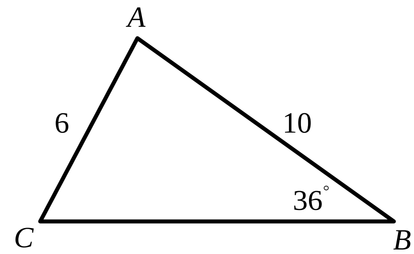
Name: ___________________________________ Date: _________________

THE AMBIGUOUS NATURE OF SINE
ALGEBRA 2 WITH TRIGONOMETRY

The Law of Sines is known as **ambiguous** because it does not always result in a unique angle solution for a triangle. In fact, the Law of Sines can result in zero, one or two possible angles, and hence triangles, in a given scenario. Which case exists is easily determined by simply solving the trigonometric equation that results from the Law of Sines.

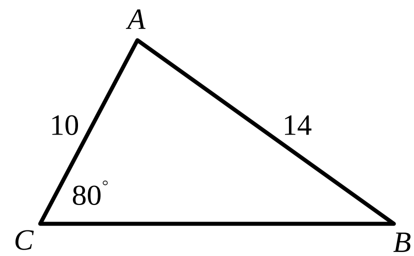
***Exercise* #1:** In triangle *ABC*, which is shown below but not drawn to scale, it is known that $AC=6$, $AB=10$, and $m\angle B=36^\circ$. Determine *all possible* values for $m\angle C$ to the nearest *tenth*.



Sine is **ambiguous** because it is positive for all angles on the interval $\left(0^\circ,180^\circ\right)$. In most sine equations two values will be possible, an acute solution and an obtuse solution. But, as we will see in *Exercise* #2, both solutions are not always realistic.

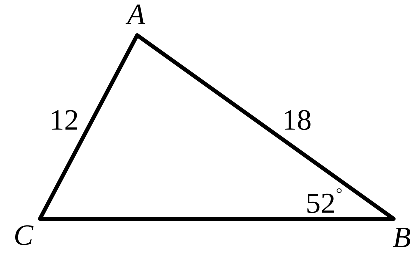
***Exercise* #2:** In triangle *ABC*, which is shown below but not drawn to scale, it is known that $AC=10$, $AB=14$, and $m\angle C=80^\circ$.

(a) Solve an equation to find all possible values for the measure of *B* to the nearest *tenth*.



(b) Considering the measures the angles of any triangle must sum to be 180°, why must we reject the obtuse solution from part (a)?

***Exercise* #3:** Explain why the triangle shown below cannot exist by finding all possible values for $m\angle C$.



***Exercise* #4:** In ΔDEF, $m\angle E = 72^\circ$, $DE = 12$, and $DF = 15$. How many triangles are possible given this information?

(1) 1 (3) 3

(2) 2 (4) 0

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***Exercise* #5:** In ΔABC, $AB = 10$, $BC = 10\sqrt{3}$, and $m\angle A = 60^\circ$. Based on this angle B is

(1) acute only (3) right only

(2) acute or obtuse (4) obtuse only

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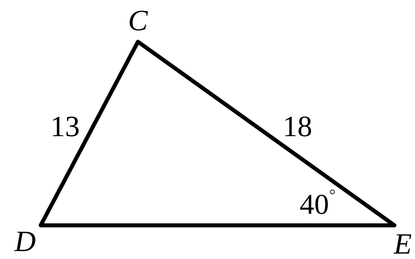
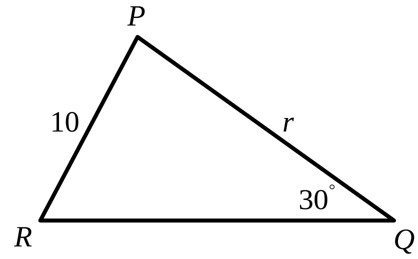
***Exercise* #6:** For ΔCDE, which is shown below not drawn to scale, it is known that $CD = 13$ inches and $CE = 18$ inches. If $m\angle E = 40^\circ$, find all possible *areas* for *CDE*. Round your final answer(s) to the nearest square inch.



