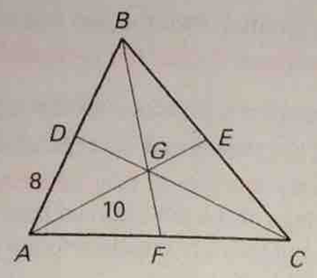
Practice B

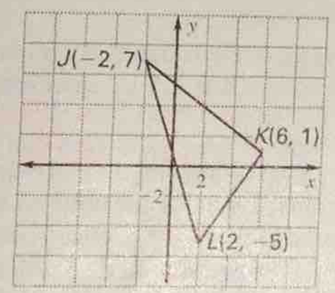
For use with pages 318–327

G is the centroid of $\triangle ABC$, $AD = 8$, $AG = 10$, and $CD = 18$. Find the length of the segment.

1. $\overline{BD}$ 8
2. $\overline{AB}$ 16
3. $\overline{EG}$ 5
4. $\overline{AE}$ 15
5. $\overline{CG}$ 12
6. $\overline{DG}$ 6



7. Use the graph shown.



a. Find the coordinates of M, the midpoint of $\overline{JK}$. Use the median $\overline{LM}$ to find the coordinates of the centroid P. $M(2, 4)$; $P(2, 1)$

b. Find the coordinates of N, the midpoint of $\overline{JL}$. Verify that $KP = \frac{2}{3}KN$.

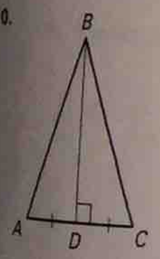
$N(0, 1)$; $KP = 4$ and $KN = 6$ therefore $KP = \frac{2}{3}KN$.

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

8. $A(-7, -4), B(-3, 5), C(1, -4)$ $(-3, -1)$
9. $A(0, -2), B(6, 1), C(9, -5)$ $(5, -2)$

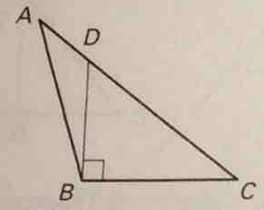
Is $\overline{BD}$ a perpendicular bisector of $\triangle ABC$? Is $\overline{BD}$ a median? an altitude?

10.



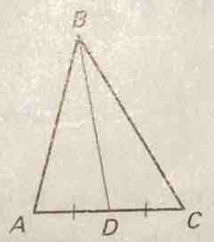
yes; yes; yes

11.



no; no; no

12.

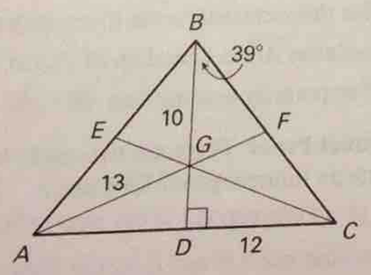


no; yes; no

Find the measurements.

13. Given that $AB = BC$, find AD and $m\angle ABC$. 12; 78°

14. Given that G is the centroid of $\triangle ABC$, find FG and BD. 6.5; 15



Practice B *continued*

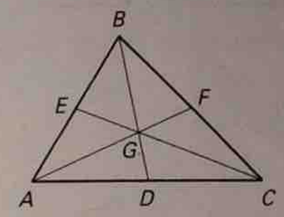
For use with pages 318–327

Copy and complete the statement for $\triangle HJK$ with medians $\overline{HN}$, $\overline{JL}$, and $\overline{KM}$, and centroid P.

15. $PN = \_?\_\ HN$ $\frac{1}{3}$
16. $PL = \_?\_\ JP$ $\frac{1}{2}$
17. $KP = \_?\_\ KM$ $\frac{2}{3}$

Point G is the centroid of $\triangle ABC$. Use the given information to find the value of x.

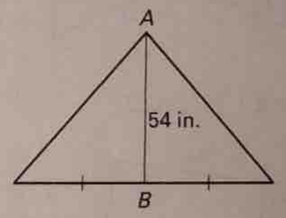
18. $CG = 3x + 7$ and $CE = 6x$ 7
19. $FG = x + 8$ and $AF = 9x - 6$ 5
20. $BG = 5x - 1$ and $DG = 4x - 5$ 3



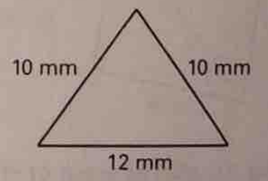
Complete the sentence with *always*, *sometimes*, or *never*.

