Triangles Chapter Problems

Classify the Triangles by Sides or Angles

Class Work

In problems #1-10, choose the most appropriate description for the given triangle. (Equilateral, Scalene, Isosceles, Obtuse, Acute, Right, Equiangular)

1. Side lengths: 3 cm, 4 cm, 5 cm
2. Side lengths: 3 cm, 3 cm, 4 cm
3. Side lengths: 2 cm, 3 cm, 2 cm
4. Side lengths: 5 cm, 5 cm, 5 cm
5. Side lengths: 2 cm, 3 cm, 4 cm
6. Angle Measures: 30°, 60°, 90°
7. Angle Measures: 60°, 60°, 60°
8. Angle Measures: 92°, 37°, 51°
10. Angle measures: 37°, 39°, 104°

Complete the statement using ALWAYS, SOMETIMES, and NEVER.

11. An isosceles triangle is ___________ a scalene triangle.
12. An equilateral triangle is ___________ an isosceles triangle.
13. An isosceles triangle is ___________ an equilateral triangle.
14. An acute triangle is ___________ an equiangular triangle.
15. An isosceles triangle is ___________ a right triangle.

For #16-20, classify the triangles by Sides & Angles

16. 17. 18.

19. 20.
Classify the Triangles by Sides or Angles

Homework

In problems #21-30, choose the most appropriate description for the given triangle. (Equilateral, Scalene, Isosceles, Obtuse, Acute, Right, Equiangular)

21. Side lengths: 5 cm, 6 cm, 7 cm
22. Side lengths: 2 cm, 2 cm, 3 cm
23. Side lengths: 3 cm, 3 cm, 3 cm
24. Side lengths: 3 cm, 4 cm, 4 cm
25. Side lengths: 4 cm, 3 cm, 2 cm
26. Angle Measures: 60°, 60°, 60°
27. Angle Measures: 60°, 30°, 90°
28. Angle Measures: 33°, 52°, 95°
29. Angle Measures: 37°, 43°, 100°
30. Angle measures: 25°, 67°, 88°

Complete the statement using ALWAYS, SOMETIMES, and NEVER.

31. A scalene triangle is ___________ an equilateral triangle.
32. An equilateral triangle is ___________ an obtuse triangle.
33. An isosceles triangle is ___________ an acute triangle.
34. An equiangular triangle is ___________ a right triangle.
35. A right triangle is ___________ an isosceles triangle.

For #36-40, classify the triangles by Sides & Angles

36. 37. 38. 39. 40.
Triangle Sum & Exterior Angle Theorems

Class Work
In the given triangles, solve for the missing variable(s).

41. \[ \begin{array}{c}
29^\circ \\
93^\circ \\
x^\circ 
\end{array} \]

42. \[ \begin{array}{c}
57^\circ \\
x^\circ 
\end{array} \]

43. \[ \begin{array}{c}
(4x + 21)^\circ \\
(2x + 8)^\circ \\
(x - 10)^\circ 
\end{array} \]

44. \[ \begin{array}{c}
55^\circ \\
85^\circ \\
x^\circ 
\end{array} \]

45. \[ \begin{array}{c}
65^\circ \\
x^\circ \\
(3y + 10)^\circ 
\end{array} \]

46. \[ \begin{array}{c}
(4x - 13)^\circ \\
2x^\circ \\
(3x + 23)^\circ 
\end{array} \]

47. \[ \begin{array}{c}
x^\circ \\
(3x - 18)^\circ 
\end{array} \]

48. \[ \begin{array}{c}
39^\circ \\
21^\circ \\
65^\circ \\
x^\circ \\
y^\circ \\
r^\circ 
\end{array} \]

49. \[ \begin{array}{c}
a^\circ \\
b^\circ \\
144^\circ \\
c^\circ \\
de^\circ \\
126^\circ \\
d^\circ \\
e^\circ \\
f^\circ \\
g^\circ \\
h^\circ \\
P 
\end{array} \]
Triangle Sum & Exterior Angle Theorems

Homework

In the given triangles, solve for the missing variable(s).

50. \(x\)°

51. \((3x-14)\)°

52. \((2x+15)\)°

53. \((x+4)\)°

54. \((3x-18)\)°

55. \((y-13)\)°

56. \(26\)°

57. \(19\)°

58. \(23\)°

59. \(19\)°
**PARCC type question**

60. Proof of Triangle Sum Theorem: Complete the proof by filling in the missing reasons with the “reasons bank” to the right. Some reasons may be used more than once, and some may not be used at all.

