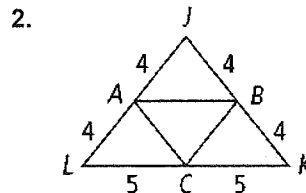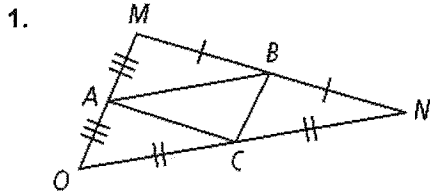# 6-1 **Practice** *Form G*

Midsegments of Triangles

Identify three pairs of triangle sides in each diagram.

1.

2.

Name the triangle sides that are parallel to the given side.
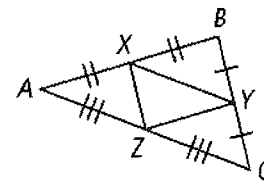
3. $\overline{AB}$

4. $\overline{AC}$

5. $\overline{CB}$

6. $\overline{XY}$

7. $\overline{XY}$

8. $\overline{ZY}$

Points *M*, *N*, and *P* are the midpoints of the sides of △*QRS*.
QR = 30, RS = 30, and SQ = 18.

9. Find *MN*.

10. Find *MQ*.

11. Find *MP*.

12. Find *PS*.

13. Find *PN*.

14. Find *RN*.
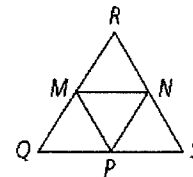
Algebra Find the value of *x*.

15.

16.

17.

18.

19.

20.

21.

22.

23.
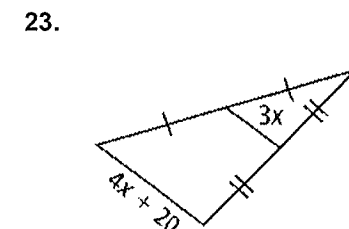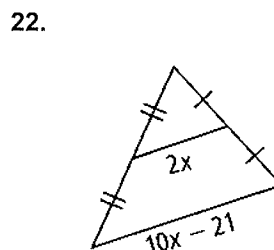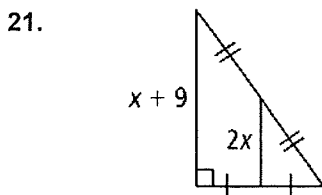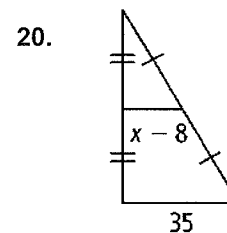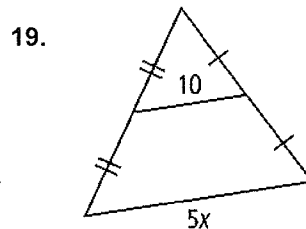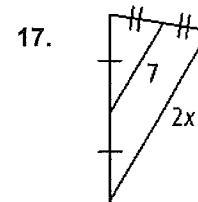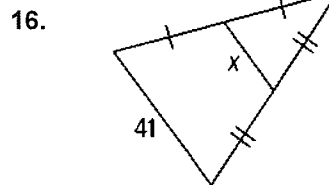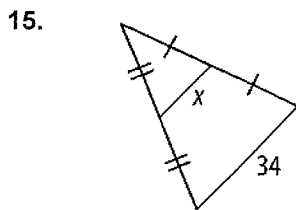
6-1 Practice (continued) — Form G

Midsegments of Triangles

D is the midpoint of $\overline{AB}$. E is the midpoint of $\overline{CB}$.

24. If $m\angle A = 70$, find $m\angle BDE$.

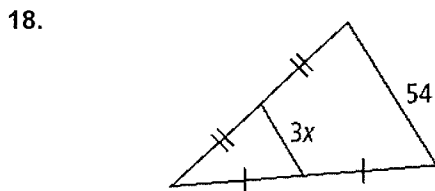**25.** If $m\angle BED = 73$, find $m\angle C$.

26. If $DE = 23$, find AC.

27. If $AC = 83$, find DE.

Find the distance across the lake in each diagram.

28.   **29.**   **30.**

Use the diagram at the right for Exercises 31 and 32.

