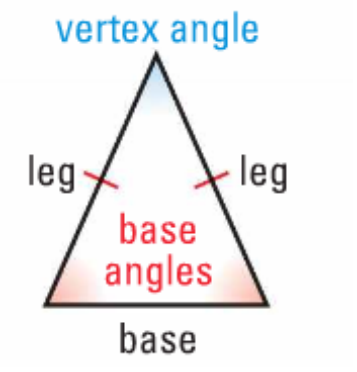
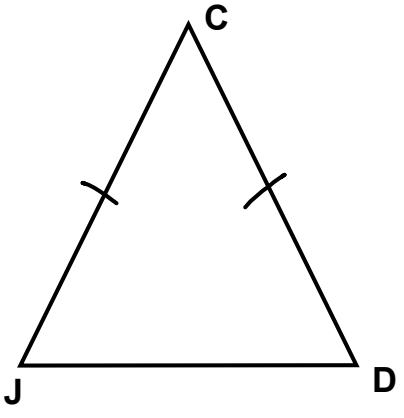
4.7 Use Isosceles and Equilateral Triangles

Before You learned about isosceles and equilateral triangles.

Now You will use theorems about isosceles and equilateral triangles.



Name the vertex angle and the legs in the triangle.

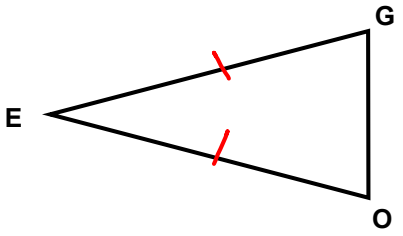


Vertex Angle: $\angle C$

Legs:

$\overline{JC}$ and $\overline{DC}$

Name the base angles and the base in the triangle.



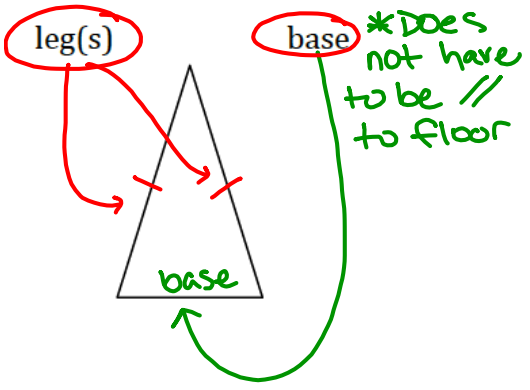
Base Angles: $\angle G$ and $\angle O$

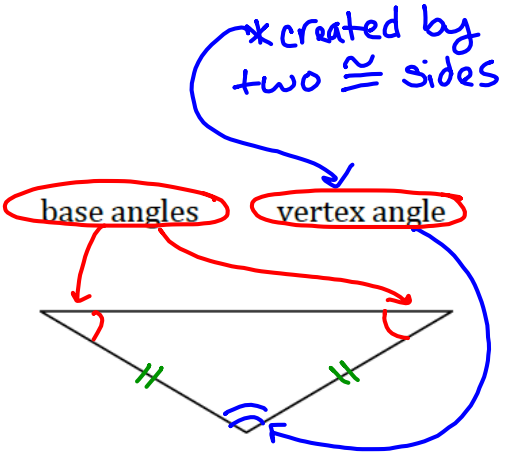
Base: $\overline{GO}$ or $\overline{OG}$

Section 4.7

EQ:

Parts of an Isosceles Triangle





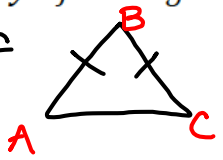
Theorem 4.7: Base Angles Theorem (Base ∠ Thm.)

If two sides of a triangle are congruent, then

the angles opposite them are congruent.

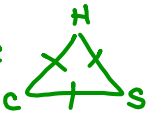
(Corollary: If a triangle is equilateral then it is equiangular*.)*

If



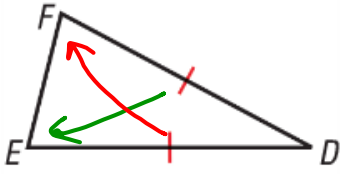
then $\angle A \cong \angle C$.

