Key

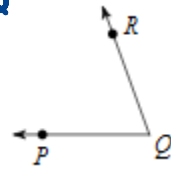**Name the vertex and sides of each angle.**

Ex 1) **M**

vertex: M

a ray

Sides: $\overrightarrow{ML}$

&

$\overrightarrow{MN}$
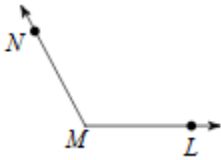
Ex 2) **Q**

Vertex: Q

sides: $\overrightarrow{QP}$

&

$\overrightarrow{QR}$

Name each angle in four ways.

Ex 3)
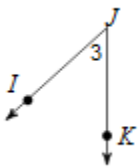
∠J
∠IJK
∠KJI
∠3

Ex 4)

∠1
∠G
∠FGH
∠HGF

Draw and label an angle to fit each description.

θ "theta"

Ex 5) an obtuse angle, ∠Y   obtuse

90° < θ < 180

Ex 6) an acute angle, ∠JIH

0° < θ < 90°

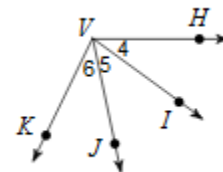Ex 7) an right angle, ∠3

θ = 90°

Ex 8) a straight angle, ∠CDE

θ = 180°

Name all the angles that have V as a vertex.

Ex 9)
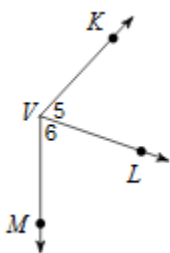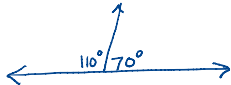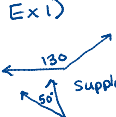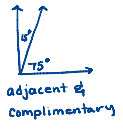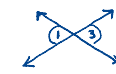
∠KVM
∠KVL or ∠5
∠MVL or ∠6

Ex 10)

∠KVH
∠KVI
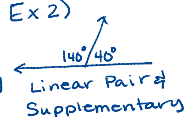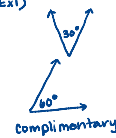∠JVH

∠KVJ or ∠6
∠JVI or ∠5
∠IVH or ∠4

Pairs of Angles

Types	Definition	Example
Linear Pair *are Supplementary*	• A pair of adjacent angles formed when two lines intersect	$110°/70°$
Supplementary Angles	A pair of angles with a sum of 180°.	Ex 1) 130 60° supplementary Ex 2) 140°/40° Linear Pair & Supplementary
Complimentary Angles	A pair of angles with a sum of 90°	Ex 1) 30° 60° complimentary Ex 2) 15° 75° adjacent & complimentary
Adjacent Angles (Next to)	A pair of angles that share a common side and a common vertex.	• ∠ADB & ∠BDC are adjacent angles • The share side DB and vertex D. • Angle Addition Postulate m∠ADB + m∠BDC = m∠ADC
Vertical Angles *are* $\cong$	• Opposite angles formed by intersecting lines.	

Ex 11) One angle of a pair of complementary is given. What the measurement is of its compliment?
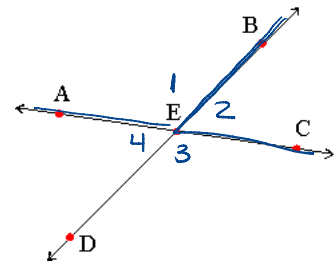
87° __3°__   23° __67°__

Ex 12) One angle of a pair of supplementary is given. What is the measurement of Its supplement?

173° __7°__   92° __108°__

Ex 13) Use the diagram to find the following angle pairs.

a) Linear Pairs $m\angle 1 + m\angle 2 = 180°$
$m\angle 2 + m\angle 3 = 180°$
$m\angle 3 + m\angle 4 = 180°$
$m\angle 4 + m\angle 1 = 180°$

b) Vertical Angles
$\angle 1 \cong \angle 3$, $\angle 4 \cong \angle 2$

Ex 14) Solve for x.

