In Exercises 1 and 2, the circles are congruent. What can you conclude?

1. To start, look at the chords. If they are equidistant from the center of the circle, what can be concluded? The chords must be equal.

2. \(QR \equiv TS \equiv \ ? \equiv \ ?\)
   \(\angle QGR \equiv \ ? \equiv \ ? \equiv \ ?\)
   \(\angle QGS \equiv \ ? \equiv \ ? \equiv \ ?\)

Find the value of \(x\).

3. 4. 5.

6. **Reasoning** \(\angle QRS\) and \(\angle TRV\) are vertical angles inscribed in \(\odot R\).
   What must be true of \(QS\) and \(TV\)? Explain.

Draw a Diagram Tell whether the statement is always, sometimes, or never true.

7. \(XY\) and \(RS\) are in congruent circles. Central \(\angle XYZ\) and central \(\angle RTS\) are congruent.

8. \(\odot I \cong \odot K\). The length of chord \(GH\) in \(\odot I\) is 3 in. and the length of chord \(LM\) in \(\odot K\) is 3 in. \(\angle GHI \cong \angle LKM\).

9. \(\angle STU\) and \(\angle RMO\) are central angles in congruent circles. \(m\angle STU = 50\) and \(m\angle RMO = 55\). \(ST \cong RO\).
10. In the diagram at the right, $\overline{ST}$ is a diameter of the circle and $\overline{ST} \perp \overline{QR}$. What conclusions can you make?

11. In the diagram at the right, $\overline{IJ}$ is a perpendicular bisector of chord $\overline{GH}$. What can you conclude?

Find the value of $x$ to the nearest tenth.

12. To start, since the radius is perpendicular to the chord, the chord is bisected. The longer leg of the triangle is $12 \div 2 = \underline{6}$.

13. $\odot D$ and $\odot E$ are congruent. $\overline{GH}$ is a chord of both circles. Round all answers to the nearest tenth.

16. If $DE = 10$ in. and $GH = 4$ in., how long is a radius?

17. If $DE = 22$ cm and radius = 14 cm, how long is $\overline{GH}$?

18. If the radius = 18 ft and $GH = 32$ ft, how long is $\overline{DE}$?

19. In the figure at the right, Sphere $Z$ with radius 9 in. is intersected by a plane 4 in. from center $Z$. To the nearest tenth, find the radius of the cross section $\odot X$.  

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12-2 Practice
Chords and Arcs

In Exercises 1 and 2, the circles are congruent. What can you conclude?

1. To start, look at the chords. If they are equidistant from the center of the circle, what can be concluded?
   The chords must be congruent.

   \[ FH \cong AC; \quad GF \cong GH \cong BA \cong BC; \quad FH \cong AC; \quad \angle FGH \cong \angle ABC \]

2. \[ QR \cong TS \cong \ ? \cong \ ? \]
   \[ KJ; \quad LM \]

   \[ \angle QGR = \ ? \cong \ ? \cong \ ? \]
   \[ \angle SGT; \quad \angle JBL; \quad \angle MBL \]

   \[ \angle QGS = \ ? \cong \ ? \cong \ ? \]
   \[ \angle RGT; \quad \angle JBM; \quad \angle KBL \]

   \[ \angle Q = \ ? \cong \ ? \cong \ ? \]
   \[ \angle KJ; \quad ST; \quad LM \]

   \[ \angle Q = \ ? \cong \ ? \cong \ ? \]
   \[ \angle QS = \ ? \cong \ ? \cong \ ? \]
   \[ \angle TR; \quad KL; \quad MJ \]

Find the value of \( x \).

3. 30

4. 9

5. 8

6. Reasoning \( \angle QRS \) and \( \angle TRV \) are vertical angles inscribed in \( \odot R \).
   What must be true of \( \overline{QS} \) and \( \overline{TV} \)? Explain.
   They must be \( \cong \) because vertical \( \angle \) are \( \cong \), and the arcs of \( \cong \) central \( \angle \) in the same circle are \( \cong \).

   Draw a Diagram Tell whether the statement is always, sometimes, or never true.

7. \( \overline{XY} \) and \( \overline{RS} \) are in congruent circles. Central \( \angle XYZ \) and central \( \angle RTS \) are congruent. sometimes

8. \( \odot I \cong \odot K \). The length of chord \( \overline{GH} \) in \( \odot I \) is 3 in. and the length of chord \( \overline{LM} \) in \( \odot K \) is 3 in. \( \angle GH \cong \angle LKM \). always

9. \( \angle STU \) and \( \angle RMO \) are central angles in congruent circles. \( m \angle STU = 50 \) and \( m \angle RMO = 55 \). \( \overline{SU} \cong \overline{RO} \). never
10. In the diagram at the right, $\overline{ST}$ is a diameter of the circle and $\overline{ST} \perp \overline{QR}$. What conclusions can you make? 
$\overline{QT} \cong \overline{TR}$, $\overline{SQ} \cong \overline{SR}$, and $\overline{QU} \cong \overline{UR}$.

11. In the diagram at the right, $\overline{IJ}$ is a perpendicular bisector of chord $\overline{GH}$. What can you conclude? 
*Answers may vary. Sample: $\overline{IJ}$ contains the center of the circle.*

Find the value of $x$ to the nearest tenth.

12. 

![Diagram of a triangle with sides 15, 12, and 4.5] To start, since the radius is perpendicular to the chord, the chord is bisected. 

The longer leg of the triangle is $12 \div 2 = 6$.

13. 

![Diagram of a triangle with sides 20, 4, and 10.8] $\odot D$ and $\odot E$ are congruent. $\overline{GH}$ is a chord of both circles. Round all answers to the nearest tenth.

14. 

![Diagram of a triangle with sides 9, 6, and 13.4] $\overline{DE} = 10$ in. and $\overline{GH} = 4$ in., how long is a radius? 5.4 in.

15. 

![Diagram of a circle with diameter $\overline{DE}$] If $\overline{DE} = 22$ cm and radius = 14 cm, how long is $\overline{GH}$? 17.3 cm

16. If the radius = 18 ft and $\overline{GH} = 32$ ft, how long is $\overline{DE}$? 16.5 ft

19. In the figure at the right, Sphere $Z$ with radius 9 in. is intersected by a plane 4 in. from center $Z$. To the nearest tenth, find the radius of the cross section $\odot X$. 8.1 in.