***Exercise* #7:** In ΔPQR it is known that $PR = 10$ and $m\angle Q = 30^\circ$. Find all possible values of *r* such that these two measures are not possible. State your answer as an inequality in interval notation.



Name: ________________________________ Date: ________________

THE AMBIGUOUS NATURE OF SINE
ALGEBRA 2 WITH TRIGONOMETRY - HOMEWORK

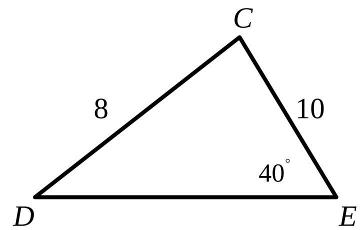
SKILLS

Diagrams given in problems are not drawn to scale and angles that appear acute may in fact be obtuse and vice versa.

1. In ΔCDE shown below $CE=10$, $CD=8$, and $m\angle E=40^\circ$. How many possible values exist for $m\angle D$?

(1) 1 (3) 3

(2) 2 (4) 0



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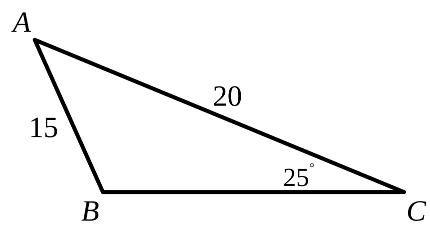
2. In ΔABC shown $m\angle C=25^\circ$, $c=15$, and $b=20$. Angle B is

(1) acute only (3) obtuse only

(2) right only (4) acute or obtuse



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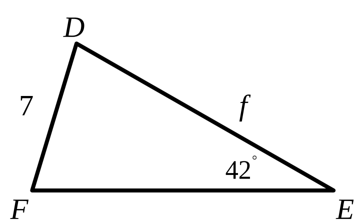
3. For which value of *f* shown below will there be no solution for angle *E* in triangle *DEF*?

(1) 9 (3) 11

(2) 10 (4) 5



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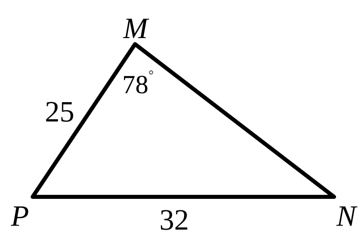
4. Accurate to the nearest *tenth* the *largest* possible value of $m\angle N$ in the diagram below is

(1) 49.8° (3) 37.3°

(2) 130.2° (4) 105.6°



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5. How many triangles can be formed in which the shortest side measures 9 inches, the longest side measures 14 inches and the smallest angle measures 48°?

(1) 1 (3) 3

(2) 2 (4) 0

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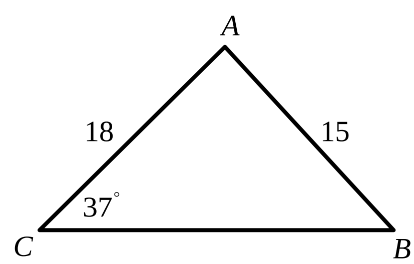
6. In ΔQRS, $QR = 8, QS = 7,$ and $m\angle R = 52^{\circ}$. Find all possible values for $m\angle Q$. Round your answers to the nearest *tenth*. Be sure to draw a diagram of ΔQRS.

7. In $\Delta ABC,$ $AC = 18,$ $AB = 15,$ and $m\angle C = 37^{\circ}$. Find all possible areas of ΔABC to the nearest *tenth*.



REASONING

8. In ΔABC below, $AB = 7\sqrt{2}$ and $m\angle C = 45^{\circ}$. Determine all values of b such that there exists no solution for $m\angle B$. Clearly justify your answer.