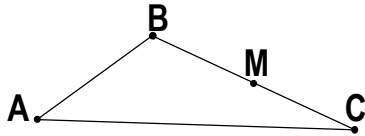(DN) Draw a diagram like the one below. Make sure that M is the midpoint of segment BC. Trace the triangle on a plastic sheet and rotate 180° around point M. Draw the rotation of the triangle on your paper. What do you notice about points B and C?
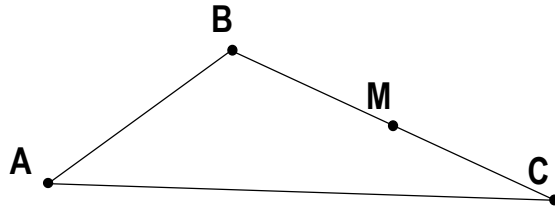
Name _____**Per**_____

LO: I can prove that the sum of the angles is 180° and use that information to solve problems.

☐ **(1)**   **Angles: Rotations and angle measures**

transparencies, dry erase markers, erasers compass

☐ Construct 180° rotation of △ABC around point midpoint M. Lightly shade △A' B' C'
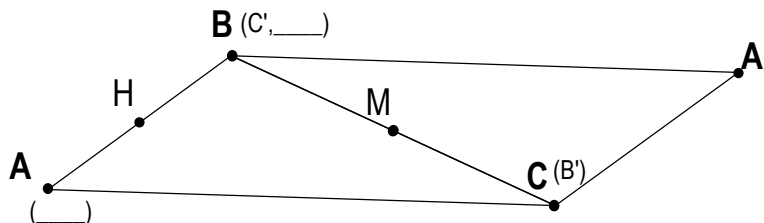
☐ (a) Mark congruent angles in the diagram above.

☐ (b) List the pairs of congruent angles: _____ _____ _____

☐ (c) Name the angle relationship between ∠BCA and ∠CBA':

_____

☐ (d) $\overline{AC} \parallel \overline{C'A'}$ because ∠BCA and ∠CBA' are _____ _____

_____ _____

☐ **(2)**

transparencies, dry erase markers, erasers compass

Angles: Rotations and angle measures

☐ Construct 180° rotation of △ABC around point midpoint H. Lightly shade △A"B"C".

B (C',___)
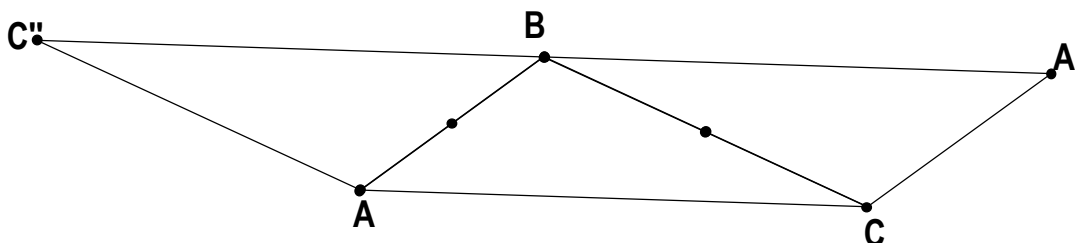
A'

H

M

A

C (B')

(___)

☐ (a) Mark congruent angles in the diagram above.

☐ (b) List the pairs of congruent angles from this rotation: _____ _____ _____

☐ (c) Name the angle relationship between ∠BAC and ∠ABC":

_____

☐ (d) $\overline{AC} \parallel \overline{C"B}$ because ∠BAC and ∠ABC" are _____ _____

_____ _____

☐ **(3)**

transparencies, dry erase markers, erasers compass

Angles: Rotations and proving the sum of the interior angles of a triangle

C"

B

A'

A

C

☐ (a) In problem #2(d), you stated that ∠BAC ≅ ∠ABC". Mark them congruent in the diagram above. (yellow)

☐ (b) In problem #1(d), you stated that ∠BCA ≅ ∠CBA'. Mark them congruent in the diagram above. (pink)

☐ (c) ∠C"BA' is a _____ angle which means that m∠ABC" + m∠ABC + m∠CBA' = _____

☐ (d) If m∠ABC" + m∠ABC + m∠CBA' = _____ then we can **substitute** equal values into the equation

⬇   ⬇

_____ + m∠ABC + _____ = _____

REMEMBER
∠BAC ≅ ∠ABC" (part a)
∠BCA ≅ ∠CBA' (part b)

☐ (e) ∠BAC, ∠ABC, ∠BCA are the three angles in the triangle.

You have just proven the **triangle sum theorem**: *the sum of the angles in any triangle is* _____

☐ (4)

transparen
cies, dry
erase
markers,
erasers
compass

Angles: Rotations and angle measures

☐ **Exterior angles** of triangles.