89°
$(6x + 5)°$

$6x + 5 = 89$
$\dfrac{6x}{6} = \dfrac{84}{6}$
$\boxed{x = 14}$
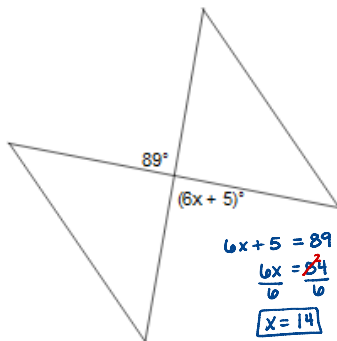
Ex 15) Given $\angle 1 = 90°$, $\angle 2 = 34°$, $\angle 7 = 127°$

Find $\angle 3 = $ __90°__ , $\angle 4 = $ __146°__ , and $\angle 8 = $ __53°__

1 3 5 /2 = 34°
4
127°
7
8 6
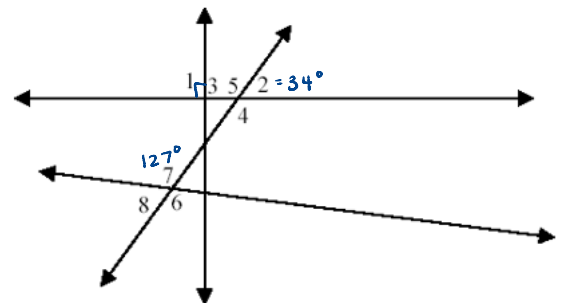
ANGLE PAIRS in two lines cut by a transversal

Corresponding angles

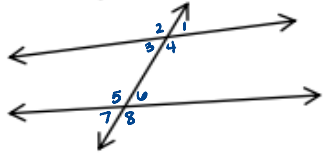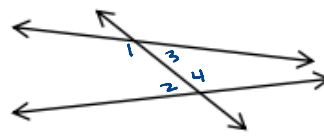- corresponding positions.

$\angle 1 \& \angle 6$, $\angle 4 \& \angle 8$
$\angle 2 \& 5$, $\angle 5 \& \angle 7$
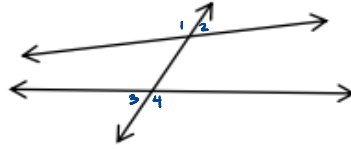
Consecutive (same side) interior angles

- same side
- between the two lines

$\angle 1 \& \angle 2$, $\angle 3 \& \angle 4$

Alternate interior angles
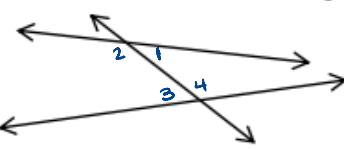
- alternate sides
- between the two lines
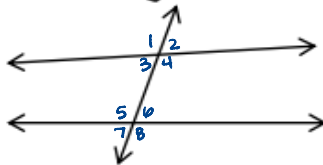
$\angle 1 \& \angle 3$, $\angle 2 \& \angle 4$

Alternate exterior angles

- alternate sides
- outside the two lines
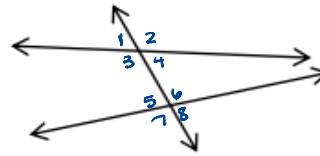
$\angle 1 \& \angle 4$, $\angle 2 \& \angle 3$

Other angle relationships that you will need to remember...

$\angle 5 + \angle 6 = 180°$
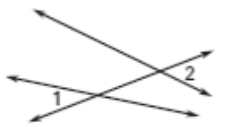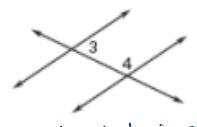$\angle 6 + \angle 8 = 180°$
$\angle 7 + \angle 8 = 180°$
$\angle 5 + \angle 7 = 180°$

Vertical angles
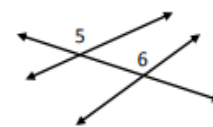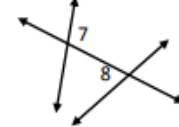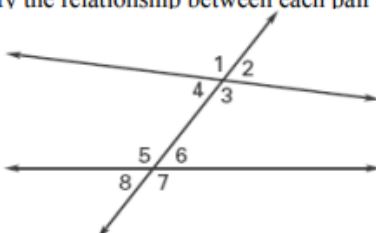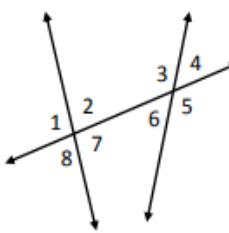
- opposite ∠s with the same vertex

$\angle 1 \cong \angle 4$ $\angle 5 \cong \angle 8$
$\angle 2 \cong 3$ $\angle 6 \cong \angle 7$

Linear Pair

- adjacent ∠s that make a straight line

$\angle 1 + \angle 2 \equiv 180°$
$\angle 1 + \angle 3 = 180°$
$\angle 2 + \angle 4 = 180°$
$\angle 3 + \angle 4 = 180°$

Example 2: Classify the pair of numbered angles.

