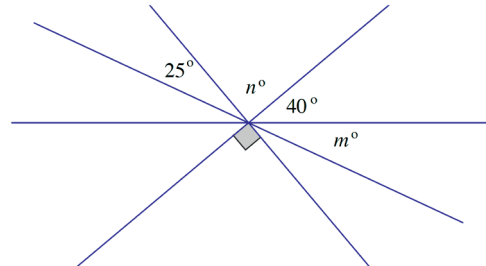Name _____   Date _____
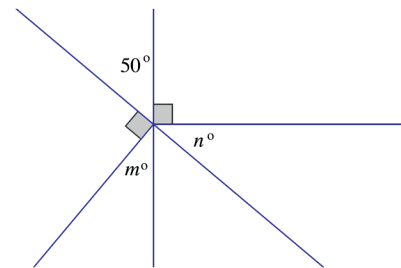
1. In each problem, set up and solve an equation for the unknown angles.

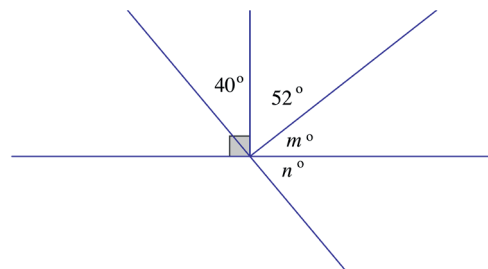   a. Four lines meet at a point. Find the measures $m°$ and $n°$.

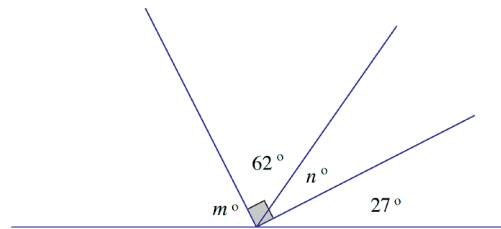   b. Two lines meet at the vertex of two rays. Find the measures $m°$ and $n°$.

    c. Two lines meet at a point that is the vertex of two rays. Find the measures $m°$ and $n°$.
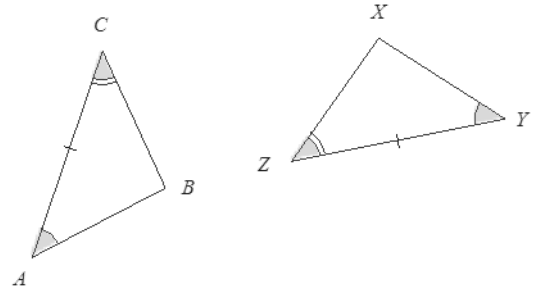
d. Three rays have a common vertex on a line. Find the measures $m°$ and $n°$.

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.

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.
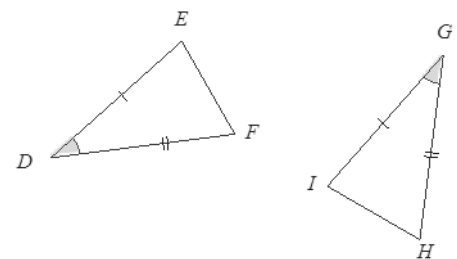
a.

b.
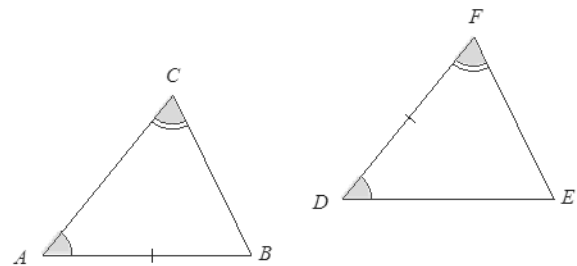
c.

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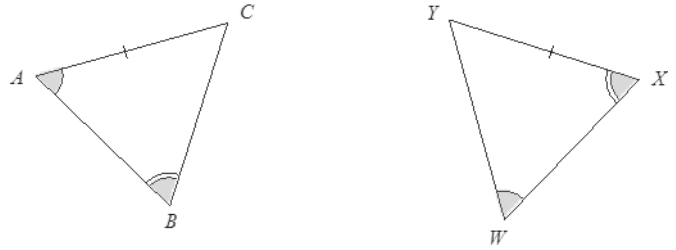
4. Use tools to draw rectangle $ABCD$ with $AB = 2$ cm and $BC = 6$ cm. Label all vertices and measurements.

