

# Angles and Triangles

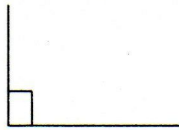
## Angles.

Different types of angles.

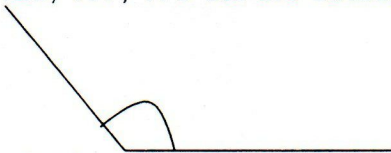
**Acute angle:** Angles between 0 to 90 degree are called Acute angles. Examples: 50, 34, 10, 89 degree etc are acute angles.



**Right angle:** Angle which is exactly 90 degree is called right angle.



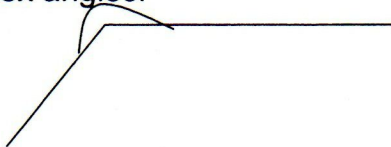
**Obtuse angle:** Angles between 90 to 180 degree are called obtuse angle. Examples: 120, 167, 179 etc are obtuse angles.



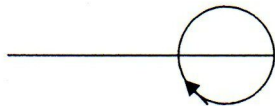
**Straight angle:** Angle which is exactly 180 degree is called straight angle.



**Reflex angle:** Angles between 180 to 360 degree are called reflex angle. Example 250, 181, 359 are reflex angles.



**Angle of a complete turn:** Angle which is exactly 360 degree is called angle of a complete turn.



**Exercise**

Write the type of the following angles.

1)  $30^{\circ}$

2)  $55^{\circ}$

3)  $76^{\circ}$

\_\_\_\_\_

4)  $90^{\circ}$

\_\_\_\_\_

5)  $85^{\circ}$

\_\_\_\_\_

6)  $180^{\circ}$

\_\_\_\_\_

7)  $89^{\circ}$

\_\_\_\_\_

8)  $360^{\circ}$

\_\_\_\_\_

9)  $270^{\circ}$

10. Draw the following angles.

a)  $30^{\circ}$

b)  $55^{\circ}$

c)  $75^{\circ}$

\_\_\_\_\_

d)  $90^{\circ}$

\_\_\_\_\_

e)  $85^{\circ}$

\_\_\_\_\_

f)  $180^{\circ}$

\_\_\_\_\_

g)  $189^{\circ}$

\_\_\_\_\_

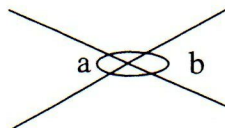
h)  $360^{\circ}$

\_\_\_\_\_

i)  $270^{\circ}$

## **Pairs of angle**

**Vertically opposite angles.** : When two straight lines crosses at a point , then the angles having same vertex but not common arms called vertically opposite angles . Vertically opposite angles are equal,

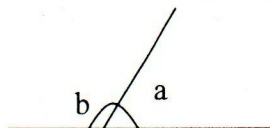


Here in the figure angles **a** and **b** are equal.  $a = b$

Example If angle  $a = 65^\circ$  , Find the value of  $b$ .

$b = 65^\circ$ , ( Vertically opposite angles are always equal)

**Supplementary angles:** Pair of Angles which add up to  $180^\circ$  degree are called supplementary angles.



Here in the figure  $a$ , and  $b$  are supplementary angles.  $a + b = 180^\circ$  .

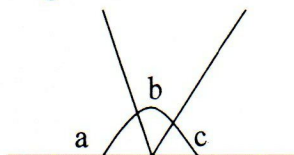
Example. If  $a = 65^\circ$  find the value of angle  $b$ .

$$b + 65^\circ = 180^\circ$$

$$b = 180^\circ - 65^\circ$$

$$b = 115^\circ$$

**Angles in a straight line:** All angles formed in the straight line add up to  $180^\circ$  degree.



Here in the figure  $a$  , $b$ , and  $c$  are angles formed in a straight line.  $a + b + c = 180^\circ$  degree.