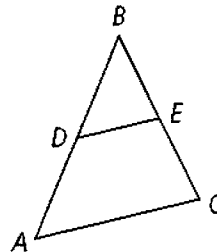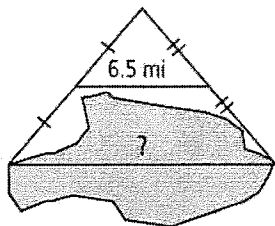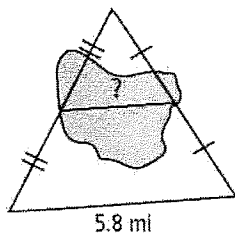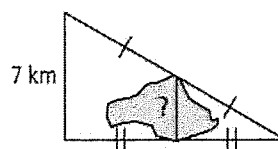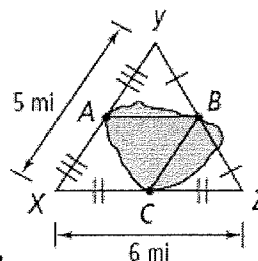**31.** Which segment is shorter for kayaking across the lake, $\overline{AB}$ or $\overline{BC}$? Explain.

32. Which distance is shorter, kayaking from A to B to C, or walking from A to X to C? Explain.

33. Open-Ended Draw a triangle and all of its midsegments. Make a col what appears to be true about the four triangles that result. What postulates could be used to prove the conjecture?

34. Coordinate Geometry The coordinates of the vertices of a triangle are $K(2, 3)$, $L(-2, -1)$, and $M(5, 1)$.

a. Find the coordinates of N, the midpoint of $\overline{KM}$, and P, the midpoint of $\overline{LM}$.

b. Show that $\overline{NP} \parallel \overline{KL}$.
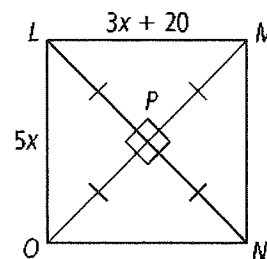
c. Show that $NP = \dfrac{1}{2}KL$

6-2 **Practice**   *Form G*
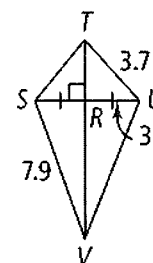
Perpendicular and Angle Bisectors

Use the figure at the right for Exercises 1–4.

1. What is the relationship between $\overline{LN}$ and $\overline{MO}$?

2. What is the value of *x?*

**3.** Find *LM.*   **4.** Find *LO.*

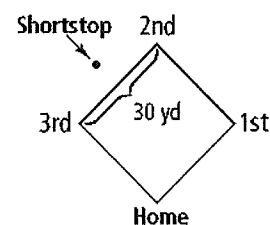**Use the figure at the right for Exercises 5–8.**

5. From the information given in the figure, how is $\overline{TV}$ related to $\overline{SU}$?

6. Find *TS.*   **7.** Find *UV.*   **8.** Find *SU.*

9. At the right is a layout for the lobby of a building placed on a coordinate grid.
   a. At which of the labeled points would a receptionist chair be equidistant from both entrances?

   **b.** Is the statue equidistant from the entrances? How do you know?
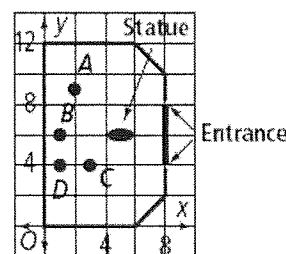
10. In baseball, the baseline is a segment connecting the bases. A shortstop is told to play back 3 yd from the baseline and exactly the same distance from second base and third base. Describe how the shortstop could estimate the correct spot. There are 30 yd between bases. Assume that the shortstop has a stride of 36 in.

Use the figure at the right for Exercises 11–15.

11. According to the figure, how far is *A* from $\overline{CD}$? from $\overline{CB}$?

12. How is $\overrightarrow{CA}$ related to $\angle DCB$? Explain.

13. Find the value of *x.*

14. Find $m\angle ACD$ and $m\angle ACB.$

15. Find $m\angle DAC$ and $m\angle BAC.$
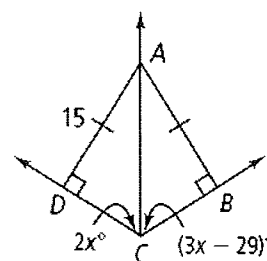
6-2 Practice (continued)   Form G

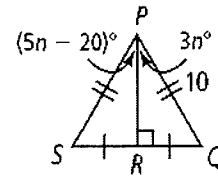Perpendicular and Angle Bisectors

Use the figure at the right for Exercises 16–19.

