For STUDENTS: Handout for Session #3

Welcome to our session all about triangles! Today we will explore how triangles are created, explore the special properties that triangles have, and identify patterns with specific types of triangles so we can use them to find solutions to real engineering problems.

Your will need materials in order to participate in all the hands-on fun we have planned for you.
All students will be given new challenges and projects every session! Please make sure that you have these things ready for today:

For the entire Geometry Course – students will be using these materials *DURING* the live classes:

- Math journal, either lined or quadrille (print your own graph paper as needed)
- Pencils and eraser
- Protractor
- Compass (one with a set screw adjustment)
- Ruler (inches and cm) (here is Aurora's favorite)
- Calculator (here is the one Aurora uses during class)

For the Projects (all levels) – students will be using these materials *AFTER* the live classes:

Session #3: Triangles

- Popsicle sticks (get a box of at least 300)
- Hot glue (low temperature, kid-friendly) with glue sticks
- Bucket (1 or 5 gallon)
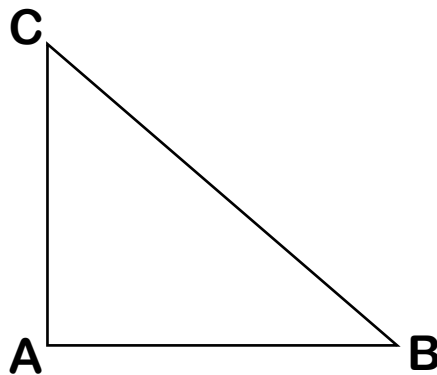- Kitchen scale (grams)
- Bathroom scale (kg or pounds)

Quick Review:

1. Construct an equilateral triangle using your compass:

2. Label each vertex (use *A, B, C*).

3. Find the center of the triangle above, label it point *P*.

4. Measure one angle inside your triangle above: _____

5. Which sides are congruent? _____

6. Which angles are congruent? _____

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1. For the triangle below: bisect ∠ABC:

Session #3: Triangles

Today we will explore how triangles are built and discover the special properties triangles have that make them so useful, and we will finish with a special Math Challenge!

A **TRIANGLE** is a shape with three sides and three vertices.	A **VERTEX** (plural = *vertices*) is the point of *intersection* of 2 or more segments, lines and/or rays.
AN EQUILATERAL TRIANGLE has three equal sides *and* three equal angles.	An **ISOSCELES TRIANGLE** has two sides and two angles that are the same.

A RIGHT TRIANGLE has one right angle. Right angles always measure exactly 90º.	A **SCALENE TRIANGLE** has no equal sides and no equal angles.
AN ACUTE TRIANGLE has three angles that all measure less than 90º.	**AN OBTUSE TRIANGLE** has one angle measuring more than 90º.

ALL ANGLES in a triangle sum to 180º.	**Construct triangle ABC** with side length $\overline{AB}$ = 3 cm and ∠ABC = 40° and ∠BAC = 70°.
	Measure & label all sides and angles.
	Type of triangle? _____

Construct triangle DEF with side length $\overline{DE}$ = 4 inches and ∠DEF = 35° and ∠EDF = 55°.
What are the unknown lengths and angle?

Construct triangle ABC with side lengths: 3cm, 4cm and 5cm.	**Construct triangle ABC** with angles: ∠A = 45° ∠B = 45° ∠C = 90°
How many triangles can you make that satisfy the conditions?	How many triangles can you make that satisfy the conditions?

