Review Section:

1. Find a counterexample to show that this statement is not true. If two angles are congruent, then they are vertical.

2. If point $(p, q)$ is $\frac{1}{3}$ of the way from $A$ to $B$, what are the values of $q$ and $q$?

   Distance between $x$-values
   
   $-3 - (-5) = 2
   
   Distance between $y$-values
   
   $3 - (-4) = 7
   
   $(\frac{2}{3}) = 1.5
   
   $7(\frac{3}{4}) = 5.25
   
   $-\frac{5}{1.5} = -\frac{3.5}{3.5}
   
   $-4 + 5.25 = 1.25$

3. Consider the statement: If James has at least two $10 bills, then he has at least $20.

   a. Is this a true statement? Justify your reasoning.

   b. Write the converse of this statement. Is this a true statement? Explain.

   If James has at least $20, then he has at least two $10 bills.

4. Find the value of the variable.

   $2x + 3x = 90
   
   $5x = 90
   
   $x = 18$

   $6x = 4x + 16
   
   $2x = 16
   
   $x = 8$

   $8x = 4x + 12
   
   $4x = 12
   
   $x = 3
   
   $8x + 13y = 180
   
   $2y + 13y = 180
   
   $13y = 150
   
   $y = 12$
Section: Properties of Parallel Lines

Use the figure to answer each question in this section.

5. If $c \parallel d$, $a \parallel b$, and $m\angle 17 = 45^\circ$, then $m\angle 6 = \underline{\ \ \ \ \ \ \ }$

6. If $\angle 15 \cong \angle 8$ then which two lines are parallel? Explain your answer.

7. Find the value of $x$.

8. Use the figure to the right. Lines $a$, $b$, $c$, and $d$ intersect as shown.
   a. Which pair of lines are parallel?

   $53y + 5y = 180$
   $2 = 53 + 5$

   b. Find the value of the variables.

   $c = 56 \quad s = 85 \quad t = 46 \quad u = 78$

   $v = 46 \quad x = 124 \quad y = 88 \quad z = 92$

9. Find the value of the variable that will make the lines parallel.

   $15x + 7 + 9x + 6 = 180$
   $24x + 12 = 180$
   $24x = 168$
   $x = 7$

   $8x + 14 = 11x - 10$
   $24 = 3x$
   $x = 8$

   $12x - 4 = 10x + 10$
   $2x = 14$
   $x = 7$
Section: Triangle Sum and Exterior Angle Theorem

10. Find the values of the variable.

\[2x + 2x + 10 + 94 = 180\]
\[4x = 76\]
\[x = 19\]

\[\begin{align*}
4y + 7y + 6 &= 114 \\
11y + 6 &= 110 \\
y &= 10
\end{align*}\]

11. Given the figure, find the values of the variables.

\[\begin{align*}
x + 82 + 54 &= 180 \\
x + 136 &= 180 \\
x &= 44
\end{align*}\]

\[y = 82 + 54 = 136\]

\[z = 136\]

Section: Slopes of Parallel and Perpendicular Lines

12. Are the lines parallel, perpendicular, or neither?

\[3x + 2y = 6\]
\[-3x\]
\[2y = -3x + 6\]

\[y = -\frac{3}{2}x + 3\]

\[3x + 2y = 6\]

\[y = \frac{2}{3}x - 2\]

13. Write an equation for a line (in slope-intercept form) parallel to \(y = -5x - 3\) and passing through the point \((2, -12)\)

\[m = -5\]

\[y - y_1 = m(x - x_1)\]

\[\begin{align*}
\gamma + 12 &= -5(x - 2) \\
\gamma + 12 &= -5x + 10
\end{align*}\]

\[\gamma = -5x - 2\]

14. Write an equation for a line (in slope intercept form) perpendicular to the line \(y = -2x + 4\) and passes through the point \((-4, -1)\)

\[m = \frac{1}{2}(-4, -1)\]

\[y + 1 = \frac{1}{2}(x + 4)\]

\[y + 1 = \frac{1}{2}x + 2\]
15. Given the following figure, find which lines will be parallel and/or perpendicular. Verify by using slopes.