1.	2.	3.	4.
alternate exterior ∠s	Same-side interior angles	Corresponding ∠s	alternate interior ∠s

5. Identify the relationship between each pair of angles, if any.

1) ∠1 and ∠7
alt. ext. ∠s

2) ∠4 and ∠6
alt. int. ∠s

3) ∠8 and ∠7
Linear Pair

4) ∠3 and ∠8
nothing

5) ∠3 and ∠5
alt. int. ∠s

6) ∠2 and ∠4
Vertica ∠s

6. Identify all pairs of the following angles.

a. Corresponding angles
$\angle 1 \& \angle 3$
$\angle 2 \& \angle 4$
$\angle 8 \& \angle 6$
$\angle 7 \& \angle 5$

b. Alternate interior angles
$\angle 2 \& \angle 6$ $\angle 3 \& \angle 7$

c. Consecutive interior angles (same-side)
$\angle 2 \& \angle 3$, $\angle 7 \& \angle 6$

d. Alternate exterior angles
$\angle 1 \& \angle 5$, $\angle 4 \& \angle 8$

e. Vertical Angles
$\angle 1 \cong \angle 7$, $\angle 2 \cong \angle 8$
$\angle 3 \cong \angle 5$, $\angle 4 \cong \angle 6$

f. Linear Pairs
$\angle 1 + \angle 2 = 180°$ $\angle 3 + \angle 4 = 180°$
$\angle 2 + \angle 7 = 180°$ $\angle 4 + \angle 5 = 180°$
$\angle 7 + \angle 8 = 180°$ $\angle 6 + \angle 5 = 180°$
$\angle 1 + \angle 8 = 180°$ $\angle 3 + \angle 6 = 180°$

WHEN LINES ARE PARALLEL! (Magic happens…HARRY POTTER!)

Corresponding Angles Postulate

If two <u>parallel</u> lines are cut by a <u>transversal</u>, then pairs of corresponding angles are __congruent, ≅__
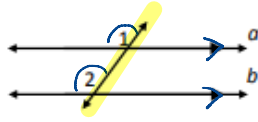
Statements	Reasons
1. $a \parallel b$	1. Given
2. $\angle\,1 \cong \angle\,2$	2. Corresponding ∠s are ≅

Alternate Interior Angles Theorem

If two <u>parallel</u> lines are cut by a transversal, then pairs of alternate interior angles are __congruent__.

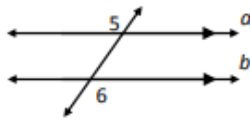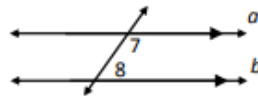| Statements	Reasons
1. $a \parallel b$	1. Given
2. $\angle\,3 \cong \angle\,4$	2. alt. int. ∠s are ≅

Alternate Exterior Angles Theorem

If two <u>parallel</u> lines are cut by a transversal, then pairs of alternate exterior angles are __Congruent__.

| Statements	Reasons
1. $a \parallel b$	1. Given
2. $\angle\,5 \cong \angle\,6$	2. alternate ext. ∠s are ≅

Consecutive Interior Angles Theorem
(same-side)

If two <u>parallel</u> lines are cut by a transversal, then pairs of consecutive interior angles are __supplementary__.

Statements	Reasons
1. $a \parallel b$	1. Given
2. $\angle\,7$ & $\angle\,8$ are supp.	2. same side int. angles are supp
3.	3.

## Example 3: Use the diagram below to find the angle measures. Explain your reasoning.
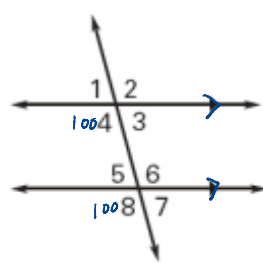
1. If the $m\angle 2 = 113°$, what is the $m\angle 6$?

