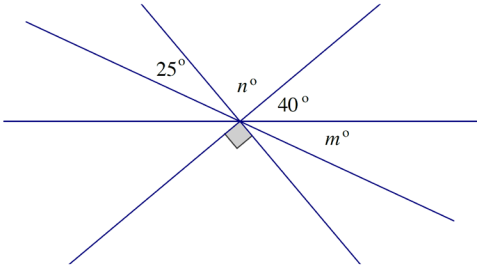
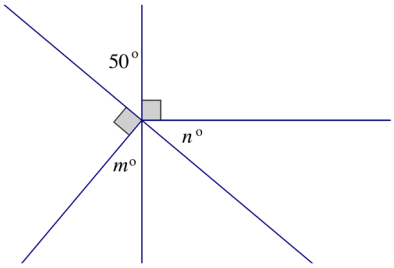
Name _____ Date _____

1. In each problem, set up and solve an equation for the unknown angles.

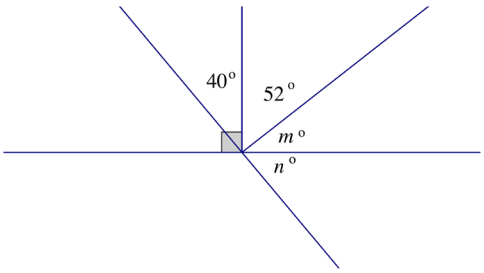
   a. Four lines meet at a point. Find the measures of m and n.



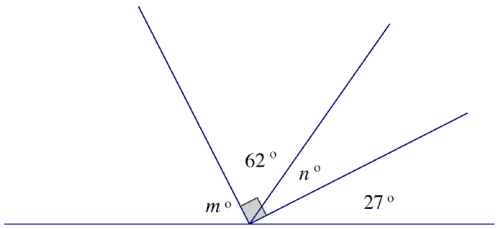
   b. Two lines meet at the vertex of two rays. Find the measures of m and n.



   c. Two lines meet at a point that is the vertex of two rays. Find the measures of m and n.



d. Three rays have a common vertex on a line. Find the measures of m and n.



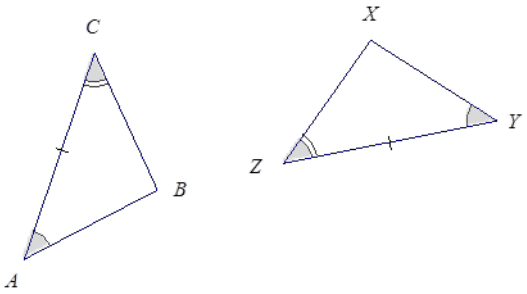
2. Use tools to construct a triangle based on the following given conditions.

a. If possible, use your tools to construct a triangle with angle measurements $20°$, $55°$, and $105°$ and leave evidence of your construction. If it is not possible, explain why.

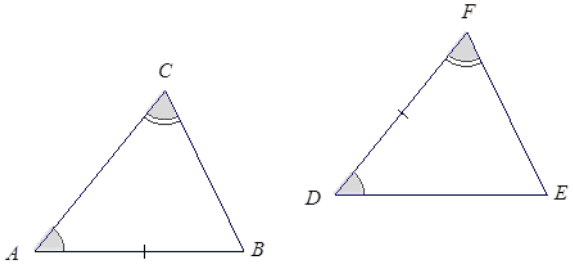
b. Is it possible to construct two different triangles that have the same angle measurements? If it is, construct examples that demonstrate this condition, and label all angle and length measurements. If it is not possible, explain why not.

3. In each of the following problems two triangles are given. For each: (1) state if there are sufficient or insufficient conditions to show the triangles are identical, and (2) explain your reasoning.

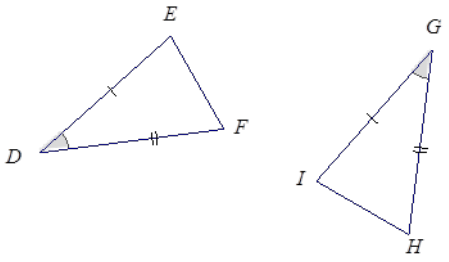
a.