Given: \( \parallel k \), \( \angle DBE \) is a straight angle
Prove: \( m\angle 1 + m\angle 4 + m\angle 7 = 180^\circ \)

<table>
<thead>
<tr>
<th>Statements</th>
<th>Reasons</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. ( j \parallel k )( \angle DBE ) is a straight angle</td>
<td>1. a) Angle Addition Postulate</td>
</tr>
<tr>
<td>2. ( m\angle DBE = 180^\circ )</td>
<td>2. b) Substitution Property of Equality</td>
</tr>
<tr>
<td>3. ( m\angle 3 + m\angle 4 + m\angle 5 = m\angle DBE )</td>
<td>3. c) If 2 parallel lines are cut by a transversal, then the alternate interior angles are congruent.</td>
</tr>
<tr>
<td>4. ( m\angle 3 + m\angle 4 + m\angle 5 = 180^\circ )</td>
<td>4. d) If 2 parallel lines are cut by a transversal, then the corresponding angles are congruent.</td>
</tr>
<tr>
<td>5. ( \angle 3 \cong \angle 1, \angle 5 \cong \angle 7 )</td>
<td>5. e) Given</td>
</tr>
<tr>
<td>6. ( m\angle 3 = m\angle 1, m\angle 5 = m\angle 7 )</td>
<td>6. f) Definition of congruent angles.</td>
</tr>
<tr>
<td>7. ( m\angle 1 + m\angle 4 + m\angle 7 = 180^\circ )</td>
<td>7. g) Definition of a straight angle.</td>
</tr>
</tbody>
</table>

**Inequalities in Triangles**

**Class work**

For each triangle list the sides from greatest to smallest #61-63.

61. \( A \), \( B \), \( C \)
62. \( D \), \( E \), \( F \)
63. \( H \), \( I \), \( G \)

For each triangle list the angles in order from greatest to smallest #64-66.

64. \( L \), \( M \), \( O \)
65. \( K \), \( J \), \( N \)
66. \( Q \), \( R \), \( P \)
Will the three lengths given make a triangle?
67. 2, 3, and 4
68. 1, 3, and 4
69. 5, 6, and 7
70. 16, 8, and 7
71. 20, 10, and 10
72. 8x, 7x, and 14x

Given the lengths of two sides of a triangle, what lengths could the third side, x, have?
73. 12 and 14
74. 15 and 6
75. 22 and 22
76. 9 and 12
77. 8y and 10y

**Inequalities in Triangles**

**Homework**

For each triangle list the sides from greatest to smallest #78-80.
78.  
79.  
80.  

For each triangle list the angles in order from greatest to smallest #81-83.
81.  
82.  
83.  

---

Geometry: Triangles

~6~
List the sides in order from **shortest** to **longest** #84-85.

84.  

85.  

Will the three lengths given make a triangle?

- 86. 21, 34, and 49
- 87. 11, 31, and 44
- 88. 8, 6, and 5
- 89. 12, 5, and 7
- 90. 20, 30, and 11
- 91. 9x, 17x, and 26x

Given the lengths of two sides of a triangle, what lengths could the third side, x, have?

- 92. 10 and 21
- 93. 19 and 8
- 94. 30 and 30
- 95. 5 and 15
- 96. 4y and 14y

**Similar Triangles**

**Class work**

97. Determine if the triangles are similar. If so, write a similarity statement & state the similarity postulate or theorem.

a.  

b.  

c.  

Geometry: Triangles
PARCC type questions: Complete the proof by filling in the missing reasons with the "reasons bank" to the right. Some reasons may not be used at all.

98. Given: $\overline{DH} \parallel \overline{FG}$
Prove: $\triangle {DEH} \sim \triangle {GEF}$

<table>
<thead>
<tr>
<th>Statements</th>
<th>Reasons</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. $\overline{DH} \parallel \overline{FG}$</td>
<td>1.</td>
</tr>
<tr>
<td>2. $\angle D \equiv \angle G$</td>
<td>2.</td>
</tr>
<tr>
<td>3. $\angle {DEH} \equiv \angle {GEF}$</td>
<td>3.</td>
</tr>
<tr>
<td>4. $\triangle {DEH} \sim \triangle {GEF}$</td>
<td>4.</td>
</tr>
</tbody>
</table>

**Reasons Bank**

a) If 2 parallel lines are cut by a transversal, then the alternate interior angles are congruent.
b) If 2 parallel lines are cut by a transversal, then the corresponding angles are congruent.
c) Given
d) Vertical angles are congruent
e) AA~
f) SAS~
g) SSS~