☐ (a) The angles inside a triangle are called **interior angles**. The angles formed by the extension of a side of a triangle are called **exterior angles**.

The **interior angles** in the diagram at right are _____, _____, and _____

The **exterior angles** in the diagram at right are _____, _____, and _____

☐ (b) Provide a reason for each step below.

a + d = 180° _____

↳ d = **180° – a** _____

a + b + c = 180° _____

↳ b + c = **180° – a** _____

Because   d = **180° – a**

and   b + c = **180° – a**

d = _____ by substitution

The **exterior angle theorem** states that

*the measure of an **exterior angle** of a triangle is equal to the sum of the **remote interior angles**.* (picture yourself at b and your friend at c sitting on the couch using a remote to control the television at d).

☐ (c) Write equations for the other two **exterior angles**.

_____   AND

_____
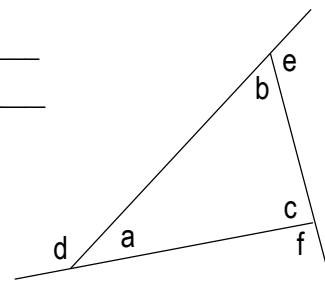
☐ **Isosceles triangles**

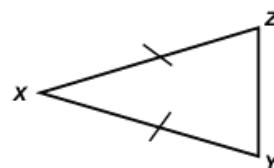☐ (a) Is there a way to fold **isosceles triangle** XYZ exactly in half?_____
Draw a line where the crease would be.

Complete each congruence statement $\overline{XY} \cong$ _____ $\angle Y \cong$ _____

$\angle Y$ and $\angle Z$ are called **base angles**. **Base angles** of isosceles triangles are always
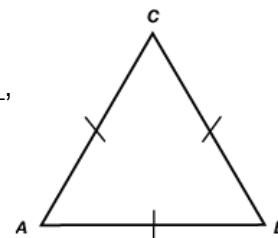
_____.

$\angle X$ is called the **vertex angle**.

☐ **Equilateral Triangles**

☐ (b) How many ways can **equilateral triangle** ABC be folded exactly in half?_____

Complete the congruence statement $\angle A \cong$ _____ $\cong$ _____

Since all of the angles in an equilateral triangle are _____,

each angle in an equilateral triangle always measures _____

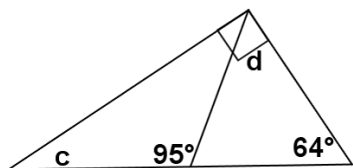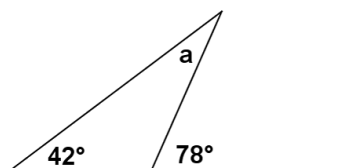☐ (4) **Angles: Using Triangle Sum**

transparencies, dry erase markers, erasers compass

☐ Use the triangle sum theorem and your angle notes sheet to name a relationship, write an equation, and solve the problem. Mention parallel lines when needed. REMEMBER: Reasons can ONLY include relationships to angles that are already known. Add auxiliary lines if necessary. Do 8 of the 14 problems below.
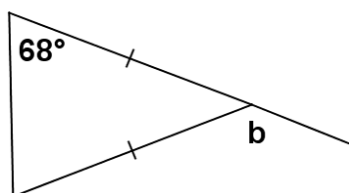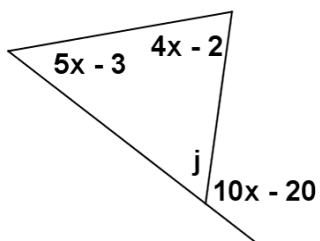
☐ (a)
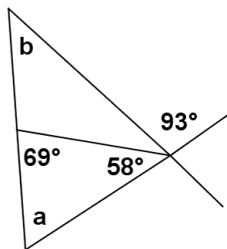
_____because_____

_____

_____

_____

_____

_____

_____

☐ (b)

_____because_____

_____

_____

_____

_____

_____

☐ (c)

_____because_____

_____

_____

_____

_____

_____

☐ (4) **Angles: Using Triangle Sum**
cont.