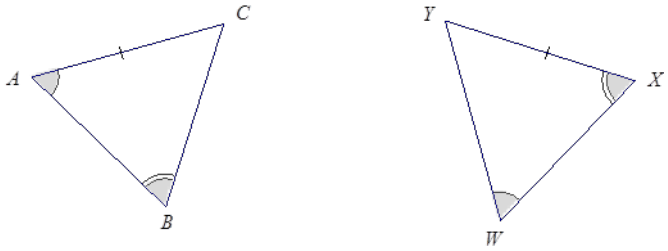
b.



c.



d.



4. Use tools to draw rectangle $ABCD$ with $AB = 2$ cm and $BC = 6$ cm. Label all vertices and measurements.

5. The measures of two complementary angles have a ratio of $3 : 7$. Set up and solve an equation to determine the measurements of the two angles.

6. The measure of the supplement of an angle is $12°$ less than the measure of the angle. Set up and solve an equation to determine the measurements of the angle and its supplement.

7. Three angles are at a point. The ratio of two of the angles is $2:3$, and the remaining angle is $32°$ more than the larger of the first two angles. Set up and solve an equation to determine the measures of all three angles.

8. Draw a right triangle according to the following conditions, and label the provided information. If it is not possible to draw the triangle according to the conditions, explain why not. Include a description of the kind of figure the current measurements allow. Provide a change to the conditions that makes the drawing feasible.

   a. Construct a right triangle $\triangle ABC$ so that $AB = 3$ cm, $BC = 4$ cm, and $CA = 5$ cm; the measure of angle B is $90°$.

   b. Construct triangle $\triangle DEF$ so that $DE = 4$ cm, $EF = 5$ cm, and $FD = 11$ cm; the measure of angle D is $50°$.

A Progression Toward Mastery					
Assessment Task Item		**STEP 1** Missing or incorrect answer and little evidence of reasoning or application of mathematics to solve the problem.	**STEP 2** Missing or incorrect answer but evidence of some reasoning or application of mathematics to solve the problem.	**STEP 3** A correct answer with some evidence of reasoning or application of mathematics to solve the problem, or an incorrect answer with substantial evidence of solid reasoning or application of mathematics to solve the problem.	**STEP 4** A correct answer supported by substantial evidence of solid reasoning or application of mathematics to solve the problem.
1	a 7.G.B.5	Student sets up correct equations to solve for m and n, but no further evidence is shown.	Student finds incorrect values for m and n, but complete supporting work is shown; conceptual errors, such as an equation that does not reflect the angle relationship, lead to incorrect answers.	Student finds one correct value for either m or n. Complete supporting work is shown, but a calculation error, such as an arithmetic error, leads to one incorrect answer.	Student finds $m = 25°$, $n = 90°$, and shows complete supporting work, including an equation that appropriately models the angle relationship(s) and a correct algebraic solution.
	b 7.G.B.5	Student sets up the correct equations to solve for m and n, but no further evidence is shown.	Student finds incorrect values for m and n, but complete supporting work is shown; conceptual errors, such as an equation that does not reflect the angle relationship, lead to incorrect answers.	Student finds one correct value for either m or n. Complete supporting work is shown, but a calculation error, such as an arithmetic error, leads to one incorrect answer.	Student finds $m = 40°$, $n = 40°$, and shows complete supporting work, including an equation that appropriately models the angle relationship(s) and a correct algebraic solution.
	c 7.G.B.5	Student sets up the correct equations to solve for m and n but no further evidence is shown.	Student finds incorrect values for m and n, but complete supporting work is shown; conceptual errors, such as an equation that does not reflect the angle relationship, lead to incorrect answers.	Student finds one correct value for either m or n. Complete supporting work is shown, but a calculation error, such as an arithmetic error, leads to one incorrect answer.	Student finds $m = 38°$, $n = 50°$,and shows complete supporting work, including an equation that appropriately models the angle relationship(s) and a correct algebraic solution.