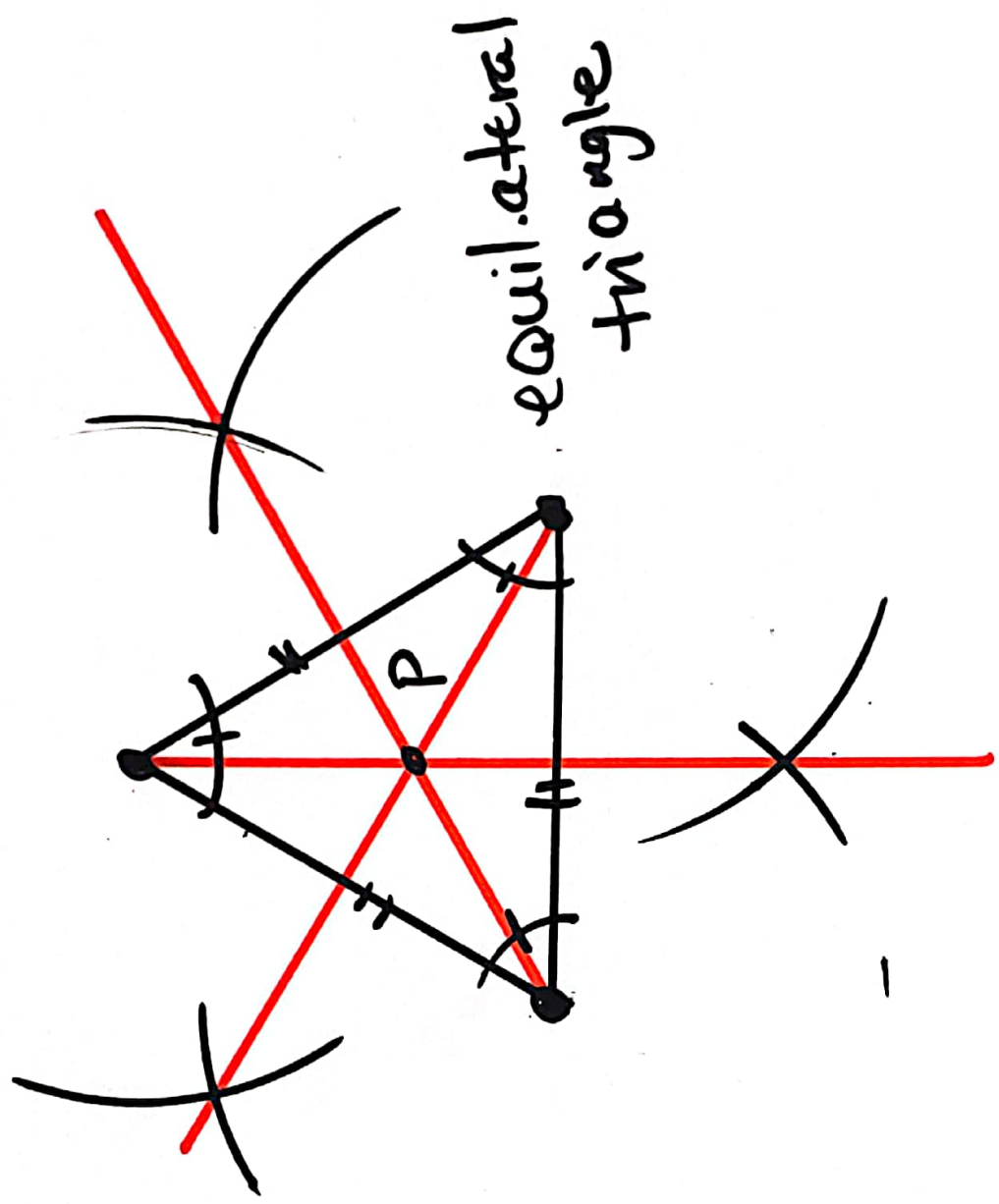**The IMPOSSIBLE Triangle:**

Quick Review:
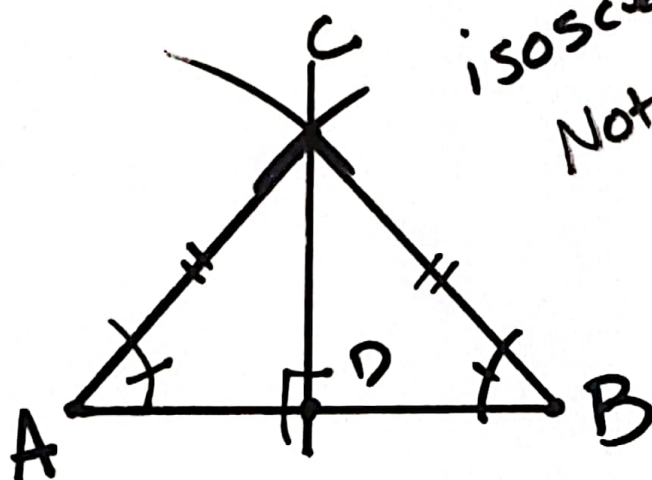
1. Construct an equilateral triangle using your compass:

isosceles!.
Not an
equilateral ...
(cont'd)