99. Given: $R\ A\ PR = 9\ ,\ QR = 7.2\ ,\ AB = 4.8\ ,\ and\ AC = 6$
Prove: $\triangle {QPR} \sim \triangle {BCA}$

<table>
<thead>
<tr>
<th>Statements</th>
<th>Reasons</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. $R\ A\ ,\ PR = 9\ ,\ QR = 7.2\ ,\ AB = 4.8\ ,\ and\ AC = 6$</td>
<td>1.</td>
</tr>
<tr>
<td>2. $\frac{PR}{CA} = \frac{9}{6} = \frac{3}{2}, \frac{QR}{BA} = \frac{7.2}{4.8} = \frac{3}{2}$</td>
<td>2.</td>
</tr>
<tr>
<td>3. $\frac{PR}{CA} = \frac{QR}{BA}$</td>
<td>3.</td>
</tr>
<tr>
<td>4. $\triangle {QPR} \sim \triangle {BCA}$</td>
<td>4.</td>
</tr>
</tbody>
</table>

**Reasons Bank**

a) If the scale factors are the same, then the sides are proportional.
b) Given
c) AA~
d) Calculating the scale factor between the sides of the triangles.
e) SAS~
f) SSS~

g) SSS~

100. Given: $A\ D\ ,\ B\ E$
Prove: $\triangle {ABC} \sim \triangle {DEF}$

<table>
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</tr>
</thead>
<tbody>
<tr>
<td>1. $A\ D\ ,\ B\ E$</td>
<td>1.</td>
</tr>
<tr>
<td>2. $\triangle {ABC} \sim \triangle {DEF}$</td>
<td>2.</td>
</tr>
</tbody>
</table>

**Reasons Bank**

a) AA~
b) SAS~
c) SSS~
d) Given
101. Given: \( \frac{AB}{DE} = \frac{BC}{EF} = \frac{CA}{FD} \)
Prove: \( \triangle ABC \sim \triangle DEF \)

<table>
<thead>
<tr>
<th>Statements</th>
<th>Reasons</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. ( \frac{AB}{DE} = \frac{BC}{EF} = \frac{CA}{FD} )</td>
<td>1.</td>
</tr>
<tr>
<td>2. ( \triangle ABC \sim \triangle DEF )</td>
<td>2.</td>
</tr>
</tbody>
</table>

In problems 102-104, determine if \( DE \parallel BC \).

102.

103.

104.

PARCC type questions:
Solve for \( y \).

105.

106.
PARCC type question: Complete the proof by filling in the missing reasons with the “reasons bank” to the right. Some reasons may not be used at all.

107. Prove the Side Splitter Theorem

Given \( \overline{BD} \parallel \overline{AE} \)
Prove \( \frac{BA}{CB} = \frac{DE}{CD} \)

<table>
<thead>
<tr>
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</thead>
<tbody>
<tr>
<td>1. ( \overline{BD} \parallel \overline{AE} )</td>
<td>1.</td>
</tr>
<tr>
<td>2. ( \angle C \cong \angle C )</td>
<td>2.</td>
</tr>
<tr>
<td>3. ( \angle C B D \cong \angle C A E )</td>
<td>3.</td>
</tr>
<tr>
<td>4. ( \Delta C B D \sim \Delta C A E )</td>
<td>4.</td>
</tr>
<tr>
<td>5. ( \frac{CA}{CB} = \frac{CE}{CD} )</td>
<td>5.</td>
</tr>
<tr>
<td>6. ( CA = CB + BA )</td>
<td>6.</td>
</tr>
<tr>
<td>( CE = CD + DE )</td>
<td></td>
</tr>
<tr>
<td>7. ( \frac{CB+BA}{CB} = \frac{CD+DE}{CD} )</td>
<td>7.</td>
</tr>
<tr>
<td>8. ( \frac{CB}{CB} + \frac{BA}{CB} = \frac{CD}{CD} + \frac{DE}{CD} )</td>
<td>8.</td>
</tr>
<tr>
<td>9. ( 1 + \frac{BA}{CB} = 1 + \frac{DE}{CD} )</td>
<td>9.</td>
</tr>
<tr>
<td>10. ( \frac{BA}{CB} = \frac{DE}{CD} )</td>
<td>10.</td>
</tr>
</tbody>
</table>

