4.* Is there a conjecture (similar to the Triangle Exterior Angle Conjecture) you can make about exterior and remote interior angles of a quadrilateral? Experiment. Write about your findings.

5.* Is there a conjecture you can make about inequalities among the sums of the lengths of sides and/or diagonals in a quadrilateral? Experiment. Write about your findings.

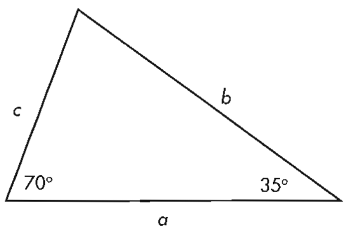
Exercise Set 5.3

For each set of lengths, determine whether it is possible to draw a triangle with sides of the given measures. If possible, write yes. If not possible, write no and make a sketch demonstrating why it is not possible.

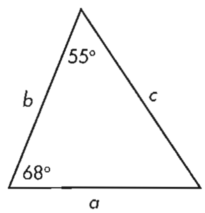
1. 3 cm, 4 cm, 5 cm
2. 4 m, 5 m, 9 m
3. 5 ft, 6 ft, 12 ft
4. 3.5 cm, 4.5 cm, 7 cm
5. 4″, 5″, $8\frac{1}{2}$″
6. 0.5 m, 0.6 m, 12 cm

In Exercises 7–12, the letter on each side of each triangle indicates the side's measure and the letter in the interior of an angle indicates that angle's measure. Use your new conjectures to arrange the letters' values in order from greatest to least.

7.*



8.



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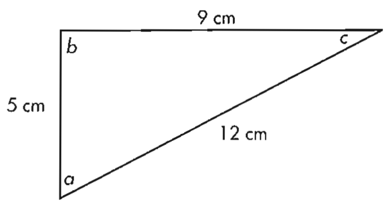

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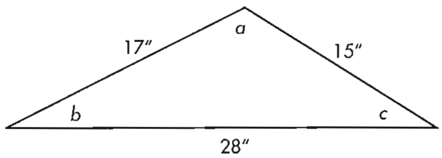

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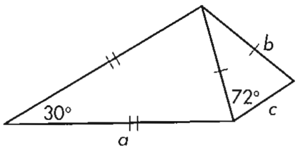

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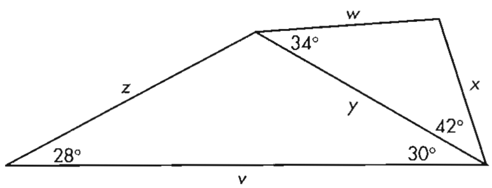
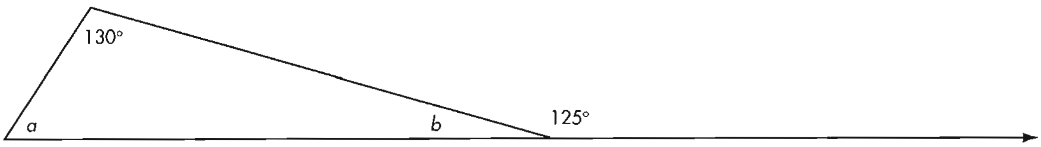
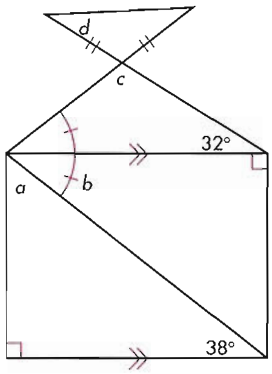


13. What's wrong with this picture? Explain.

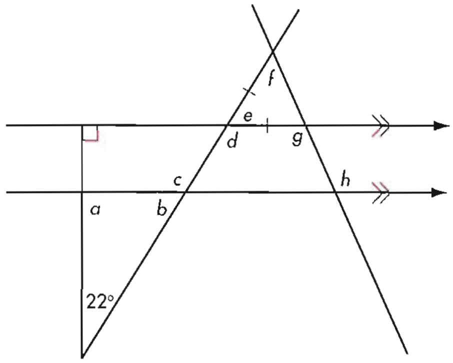


In Exercises 14 and 15, calculate each lettered angle measure.

14.*

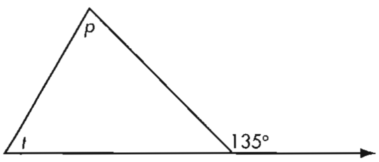


15.