2. Label each vertex (use *A, B, C*).

3. Find the center of the triangle above, label it point *P*.

4. Measure one angle inside your triangle above: ___**60°**___

5. Which sides are congruent? ___**all**___

6. Which angles are congruent? ___**all**___

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1. For the triangle below: bisect ∠ABC:
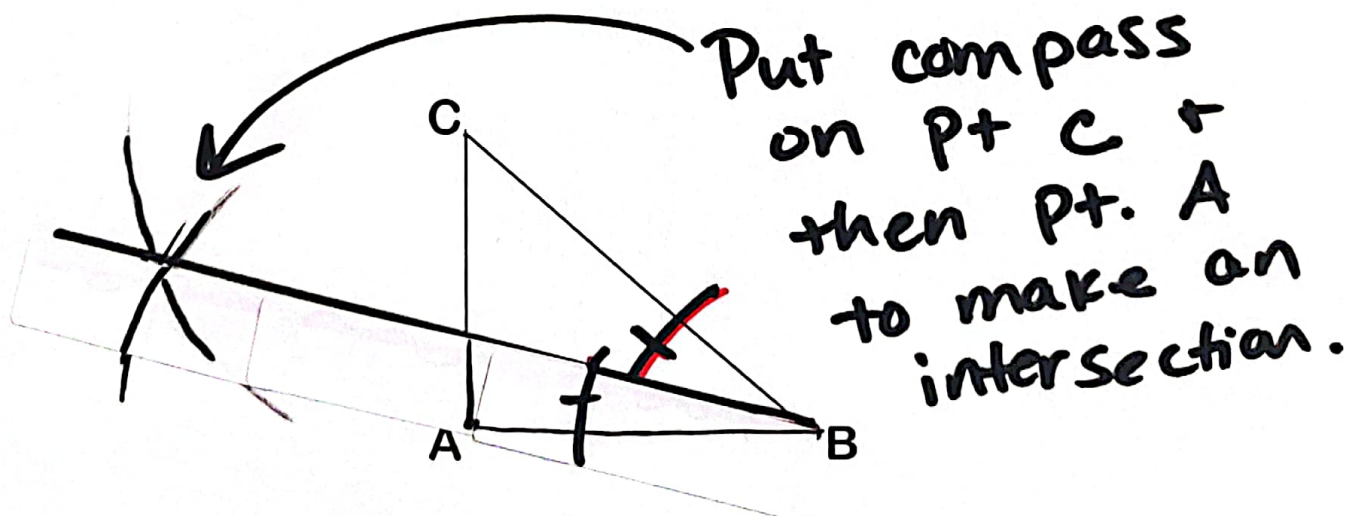
Put compass
on Pt C +
then Pt. A
to make an
intersection.