21. The median of a triangle is _?_ the perpendicular bisector. sometimes
22. The altitude of a triangle is _?_ the perpendicular bisector. sometimes
23. The medians of a triangle _?_ intersect inside the triangle. always
24. The altitudes of a triangle _?_ intersect inside the triangle. sometimes

25. **House Decoration** You are going to put a decoration on your house in the triangular area above the front door. You want to place the decoration on the centroid of the triangle. You measure the distance from point A to point B (see figure). How far down from point A should you place the decoration? *Explain*. See below.



26. **Art Project** You are making an art piece which consists of different items of all shapes and sizes. You want to insert an isosceles triangle with the dimensions shown. In order for the triangle to fit, the height (altitude) must be less than 8.5 millimeters. Find the altitude. Will the triangle fit in your art piece? 8 mm; yes



25. 36 in.; By Theorem 5.8, the distance from the vertex to the centroid is $\frac{2}{3}$ times the median $(\overline{AB})$.

5 Lesson Practice Level B

LESSON 5.5

Practice B

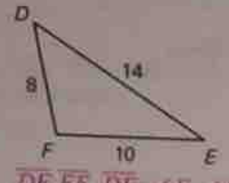
For use with pages 328–334

Use a ruler and protractor to draw the given type of triangle. Mark the largest angle and longest side in red and the smallest angle and shortest side in blue. What do you notice?

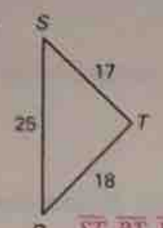
1. Obtuse scalene
2. Acute isosceles
3. Right isosceles

1–3. Check student's drawings. Longest side and largest angle are opposite each other, shortest side and smallest angle are opposite each other.

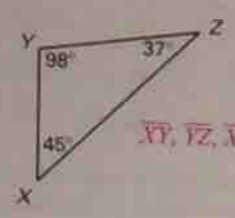
List the sides and the angles in order from smallest to largest.

4. 

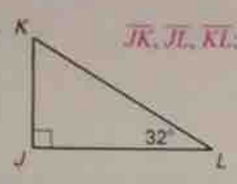
$\overline{DF}, \overline{FE}, \overline{DE}, \angle E, \angle D, \angle F$

5. 

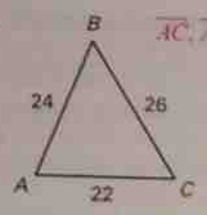
$\overline{ST}, \overline{RT}, \overline{RS}, \angle R, \angle S, \angle T$

6. 

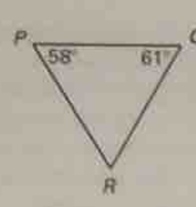
$\overline{XY}, \overline{YZ}, \overline{XZ}, \angle Z, \angle X, \angle Y$

7. 

$\overline{JK}, \overline{JL}, \overline{KL}, \angle L, \angle K, \angle J$

8. 

$\overline{AC}, \overline{AB}, \overline{BC}, \angle B, \angle C, \angle A$

9. 

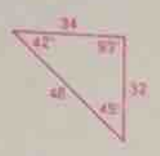
$\overline{QR}, \overline{PR}, \overline{PQ}, \angle P, \angle Q, \angle R$

Sketch and label the triangle described.

10. Side lengths: 14, 17, and 19, with longest side on the bottom
Angle measures: 45°, 60°, and 75°, with smallest angle at the right

11. Side lengths: 11, 18, and 24, with shortest side on the bottom
Angle measures: 25°, 44°, and 111°, with largest angle at the left

12. Side lengths: 32, 34, and 48, with shortest side arranged vertically at the right.
Angle measures: 42°, 45°, and 93°, with largest angle at the top.



Is it possible to construct a triangle with the given side lengths? If not, *explain* why not.

13. 3, 4, 5 yes
14. 1, 4, 6 No; $1 + 4 < 6$.
15. 17, 17, 33 yes
16. 22, 26, 65 No; $22 + 26 < 65$.
17. 6, 43, 39 yes
18. 7, 54, 45 No; $7 + 45 < 54$.

LESSON 5.5

Practice B *continued*

For use with pages 328–334

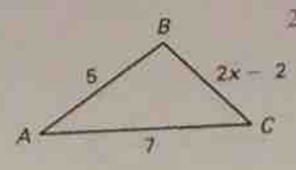
***Describe* the possible lengths of the third side of the triangle given the lengths of the other two sides.**

19. 6 in., 9 in. $3 \text{ in.} < x < 15 \text{ in.}$
20. 4 ft, 12 ft $8 \text{ ft} < x < 16 \text{ ft}$
21. 9 m, 18 m $9 \text{ m} < x < 27 \text{ m}$
22. 21 yd, 16 yd $5 \text{ yd} < x < 37 \text{ yd}$
23. 22 in., 2 ft $2 \text{ in.} < x < 46 \text{ in.}$
24. 24 in., 1 yd $12 \text{ in.} < x < 60 \text{ in.}$

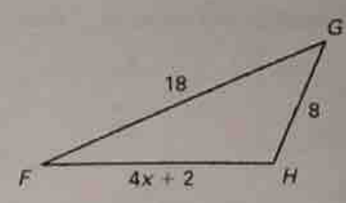
Is it possible to build a triangle using the given side lengths? If so, order the angle measures of the triangle from least to greatest.