	d **7.G.B.5**	Student sets up the correct equations to solve for m and n, but no further evidence is shown.	Student finds incorrect values for m and n, but complete supporting work is shown; conceptual errors, such as an equation that does not reflect the angle relationship, lead to incorrect answers.	Student finds one correct value for either m or n. Complete supporting work is shown, but a calculation error, such as an arithmetic error, leads to one incorrect answer.	Student finds $m = 63°$, $n = 28°$, and shows complete supporting work, including an equation that appropriately models the angle relationship(s) and a correct algebraic solution.
2	**a** **7.G.A.2**	Student constructs a triangle with angle measurements that are off by more than $3°$ of the given measurements, with the intersection of two extended sides of two angles shown as the location of the last vertex.	Student constructs a triangle with the given angle measurements, but no evidence of the construction is provided.	Student constructs a triangle with angle measurements that are not exact but are within $3°$ of the given measurements, with the intersection of two extended sides of two angles shown as the location of the last vertex.	Student constructs a triangle with the given angle measurements, with the intersection of two extended sides of two angles shown as the location of the last vertex.
	b **7.G.A.2**	Student constructs two triangles, but with corresponding angle measurements that are that are off by more than $3°$ of each other, and different corresponding side lengths.	Student provides no examples, but answer does contain a verbal description stating that triangles that are scale drawings of each other have the same angle measurements and corresponding side lengths that are proportional.	Student constructs two triangles; however, the corresponding angle measurements are not exactly equal to each other but are within $3°$ of each other and have different corresponding side lengths.	Student constructs two triangles that both have the same set of angle measurements, but different corresponding side lengths.
3	**a** **7.G.A.2**	Student response is missing or fails to provide evidence of comprehension.	Student correctly identifies triangles as identical or not identical, but no further evidence is provided.	Student correctly identifies triangles as identical or not identical, but with the incorrect supporting evidence, such as the incorrect condition by which they are identical.	Student correctly identifies triangles as identical or not identical and supported with appropriate evidence, such as the condition by which they are identical or the information that prevents them from being identical.
	b	Student response is missing or fails to provide evidence of comprehension.	Student correctly identifies triangles as identical or not identical, but no further evidence is provided.	Student correctly identifies triangles as identical or not identical but with the incorrect supporting evidence, such as the incorrect condition by which they are identical.	Student correctly identifies triangles as identical or not identical and supported with appropriate evidence, such as the condition by which they are identical or the information that prevents them from being identical.

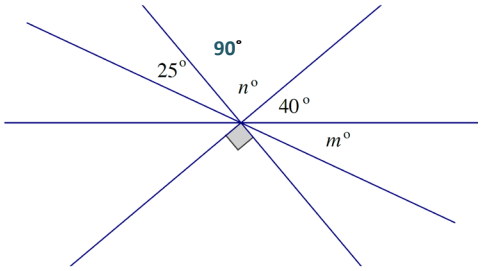
	c	Student response is missing or fails to provide evidence of comprehension.	Student correctly identifies triangles as identical or not identical, but no further evidence is provided.	Student correctly identifies triangles as identical or not identical, but with the incorrect supporting evidence, such as the incorrect condition by which they are identical.	Student correctly identifies triangles as identical or not identical and supported with appropriate evidence, such as the condition by which they are identical or the information that prevents them from being identical.
	d	Student response is missing or fails to provide evidence of comprehension.	Student correctly identifies triangles as identical or not identical, but no further evidence is provided.	Student correctly identifies triangles as identical or not identical but with the incorrect supporting evidence, such as the incorrect condition by which they are identical	Student correctly identifies triangles as identical or not identical and supported with appropriate evidence, such as the condition by which they are identical or the information that prevents them from being identical.
4	**7.G.A.2**	Student response has inaccurate measurements and is missing labeling.	Student response shows a drawing with errors in the measurements of the provided sides and angle, but has all the provided information labeled in the figure.	Student response shows a drawing that is accurate in measurements but is missing labeling in the figure.	Student response shows all provided information labeled and accurately drawn rectangle with dimensions 2 cm and 6 cm.
5	**7.G.B.5**	Student finds incorrect angle measurements because the equations were incorrectly set up and the supporting work is incorrect.	Student finds one or both angle measurements incorrectly due to conceptual errors, such as an equation that does not reflect the angle relationship. All other supporting work is correct and shown.	Student finds one or both angle measurements incorrectly due to errors in calculation, such as an arithmetic error, but all other supporting work is correct and shown.	Student finds the two angle measurements to be $27°$ and $63°$ and shows all and complete supporting work, including an equation that appropriately models the angle relationship(s) and a correct algebraic solution.
6	**7.G.B.5**	Student finds incorrect angle measurements because the equations were incorrectly set up and the supporting work is incorrect.	Student finds one or both angle measurements incorrectly due to conceptual errors, such as an equation that does not reflect the angle relationship. All other supporting work is correct and shown.	Student finds one or both angle measurements incorrectly due to errors in calculation, such as an arithmetic error, but all other supporting work is correct and shown.	Student finds the two angle measurements to be $96°$ and $84°$ are correct and shows complete supporting work, including an equation that appropriately models the angle relationship(s) and a correct algebraic solution.