equilateral triangle

P

Session #3: Triangles

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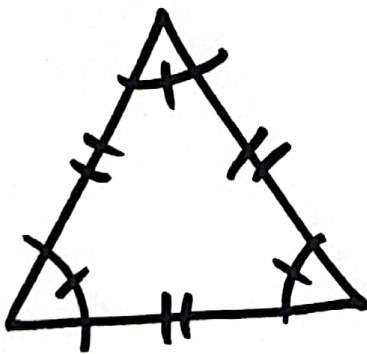
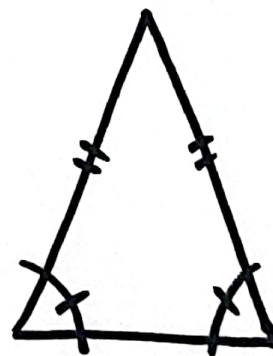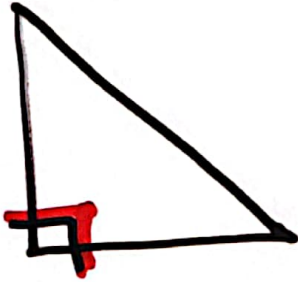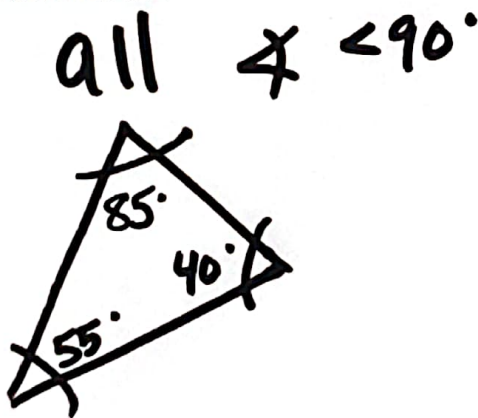|	
A **TRIANGLE** is a shape with three sides and three vertices.	A **VERTEX** (plural = *vertices*) is the point of *intersection* of 2 or more segments, lines and/or rays.
AN EQUILATERAL TRIANGLE has three equal sides *and* three equal angles. $\angle = 60°$	An **ISOSCELES TRIANGLE** has two sides and two angles that are the same.

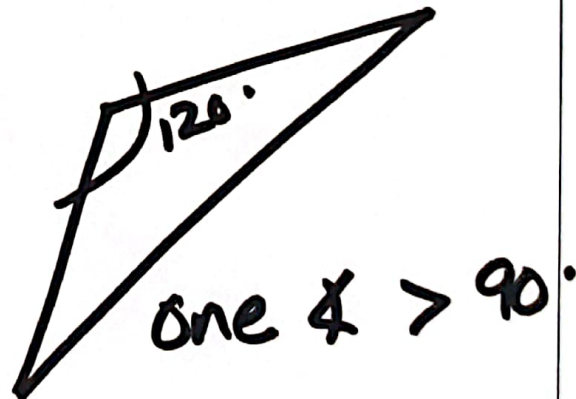**A RIGHT TRIANGLE** has one right angle. Right angles always measure exactly 90°.

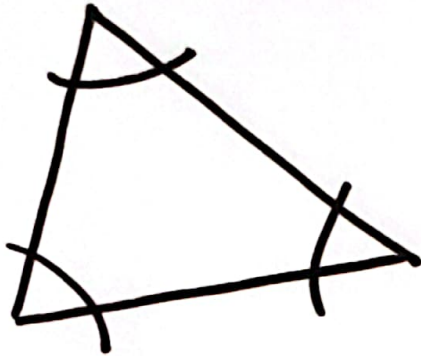**A SCALENE TRIANGLE** has no equal sides and no equal angles.

4"   80°   5"
70°
30°
6"
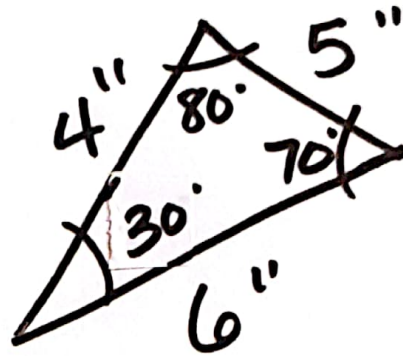
AN ACUTE TRIANGLE has three angles that all measure less than 90°.

all ∡ <90°

85°
40°
55°

AN OBTUSE TRIANGLE has one angle measuring more than 90°.

120°

one ∡ > 90°

#1

ALL ANGLES in a triangle sum to 180°.