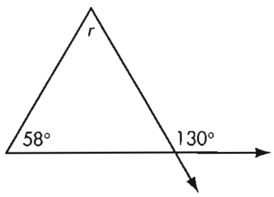


In Exercises 16–18, use one of your new conjectures to find the lettered angle measures.

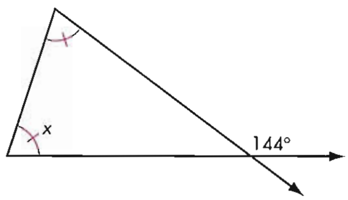
16.* $t + p$ = -?-



17. r = -?-

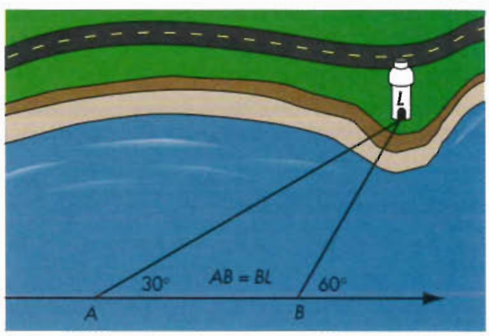


18. x = -?-



19. Geometry is used quite often in sailing. For example, the Isosceles Triangle Conjecture and the Triangle Exterior Angle Conjecture are used to determine the distance between a boat and a landmark near shoreline.

The rule sailors use is called doubling the angle on the bow. The rule says, with your hand-bearing compass, measure the angle off the bow (the angle formed by your path and your line of sight to a landmark on shore) at point *A*. Keep checking your bearing as you get closer to the landmark (point *L*) on shore until at point *B* the bearing is double the reading at point *A*. The distance traveled from point *A* to point *B* is also the distance from the landmark to your new position (point *B*). Explain why this process works.



20. If Cara wishes to know the perpendicular distance from a landmark to the course of her boat, what should be the measurement of her bow angle when she begins recording?

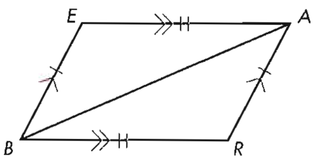
In Exercises 21 and 22, isosceles triangle *ABC* has vertices with coordinates *A*(0, 0), *B*(4, 4), and *C*(-3, 7).

21. Find the coordinates of the centroid of $\triangle ABC$.

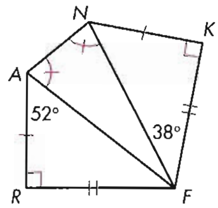
22. Find the coordinates of the circumcenter of $\triangle ABC$.

In Exercises 23 and 24, complete the statement of congruence from the information given.

23.* $\triangle BAR \cong \triangle$ -?-

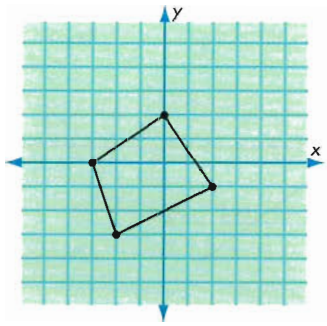


24. $\triangle FAR \cong \triangle$ -?-

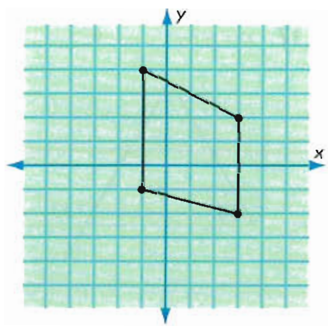


In Exercises 25–27, determine whether the quadrilateral is a parallelogram, a rectangle, a trapezoid, or none of these.

25.*



26.



27. Quadrilateral *ABCD* with vertices *A*(-3, 1), *B*(3, 5), *C*(5, 2), and *D*(-1, -2)

Improving Reasoning Skills—*Hundreds Puzzle*

Fill in the missing blanks of each numerical equation below. Use all nine digits—1, 2, 3, 4, . . . , 8, 9—in order! You may use any combination of the four basic operations (+, –, ·, ÷), parentheses, the decimal point, exponents, factorials, and the square root symbol, and you may place the digits next to each other to create two- or three-digit numbers.

Example: 1 + 2(3 + 4.5) + 67 + 8 + 9 = 100

1. 1 + 2 + 3 - 4 + 5 + 6 + _____ + 9 = 100

2. 1 + 2 + 3 + 4 + 5 + _____ + _____ + _____ = 100

3. 1 + 2 + [(3)(4)(5) ÷ 6] + _____ = 100

4. [(-1 - _____) ÷ 5] + 6 + 7 + 89 = 100

5. 1 + 23 – 4 + _____ + 9 = 100