7	**7.G.B.5**	Student finds incorrect angle measurements because the equations were incorrectly set up and the supporting work is incorrect.	Student finds one, two, or all three angle measures incorrectly due to conceptual errors, such as an equation that does not reflect the angle relationship. All other supporting work is correct and shown.	Student finds one, two, or all three angle measurements incorrectly due to errors in calculation, such as an arithmetic error, but all other supporting work is correct and shown.	Student finds the three angle measurements to be $82°$, $123°$, and $155°$ and shows complete supporting work, including an equation that appropriately models the angle relationship(s) and a correct algebraic solution.
8	**a** **7.G.A.2**	Student response has inaccurate measurements and is missing labeling.	Student response shows a drawing that has errors in the measurements of the provided sides and angle, but has all the provided information labeled in the figure.	Student response shows a drawing that is accurate in measurements but is missing labeling in the figure.	Student response shows all provided information labeled, and has an accurately drawn right triangle with lengths 3 cm, 4 cm, and 5 cm and $\angle B = 90°$.
	b **7.G.B.5**	Student response indicates the triangle cannot be drawn, but provides no further evidence of understanding and fails to include a description of the figure formed by the current measurements, and no alteration to one of the measurements such that the triangle can be drawn under is provided.	Student response clearly indicates that the triangle cannot be drawn because the sum of the lengths of the two smaller sides, DE and EF, is less than the length of the third side, FD, but fails to include a description of the figure formed by the current measurements, and no alteration to one of the measurements such that the triangle can be drawn under is provided.	Student response clearly indicates that the triangle cannot be drawn because the sum of the lengths of the two smaller sides, DE and EF, is less than the length of the third side, FD, but fails to include a description of the figure formed by the current measurements, or no alteration to one of the measurements such that the triangle can be drawn under is provided.	Student response clearly indicates that the triangle cannot be drawn because the sum of the lengths of the two smaller sides, DE and EF, is less than the length of the third side, FD. The response should include some description of the two smaller sides as being unable to meet because their lengths are less than that of the third side. The response includes an alteration to one of the measurements so that the triangle can be drawn, i.e. to one of the two smaller side lengths is increased so that the sum of the two smaller lengths is greater than 11 cm, or the side FD is decreased to less than 9 cm.

Name _____ Date _____

1. In each problem, solve for the measures of m and n.

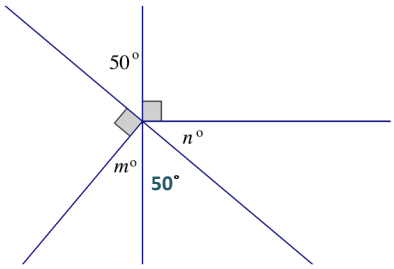
a. Four lines meet at a point.



n=90°, vertical angles

25 + (90) + 40 + m = 180
155 + m = 180
155 − 155 + m = 180 − 155
m = 25°

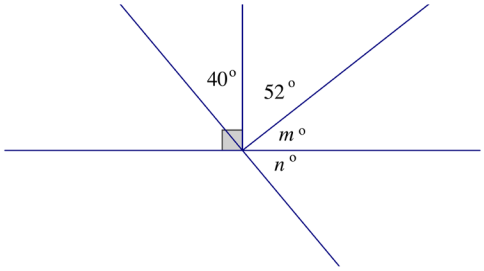
b. Two lines meet at the vertex of two rays.



