Pythagoras and Trigonometry
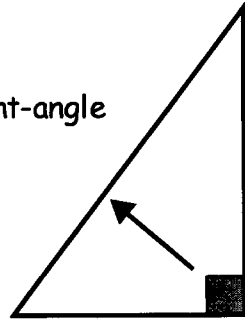
PYTHAGORAS made simple

1) Is the triangle right-angled? If the answer is no, you cannot use Pythagoras.

2) Identify the "longest side". This is opposite the right angle

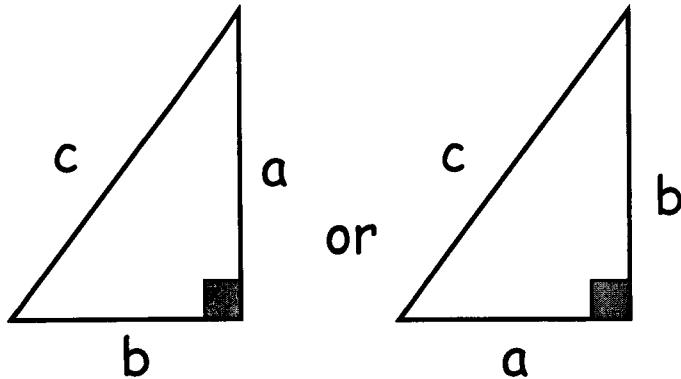The longest side, opposite the right-angle

3) The rule

the longest side squared is equal to the sum of the squares of the other two sides

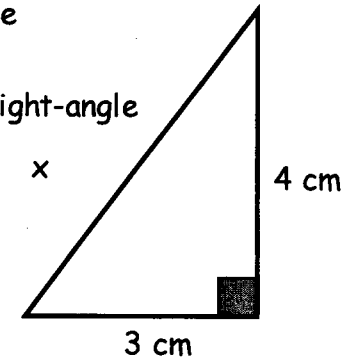This is often written as $c^2 = a^2 + b^2$

c is the longest side.

a and b are the two shorter sides. Their order does not matter

c   a   or   c   b

b   a

4) Finding the longest side

The longest side, opposite the right-angle

x   4 cm

3 cm

From the rule $c^2 = a^2 + b^2$

$x^2 = 3^2 + 4^2$

$x^2 = 9 + 16$
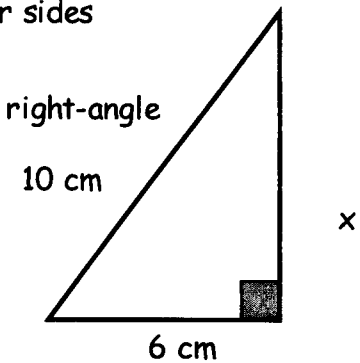
$x^2 = 25$

$x = \sqrt{25} = 5$ cm

Check your answer is bigger than both of the shorter sides

5) Finding one of the shorter sides

The longest side, opposite the right-angle

10 cm   x

From the rule $c^2 = a^2 + b^2$

$10^2 = 6^2 + x^2$

$100 = 36 + x^2$ 6 cm
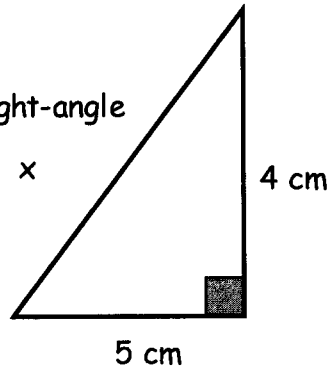
$x^2 = 100 - 36 = 64$

$x = \sqrt{64} = 8$ cm

Check your answer is smaller than longest side

①
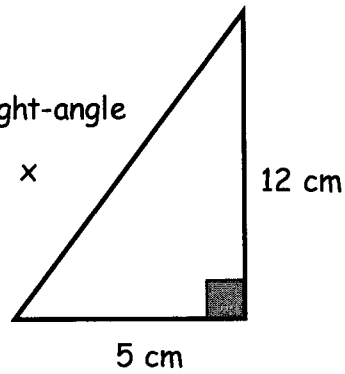
Find the side x using Pythagoras. Give answers to 1 d.p.

1

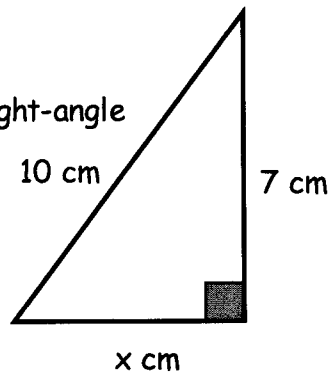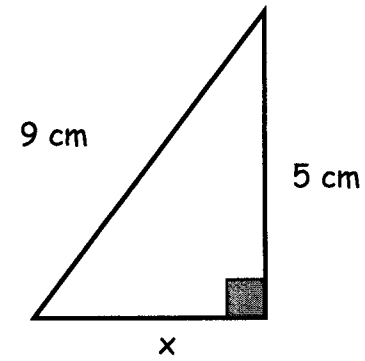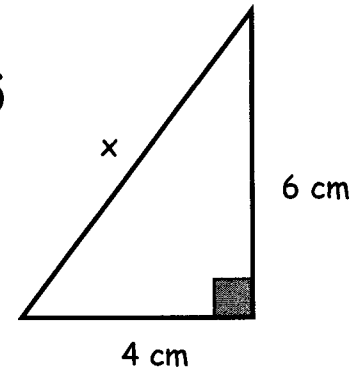The longest side, opposite the right-angle

x

4 cm

5 cm

2

The longest side, opposite the right-angle

x

12 cm

5 cm

3

The longest side, opposite the right-angle

10 cm

7 cm

x cm

4
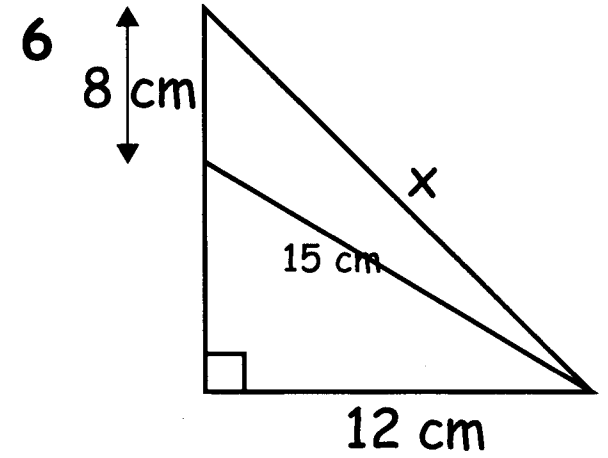
9 cm

5 cm

x

5

x

6 cm

4 cm

6

5 cm

x

2 cm
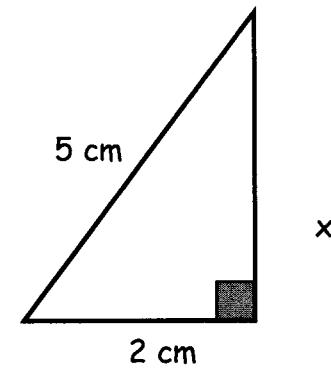
Pythagoras. Find the missing length 'x' for each question. Show your working out