**Reasons Bank**

a) If 2 parallel lines are cut by a transversal, then the alternate interior angles are congruent.
b) If 2 parallel lines are cut by a transversal, then the corresponding angles are congruent.
c) Given
d) Reflexive Property of Congruence
e) AA~
f) SAS~
g) If two triangles are similar, then their corresponding sides are proportional.
h) SSS~
i) Substitution Property of Equality
j) Subtraction Property of Equality
k) Addition Property of Equality
l) Segment Addition Postulate
m) Addition Property of Fractions
   \( (e.g. \frac{2}{5} + \frac{1}{5} = \frac{2+1}{5} = \frac{3}{5}) \)
   n) Simplifying the Equation

**Similar Triangles**

**Homework**

108. Determine if the triangles are similar. If so, write a similarity statement & state the similarity postulate or theorem.

a. 

b. 

c. 

Geometry: Triangles

~10~
PARCC type questions: Complete the proof by filling in the missing reasons with the “reasons bank” to the right. Some reasons may not be used at all.

109. Given: \( \overline{BD} \parallel \overline{AE} \)
Prove: \( \triangle ACE \sim \triangle BCD \)

\[
\begin{array}{c|c}
\text{Statements} & \text{Reasons} \\
1. \overline{BD} \parallel \overline{AE} & 1. \\
2. \angle C \cong \angle C & 2. \\
3. \angle CDB \cong \angle CEA & 3. \\
4. \triangle ACE \sim \triangle BCD & 4. \\
\end{array}
\]

Reasons Bank

a) If 2 parallel lines are cut by a transversal, then the alternate interior angles are congruent.
b) If 2 parallel lines are cut by a transversal, then the corresponding angles are congruent.
c) Given
d) Reflexive Property of Congruence
e) AA~
f) SAS~
g) SSS~

110. Given: \( m \angle P = 48^\circ, m \angle Q = 55^\circ, m \angle B = 55^\circ, m \angle C = 77^\circ \)
Prove: \( \triangle PQR \sim \triangle ABC \)

\[
\begin{array}{c|c}
\text{Statements} & \text{Reasons} \\
1. m \angle P = 48^\circ, m \angle Q = 55^\circ, & 1. \\
\quad m \angle B = 55^\circ, m \angle C = 77^\circ & 2. \\
2. m \angle R = 77^\circ & 3. \\
3. \angle Q \cong \angle B, \angle R \cong \angle C & 3. \\
4. \triangle PQR \sim \triangle ABC & 4. \\
\end{array}
\]

Reasons Bank

a) Triangle Sum Theorem
b) Given
c) AA~
d) SAS~
e) Definition of congruent angles
f) SSS~

c) Given

111. Given: \( \frac{AB}{DE} = \frac{CA}{FD} \), \( A \quad D \)
Prove: \( \triangle ABC \sim \triangle DEF \)

\[
\begin{array}{c|c}
\text{Statements} & \text{Reasons} \\
1. \frac{AB}{DE} = \frac{CA}{FD} & 1. \\
2. \triangle ABC \sim \triangle DEF & 2. \\
\end{array}
\]

Reasons Bank

a) AA~
b) SAS~
c) SSS~
d) Given

Geometry: Triangles
In problems 112-114, determine if $DE \parallel BC$.

112.

113.

114.

PARCC type questions:
Solve for $y$.

115.

116.

117.
PARCC type question:
118. Prove the Converse to the Side Splitter Theorem: Complete the proof by filling in the missing reasons with the “reasons bank” to the right. Some reasons may not be used at all.

Given \( \frac{BA}{CB} = \frac{DE}{CD} \)
Prove \( BD \parallel AE \)

<table>
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<tbody>
<tr>
<td>1. ( \frac{BA}{CB} = \frac{DE}{CD} )</td>
<td>1.</td>
</tr>
<tr>
<td>2. ( 1 + \frac{BA}{CB} = 1 + \frac{DE}{CD} )</td>
<td>2.</td>
</tr>
<tr>
<td>3. ( \frac{CB}{CB + BA} = \frac{CD}{CD + DE} )</td>
<td>3.</td>
</tr>
<tr>
<td>4. ( \frac{CA}{CB} )</td>
<td>4.</td>
</tr>
<tr>
<td>5. ( CA = CB + BA )</td>
<td>5.</td>
</tr>
<tr>
<td>6. ( CE = CD + DE )</td>
<td>6.</td>
</tr>
<tr>
<td>7. ( \angle C \cong \angle C )</td>
<td>7.</td>
</tr>
<tr>
<td>8. ( \Delta CBD \sim \Delta CAE )</td>
<td>8.</td>
</tr>
<tr>
<td>9. ( \angle CBD \cong \angle CAE )</td>
<td>9.</td>
</tr>
<tr>
<td>10. ( BD \parallel AE )</td>
<td>10.</td>
</tr>
</tbody>
</table>