☐ (d)

68°

b

_____because_____

☐ (e)

5x - 3   4x - 2

j

10x - 20

_____because_____

☐ (f)

72°

30°   h   25°

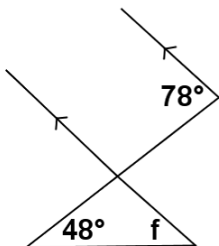_____because_____

☐ (g)

34°

115°

e   30°
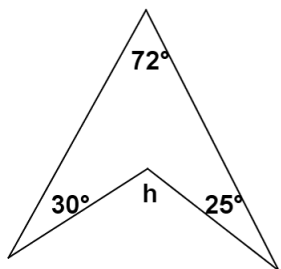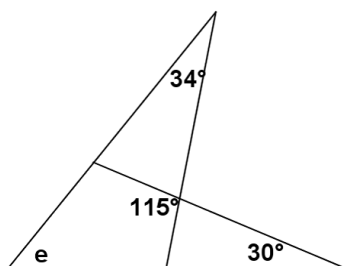
_____because_____

☐ (4) **Angles: Using Triangle Sum**
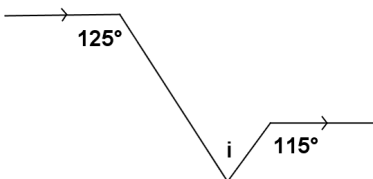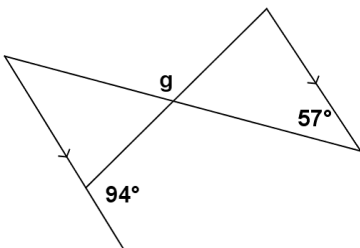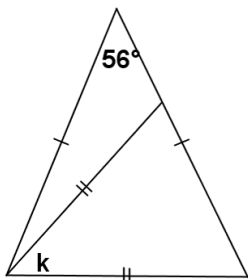cont.

☐ (h)

_____because_____

☐ (i)

_____because_____

☐ (j)

_____because_____

☐ (k)

_____because_____

☐ **(4)** **Angles: Rotations and angle measures**
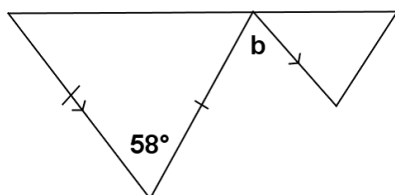cont.

☐ (l)

95°

39°

a

_____because_____
_____
_____
_____
_____
_____
_____

☐ (m)

b

58°

_____because_____
_____
_____
_____
_____
_____
_____

☐ (n)

2x + 9   3x - 1

c

x + 12

42°
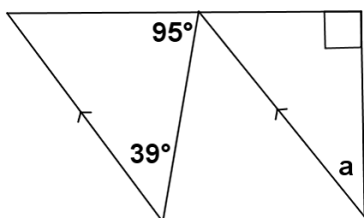
_____because_____
_____
_____
_____
_____
_____
_____

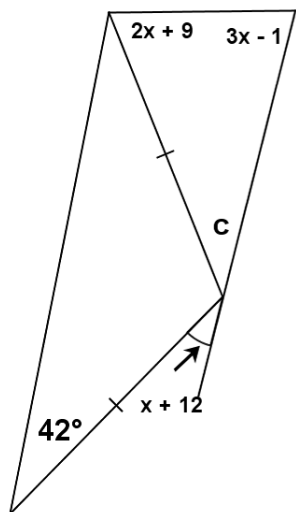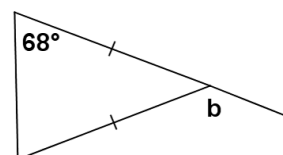**Exit Ticket**

Find the unknown angle measure in the diagram. You may want to add letters to
the diagram. You must write down a reason that includes an angle
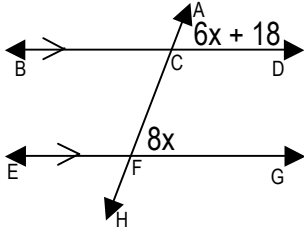relationship for each angle measure you find.
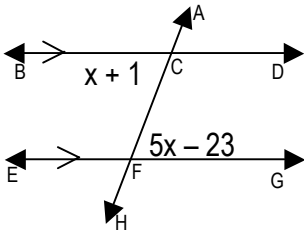
68°

b

Homework Next Page

☐ (4) **Homework** Using all angle relationships. Find the measure of the given angle and explain your reasoning.
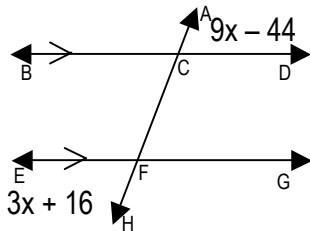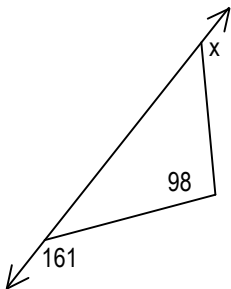cont.

☐ (1) Find the measure of angle ACD

A
6x + 18
B   C   D
8x
E F   G
H

☐ (2) Find the measure of angle BCF

A
B   x + 1 C   D
5x − 23
E   F   G
H

☐ (3) Find the measure of angle BCA

A 9x − 44
B   C   D
E   F   G
3x + 16   H

☐ (4) Find the measure of *x*.

x

98

161

☐ (5) Find the measure of *b*.

65°

b