6.

**Given:** \( a \perp b \)

**Prove:** \( \angle 1 = \angle 2 \)

<table>
<thead>
<tr>
<th>Statements</th>
<th>Reasons</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. ( a \perp b )</td>
<td>1. Given</td>
</tr>
<tr>
<td>2. ( \angle 1 ) &amp; ( \angle 2 ) are right ( \angle )s</td>
<td>2. If 2 lines are ( \perp ), then they intersect at right ( \angle )s.</td>
</tr>
<tr>
<td>3. ( \angle 1 = \angle 2 )</td>
<td>3. If 2 ( \angle )s are right ( \angle )s, then they are ( \cong ).</td>
</tr>
</tbody>
</table>

---

7.

**Given:** \( m\angle ACB = 90^\circ \)

\( AD \perp BD \)

**Prove:** \( \angle C = \angle D \)

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<td>1. ( m\angle ACB = 90^\circ )</td>
<td>1. Given</td>
</tr>
<tr>
<td>2. ( AD \perp BD )</td>
<td>2. Given</td>
</tr>
<tr>
<td>3. ( \angle ADB ) is a right ( \angle )</td>
<td>3. If 2 segments are ( \perp ), then they intersect at right ( \angle )s.</td>
</tr>
<tr>
<td>4. ( m\angle ADB = 90^\circ )</td>
<td>4. If an ( \angle ) is a right ( \angle ), then its measure is 90°.</td>
</tr>
<tr>
<td>5. ( \angle C = \angle D )</td>
<td>5. If 2 ( \angle )s have the same measure, then they are ( \cong ).</td>
</tr>
</tbody>
</table>
8.

Given:  
\[ \angle MOR = (3x + 7)^\circ \]
\[ \angle ROP = (4x - 1)^\circ \]
\[ MO \perp OP \]

Which \( \angle \) is larger, \( \angle MOR \) or \( \angle ROP \)?

\[
(3x + 7) + (4x - 1) = 90
\]
\[ \Rightarrow x = 12 \]

\[
\therefore \angle MOR = 3x + 7 = 3(12) + 7 = 43
\]
\[
\angle ROP = 4x - 1 = 4(12) - 1 = 47
\]

12.

\[ \overline{DE} \perp \overline{EF} \]. The resulting \( \angle \) is trisected, then one of the new \( \angle \)'s is bisected, and then one of the resulting \( \angle \)'s is trisected. How large is the smallest \( \angle \)?

\[
\frac{90}{3} = 30^\circ
\]
\[
\frac{30}{2} = 15^\circ
\]
\[
\frac{15}{3} = 5^\circ
\]
14.

Given: \( \overline{AB} \perp \overline{BC} \)
- \( \angle ABO = (2x + y)^\circ \)
- \( \angle OBC = (6x + 8)^\circ \)
- \( \angle AOB = (23y + 90)^\circ \)
- \( \angle BOC = (4x + 4)^\circ \)

Find \( \angle ABO \)

\[
(2x + y) + (6x + 8) = 90
\]
\[
\Rightarrow 8x + y = 82
\]
\[
\Rightarrow y = 82 - 8x
\]

\[
(23y + 90) + (4x + 4) = 180
\]
\[
\Rightarrow 4x + 23y = 86
\]
\[
\Rightarrow 4x + 23(82 - 8x) = 86
\]
\[
\Rightarrow 4x + 1886 - 184x = 86
\]
\[
\Rightarrow 180x = 1800
\]
\[
\Rightarrow x = 10
\]

\[
\Rightarrow y = 82 - 8(10) = 2
\]
\[
\therefore \angle ABO = (2x + y) = 2(10) + 2 = 22^\circ
\]
15. If a ray, \( \overrightarrow{BD} \), is chosen randomly between the sides of \( \angle ABC \), where \( m \angle ABC = 100^\circ \),
\[
\begin{align*}
  m \angle ABD &= 86^\circ \\
  m \angle DBC &= 14^\circ \\
  m \angle ABC &= 100^\circ 
\end{align*}
\]

a. What is the probability that \( \angle ABD \) is acute?

Using divisions of size 10,
\[
P = \frac{\text{# divisions where } \angle ABD \text{ is acute}}{\text{total # of divisions}} = \frac{9}{10}
\]

b. What is the probability that \( \angle DBC \) is acute?

Using divisions of size 10,
\[
P = \frac{\text{# divisions where } \angle DBC \text{ is acute}}{\text{total # of divisions}} = \frac{9}{10}
\]

c. What is the probability that both \( \angle ABD \) and \( \angle DBC \) are acute?

Using divisions of size 10,
\[
P = \frac{\text{# divisions where both } \angle ABD \text{ & } \angle DBC \text{ are acute}}{\text{total # of divisions}} = \frac{8}{10} = \frac{4}{5}
\]