Reasons Bank
a) If 2 lines are cut by a transversal and the alternate interior angles are congruent, then the lines are parallel.
b) If 2 lines are cut by a transversal and the corresponding angles are congruent, then the lines are parallel.
c) Given
d) Reflexive Property of Congruence
e) AA~
f) SAS~
g) SSS~
h) If two triangles are similar, then the corresponding angles are congruent.
i) Substitution Property of Equality
j) Subtraction Property of Equality
k) Addition Property of Equality
l) Segment Addition Postulate
m) Addition Property of Fractions
\( \left( e.g. \frac{2}{5} + \frac{1}{5} = \frac{2+1}{5} = \frac{3}{5} \right) \)
n) Simplifying the Equation

Applications
Class work
119. You want to know the approximate height of your school building. You place a mirror on the ground and stand where you can see the top of the building in the mirror. How tall is your school? The mirror is 30 feet from the base of the school. You are 36 inches from the mirror and your eyes are 5 feet above the ground. Round your answer to the nearest whole number.

120. You want to know the approximate height of a very tall pine tree. You place a mirror on the ground and stand where you can see the top of the tree in the mirror. How tall is the tree? The mirror is 24 feet from the base of the tree. You are 24 inches from the mirror and your eyes are 6 feet above the ground. Round your answer to the nearest tenth.
121. To find the distance $d$ across a lake, you locate the points as shown. Find the value of $d$. Round your answer to the nearest tenth.

122. You want to know the approximate height of your house. You place a mirror on the ground and stand where you can see the top of your house in the mirror. How tall is your house? The mirror is 25 feet from the base of your house. You are 60 inches from the mirror and your eyes are 5 feet 6 inches above the ground. Round your answer to the nearest tenth.

123. You want to know the approximate height of a tall oak tree. You place a mirror on the ground and stand where you can see the top of the tree in the mirror. How tall is the tree? The mirror is 24 feet from the base of the tree. You are 36 inches from the mirror and your eyes are 5 feet above the ground. Round your answer to the nearest tenth.

124. To find the distance $d$ across a lake, you locate the points as shown. Find the value of $d$. Round your answer to the nearest tenth.
### Triangles Review

#### Multiple Choice

1. Identify the triangles by sides and angles
   a. scalene, acute
   b. isosceles, obtuse
   c. scalene, obtuse
   d. equilateral, equiangular

2. Angle measures of a triangle are given, find the value of $x$.
   a. 24
   b. 28
   c. 32
   d. 30

3. Classify the triangle by sides and angles.
   a. scalene, obtuse
   b. isosceles, acute
   c. scalene, acute
   d. isosceles, obtuse

4. Using the figure at right, list the segments from least to greatest.
   a. $\overline{BC}, \overline{AC}, \overline{BC}, \overline{AD}, \overline{DC}$
   b. $\overline{AB}, \overline{BC}, \overline{AC}, \overline{AD}, \overline{DC}$
   c. $\overline{AD}, \overline{DC}, \overline{AC}, \overline{AB}, \overline{BC}$
   d. cannot be determined

5. Use the diagram to find the value of $x$.
   a. 130
   b. 125
   c. 120
   d. 110

6. Which of the following values cannot be the third side of a triangle if two of the sides are 14 and 20?
   a. 18
   b. 20
   c. 32.5
   d. 34
7. Decide whether the triangles are similar. If so, write a similarity statement.

\[ \triangle ABC \sim \triangle DEF \]

a. Yes, \( \triangle ABC \sim \triangle DEF \)
b. Yes, \( \triangle ABC \sim \triangle DFE \)
c. Yes, \( \triangle ABC \sim \triangle FDE \)
d. The triangles are not similar

8. Determine if the triangles are similar. If so, state the similarity postulate or theorem.

\[ \triangle ABC : \triangle DEF \]

a. Yes, by AA
b. Yes, by SSS

c. Yes, by SAS

d. The triangles are not similar

9. Determine if the triangles are similar. If so, state the similarity postulate or theorem.

\[ \triangle ABC : \triangle DEF \]

a. Yes, by AA
b. Yes, by SSS

c. Yes, by SAS

d. The triangles are not similar

10. Solve for y

\[ \triangle ABC \]

a. 8
b. 4.5
c. 6
d. 12
11. Solve for x

12. Find the values of x and z.

13. \( \triangle JKL \sim \triangle NPM \). Find the values if \( x \) & \( y \)
14. To find the distance \( d \) across a stream, you locate the points as shown. Find the value of \( d \).

\[ \text{\includegraphics{stream_diagram.png}} \]

Extended Constructed Response – Write the correct answer for each question. Partial credit will be given.