sum to 180°
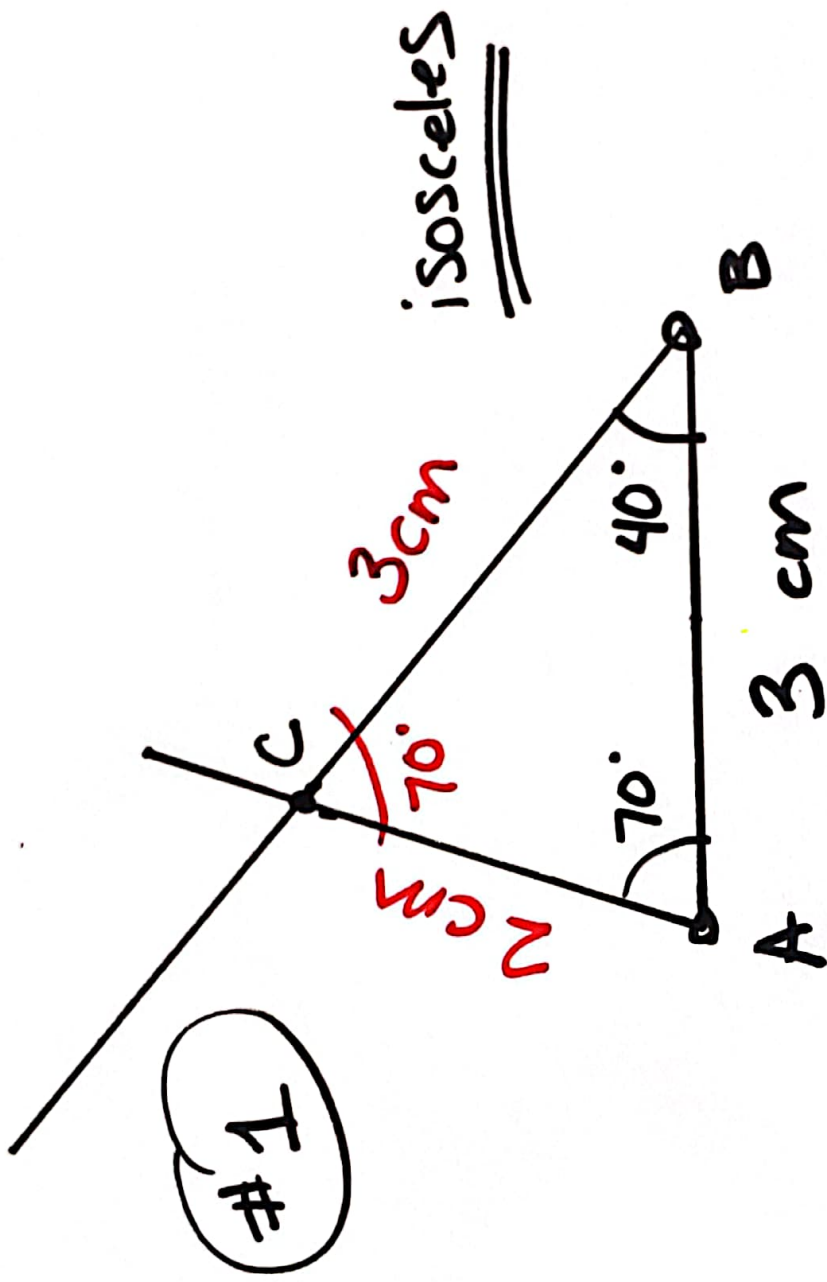
Construct triangle ABC with side length
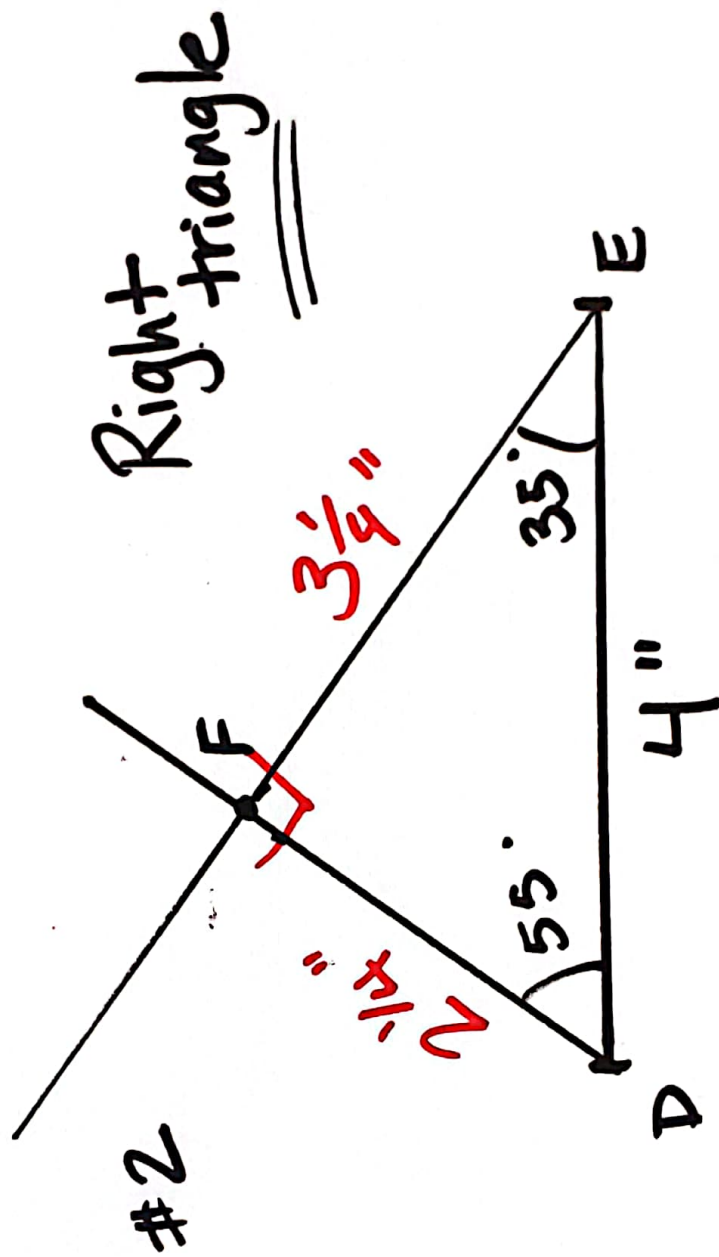$\overline{AB}$ = 3 cm and ∠ABC = 40° and ∠BAC = 70°.
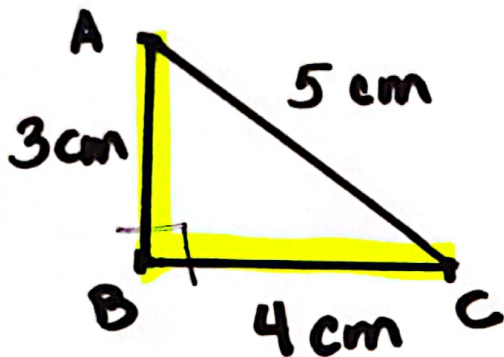
Measure & label all sides and angles.