1

8 cm

x

6 cm

2

10 cm

5 cm

x

3

10 cm

x

x

4

10 cm

x

6 cm   15 cm

5

10 cm

10 cm

30 cm

x

6

8 cm

15 cm

x

12 cm
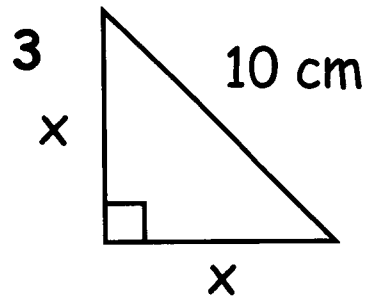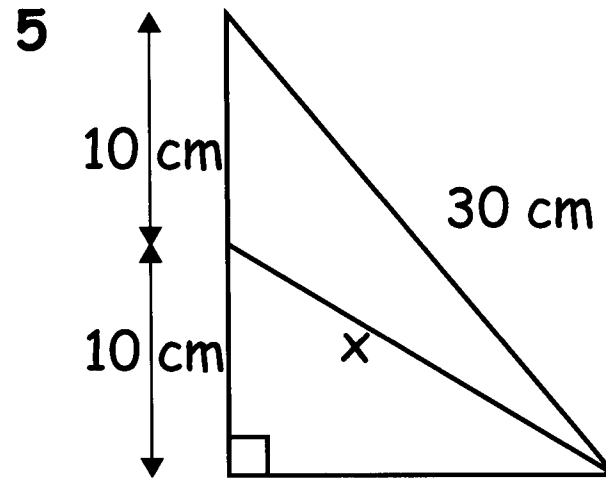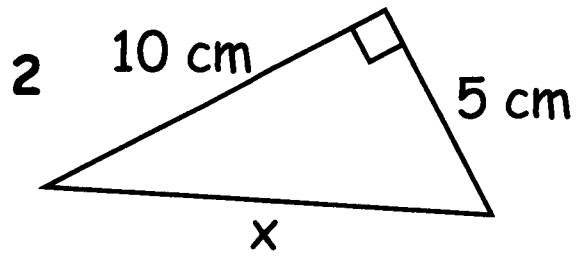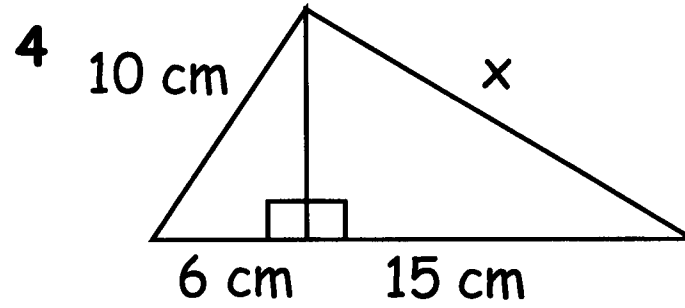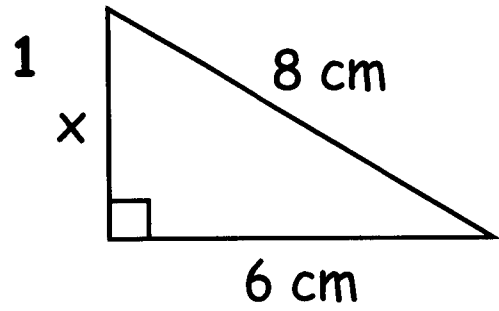
7) Plot A (2,3), B (2, 10), C (9,3).
length BC.

③
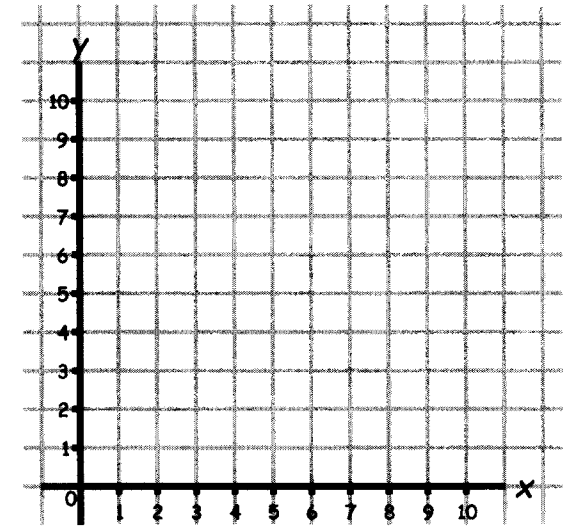
Pythagoras Questions using Coordinates

Plot the following triangles and then calculate the length of the longest side. Answers to 1 decimal place.

1) A (2,9), B(9,2) and C(2,2). Join the points to make a triangle. Find the length of AB.

2) D (2,-2), E(5,-2) and F(2,-10). Join the points to make a triangle. Find the length of EF.
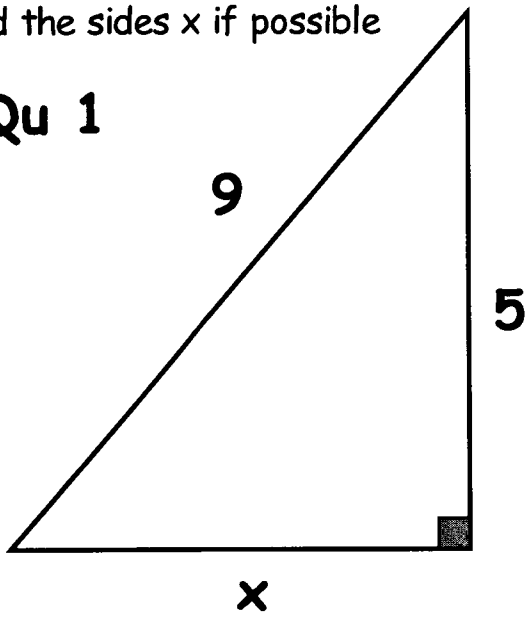
3) G (-9,-3), H(-2,-3) and I(-2,-7). Join the points to make a triangle. Find the length of GI.