**Example.** If  $b = 45^\circ$  and  $c = 65^\circ$  find the value of angle ' $a$ '.

$$a + 45^\circ + 65^\circ = 180^\circ$$

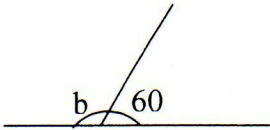
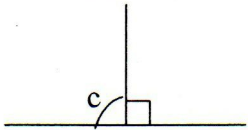
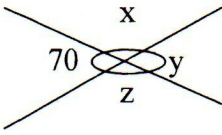
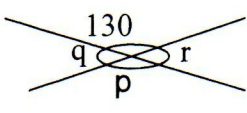
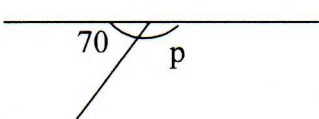
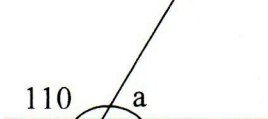
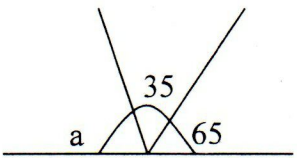
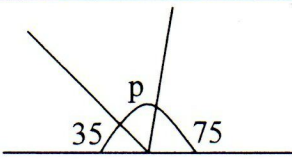
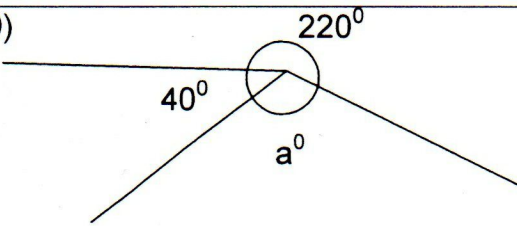
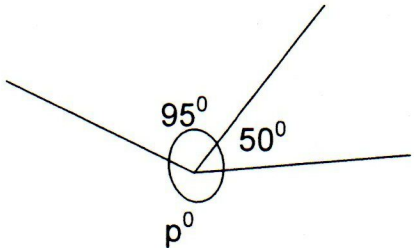
$$a + 110^\circ = 180^\circ$$

$$a = 180^\circ - 110^\circ$$

$$a = 70^\circ$$

**Exercise**

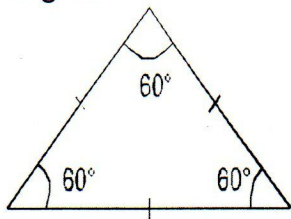
Find the size of the unknown angles.

1)   b = _____	2)   c = _____
3)   x = _____ y = _____ z = _____	4)   p = _____ q = _____ r = _____
5)   p = _____	6)   a = _____
7)   a = _____	8)   p = _____
9)   a = _____	10)   p = _____

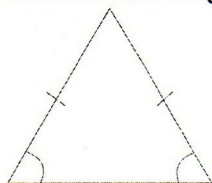
Note: Angles at a point add up to  $360^\circ$ .

**Triangle:** A closed figure formed by the 3 straight line is triangle . There are different types of triangle.

1) **Equilateral Triangle** : All three sides are equal. All three angles are equal to 60 degree.



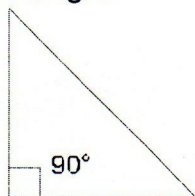
2) **Isosceles triangle**: Two sides of a triangle are equal. Base angles of the isosceles triangle are equal.



3) **Scalene triangle**: None of the sides are equal.



4) **Right angled triangle**: Triangle having 1 right angle is called the right angle triangle.

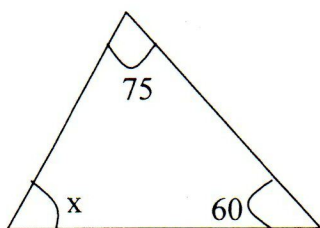


Properties of triangle: All three angles of a triangle sum 180 degree. If two angles of triangle are known then we can find the 1 unknown angle. If angles a, b , and c are three interior angles of a triangle then,  
 $a + b + c = 180$  degree.

Exercise

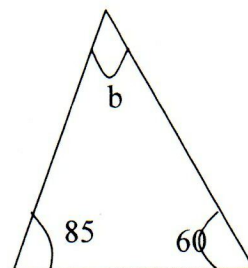
Find the unknown angles from the figure.

1)



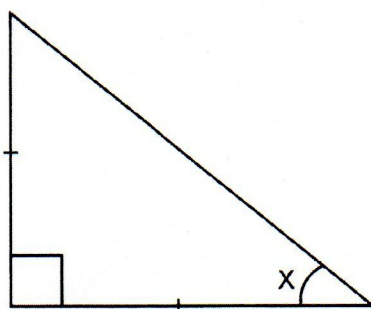
$x =$  \_\_\_\_\_

2)



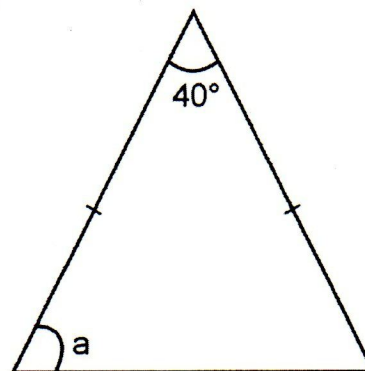
$b =$  \_\_\_\_\_

3)