15. Complete the proof by filling in the missing reasons with the “reasons bank” to the right. Some reasons may not be used at all.

Given \( \overline{BD} \parallel \overline{AE} \)

Prove \( \triangle BCD \sim \triangle ACE \)

<table>
<thead>
<tr>
<th>Statements</th>
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<tbody>
<tr>
<td>1. ( \overline{BD} \parallel \overline{AE} )</td>
<td>1.</td>
</tr>
<tr>
<td>2. ( \angle C \cong \angle C )</td>
<td>2.</td>
</tr>
<tr>
<td>3. ( \angle CBD \cong \angle CAE )</td>
<td>3.</td>
</tr>
<tr>
<td>4. ( \triangle BCD \sim \triangle ACE )</td>
<td>4.</td>
</tr>
</tbody>
</table>

Reasons Bank

a) If 2 parallel lines are cut by a transversal, then the alternate interior angles are congruent.
b) If 2 parallel lines are cut by a transversal, then the corresponding angles are congruent.
c) Reflexive Property of Congruence
d) AA~
e) SAS~
f) Given
g) SSS~
### Answers

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Scalene</td>
</tr>
<tr>
<td>2.</td>
<td>Isosceles</td>
</tr>
<tr>
<td>3.</td>
<td>Isosceles</td>
</tr>
<tr>
<td>4.</td>
<td>Equilateral and isosceles</td>
</tr>
<tr>
<td>5.</td>
<td>Scalene</td>
</tr>
<tr>
<td>6.</td>
<td>Right</td>
</tr>
<tr>
<td>7.</td>
<td>Equiangular &amp; acute</td>
</tr>
<tr>
<td>8.</td>
<td>Obtuse</td>
</tr>
<tr>
<td>9.</td>
<td>Acute</td>
</tr>
<tr>
<td>10.</td>
<td>Obtuse</td>
</tr>
<tr>
<td>11.</td>
<td>Never</td>
</tr>
<tr>
<td>12.</td>
<td>Always</td>
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<tr>
<td>13.</td>
<td>Sometimes</td>
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<tr>
<td>14.</td>
<td>Sometimes</td>
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<tr>
<td>15.</td>
<td>Sometimes</td>
</tr>
<tr>
<td>17.</td>
<td>Sides: Scalene, Angles: Obtuse</td>
</tr>
<tr>
<td>18.</td>
<td>Sides: Isosceles, Angles: Obtuse</td>
</tr>
<tr>
<td>19.</td>
<td>Sides: Scalene, Angles: Right</td>
</tr>
<tr>
<td>20.</td>
<td>Sides: Isosceles, Angles: Obtuse</td>
</tr>
<tr>
<td>21.</td>
<td>Scalene</td>
</tr>
<tr>
<td>22.</td>
<td>Isosceles</td>
</tr>
<tr>
<td>23.</td>
<td>Equilateral and isosceles</td>
</tr>
<tr>
<td>24.</td>
<td>Isosceles</td>
</tr>
<tr>
<td>25.</td>
<td>Scalene</td>
</tr>
<tr>
<td>26.</td>
<td>Equiangular &amp; acute</td>
</tr>
<tr>
<td>27.</td>
<td>Right</td>
</tr>
<tr>
<td>28.</td>
<td>Obtuse</td>
</tr>
<tr>
<td>29.</td>
<td>Obtuse</td>
</tr>
<tr>
<td>30.</td>
<td>Acute</td>
</tr>
<tr>
<td>31.</td>
<td>Never</td>
</tr>
<tr>
<td>32.</td>
<td>Never</td>
</tr>
<tr>
<td>33.</td>
<td>Sometimes</td>
</tr>
<tr>
<td>34.</td>
<td>Never</td>
</tr>
<tr>
<td>35.</td>
<td>Sometimes</td>
</tr>
<tr>
<td>36.</td>
<td>Sides: Scalene, Angles: Right</td>
</tr>
<tr>
<td>37.</td>
<td>Sides: Scalene, Angles: Obtuse</td>
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<tr>
<td>38.</td>
<td>Sides: Isosceles, Angles: Obtuse</td>
</tr>
<tr>
<td>39.</td>
<td>Sides: Isosceles, Angles: Acute</td>
</tr>
<tr>
<td>40.</td>
<td>Sides: Isosceles, Angles: Acute</td>
</tr>
<tr>
<td>41.</td>
<td>$X=58^\circ$</td>
</tr>
<tr>
<td>42.</td>
<td>$X=33^\circ$</td>
</tr>
<tr>
<td>43.</td>
<td>$X=23^\circ$</td>
</tr>
<tr>
<td>44.</td>
<td>$X=30^\circ$</td>
</tr>
<tr>
<td>45.</td>
<td>$X=79^\circ$, $Z=144^\circ$, $y=55^\circ$</td>
</tr>
<tr>
<td>46.</td>
<td>$X=12$</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Statements</th>
<th>Reasons</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. $j \parallel k$</td>
<td>1. e</td>
</tr>
<tr>
<td>$\angle DBE$ is a straight angle</td>
<td></td>
</tr>
<tr>
<td>2. $m\angle DBE = 180^\circ$</td>
<td>2. g</td>
</tr>
<tr>
<td>$m\angle 3 + m\angle 4 + m\angle 5 = m\angle DBE$</td>
<td>3. a</td>
</tr>
<tr>
<td>$m\angle 5 = 180^\circ$</td>
<td>4. b</td>
</tr>
<tr>
<td>$\angle 3 \cong \angle 1$, $\angle 5 \cong \angle 7$</td>
<td>5. c</td>
</tr>
<tr>
<td>$m\angle 3 = m\angle 1$, $m\angle 5 = m\angle 7$</td>
<td>6. f</td>
</tr>
<tr>
<td>$m\angle 1 + m\angle 4 + m\angle 7 = 180^\circ$</td>
<td>7. b</td>
</tr>
</tbody>
</table>