16. According to the diagram, what are the lengths of $\overline{PQ}$ and $\overline{PS}$?
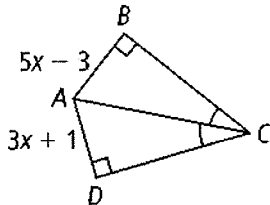
17. How is $\overline{PR}$ related to $\angle SPQ$?

18. Find the value of n.

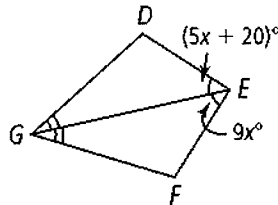**19.** Find $m\angle SPR$ and $m\angle QPR$.

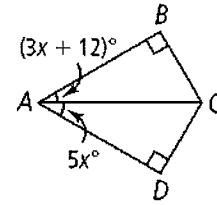**Algebra Find the indicated values of the variables and measures.**
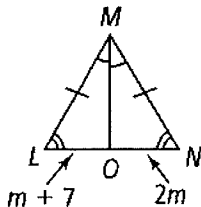
20. x, BA, DA

21. x, $m\angle DEF$

22. x, $m\angle DAB$

23. m, LO, NO

24. x, $m\angle QTS$
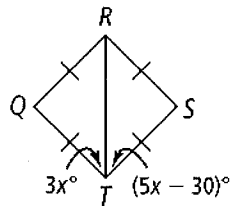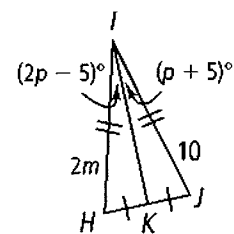
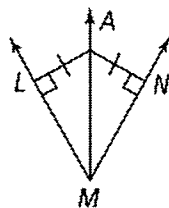**25.** p, IJ, KJ
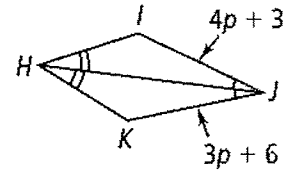
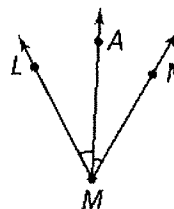**26.** r, UW
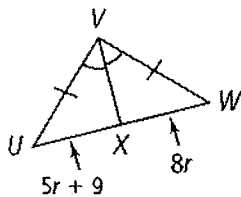
27. y, $m\angle DEF$
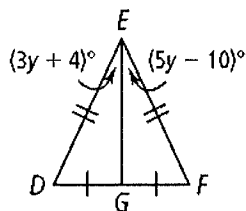
28. m, p

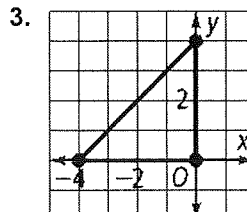**Writing Determine whether A must be on the bisector of $\angle LMN$. Explain.**
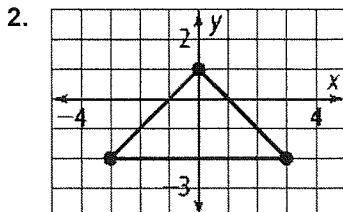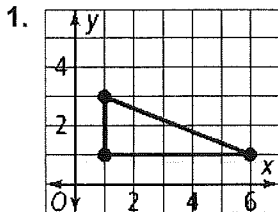
29.

30.

6-3 Practice

Form G

Bisectors in Triangles

Coordinate Geometry Find the circumcenter of each triangle.

1.

2.

3.

Coordinate Geometry Find the circumcenter of $\triangle ABC$.

4. $A(1, 3)$
   $B(4, 3)$
   $C(4, 2)$

5. $A(2, -3)$
   $B(-4, -3)$
   $C(-4, -7)$

6. $A(-5, -2)$
   $B(1, -2)$
   $C(1, 6)$

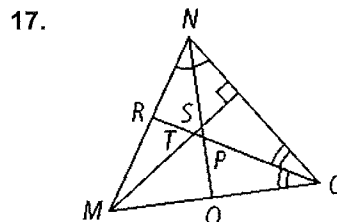**7.** $A(5, 6)$
   $B(0, 6)$
   $C(0, -3)$