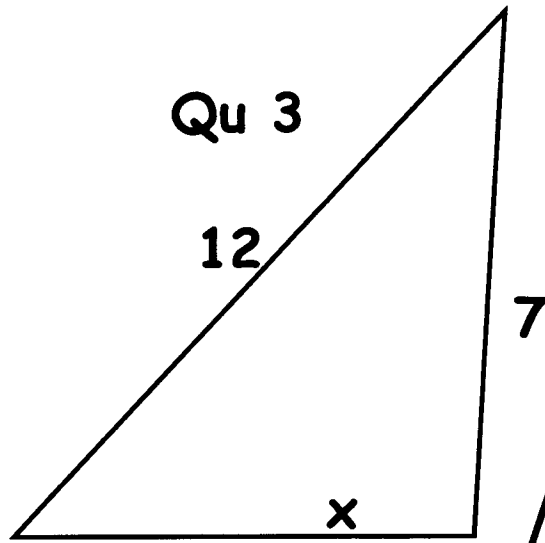4) J (-9,4), K(-2,10) and L(-2,4). Join the points to make a triangle. Find the length of JK.
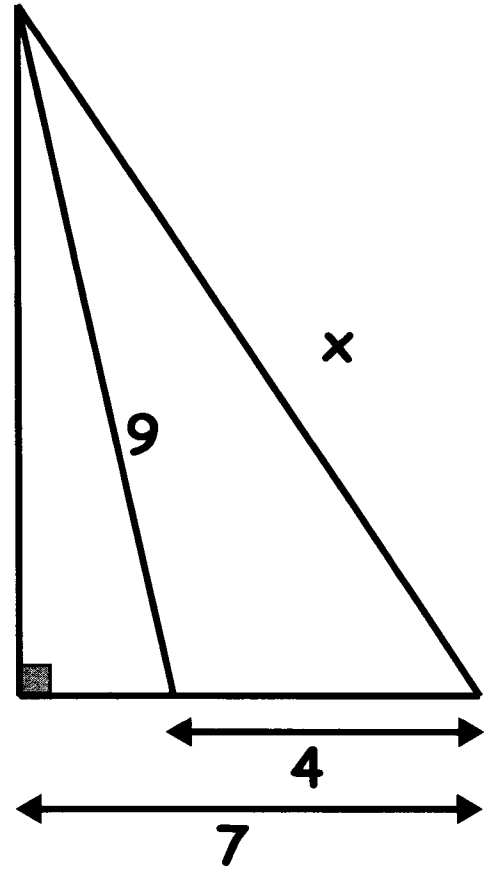
④
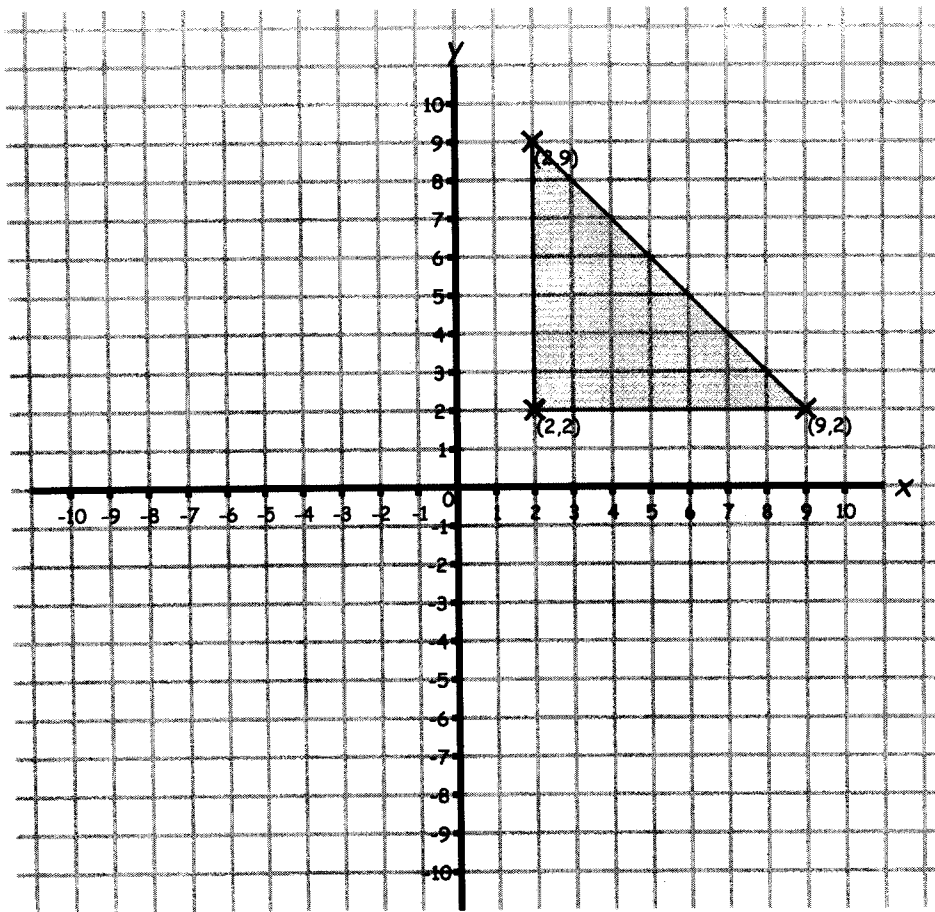
Find the sides x if possible
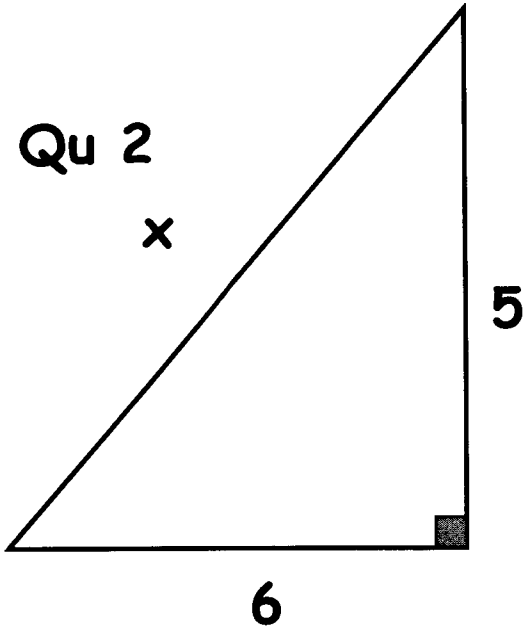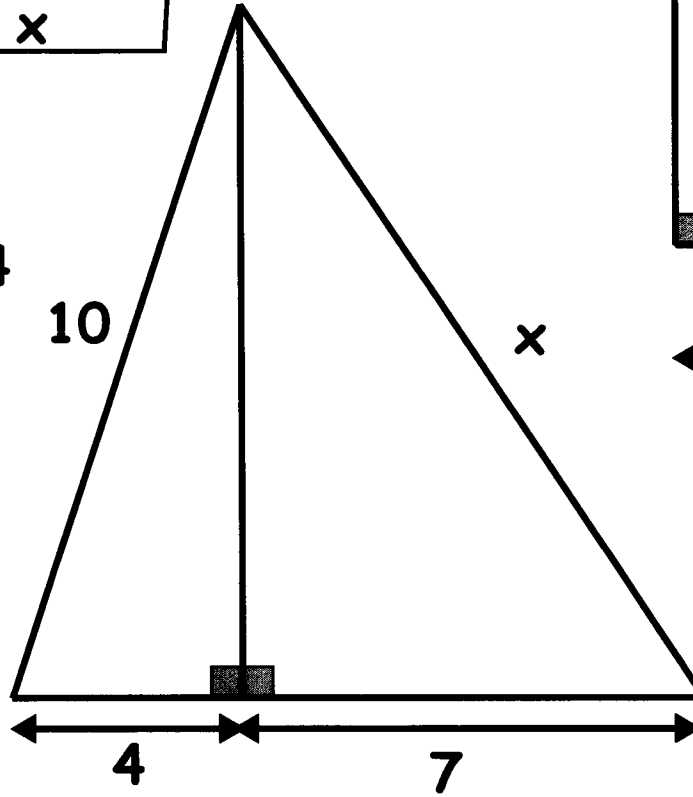
Qu 1

9
5
x

Qu 2

x
5
6

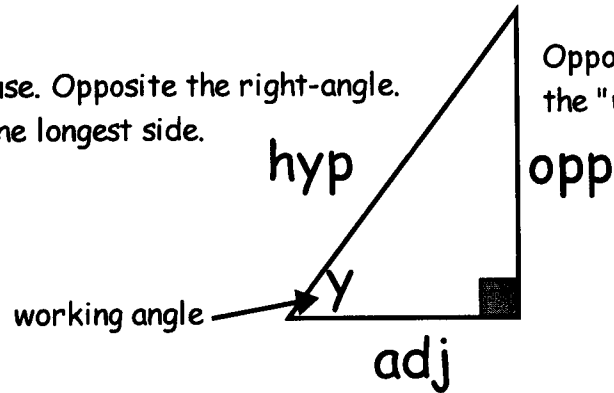**Qu 3**

12
7
x

Qu 4

10
x
4
7

Qu 5

x
9
4
7

Ⓢ

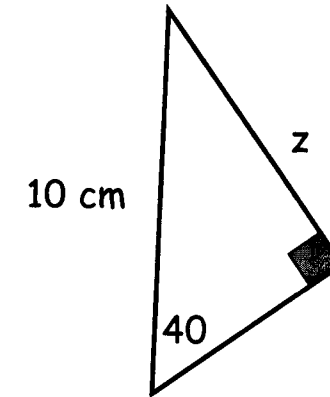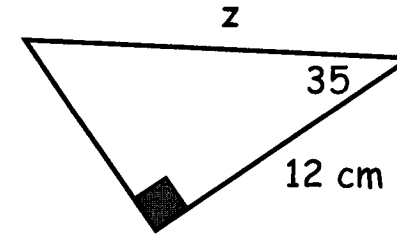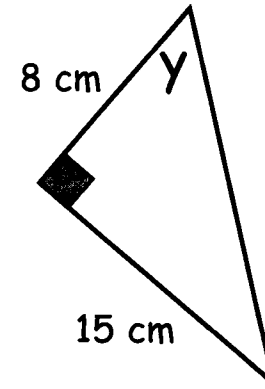# Trigonometry made simple

Always check your answer is sensible

1) Is the triangle right-angled? If the answer is no you cannot use Trigonometry.

2) Identify the "working angle". This may be an angle you are given, or one that you are asked to find.

3) Label the sides in order hyp, opp, adj.

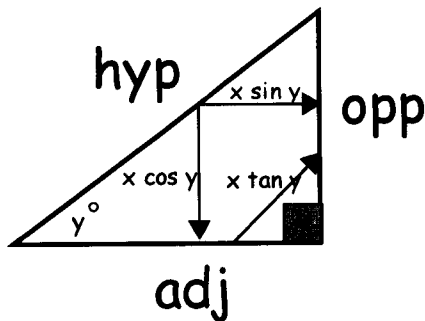Hypotenuse. Opposite the right-angle. Always the longest side.
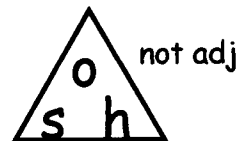
Opposite. The side opposite the "working angle".

hyp

opp

working angle

y

adj

Adjacent. The third side.

z

35

12 cm

8 cm

y

15 cm

z

10 cm

40

4) Choose the correct ratio you need to solve the problem.

hyp

x sin y

opp

x cos y

x tan y

y°

adj

sin	cos	tan
opp = hyp × sin y	adj = hyp × cos y	opp = adj × tan y
hyp = opp ÷ sin y	hyp = adj ÷ cos y	adj = opp ÷ tan y
sin y = opp ÷ hyp	cos y = adj ÷ hyp	tan y = opp ÷ adj

o
s   h
not adj

a
c   h
not opp

o
t   a
not hyp
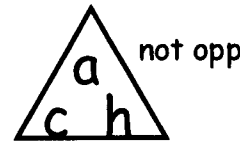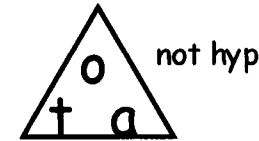
Note : if you are calculating an angle, remember to press SHIFT, before SIN, COS or TAN.