Type of triangle? _____

#2

Construct triangle DEF with side length $\overline{DE}$ = 4 inches and ∠DEF = 35° and ∠EDF = 55°.
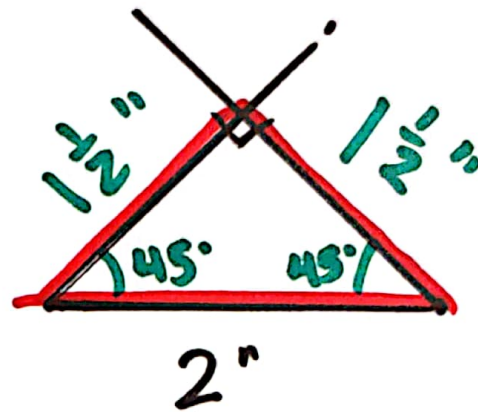What are the unknown lengths and angle?

isosceles

#1

3cm

2 cm

C

70°

70°

40°

A

B

3 cm

3

Right triangle

#2

F

3½"

2¼"

55°

35°

4"

D

E

Construct triangle ABC with side lengths:
3cm, 4cm and 5cm.

A

5 cm

3cm

B

4 cm   C

1 unique
△

How many triangles can you make
that satisfy the conditions?

Construct triangle ABC with angles:
$\angle A = 45°$ $\angle B = 45°$ $\angle C = 90°$

$1\frac{1}{2}$ " $1\frac{1}{2}$ "

45°   45°

2 "

a lot

How many triangles can you make
that satisfy the conditions?

The IMPOSSIBLE Triangle: If the sum of 2 sides
is ≤ 3rd = impossible !!

2   ✓ 13

8

5   6   ✗

13

3   4
✗
10

6   ✓ 6

6

✗ 8
2
6