8. $A(1, 3)$
   $B(5, 3)$
   $C(5, 2)$

9. $A(2, -2)$
   $B(-4, -2)$
   $C(-4, -7)$

10. $A(-5, -3)$
   $B(1, -3)$
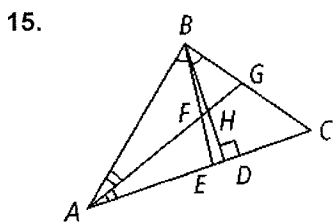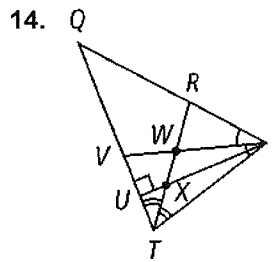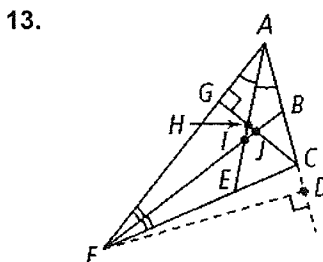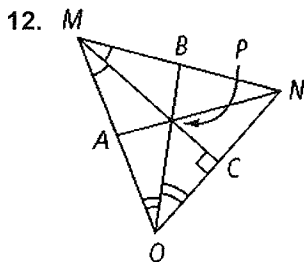 $C(1, 6)$

11. $A(5, 2)$
   $B(-1, 2)$
   $C(-1, -3)$
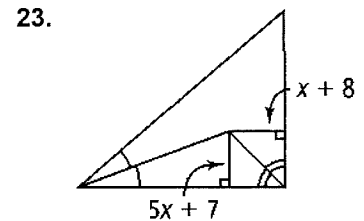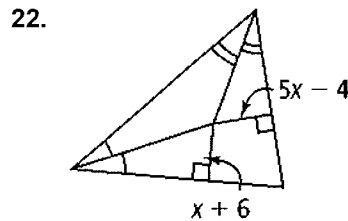
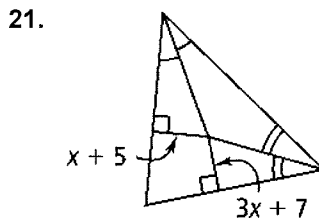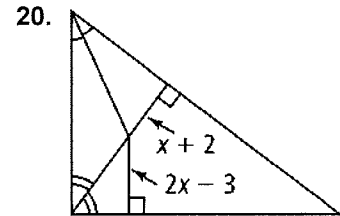**Name the point of concurrency of the angle bisectors.**
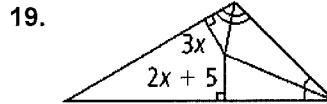
12.

13.

14.

15.

16.

17.

6-3 Practice (continued)   Form G

Bisectors in Triangles

Find the value of x.

18.

$2x$ $x + 3$

19.

$3x$ $2x + 5$

20.

$x + 2$ $2x - 3$

21.

$x + 5$ $3x + 7$

22.

$5x - 4$ $x + 6$

23.

$x + 8$ $5x + 7$
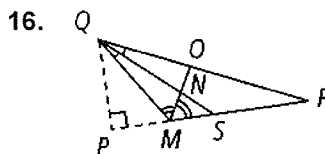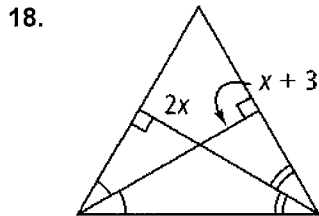
24. Where should the farmer place the hay bale so that it is equidistant from the three gates?
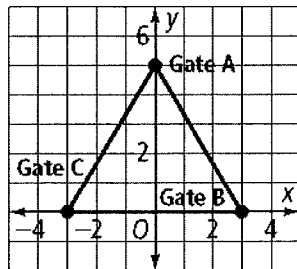
25. Where should the fire station be placed so that it is equidistant from the grocery store, the hospital, and the police station?
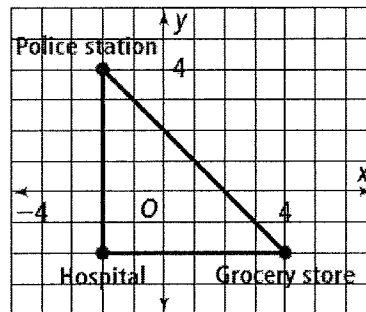
26. Construction Construct three perpendicular bisectors for $\triangle LMN$. Then use the point of concurrency to construct the circumscribed circle.
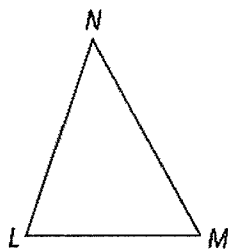
27. Construction Construct two angle bisectors for $\triangle ABC$. Then use the point of concurrency to construct the inscribed circle.
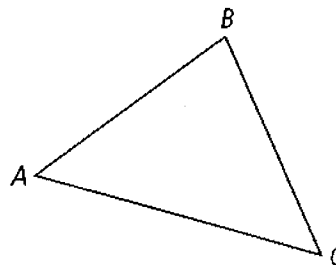
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6-4 **Practice**   *Form G*