⑥

Trigonometry -Finding a missing angle

1) Is the triangle right-angled?

2) Label the sides.

3) Draw and label the arrow you need

Hyp to Opp is SIN
Hyp to Adj is COS
Adj to Opp is TAN

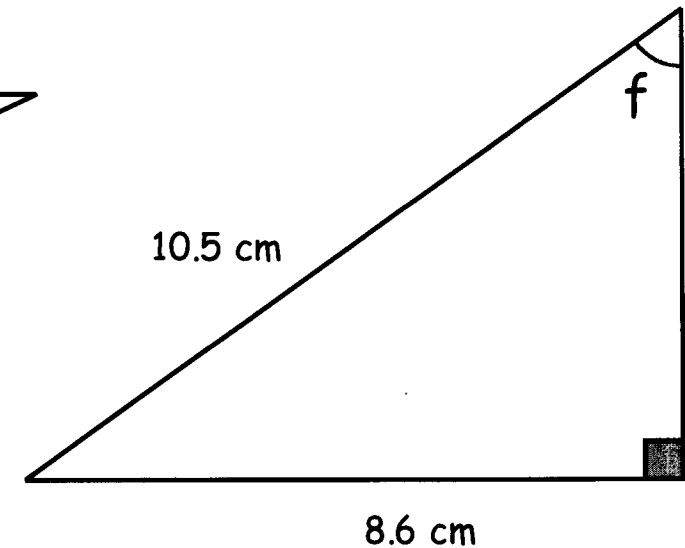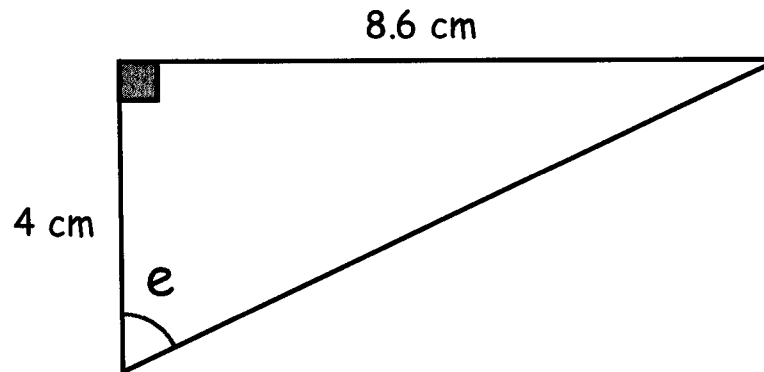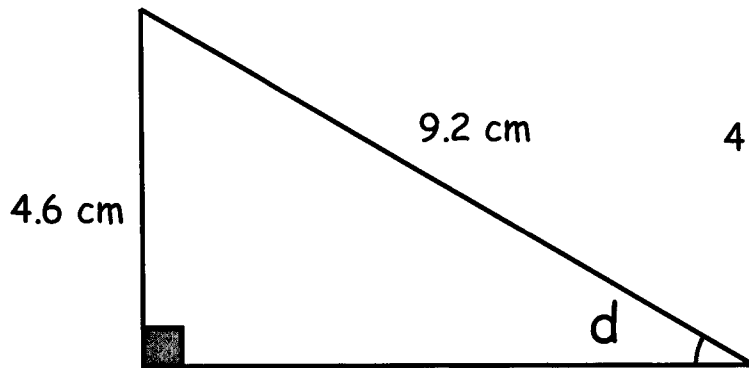4) Calculate the multiplier. For SIN it is Opp ÷ Hyp
For COS it is Adj ÷ Hyp
For TAN it is Opp ÷ Adj

5) Press SHIFT $\begin{array}{l}\text{SIN}\\ \text{COS}\\ \text{TAN}\end{array}$ =

To get the angle. Round to 1 d.p.

5 cm

7 cm

a

7.7 cm

7 cm

b

c

4 cm

8 cm

9.2 cm

4.6 cm

d

8.6 cm

4 cm

e

10.5 cm

f

8.6 cm

⑦
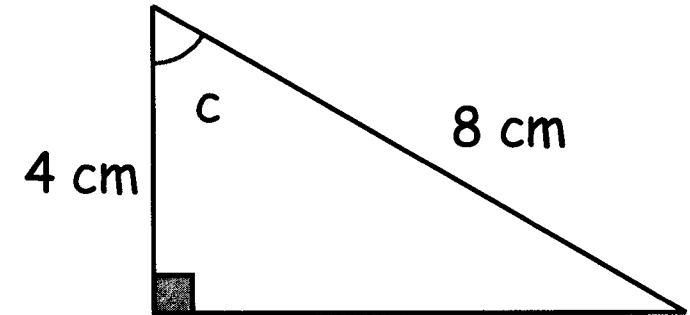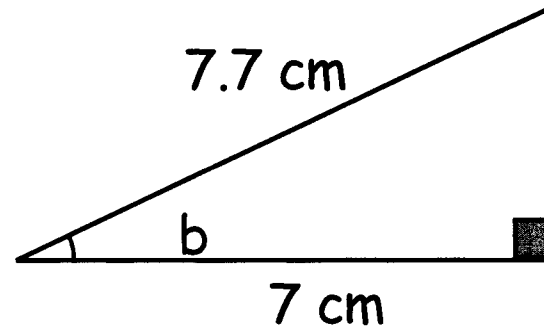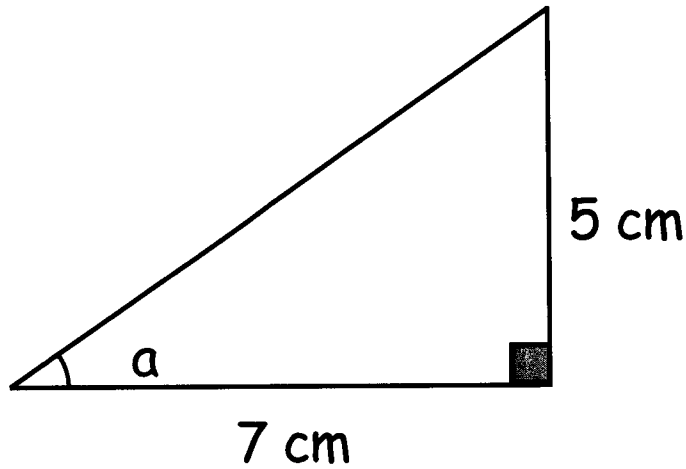
1) Work out the value of sin 30°

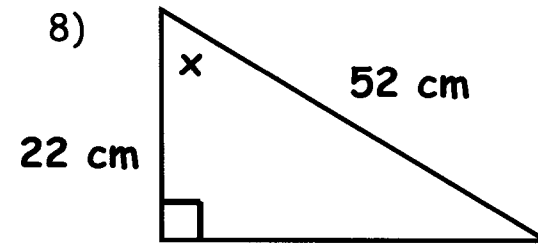2) Work out the value of cos 30°, answer to 3 d.p.

3) tan(x) = 0.839. What is th of angle x?