50 + 90 + n = 180
140 + n = 180
140 − 140 + n = 180 − 140
n = 40°

m + 50 = 90
m + 50 − 50 = 90 − 50
m = 40°

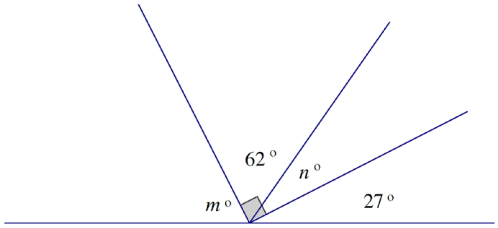
c. Two lines meet at a point that is the vertex of two rays.



m + 52 = 90
m + 52 − 52 = 90 − 52
m = 38°

40 + 52 + (38) + n = 180
130 + n = 180
130 − 130 + n = 180 − 130
n = 50°

d. Three rays have a common vertex on a line.



$n + 62 = 90$

$n + 62 - 62 = 90 - 62$

$n = 28°$

$m + 62 + (28) + 27 = 180$

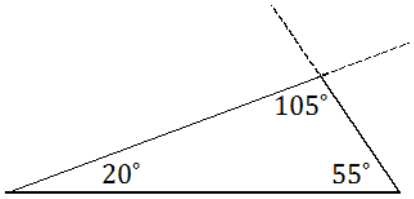
$m + 117 - 117 = 180 - 117$

$m = 63°$

2. Use tools to construct a triangle based on the following given conditions.

a. If possible, use your tools to construct a triangle with angle measurements $20°$, $55°$, and $105°$ and leave evidence of your construction. If it is not possible, explain why.

Solutions will vary. An example of a correctly constructed triangle is shown here.

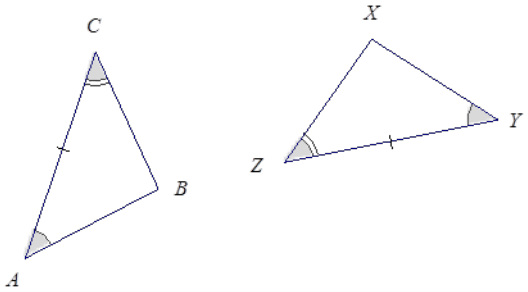


b. Is it possible to construct two different triangles that have the same angle measurements? If it is, construct examples that demonstrate this condition and label all angle and length measurements. If it is not possible, explain why not.

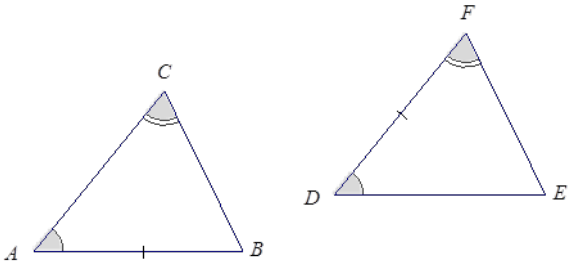
Solutions will vary; refer to rubric.

3. In each of the following problems two triangles are given. For each: (1) state if there are sufficient or insufficient conditions to show the triangles are identical, and (2) explain your reasoning.

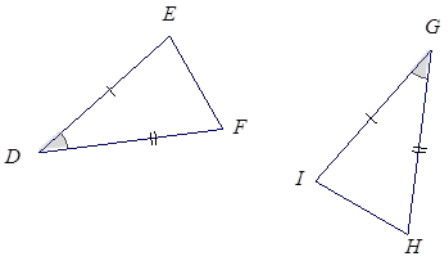
a. The triangles are identical by the two angles and corresponding side condition. The marked side is between the given angles. $\triangle ABC \leftrightarrow \triangle YXZ$.



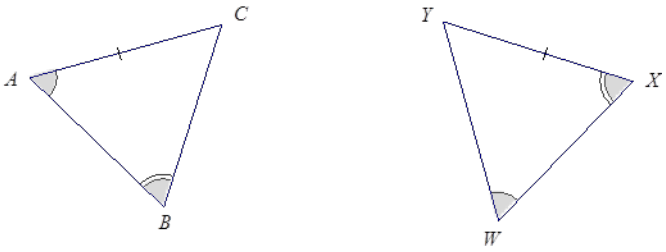
b. There is insufficient evidence to determine that the triangles identical. In $\triangle DEF$, the marked side is between the marked angles but in $\triangle ABC$, the marked side is not between the marked angles.