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.

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MATH

Module 6:   Geometry

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

    b.   Construct 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 $m° = 25°$ and $n° = 90°$, shows complete supporting work, including an equation that appropriately models the angle relationship(s), and gives 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 $m° = 40°$ and $n° = 40°$, shows complete supporting work, including an equation that appropriately models the angle relationship(s), and gives 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 $m° = 38°$ and $n° = 50°$, shows complete supporting work, including an equation that appropriately models the angle relationship(s), and gives 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 $m° = 63°$ and $n° = 28°$, shows complete supporting work, including an equation that appropriately models the angle relationship(s), and gives 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 that have corresponding angle measurements that are off by more than 3° of each other and different corresponding side lengths.	Student provides no examples, but the 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 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 does not provide a response. OR Student 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 supports with appropriate evidence, such as the condition by which they are identical or the information that prevents them from being identical.

	b **7.G.A.2**	Student does not provide a response. OR Student 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 supports with appropriate evidence, such as the condition by which they are identical or the information that prevents them from being identical.
	c **7.G.A.2**	Student does not provide a response. OR Student 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 supports with appropriate evidence, such as the condition by which they are identical or the information that prevents them from being identical.
	d **7.G.A.2**	Student does not provide a response. OR Student 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 supports 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 provides a response that has inaccurate measurements and is missing labeling.	Student provides a drawing with errors in the measurements of the provided sides and angle, but the figure has all the provided information labeled.	Student provides a drawing that is accurate in measurements, but the figure is missing labeling.	Student provides an accurately drawn rectangle with dimensions 2 cm and 6 cm and all provided information labeled.
5	**7.G.B.5**	Student finds incorrect angle measurements because the equations are 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 correctly 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 correctly shown.	Student finds the two angle measurements to be 27° and 63° and shows 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 are 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 correctly 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 correctly shown.	Student finds the two angle measurements to be 96° and 84° 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 are 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 correctly 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 correctly 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 provides a response that has inaccurate measurements and is missing labeling.	Student provides a drawing that has errors in the measurements of the provided sides and angle, but the figure has all the provided information labeled.	Student provides a drawing that is accurate in measurements, but the figure is missing labeling.	Student provides an accurately drawn right triangle with lengths 3 cm, 4 cm, and 5 cm, and $\angle B = 90°$; all provided information is labeled.

	b **7.G.B.5**	Student indicates the triangle cannot be drawn but provides no further evidence of understanding. AND Student fails to include a description of the figure formed by the current measurements and provides no alteration to one of the measurements so that the triangle can be drawn.	Student clearly indicates that the triangle cannot be drawn because the sum of the lengths of the two smaller sides, $\overline{DE}$ and $\overline{EF}$, is less than the length of the third side, $\overline{FD}$; however, student fails to include a description of the figure formed by the current measurements and provides no alteration to one of the measurements so that the triangle can be drawn.	Student clearly indicates that the triangle cannot be drawn because the sum of the lengths of the two smaller sides, $\overline{DE}$ and $\overline{EF}$, is less than the length of the third side, $\overline{FD}$. AND Student includes a brief description of the figure formed by the current measurements. OR Student provides an alteration to one of the measurements so that the triangle can be drawn.	Student clearly indicates that the triangle cannot be drawn because the sum of the lengths of the two smaller sides, $\overline{DE}$ and $\overline{EF}$, is less than the length of the third side, $\overline{FD}$. 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. OR The response includes an alteration to one of the measurements so that the triangle can be drawn (i.e., 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 $\overline{FD}$ is decreased to less than 9 cm).