61. $\overline{AC}$, $\overline{BC}$, $\overline{AB}$
62. $\overline{DF}$, $\overline{EF}$, $\overline{DE}$
63. $\overline{GI}$, $\overline{HI}$, $\overline{HG}$
64. $<K$, $<L$, $<J$
65. $<N$, $<M$, $<O$
66. $<P$, $<Q$, $<R$
67. yes
68. no
69. yes
70. no
71. no
72. yes
73. $2 < x < 26$
74. $9 < x < 21$
75. \(0 < x < 44\)
76. \(3 < x < 21\)
77. \(2y < x < 18y\)
78. \(\frac{BC}{AB}, \frac{AB}{AC}\)
79. \(\frac{EF}{DE}, \frac{DE}{DF}\)
80. \(\overline{GH}, \overline{HI}, \overline{GH}\)
81. \(<H, <I, <G\)
82. \(<K, <J, <L\)
83. \(<N, <M, <O\)
84. \(\overline{UV}, \overline{TV}, \overline{UT}, \overline{ST}, \overline{SU}\)
85. \(\overline{FJ}, \overline{GF}, \overline{GJ}, \overline{GH}, \overline{HI}, \overline{JI}\)
86. yes
87. no
88. yes
89. no
90. yes
91. no
92. \(11 < x < 31\)
93. \(11 < x < 27\)
94. \(0 < x < 60\)
95. \(10 < x < 20\)
96. \(10y < x < 20y\)
97. a. not similar
   b. yes by SAS
   c. not similar

101.

<table>
<thead>
<tr>
<th>Statements</th>
<th>Reasons</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. (\frac{AB}{BC} = \frac{BC}{AC})</td>
<td>1. d</td>
</tr>
<tr>
<td>2. (\frac{DE}{EF} = \frac{EF}{FD})</td>
<td>2. c</td>
</tr>
</tbody>
</table>

102. yes
103. no
104. no
105. 12
106. 11.36
107.

<table>
<thead>
<tr>
<th>Statements</th>
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</thead>
<tbody>
<tr>
<td>1. (\overline{BD} \parallel \overline{AE})</td>
<td>1. c</td>
</tr>
<tr>
<td>2. (\angle C \cong \angle C)</td>
<td>2. d</td>
</tr>
<tr>
<td>3. (\angle CBD \cong \angle C)</td>
<td>3. b</td>
</tr>
<tr>
<td>4. (\triangle ABC \sim \triangle DEF)</td>
<td>4. e</td>
</tr>
</tbody>
</table>

108. a. yes, by AA~ or SAS~
   b. not similar
   c. yes, by SSS~

109.