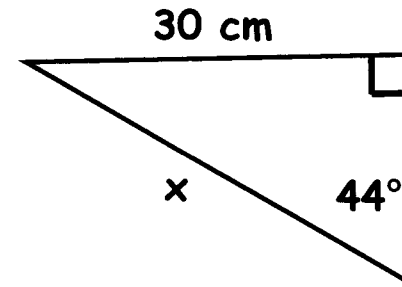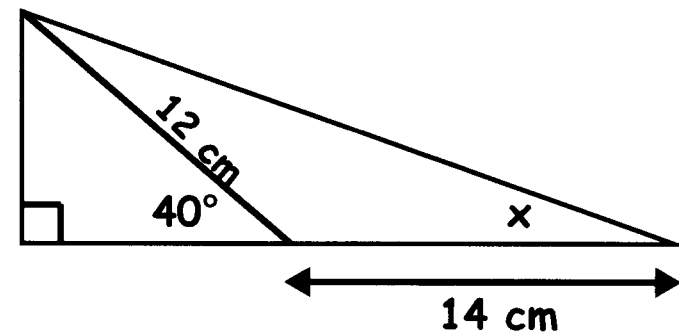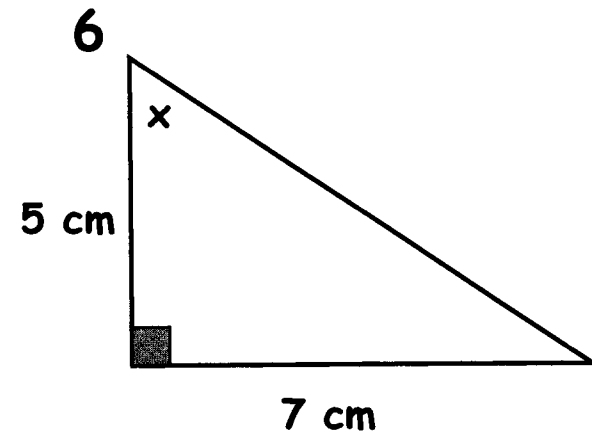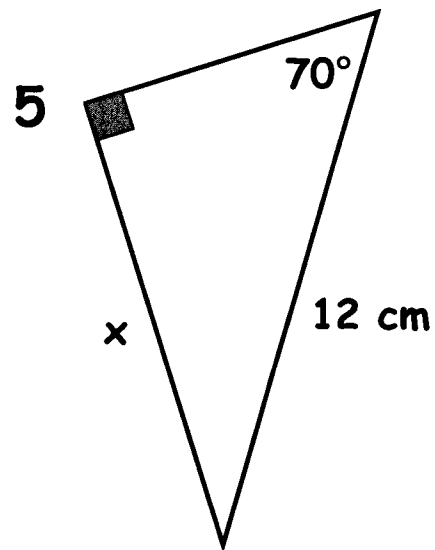Find the value of 'x' in each of these triangles. To 1 d.p.

4)

12 cm

x

27°

5)

10 cm

35°

x

6)

8 cm

5 cm

x

7)

65°

12 cm

x

8)

x

52 cm

22 cm

9)

30 cm

x

44°

10)

12 cm

40°

x

14 cm

⑧

1

12 cm

x

32°

2

x

63°

9 cm

3

10 cm

17 cm

x

4

16°

8 cm

x

5

70°

x

12 cm

6

x

5 cm

7 cm
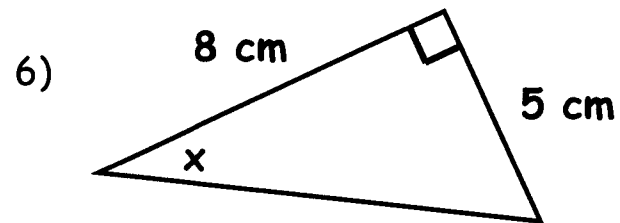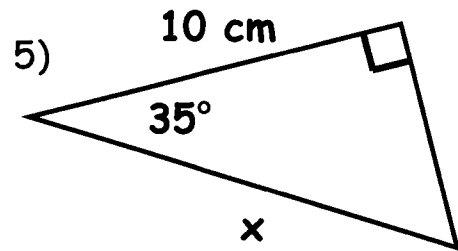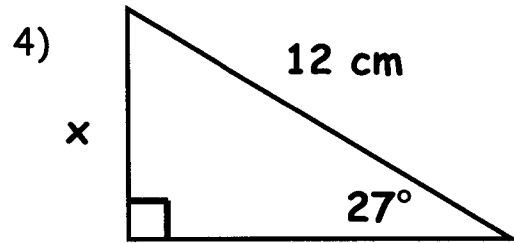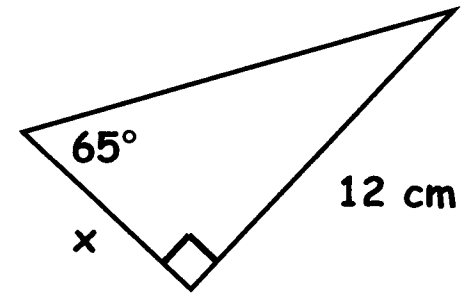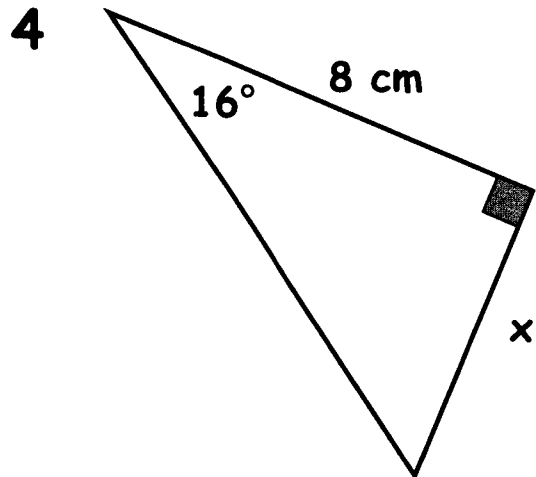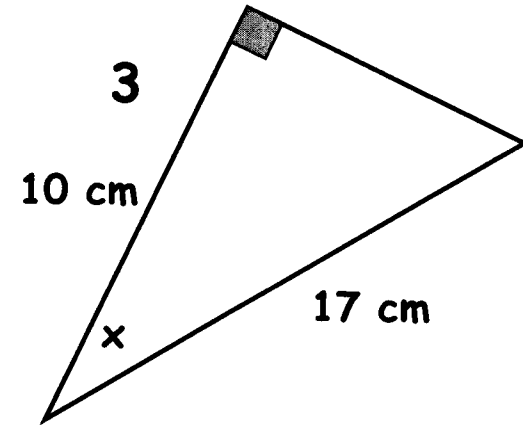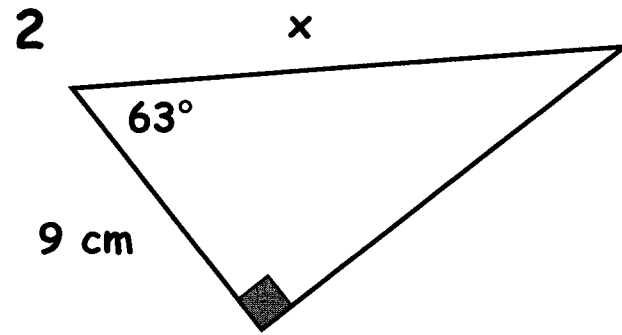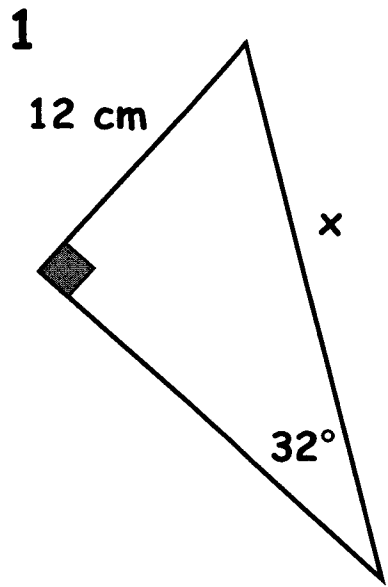
⑨