If



then $\angle C \cong \angle H \cong \angle S$ (all $m\angle = 60°$)

In $\triangle DEF$, $\overline{DE} \cong \overline{DF}$. Name two congruent angles.



$\angle E \cong \angle F$

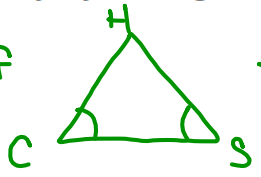
Theorem 4.8: Base Angles Converse Theorem

If two angles of a triangle are congruent, then

the sides opposite them are congruent.

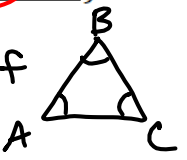
(Corollary: If a triangle is equiangular then it is equilateral*.)*

If



then $\overline{HS} \cong \overline{HC}$

If

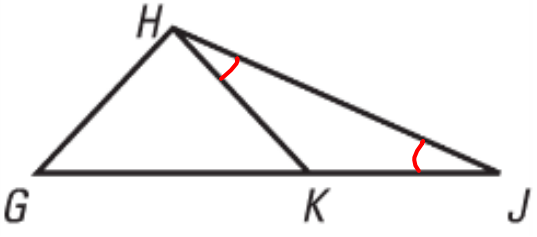


then

$AB = BC = CA$

If $\angle KHJ \cong \angle KJH$, then ? $\cong$?.

$\overline{KH} \cong \overline{KJ}$



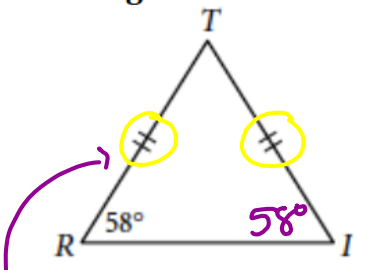
A1. Complete the following statements based on the figure.

a. ΔIRT is a(n) isosceles triangle.

b. $\angle R$ and $\angle I$ are base angles.

c. The vertex angle is angle T.

d. $m\angle T =$ 64°

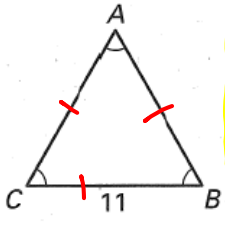


isosceles Δ
$\therefore$ base $\angle$'s $\cong$
(Base $\angle$ Thm)

180
Δ Sum Thm. −58 −58
64

$m\angle T = 64°$

A2. Give the measures of the sides and angle not given.

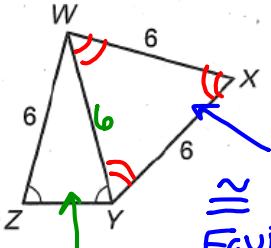


$m\angle A = 60°$
$m\angle B = 60°$
$m\angle C = 60°$

$AB = 11$
$AC = 11$

Equiangular Δ
$\therefore$ Equilateral Δ
(Base $\angle$ Conv.)

A3. Find YW and $m\angle XWY$.



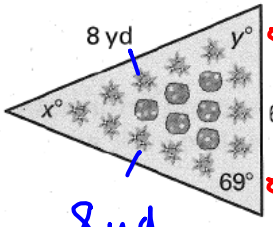
All sides $\cong$ $\therefore$ Equilateral $\therefore$ Equiangular

$\therefore$ $m\angle XWY = 60°$

ISOS Δ

$\therefore$ $YW = 6$

A4. Find the perimeter of the triangular garden, x, and y.



Base ∠s ≅ → $y = 69°$

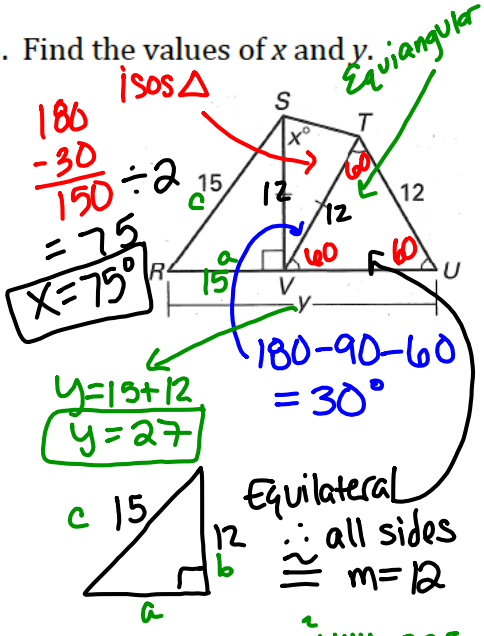
8 yd.