25. $RS = \sqrt{46}, ST = 3\sqrt{5}, RT = 5$
yes; $\angle S, \angle R, \angle T$
26. $AB = \sqrt{26}, BC = 4\sqrt{5}, AC = 2\sqrt{2}$ no

***Describe* the possible values of *x*.**

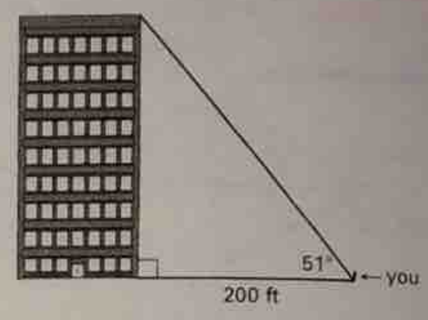
27. 

$2 < x < 7$

28. 

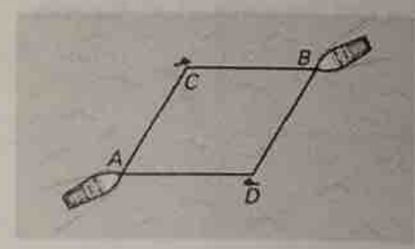
$2 < x < 6$

29. **Building** You are standing 200 feet from a tall building. The angle of elevation from your feet to the top of the building is 51° (as shown in the figure). What can you say about the height of the building?
The building is taller than 200 feet.



32. Think of the 60- and 24-foot distances as two sides of a triangle. Then the unknown distance d is $36 \text{ ft} < d < 84 \text{ ft}$. This doesn't account for the cases when the ball lands straight forward ($d = 36$ ft) or straight backward ($d = 84$ ft).

30. **Sea Rescue** The figure shows the relative positions of two rescue boats and two people in the water. Talking by radio, the captains use certain angle relationships to conclude that boat A is the closest to person C and boat B is the closest to person D. *Describe* the angle relationships that would lead to this conclusion.
$m\angle ABC < m\angle BAC$ and $m\angle BAD < m\angle ABD$



31. **Airplanes** Two airplanes leave the same airport heading in different directions. After 2 hours, one airplane has traveled 710 miles and the other has traveled 640 miles. *Describe* the range of distances that represents how far apart the two airplanes can be at this time. $70 \text{ mi} < d < 1350 \text{ mi}$

32. **Baseball** A pitcher throws a baseball 60 feet from the pitcher's mound to home plate. A batter pops the ball up and it comes down just 24 feet from home plate. What can you determine about how far the ball lands from pitcher's mound? Explain why the Triangle Inequality Theorem can be used to describe all but the shortest and longest possible distances. See above.

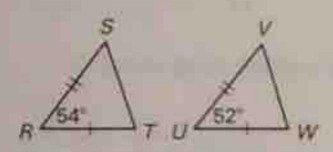
LESSON 5.6

Practice B

For use with pages 335–341

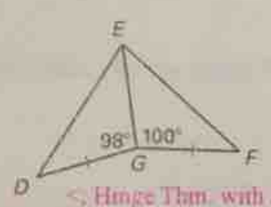
Copy and complete with <, >, or =. *Explain*.

1. ST ? VW



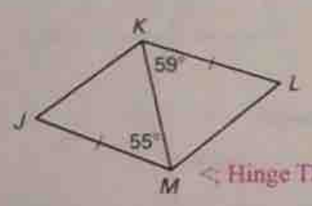
>; Hinge Thm. with $m\angle R > m\angle U$

2. DE ? EF



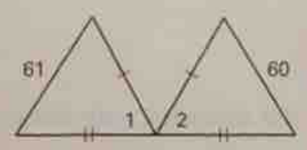
<; Hinge Thm. with $m\angle DGE < m\angle EGF$

3. JK ? LM



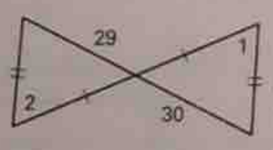
<; Hinge Thm. with $m\angle JMK < m\angle LKM$

4. $m\angle 1$? $m\angle 2$



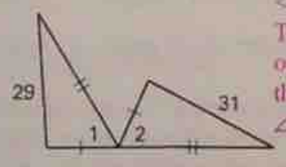
>; Converse of Hinge Thm. with the side opposite $\angle 1$ longer than the side opposite $\angle 2$.