$m\angle 6 = 113°$
Corresponding ∠s

2. If the $m\angle 4 = 100°$, what is the $m\angle 6$?

$m\angle 6 = 100°$
alternate int. ∠s

3. If the $m\angle 1 = 84°$, what is the $m\angle 3$?

$m\angle 3 = 84°$
Vertical ∠s

4. If the $m\angle 7 = 75°$, what is the $m\angle 1$?

$m\angle 1 = 75°$
alternate exterior angles

5. If the $m\angle 3 = 81°$, what is the $m\angle 4$?

$m\angle 4 = 99°$
linear pair / supplementary

6. If the $m\angle 6 = 111°$, what is the $m\angle 3$? $m\angle 3 = 79°$

Same-side interior angles
or
(consecutative) angles

Example 4: Finding all the angle measures.

If $p \parallel q$ and $m\angle 1 = 75°$, find the measures of <u>all</u> the angles formed by the parallel lines cut by the transversal.
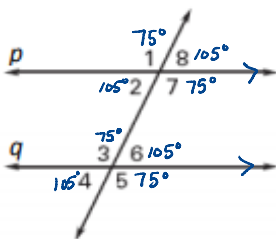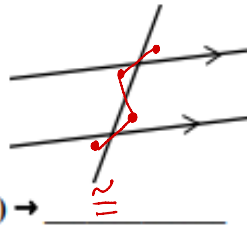
$m\angle 1 = 75°$ $m\angle 2 = 105°$

$m\angle 3 = 75°$ $m\angle 4 = 105°$

$m\angle 5 = 75°$ $m\angle 6 = 105°$

$m\angle 7 = 75°$ $m\angle 8 = 105°$
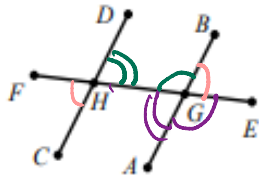
DO YOU NOTICE A PATTERN???? Describe it!

THE HARRY POTTER SCAR!

1. Mark any angle with a dot
2. Find its vertical ∠ and mark it with a dot
3. Copy the same dot pattern on the other parallel
4. Connect the dots

- **If they both have a dot or are both blank (SAME)** → $\underline{\cong}$

- **If one has a dot and the other it blank (DIFFERENT)** → <u>supplementary</u>

Example 5: If $\overline{DC} \parallel \overline{BA}$, are the angles congruent or supplementary?

1. ∠DHG and ∠HGA
   alternate interior ∠s are ≅
2. ∠FHC and ∠DHG
   vertical ∠s are ≅
2. ∠BGE and ∠FHC
   alternate exterior ∠s are ≅
3. ∠EGA and ∠GHC
   corresponding ∠s are ≅
4. ∠AGH and ∠EGA
   Linear pairs have a sum 180°
5. ∠DHG and ∠BGH
   same-side interior ∠s are supplementary

Example 6: Solve for x and explain your reasoning.

1.

$17x - 4 = 132°$

$12 + 15x = 132°$

Corresponding ∠s are ≅

$17x - 4 = 12 + 15x$

$17x - 15x = 12 + 4$

$\dfrac{2x}{2} = \dfrac{16}{2}$

$\boxed{x = 8}$

$17(8) - 4 = 132°$ $12 + 15(8) = 132°$

2.

$x + 67 = 60°$

$x + 127 = 120°$

same-side interior ∠s are supplementary

$(x + 67) + (x + 127) = 180°$

$2x + 194 = 180°$

$2x = -14$

$\boxed{x = -7}$

3.

$15x - 5$

$13x + 5$

$15x - 5 = 13x + 5$

$15x - 13x = 5 + 5$

$\dfrac{2x}{2} = \dfrac{10}{2}$

$\boxed{x = 5}$

4.

$14x + 7$

$10x + 5$

$14x + 7 + 10x + 5 = 180°$

$24x + 12 = 180°$

$\dfrac{24x}{24} = \dfrac{168}{24}$

$\boxed{x = 7}$

5.

$(3x - 7)°$

$(x + 5)°$

$3x - 7° + x + 5 = 180°$

$4x - 2 = 180°$

$\dfrac{4x}{4} = \dfrac{182}{4}$

$\boxed{x = 45.5}$

6.

$(4x - 8)°$

$(3x + 10)°$ $(11x + 2y)°$

$4x - 8 = 3x + 10$

$4x - 3x = 8 + 10$

$\boxed{x = 18}$

$64°$ $11(18) + 2(-41)$

$198 - 82$

$116°$

$3x + 10 + 11x + 2y = 180$

$14x + 10 + 2y = 180$

$14(18) + 10 + 2y = 180$

$252 + 10 + 2y = 180$

$262 + 2y = 180$

$2y = -82$

$y = -41$