angle	sin	cos	tan
	0.139		
25°			
42°			
		0.707	
			2.145
85°			

1

8 cm

x

25°

2

8 cm

25°

x

3

x

25°

8 cm

4

8 cm

x

7.25 cm

5

10 cm

x

27°

6

12 cm

x

66°

7

32°

x

12 cm

8

14 cm

x

12 cm
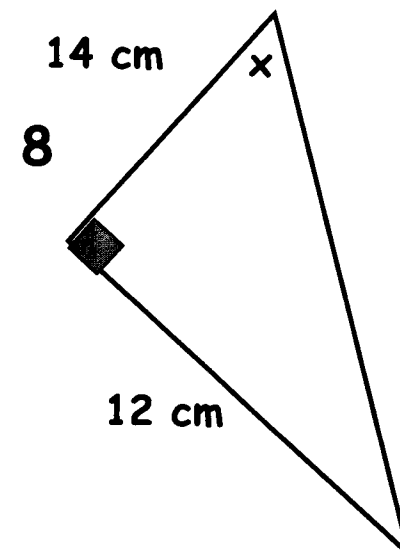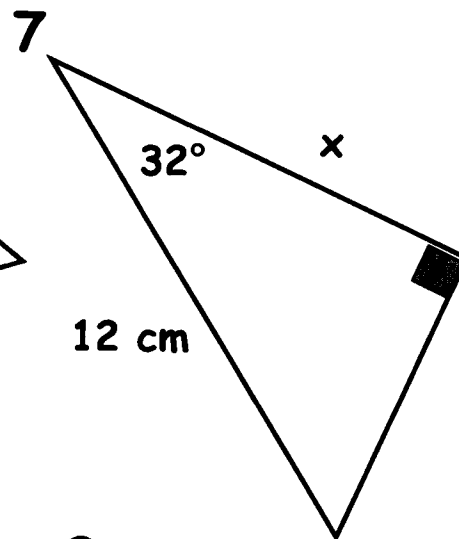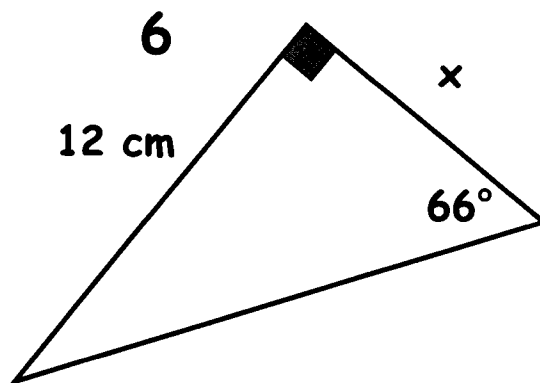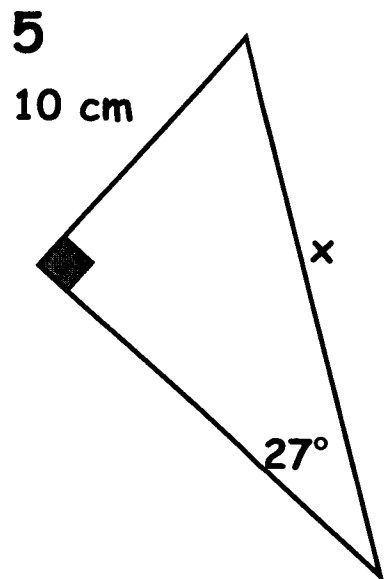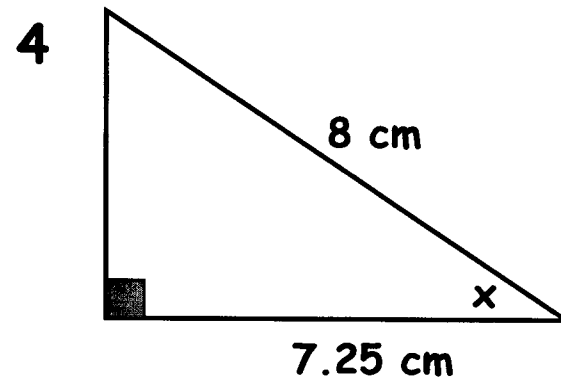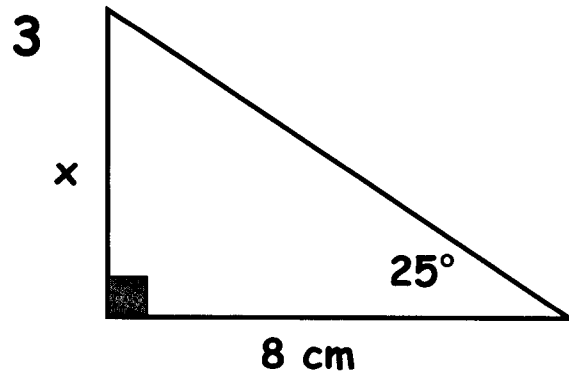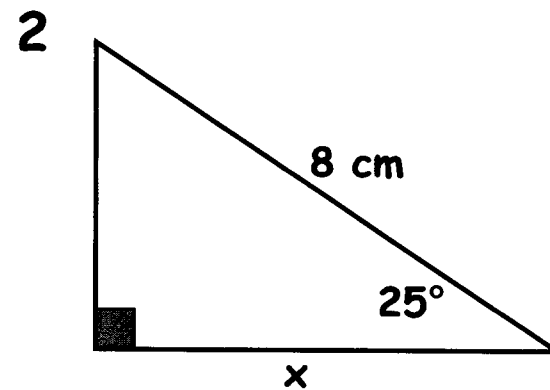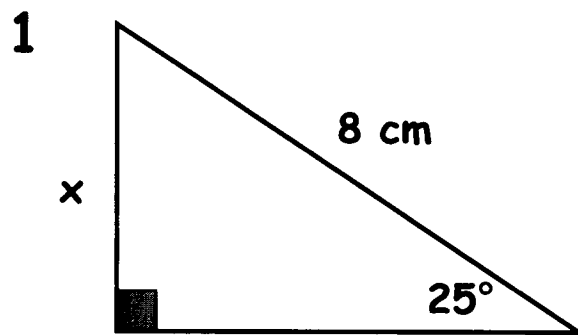
Triangles - find the value of x for each triangle.

1

6 cm

x

4 cm

2

x

50°

4 cm

3

6 cm

x

4 cm

4

60°   8 cm

x

5

6 cm

x

8 cm

6

10 cm   7 cm

x

8 cm

7

A
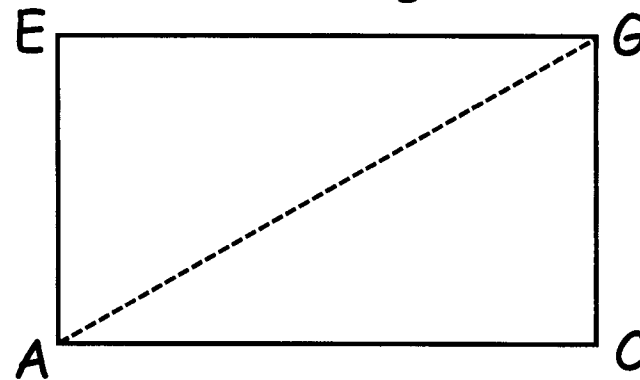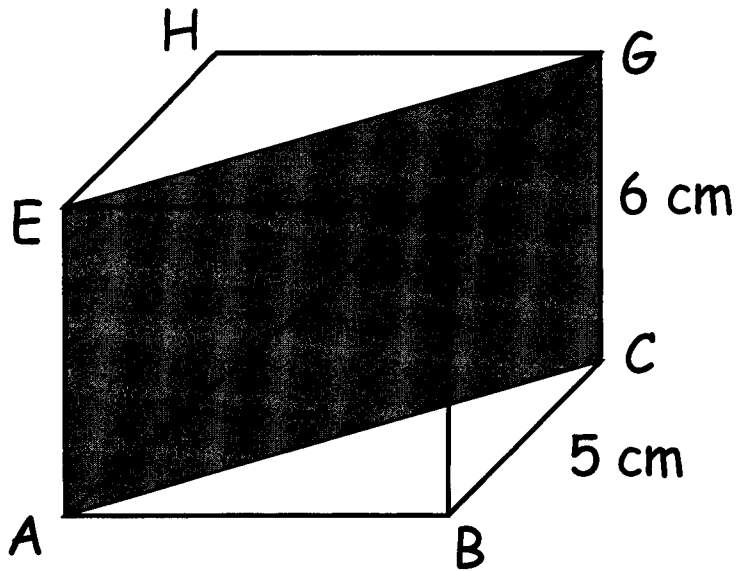
D is the midpoint of BC.