Medians and Altitudes

In ⊙ABC, X is the centroid.

1. If CW = 15, find CX and XW.

2. If BX = 8, find BY and XY.

3. If XZ = 3, find AX and AZ.
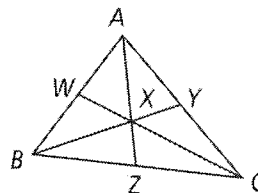
Is ‾AB a *median*, an *altitude*, or *neither*? Explain.

4.
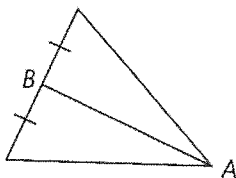
5.
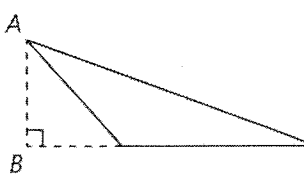
6.
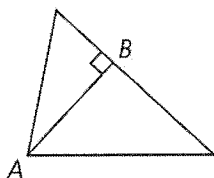
7.

Coordinate Geometry Find the orthocenter of ⊙ABC.

8. A(2, 0), B(2, 4), C(6, 0)

9. A(1, 1), B(3, 4), C(6, 1)

10. Name the centroid.

11. Name the orthocenter.

Draw a triangle that fits the given description. Then construct the centroid and the orthocenter.

12. equilateral ⊙CDE

13. acute isosceles ⊙XYZ

6-4 Practice (continued)
Form G

Medians and Altitudes

In Exercises 14–18, name each segment.

14. a median in $\triangle ABC$

15. an altitude for $\triangle ABC$

16. a median in $\triangle AHC$

17. an altitude for $\triangle AHB$

18. an altitude for $\triangle AHG$

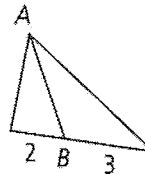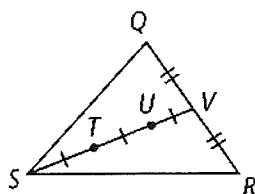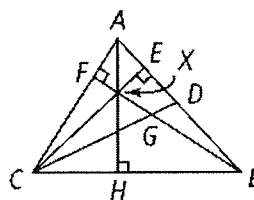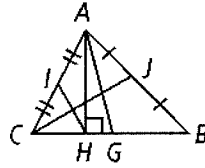19. $A(0, 0)$, $B(0, -2)$, $C(-3, 0)$. Find the orthocenter of $\triangle ABC$.

20. Cut a large isosceles triangle out of paper. Paper-fold to construct the medians and the altitudes. How are the altitude to the base and the median to the base related?

21. In which kind of triangle is the centroid at the same point as the orthocenter?

22. P is the centroid of $\triangle MNO$. $MP = 14x + 8y$. Write expressions to represent PR and MR.
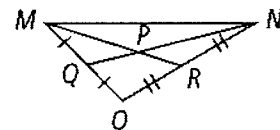
23. F is the centroid of $\triangle ACE$. $AD = 15x^2 + 3y$. Write expressions to represent AF and FD.
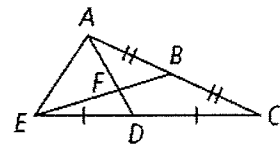
24. Use coordinate geometry to prove the following statement.

   Given: $\triangle ABC$; $A(c, d)$, $B(c, e)$, $C(f, e)$

   Prove: The circumcenter of $\triangle ABC$ is a point on the triangle.

6-6 Practice

Form G

Inequalities in One Triangle

Explain why $m\angle 1 > m\angle 2$.

