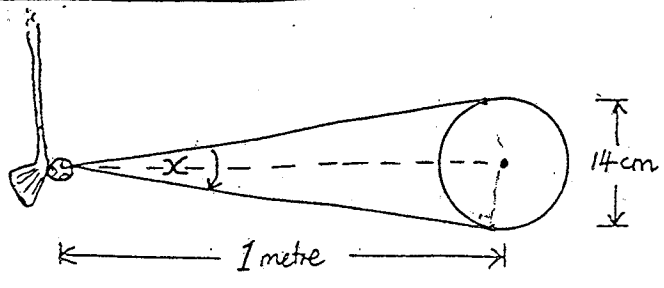


70.7mm

(D)



30.08°



8.03

ANSWERS

Exercise 38

(a) AB (b) BC (c) AC (d) AC
(e) BC (f) DF (g) EF (h) EF , DF
(i) DE (j) LM (k) LN (l) MN
(m) LN (n) MN (o) XY (p) XZ
(q) XY (r) YZ (s) XY
(t) $\cos 32^\circ$ or $\sin 58^\circ$ (u) $\text{Tan } 58^\circ$

Exercise 39

1. 12·02 2. 5·95 3. 17·05
4. 23 5. 28·21 6. 119·7
7. $44{\cdot}43^\circ$ or $44^\circ 26'$ 8. $36{\cdot}87^\circ$ or $36^\circ 52'$
9. $30{\cdot}96^\circ$ or $30^\circ 58'$

HW Sheet (19)

Q1. (a) YZ (b) XY (c) YZ (d) XZ
(e) YZ (f) $\text{Sin}62^\circ$ (g) $\text{Tan}62^\circ$ (h) $\text{Tan}28^\circ$

Q2. (1) 36·61 (2) 12·14
(3) $36^\circ 52'$ (4) $x = \sqrt{80} = 4\sqrt{5} \approx 8{\cdot}94$