13 cm

C   x   B

D

12 cm

8

8 cm   8 cm

x

6 cm

⑪
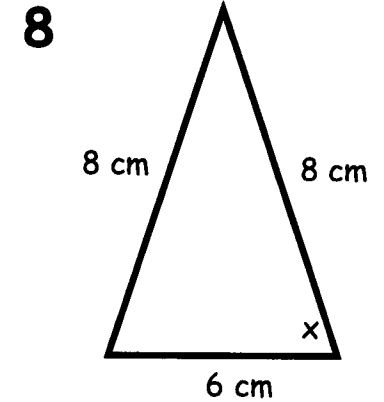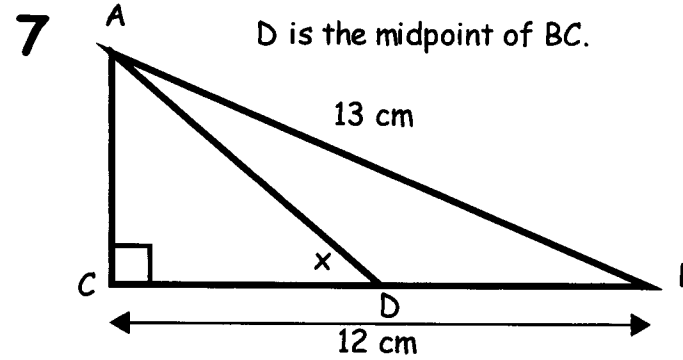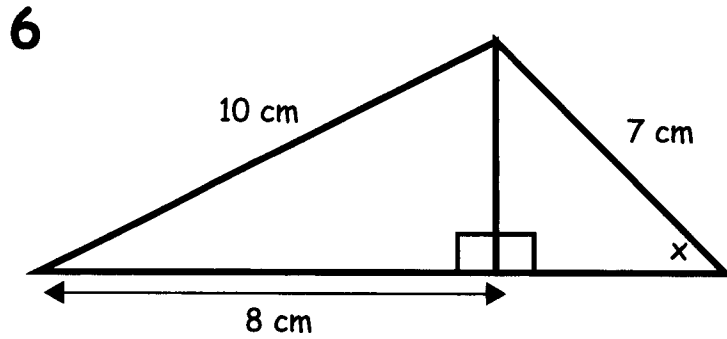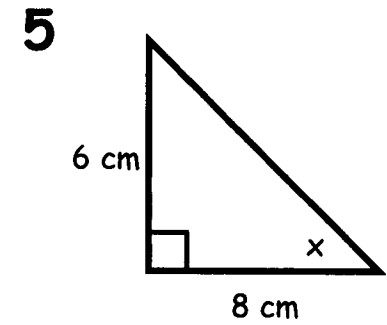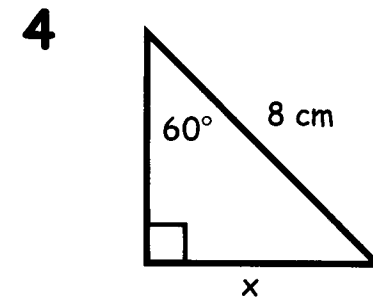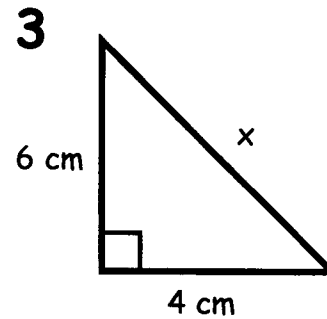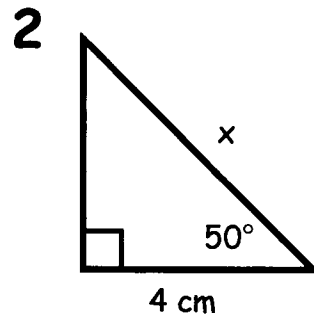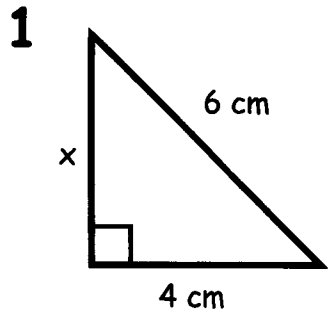
1) Find the angle GAC in this cuboid

H G

E F

6 cm

D C

5 cm

A B

Find length AC

D C

A 32°

B

Find angle GAC

H G

E

6 cm

C

5 cm

A B
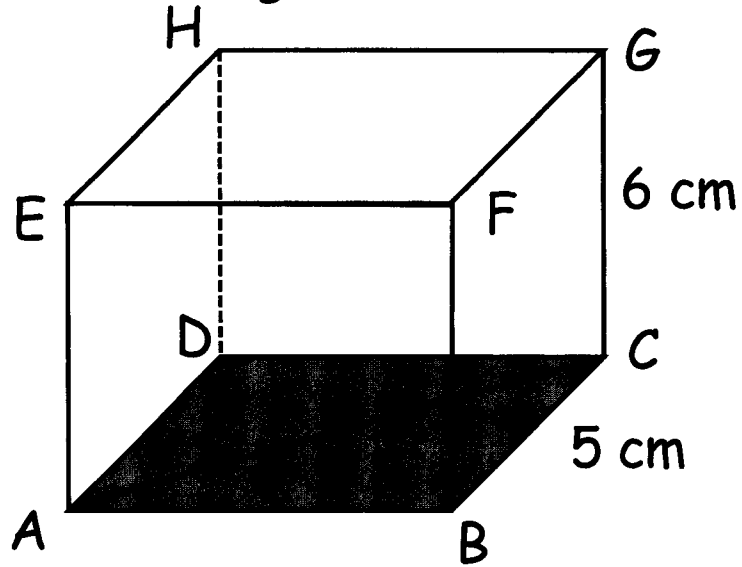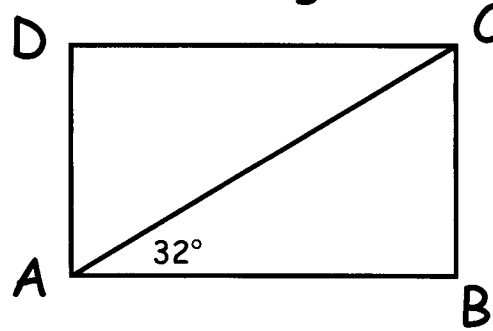
E G

A C

2) Find angle EBD in this shape.

E

4 cm

D

C

A 6 cm B

Find length BD

D C

30° B

A

E Find angle EBD

E

4

D C

A 6 cm B

E

D B

⑬
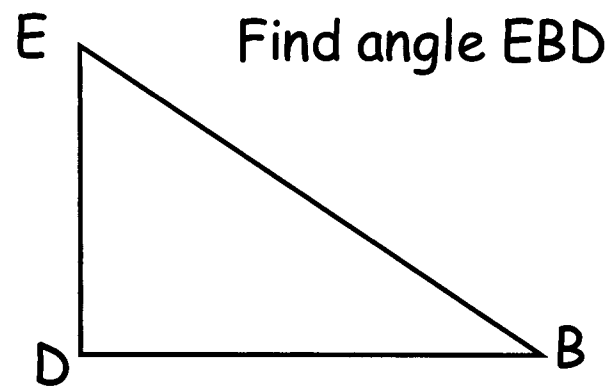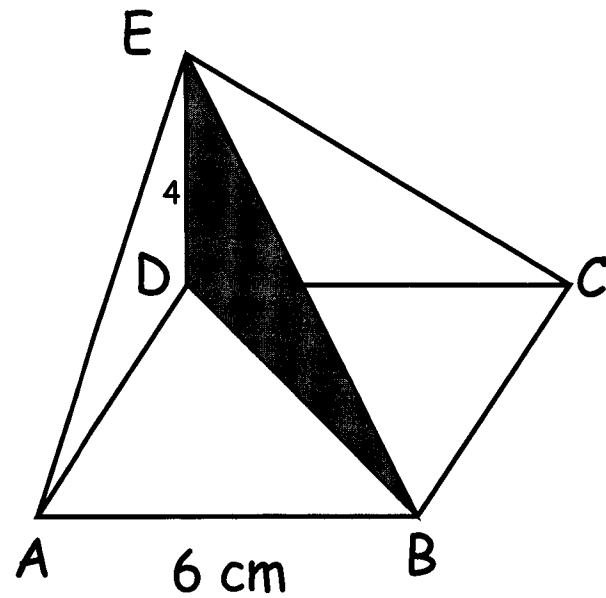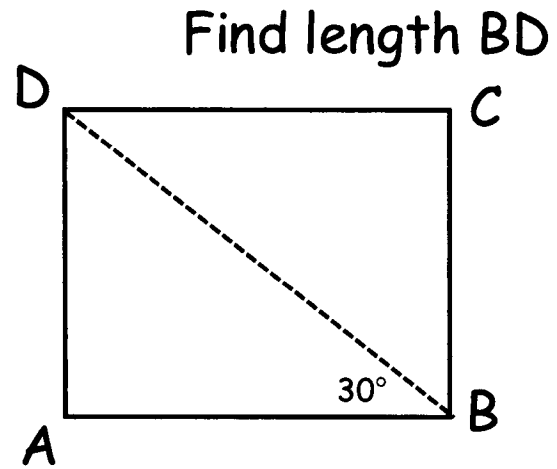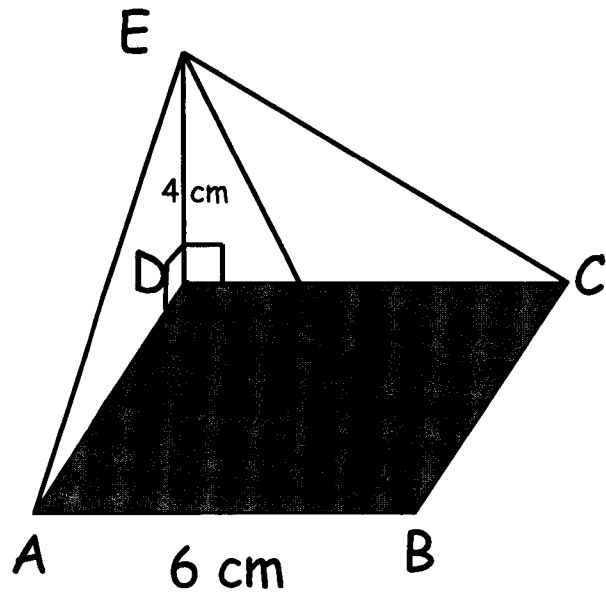
3) Find length BE in this square based pyramid