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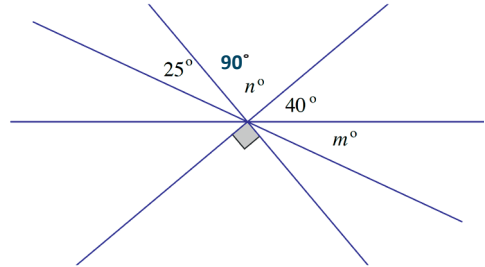
1. In each problem, set up and solve an equation for the unknown angles.

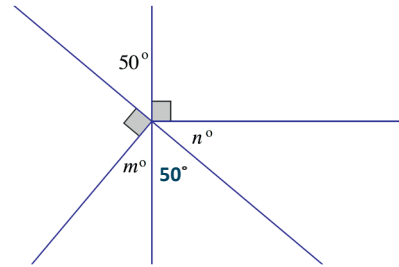   a. Four lines meet at a point. Find the measures $m°$ and $n°$.

   $n° = 90°$, 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. Find the measures $m°$ and $n°$.

   $50° + 90° + n° = 180°$
   $140° + n° = 180°$
   $140° - 140° + n° = 180° - 140°$
   $n° = 40°$

   $m° + 50° = 90°$
   $m° + 50° - 50° = 90° - 50°$
   $m° = 40°$

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

   $m° + 52° = 90°$
   $m° + 52° - 52° = 90° - 52°$
   $m° = 38°$
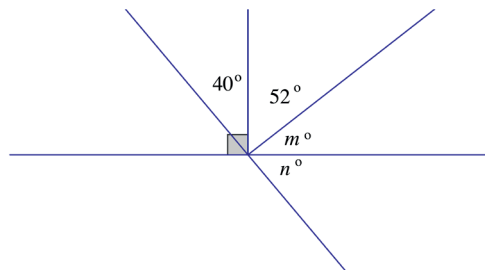
   $40 + 52 + (38) + n° = 180$
   $130 + n° = 180$
   $130 - 130 + n° = 180 - 130$
   $n° = 50°$

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

$$n° + 62° = 90°$$
$$n° + 62° − 62° = 90° − 62°$$
$$n° = 28°$$

$$m° + 62° + (28°) + 27° = 180°$$
$$m° + 117° = 180$$
$$m° + 117° − 117° = 180° − 117°$$
$$m° = 63°$$
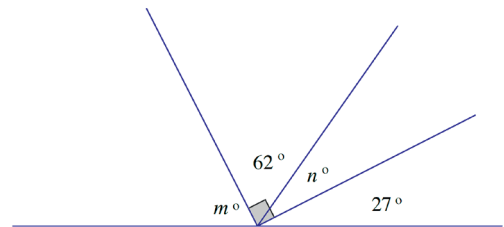
2. Use tools to construct a triangle based on the following given conditions.

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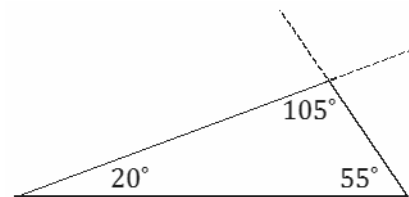
b.   Is it possible to construct two different triangles that have the same angle measurements? If it is,
    construct examples that demonstrate this condition, and label all angle and length measurements.
    If it is not possible, explain why.