\[ m = \frac{y_2 - y_1}{x_2 - x_1} \]

- **Slope of \( \ell \)** (0, 5) (8, 5)
  \[ \frac{5 - 5}{8 - 0} = \frac{0}{8} = 0 \]
- **Slope of \( \nu \)** (6, 8) (8, 5)
  \[ \frac{8 - 5}{8 - 6} = \frac{3}{2} \]
- **Slope of \( \delta \)** (0, 1) (5, 2)
  \[ \frac{2 - 1}{5 - 0} = \frac{1}{5} \]

**Slope of \( r \)** (1, 1) (0, -4)
\[ \frac{-4 - 1}{0 + 1} = -5 \]

**Slope of \( t \)** (8, 5) (4, 7)
\[ \frac{7 - 5}{4 - 8} = \frac{-2}{-4} = \frac{1}{2} \]

\( q \parallel v \)
\( s \perp r \)

**Section Proofs**

16. Given \( a \parallel b, b \parallel c \)

Prove \( a \parallel c \)

<table>
<thead>
<tr>
<th>Statement</th>
<th>Reason</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. [ a \parallel b, b \parallel c ]</td>
<td>1. Given</td>
</tr>
<tr>
<td>2. ( \angle 1 \equiv \angle 2 ) and ( \angle 2 \equiv \angle 3 )</td>
<td>2. Corresponding ( \angle )'s</td>
</tr>
<tr>
<td>3. ( \angle 1 \equiv \angle 3 )</td>
<td>3. Substitution Property</td>
</tr>
<tr>
<td>4. [ a \parallel c ]</td>
<td>4. Converse of Corresponding ( \angle )'s</td>
</tr>
</tbody>
</table>
17. Given: \( FD \parallel CA \)
   \( \angle 3 \equiv \angle 4 \)

Prove: \( \angle 5 \equiv \angle 6 \)

<table>
<thead>
<tr>
<th>Statement</th>
<th>Reason</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. ( FD \parallel CA ) ( \angle 3 \equiv \angle 4 )</td>
<td>1. Given</td>
</tr>
<tr>
<td>2. ( \angle 1 \equiv \angle 4 )</td>
<td>2. Alternate Interior ( \angle )’s</td>
</tr>
<tr>
<td>3. ( \angle 1 \equiv \angle 5 )</td>
<td>3. Vertical Angles are Congruent</td>
</tr>
<tr>
<td>4. ( \angle 3 \equiv \angle 6 )</td>
<td>4. Alternate Interior ( \angle )’s</td>
</tr>
<tr>
<td>5. ( \angle 3 \equiv \angle 1 )</td>
<td>5. Substitution</td>
</tr>
<tr>
<td>6. ( \angle 3 \equiv \angle 5 )</td>
<td>6. Substitution</td>
</tr>
<tr>
<td>7. ( \angle 5 \equiv \angle 6 )</td>
<td>7. Substitution</td>
</tr>
</tbody>
</table>

18. Given: \( a \parallel b \)

Prove: \( \angle 9 \text{ and } \angle 14 \text{ are supplementary} \)

<table>
<thead>
<tr>
<th>Statement</th>
<th>Reason</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. ( a \parallel b )</td>
<td>1. Given</td>
</tr>
<tr>
<td>2. ( m\angle 9 + m\angle 11 = 180 )</td>
<td>2. Linear Pair Post.</td>
</tr>
<tr>
<td>3. ( \angle 11 \equiv \angle 14 )</td>
<td>3. Alt ( \angle ) Interior ( \angle )’s</td>
</tr>
<tr>
<td>4. ( m\angle 11 = m\angle 14 )</td>
<td>4. Definition of Congruent Angles</td>
</tr>
<tr>
<td>5. ( m\angle 9 + m\angle 14 = 180 )</td>
<td>5. Substitution Property</td>
</tr>
<tr>
<td>6. ( \angle 9 \text{ and } \angle 14 \text{ are Supp} )</td>
<td>6. Def of Supp ( \angle )’s</td>
</tr>
</tbody>
</table>