6 cm

8 cm

8 cm

A   8 cm   B

E

D

C

Find BD

D   C

A   B

E

Find BE

Find angle DBE

D   B

A   B   D   C

(14)
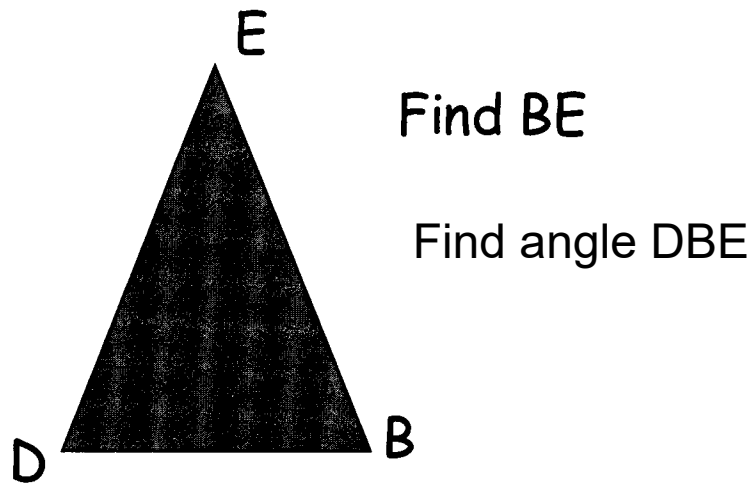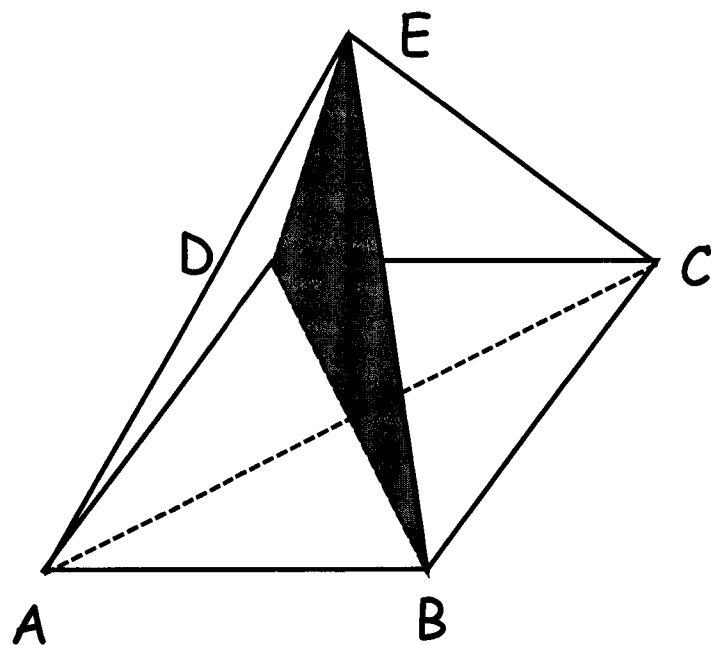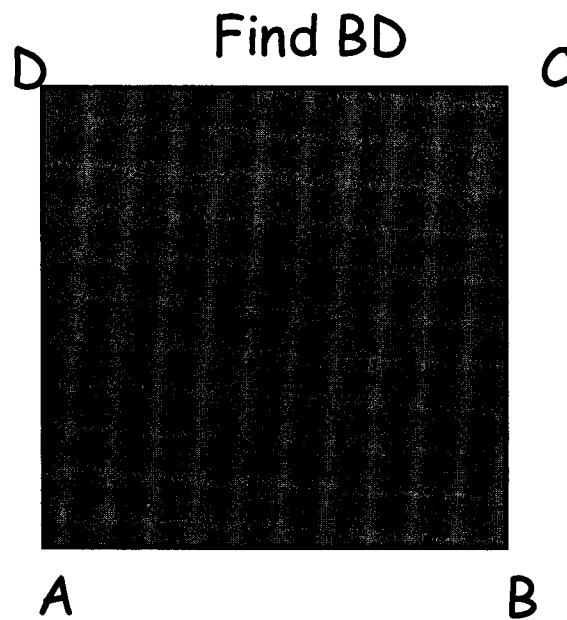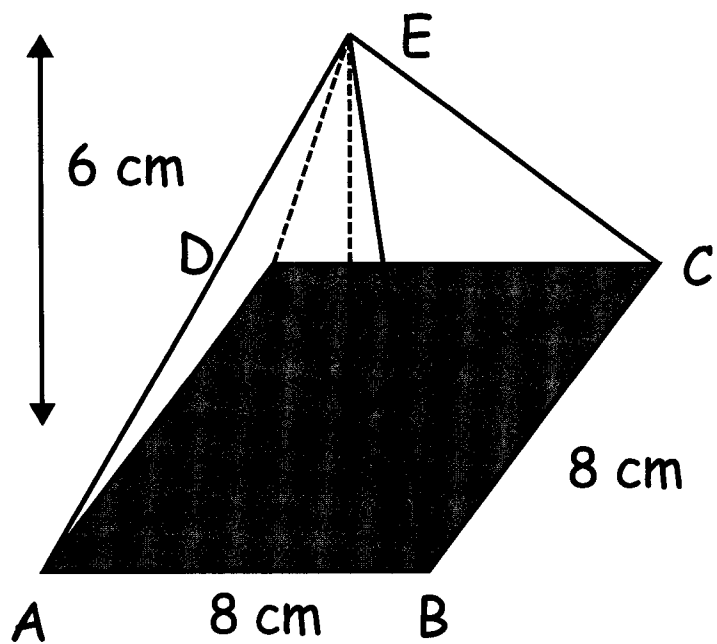
4) Find length EF in this square based pyramid. F is the midpoint of the side BC.

E

6 cm

D

C

8 cm

F

A   8 cm   B
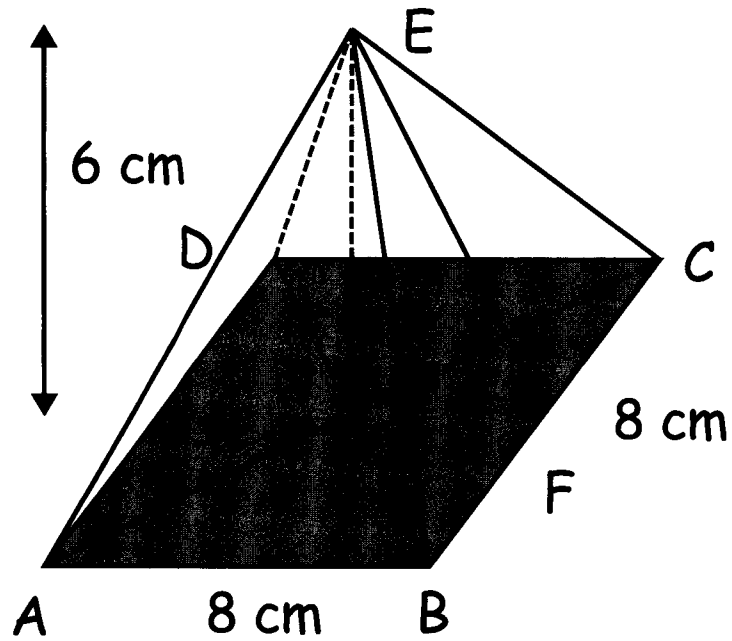
Find FG. G is the midpoint of AD.

D   C

G   F

A   B

E

Find EF

Find angle EFG

G   F

(15)