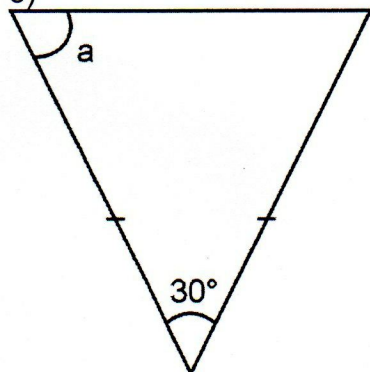
$x =$  \_\_\_\_\_

4)



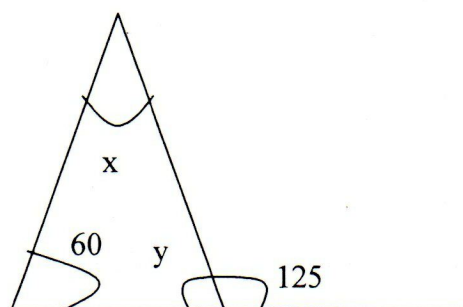
$a =$  \_\_\_\_\_

5)



$a =$  \_\_\_\_\_

6)

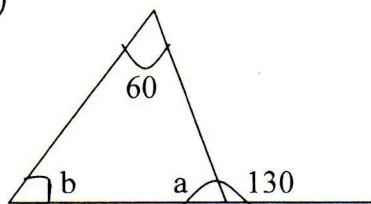


$x =$  \_\_\_\_\_

$y =$  \_\_\_\_\_

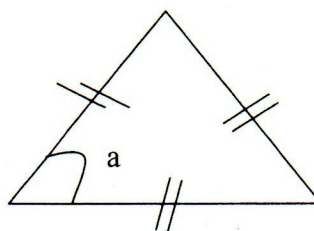


7)



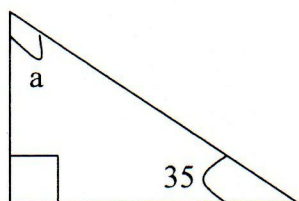
\_\_\_\_\_

8)



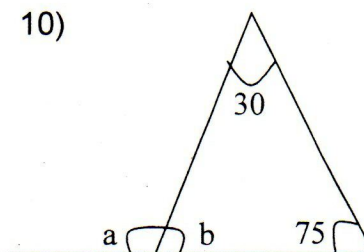
\_\_\_\_\_

9)



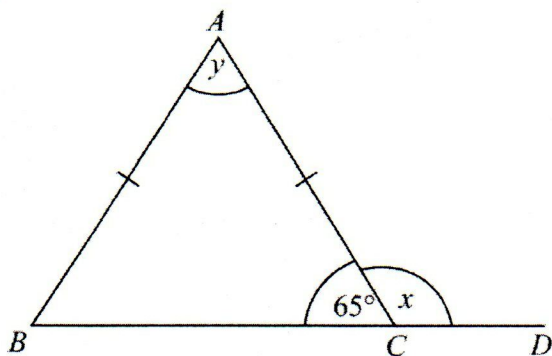
a: \_\_\_\_\_

10)



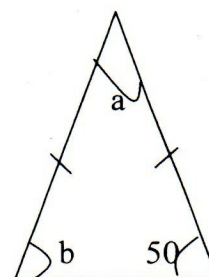
a: \_\_\_\_\_, b: \_\_\_\_\_

11)



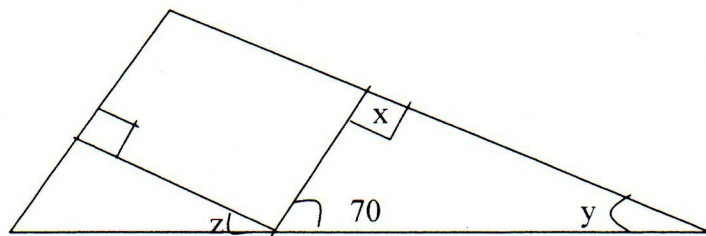
x: \_\_\_\_\_, y: \_\_\_\_\_

12)



a: \_\_\_\_\_, b: \_\_\_\_\_

13)



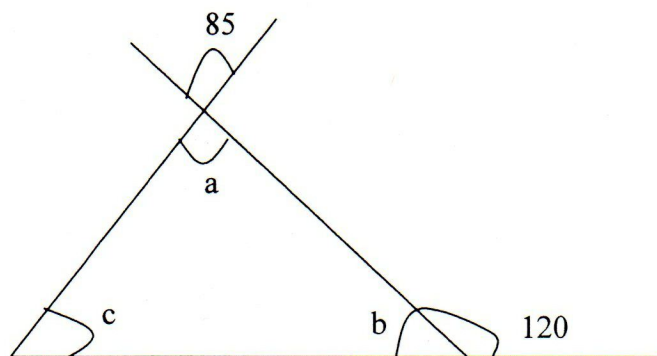
The rectangle exactly fits inside the triangle .  
Work out the sizes of angles  $x$ ,  $y$ , and  $z$ .