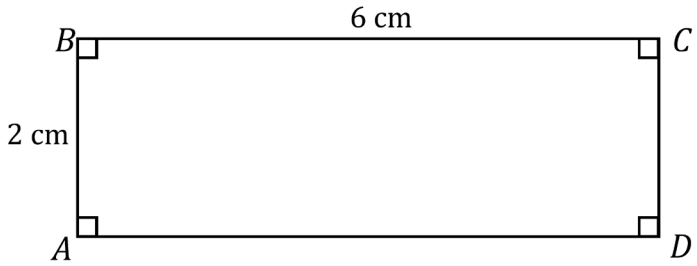
c. The triangles are identical by the two sides and included angle condition. $\triangle DEF \leftrightarrow \triangle GIH$.



d. The triangles are not identical. In $\triangle ABC$, the marked side is opposite $\angle B$. In $\triangle WXY$, the marked side is opposite $\angle W$. $\angle B$ and $\angle W$ are not necessarily equal in measure.



4. Use tools to draw rectangle $ABCD$ with $AB = 2$ cm and $BC = 6$ cm. Label all vertices and measurements.



5. The measures of two complementary angles have the ratio of $3:7$. Find the measures of the two angles.

$3x + 7x = 90$

$10x = 90$

$\left(\frac{1}{10}\right)10x = \left(\frac{1}{10}\right)90$

$x = 9$

Measure of Angle 1 = $3(9) = 27°$

Measure of Angle 2 = $7(9) = 63°$

6. The measure of the supplement of an angle is 12° less than the measure of the angle in degrees. Find the measure of the angle and its supplement.

Let y be the number of degrees in the angle.

$$y + (y - 12) = 180$$
$$2y - 12 = 180$$
$$2y - 12 + 12 = 180 + 12$$
$$2y = 192$$
$$\left(\frac{1}{2}\right)2y = \left(\frac{1}{2}\right)192$$
$$y = 96$$

The measure of $y = 96°$; the measure of the supplement of y: $(96) - 12 = 84°$.

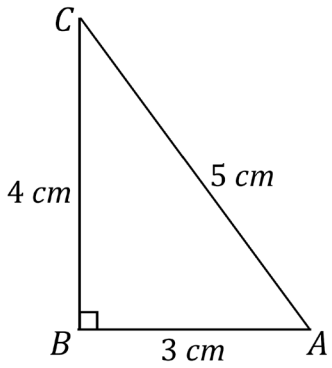
7. Three angles are at a point. The ratio of two of the angles is 2: 3, and the remaining angle is 32° more than the larger of the first two angles. Find the measures of all three angles.

$$2x + 3x + (3x + 32) = 360$$
$$8x + 32 = 360$$
$$8x + 32 - 32 = 360 - 32$$
$$8x = 328$$
$$\left(\frac{1}{8}\right)8x = \left(\frac{1}{8}\right)328$$
$$x = 41$$

Measure of Angle 1 = $2(41) = 82°$
Measure of Angle 2 = $3(41) = 123°$
Measure of Angle 3 = $3(41) + 32 = 155°$

8. Draw a right triangle according to the following conditions and label the provided information. If it is not possible to draw the triangle according to the conditions, explain why not. Include a description of the kind of figure the current measurements allow for. Provide a change to the condition that makes the drawing feasible.

   a. Construct a right triangle $\triangle ABC$ so that $AB = 3$ cm, $BC = 4$ cm, and $CA = 5$ cm; the measure of angle B is 90°.



   b. Construct triangle $\triangle DEF$ so that $DE = 4$ cm, $EF = 5$ cm, and $FD = 11$ cm; the measure of angle D is 50°.

It is not possible to draw this triangle because the lengths of the two shorter sides do not sum to be greater than the longest side. In this situation the total lengths of DE and EF are less than the length of FD; there is no way to arrange DE and EF so that they meet. If they do not meet, there is no arrangement of three non-collinear vertices of a triangle; therefore, a triangle cannot be formed.