Perimeter $= 8+8+6$

$P = 22$ yds.

$180 - 69 - 69 = 42$ ΔSum Thm. → $x = 42°$

A5. Find the values of x and y.



isos Δ

$180 - 30 = 150 \div 2 = 75$

$x = 75°$

Equiangular

$y = 15 + 12$

$y = 27$

$180 - 90 - 60 = 30°$

Equilateral ∴ all sides ≅ $m = 12$

$a^2 + b^2 = c^2$

$a^2 + 12^2 = 15^2$

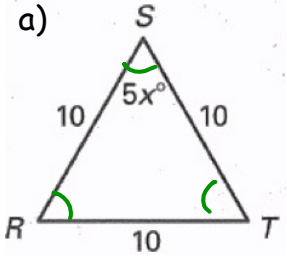
$a^2 + 144 = 225$

$a^2 = 81$

$a = 9$

A6. Find the value of x.

a)



Equilateral Δ

∴ Equiangular Δ

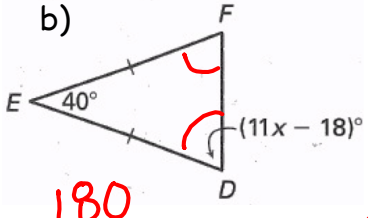
(all ∠s = 60°)

$5x = 60$

$x = 12$

b)

Isos. Δ



$180 - 40 = 140 \div 2 = 70°$ per base ∠

$11x - 18 = 70$

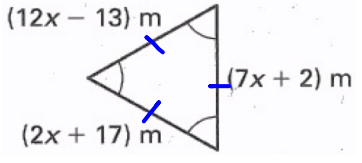
$+18 \quad +18$

$11x = 88$

$x = 8$

c) ∴ Equilateral

Equiangular Δ



All sides = (option)

$2x + 17 = 7x + 2$

$-2 \quad -2x$

$15 = 5x$

$x = 3$

A7. Fill in the proof

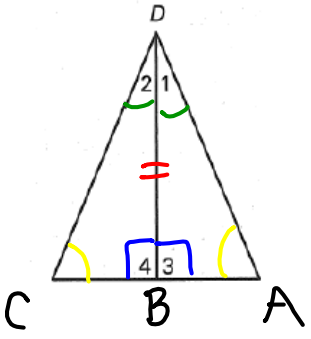
GIVEN:

$\overline{DB} \perp \overline{AC}$,

$\overline{BD}$ bisects $\angle ADC$

PROVE:

ΔADC is isosceles



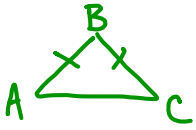
Statement	Reason
1. $\overline{BD}$ bisects $\angle ADC$	1. Given
2. $\angle 1 \cong \angle 2$	2. Def. $\angle$ bisector
3. $\overline{DB} \perp \overline{AC}$	3. Given
4. $\angle 4 \cong \angle 3$	4. Thm 3.9/Thm 2.3
5. $\overline{DB} \cong \overline{DB}$	5. Reflexive
6. $\Delta CBD \cong \Delta ABD$	6. ASA $\cong$
7. $\angle C \cong \angle A$	7. CPCTC
8. ΔADC is isosceles	8. Def. of an isosceles

Section 4.7

EQ: How are the sides & angles of a triangle related if there are two or more congruent sides or angles?

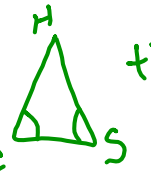
Summary:

If a Δ has 2 $\cong$ sides then the angles opposite of those sides are $\cong$.

If 

then $\angle A \cong \angle C$.

If a Δ has 2 $\cong$ $\angle$s then the sides opposite of those $\angle$'s are $\cong$.

If 

then $\overline{CH} \cong \overline{SH}$ and $CH = SH$.