$x =$  \_\_\_\_\_ degree

$y =$  \_\_\_\_\_ degree

$z =$  \_\_\_\_\_ degree.

14).



Write the value of the following angles. Also write the reason.

$a =$  \_\_\_\_\_

$b =$  \_\_\_\_\_

$c =$  \_\_\_\_\_

15) If angles  $a$ ,  $b$ , and  $c$  are the three interior angles of a triangle, then find the unknown angles.

a) If  $a = 35$  and  $b = 60$  find  $c$  . \_\_\_\_\_

b) If  $a = 65$  and  $c = 65$  find  $b$  . \_\_\_\_\_

c) If  $c = 45$  and  $a = 90$  find  $b$  . \_\_\_\_\_

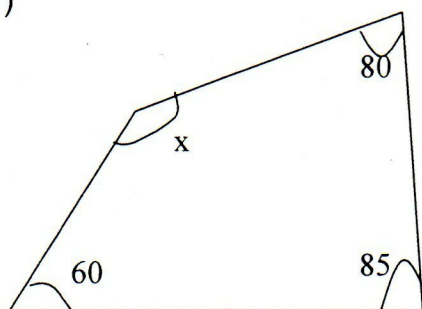
d) If  $c = 35$  and  $b = 110$  find  $a$  . \_\_\_\_\_

e) If  $b = 41$  and  $a = 48$  find  $c$  . \_\_\_\_\_



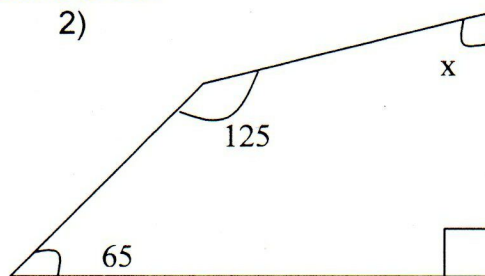
Find the unknown angle of the following quadrilaterals.

1)



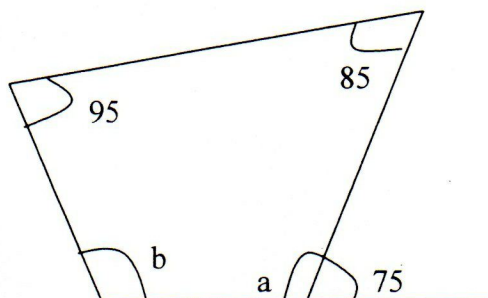
$x$ : \_\_\_\_\_

2)



$x$ : \_\_\_\_\_

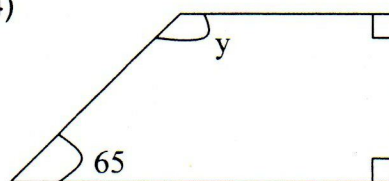
3)



$a$ = \_\_\_\_\_

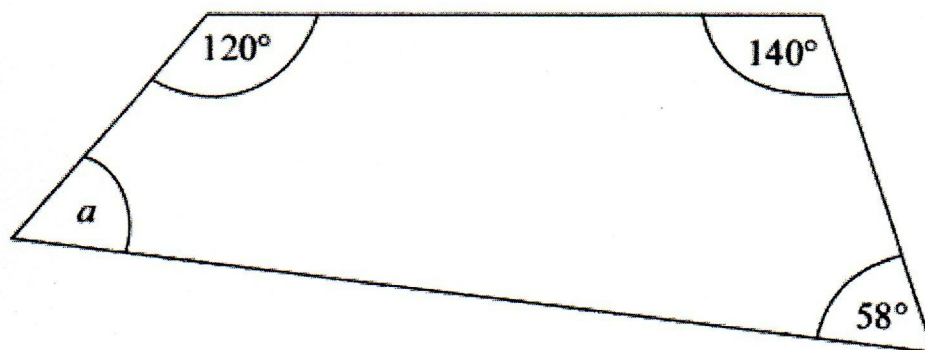
$b$ = \_\_\_\_\_

4)



$y$ = \_\_\_\_\_

5)



$a$ = \_\_\_\_\_