5. $m\angle 1$? $m\angle 2$



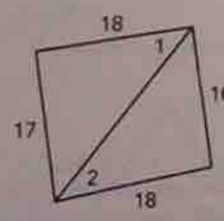
>; Converse of Hinge Thm. with the side opposite $\angle 1$ longer than the side opposite $\angle 2$.

6. $m\angle 1$? $m\angle 2$



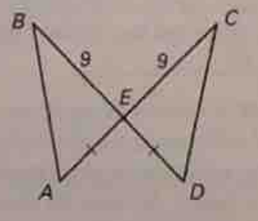
<; Converse of Hinge Thm. with the side opposite $\angle 1$ shorter than the side opposite $\angle 2$.

7. $m\angle 1$? $m\angle 2$



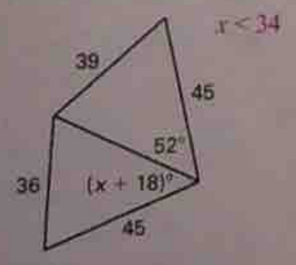
>; Converse of Hinge Thm. with the side opposite $\angle 1$ longer than the side opposite $\angle 2$.

8. AB ? CD

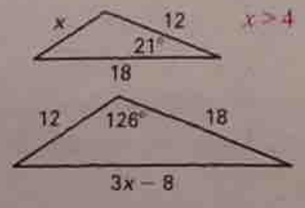


=; The triangles are ≅ by SAS.

Use the Hinge Theorem or its converse and properties of triangles to write and solve an inequality to describe a restriction on the value of *x*.

9. 

$x < 34$

10. 

$x > 4$

LESSON 5.6

Practice B *continued*

For use with pages 335–341

Write a temporary assumption you could make to prove the conclusion indirectly.

11. If two lines in a plane are parallel, then the two lines do not contain two sides of a triangle. Assume temporarily that the two parallel lines contain two sides of a triangle.

12. If two parallel lines are cut by a transversal so that a pair of consecutive interior angles is congruent, then the transversal is perpendicular to the parallel lines.
Assume temporarily that the transversal is not perpendicular to the parallel lines.

13. **Table Making** All four legs of the table shown have identical measurements, but they are attached to the table top so that $\angle 3$ is smaller than $\angle 1$.

   a. Use the Hinge Theorem to *explain* why the table top is not level. See below.
   b. Use the Converse of the Hinge Theorem to *explain* how to use a length measure to determine when $\angle 4 \cong \angle 2$ in reattaching the rear pair of legs to make the table level. By the Converse of the Hinge Thm., $\angle 4$ will be larger than $\angle 2$ until the distance between the tops of each pair of legs is the same.

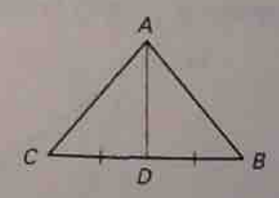
14. **Fishing Contest** One contestant in a catch-and-release fishing contest spends the morning at a location 1.8 miles due north of the starting point, then goes 1.2 miles due east for the rest of the day. A second contestant starts out 1.2 miles due east of the starting point, then goes another 1.8 miles in a direction 84° south of due east to spend the rest of the day. Which angler is farther from the starting point at the end of the day? *Explain* how you know.
the second angler. The included $\angle$ for the second angler is 96° and for the first angler is 90°.

15. **Indirect Proof** Arrange statements A–F in order to write an indirect proof of Case 1. F, E, B, A, D, C

GIVEN: $\overline{AD}$ is a median of $\triangle ABC$; $\angle ADB \cong \angle ADC$

PROVE: $AB = AC$

Case 1:



   A. Then $m\angle ADB < m\angle ADC$ by the converse of the Hinge Theorem.
   B. Then $\overline{BD} \cong \overline{CD}$ by the definition of midpoint. Also, $\overline{AD} \cong \overline{AD}$ by the reflexive property.
   C. This contradiction shows that the temporary assumption that $AB < AC$ is false.
   D. But this contradicts the given statement that $\angle ADB \cong \angle ADC$.
   E. Because $\overline{AD}$ is a median of $\triangle ABC$, D is the midpoint of $\overline{BC}$.
   F. Temporarily assume that $AB < AC$.

16. **Indirect Proof** There are two cases to consider for the proof in Exercise 15. Write an indirect proof for Case 2. Temporarily assume that $AB > AC$. The steps of the proof correspond to the steps of the proof in Ex. 15.

13. a. Because $m\angle 3 < m\angle 1$, by the Hinge Thm. the far side of the table is lower than the near side.