*Solutions will vary; refer to the 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 included side condition. The marked side is between the given angles.*
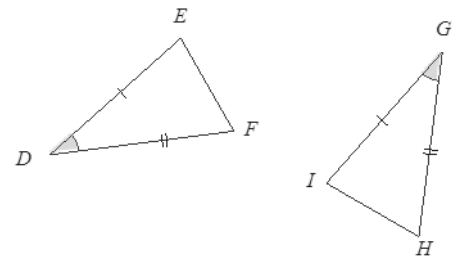
    △ABC ↔ △YXZ
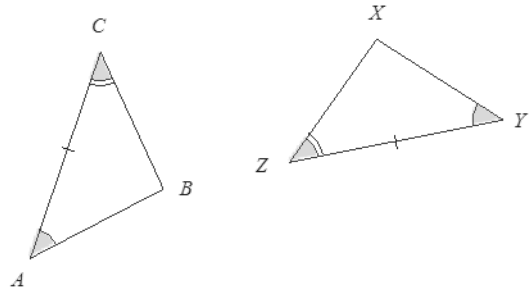
b. *There is insufficient evidence to determine that the triangles are identical. In △DEF, the marked side is between the marked angles, but in △ABC, the marked side is not between the marked angles.*
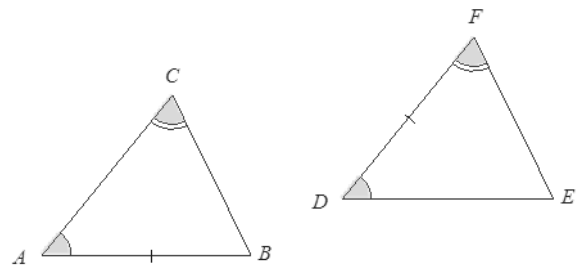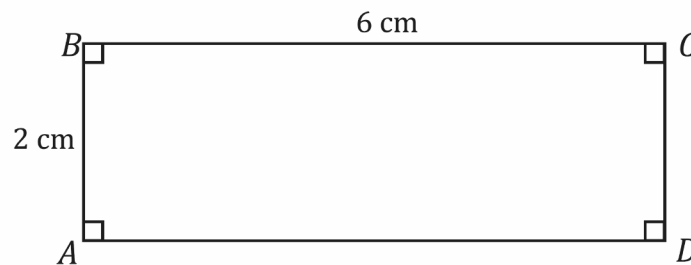
c. *The triangles are identical by the two sides and included angle condition.*

    △DEF ↔ △GIH

d.   The triangles are not identical. In
      △ABC, the marked side is opposite
      ∠B. In △WXY, the marked side is
      opposite ∠W. ∠B and ∠W are not
      necessarily equal in measure.
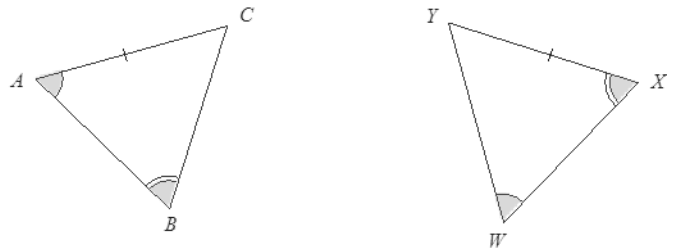
4.   Use tools to draw rectangle $ABCD$ with $AB = 2$ cm and $BC = 6$ cm. Label all vertices and
     measurements.

5.   The measures of two complementary angles have a ratio of $3:7$. Set up and solve an equation to
     determine the measurements 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: $3(9) = 27$. The measure of the first angle is 27°.

   Measure of Angle 2: $7(9) = 63$. The measure of the second angle is 63°.

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.

Let $y°$ be the number of degrees in the angle.

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

Measure of the angle: 96°

Measure of its supplement: $(96)° - 12° = 84°$

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. Set up and solve an equation to determine 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. Include a description of the kind of figure the current measurements allow. Provide a change to the condition that makes the drawing feasible.

    a. Construct a right triangle ABC so that $AB = 3$ cm, $BC = 4$ cm, and $CA = 5$ cm; the measure of angle B is 90°.
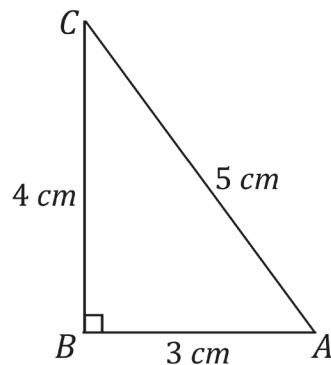
    b. Construct triangle DEF so that $DE = 4$ cm, $EF = 5$ cm, and $FD = 11$ cm; the measure of angle D is 50°.

    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 $\overline{DE}$ and $\overline{EF}$ are less than the length of $\overline{FD}$; there is no way to arrange $\overline{DE}$ and $\overline{EF}$ 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. I would change $\overline{EF}$ to 9 cm instead of 5 cm so that the three sides would form a triangle.