1.

2.

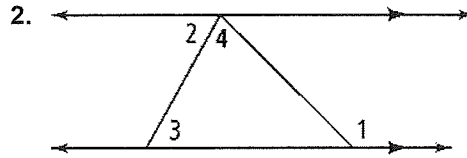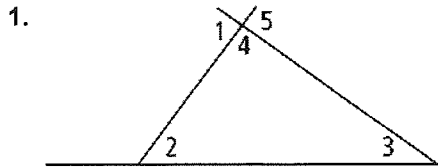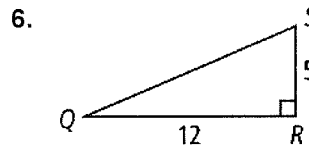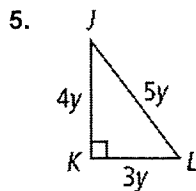**For Exercises 3–6, list the angles of each triangle in order from smallest to largest.**

3.

4.

5.

6.
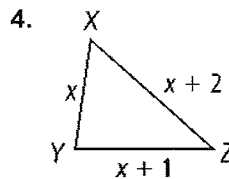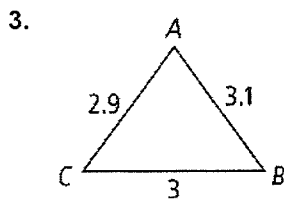
For Exercises 7–10, list the sides of each triangle in order from shortest to longest.

7.

8.
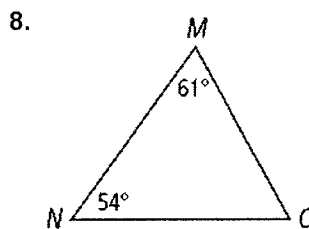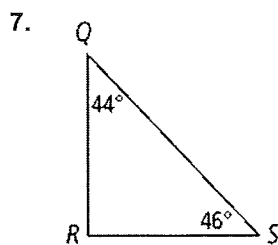
9. $\triangle ABC$, with $m\angle A = 99$, $m\angle B = 44$, and $m\angle C = 37$

10. $\angle ABC$, with $m\angle A = 122$, $m\angle B = 22$, and $m\angle C = 36$

For Exercises 11 and 12, list the angles of each triangle in order from smallest to largest.

11. $\triangle ABC$, where $AB = 17$, $AC = 13$, and $BC = 29$

12. $\triangle MNO$, where $MN = 4$, $NO = 12$, and $MO = 10$

6-6 **Practice** (continued)   *Form G*

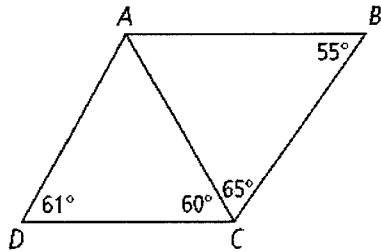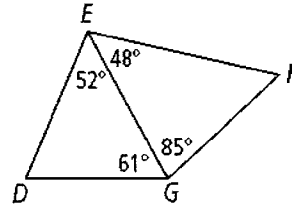Inequalities in One Triangle

Determine which side is shortest in the diagram.

13.

14.

Can a triangle have sides with the given lengths? Explain.

15. 8 cm, 7 cm, 9 cm

16. 7 ft, 13 ft, 6 ft

17. 20 in., 18 in., 16 in.

18. 3 m, 11 m, 7 m

Algebra The lengths of two sides of a triangle are given. Describe the possible lengths for the third side.

19. 5, 11

20. 12, 12

21. 25, 10

22. 6, 8

23. Algebra List the sides in order from shortest to longest in PQR, with $m\angle P = 45$, $m\angle Q = 10x + 30$, and $m\angle R = 5x$.

24. Algebra List the sides in order from shortest to longest in ABC, with $m\angle A = 80$, $m\angle B = 3x + 5$, and $m\angle C = 5x - 1$.