<table>
<thead>
<tr>
<th>Statements</th>
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<tbody>
<tr>
<td>1. (\overline{BD} \parallel \overline{AE})</td>
<td>1. c</td>
</tr>
<tr>
<td>2. (\angle C \cong \angle C)</td>
<td>2. d</td>
</tr>
<tr>
<td>3. (\angle CDB \cong \angle C)</td>
<td>3. b</td>
</tr>
<tr>
<td>4. (\triangle CDB \cong \triangle C)</td>
<td>4. e</td>
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110.

<table>
<thead>
<tr>
<th>Statements</th>
<th>Reasons</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. (m = 48^\circ), (m = 55^\circ), (m = 77^\circ)</td>
<td>1. b</td>
</tr>
</tbody>
</table>

111.

<table>
<thead>
<tr>
<th>Statements</th>
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</tr>
</thead>
<tbody>
<tr>
<td>1. (m = P = 48^\circ), (m = Q = 55^\circ), (m = C = 77^\circ)</td>
<td>1. b</td>
</tr>
</tbody>
</table>

112.

<table>
<thead>
<tr>
<th>Statements</th>
<th>Reasons</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. (\angle \alpha = \angle \beta), (\angle \gamma = \angle \delta)</td>
<td>1. b</td>
</tr>
</tbody>
</table>

113.

<table>
<thead>
<tr>
<th>Statements</th>
<th>Reasons</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. (\overline{AD} \parallel \overline{BE})</td>
<td>1. d</td>
</tr>
<tr>
<td>2. (\triangle ABC \sim \triangle DEF)</td>
<td>2. a</td>
</tr>
</tbody>
</table>

114.
<table>
<thead>
<tr>
<th>Statements</th>
<th>Reasons</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. ( \frac{AB}{DE} = \frac{CA}{FD} ), ( A \neq D )</td>
<td>1. d</td>
</tr>
<tr>
<td>2. ( ABC \sim DEF )</td>
<td>2. b</td>
</tr>
</tbody>
</table>

112. yes
113. yes
114. no
115. 10
116. 11.25
117. 10

<table>
<thead>
<tr>
<th>Statements</th>
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</tr>
</thead>
<tbody>
<tr>
<td>1. ( \frac{BA}{CB} = \frac{DE}{CD} )</td>
<td>1. c</td>
</tr>
<tr>
<td>2. ( 1 + \frac{BA}{CB} = 1 + \frac{DE}{CD} )</td>
<td>2. k</td>
</tr>
<tr>
<td>3. ( \frac{CB + BA}{CB + CD} = \frac{CD + DE}{CD} )</td>
<td>3. n</td>
</tr>
<tr>
<td>4. ( \frac{CB}{CD} = \frac{CE}{DE} )</td>
<td>4. m</td>
</tr>
<tr>
<td>5. ( CA = CB + BA )</td>
<td>5. l</td>
</tr>
<tr>
<td>( CE = CD + DE )</td>
<td></td>
</tr>
<tr>
<td>6. ( \frac{CA}{CB} = \frac{CE}{CD} )</td>
<td>6. i</td>
</tr>
<tr>
<td>7. ( \angle C \cong \angle C )</td>
<td>7. d</td>
</tr>
<tr>
<td>8. ( \triangle CBD \sim \triangle CAE )</td>
<td>8. f</td>
</tr>
<tr>
<td>9. ( \angle CBD \cong \angle CAE )</td>
<td>9. h</td>
</tr>
<tr>
<td>10. ( \overline{BD} \parallel \overline{AE} )</td>
<td>10. b</td>
</tr>
</tbody>
</table>

119. 50 feet
120. 72 ft
121. 90 ft
122. 27.5 feet
123. 40 ft
124. 45 ft

**Unit Review Answer Key**

1. c
2. b
3. c
4. b
5. b
6. d

12. \( x = 50 \) & \( z = 90 \)
13. \( x = 18 \) & \( y = 22.5 \)
14. 150 ft
15.

<table>
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<tr>
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<tr>
<td>1. ( \overline{BD} \parallel \overline{AE} )</td>
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<td>2. ( \angle C \cong \angle C )</td>
<td>2. c</td>
</tr>
<tr>
<td>3. ( \angle CBD \cong \angle CAE )</td>
<td>3. b</td>
</tr>
<tr>
<td>4. ( \triangle BCD \sim \triangle ACE )</td>
<td>4. d</td>
</tr>
</tbody>
</table>