25. Error Analysis A student draws a triangle with a perimeter 36 cm. The student says that the longest side measures 18 cm. How do you know that the student is incorrect? Explain.
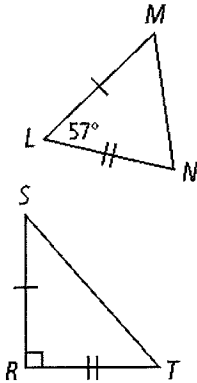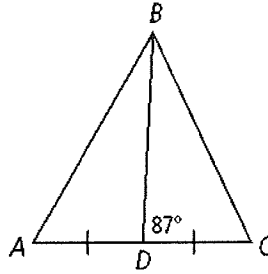
6-7 Practice

Form G

Inequalities in Two Triangles

Write an inequality relating the given side lengths. If there is not enough information to reach a conclusion, write *no conclusion*.
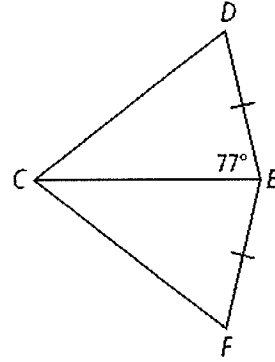
**1.** *ST* and *MN*

2. *BA* and *BC*

3. *CD* and *CF*

4. A crocodile opens his jaws at a 30° angle. He closes his jaws, then opens them again at a 36° angle. In which case is the distance between the tip of his upper jaw and the tip of his lower jaw greater? Explain.
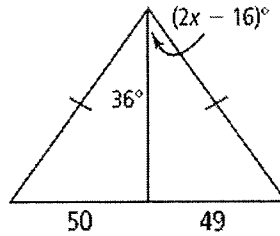
5. At which time is the distance between the tip of the hour hand and the tip of the minute hand greater, 2:20 or 2:25?

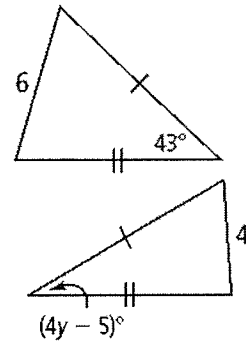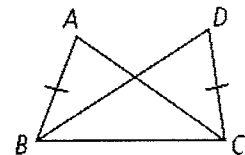**Find the range of possible values for each variable.**

6.
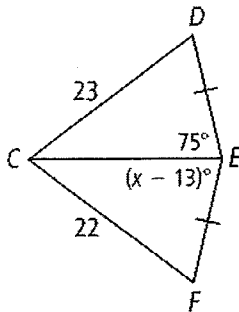
7.

8.

9. In the triangles at the right, *AB = DC* and *m∠ABC < m∠DCB*. Explain why *AC < BD*.

6-7 **Practice** (continued)   *Form G*

Inequalities in Two Triangles

Copy and complete with > or <. Explain your reasoning.

10. $m\angle POQ$ __?__ $m\angle MON$

11. MN __?__ PQ

12. MP __?__ OP
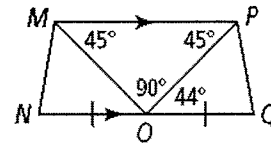
13. Jogger A and Jogger B start at the same point. Jogger A travels 0.9 mi due east, then turns $120°$ clockwise, then travels another 3 mi. Jogger B travels 0.9 mi due west, then turns $115°$ counterclockwise, then travels another 3 mi. Do the joggers end in the same place? Explain.

14. In the diagram at the right, in which position are the tips of the scissors farther apart?
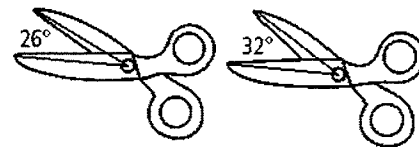
Position A   **Position B**

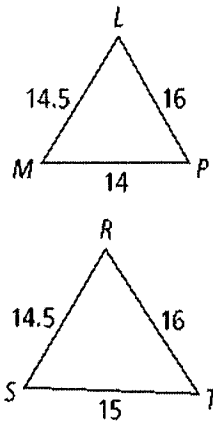15. The legs of an isosceles triangle with a $65°$ vertex angle are congruent with the sides of an equilateral triangle. Which triangle has a greater perimeter? How do you know?

Write an inequality relating the given angle measures. If there is not enough information to reach a conclusion, write *no conclusion*.
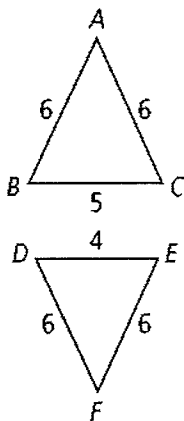
16. $m\angle A$ and $m\angle F$ 17. $m\angle L$ and $m\angle R$ 18. $m\angle MLN$ and $m\angle ONL$