1. bisector

2. Is point B collinear with X and Z?; no; yes

3. 4.6; Because $GK = KJ$ and $\overleftrightarrow{HK} \perp \overleftrightarrow{GJ}$, point H is on the perpendicular bisector of $\overline{GJ}$. So, by the Perpendicular Bisector Theorem (Thm. 6.1), $GH = HJ = 4.6$.

4. 1.3; Because point T is equidistant from Q and S, point T is on the perpendicular bisector of $\overline{QS}$ by the Converse of the Perpendicular Bisector Theorem (Thm. 6.2). So, by definition of segment bisector, $QR = RS = 1.3$.

5. 15; Because $\overleftrightarrow{DB} \perp \overleftrightarrow{AC}$ and point D is equidistant from A and C, point D is on the perpendicular bisector of $\overline{AC}$ by the Converse of the Perpendicular Bisector Theorem (Thm. 6.2). By definition of segment bisector, $AB = BC$. So, $5x = 4x + 3$, and the solution is $x = 3$. So, $AB = 5x = 5(3) = 15$.

6. 55; Because $\overline{VD} \cong \overline{WD}$ and $\overleftrightarrow{UX} \perp \overline{VW}$, point U is on the perpendicular bisector of $\overline{VW}$. So, by the Perpendicular Bisector Theorem (Thm. 6.1), $VU = WU$. So, $9x + 1 = 7x + 13$, and the solution is $x = 6$, which means that $UW = 7x + 13 = 7(6) + 13 = 55$.

7. yes; Because point N is equidistant from L and M, point N is on the perpendicular bisector of $\overline{LM}$ by the Converse of the Perpendicular Bisector Theorem (Thm. 6.2). Because only one line can be perpendicular to $\overline{LM}$ at point K, $\overrightarrow{NK}$ must be the perpendicular bisector of $\overline{LM}$, and P is on $\overrightarrow{NK}$.

8. no; You would need to know that either $LN = MN$ or $LP = MP$.

9. no; You would need to know that $\overleftrightarrow{PN} \perp \overleftrightarrow{ML}$.

10. yes; Because point P is equidistant from L and M, point P is on the perpendicular bisector of $\overline{LM}$ by the Converse of the Perpendicular Bisector Theorem (Thm. 6.2). Also, $\overline{LN} \cong \overline{MN}$, so $\overrightarrow{PN}$ is a bisector of $\overline{LM}$. Because P can only be on one of the bisectors, $\overrightarrow{PN}$ is the perpendicular bisector of $\overline{LM}$.

11. 20°; Because D is equidistant from $\overrightarrow{BC}$ and $\overrightarrow{BA}$, $\overrightarrow{BD}$ bisects $\angle ABC$ by the Converse of the Angle Bisector Theorem (Thm. 6.4). So, $m\angle ABD = m\angle CBD = 20°$.

12. 12; $\overrightarrow{QS}$ is an angle bisector of $\angle PQR$, $\overline{PS} \perp \overrightarrow{QP}$, and $\overline{SR} \perp \overrightarrow{QR}$. So, by the Angle Bisector Theorem (Thm. 6.3), $PS = RS = 12$.

13. 28°; Because L is equidistant from $\overrightarrow{JK}$ and $\overrightarrow{JM}$, $\overrightarrow{JL}$ bisects $\angle KJM$ by the Angle Bisector Theorem (Thm. 6.3). This means that $7x = 3x + 16$, and the solution is $x = 4$. So, $m\angle KJL = 7x = 7(4) = 28°$.

14. 16; $\overrightarrow{EG}$ is an angle bisector of $\angle FEH$, $\overline{FG} \perp \overrightarrow{EF}$, and $\overline{GH} \perp \overrightarrow{EH}$. So, by the Converse of the Angle Bisector Theorem (Thm. 6.4), $FG = GH$. This means that $x + 11 = 3x + 1$, and the solution is $x = 5$. So, $FG = x + 11 = 5 + 11 = 16$.

15. yes; Because H is equidistant from $\overrightarrow{EF}$ and $\overrightarrow{EG}$, $\overrightarrow{EH}$ bisects $\angle FEG$ by the Angle Bisector Theorem (Thm. 6.3).

16. no; Congruent segments connect H to both $\overrightarrow{EF}$ and $\overrightarrow{EG}$, but unless those segments are also perpendicular to $\overrightarrow{EF}$ and $\overrightarrow{EG}$, you cannot conclude that H is equidistant from $\overrightarrow{EF}$ and $\overrightarrow{EG}$.

17. no; Because neither $\overline{BD}$ nor $\overline{DC}$ are marked as perpendicular to $\overrightarrow{AB}$ or $\overrightarrow{AC}$ respectively, you cannot conclude that $DB = DC$.

18. yes; D is on the angle bisector of $\angle BAC$, $\overline{DB} \perp \overrightarrow{AB}$ and $\overline{CD} \perp \overrightarrow{AC}$. So, $DB = DC$ by the Angle Bisector Theorem (Thm. 6.3).

19. $y = x - 2$

20. $y = -\frac{2}{3}x + \frac{22}{3}$

21. $y = -3x + 15$

22. $y = \frac{7}{4}x - \frac{33}{4}$

23. Because $\overline{DC}$ is not necessarily congruent to $\overline{EC}$, $\overleftrightarrow{AB}$ will not necessarily pass through point C; Because $AD = AE$, and $\overleftrightarrow{AB} \perp \overline{DE}$, $\overleftrightarrow{AB}$ is the perpendicular bisector of $\overline{DE}$.

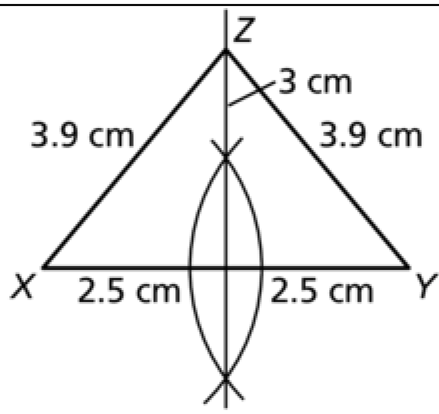
24. Because $\overline{BP}$ is not necessarily perpendicular to $\overrightarrow{CB}$, you do not have sufficient evidence to say that $BP = AP$. By the Angle Bisector Theorem (Thm. 6.3), point P is equidistant from $\overrightarrow{CB}$ and $\overrightarrow{CA}$.

25. Perpendicular Bisector Theorem (Thm. 6.1)

26. **a.** $\overrightarrow{PG}$ should bisect $\angle APB$.

b. $m\angle APB$ gets larger; more difficult; As the angle increases, the goalie is farther away from each side of the angle.

27.



Perpendicular Bisector Theorem (Thm. 6.1)

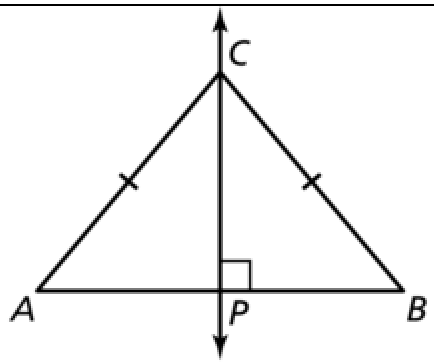
28. Because every point on a compass arc is the same distance from one endpoint, and every point on the other compass arc with the same setting is the same distance from the other endpoint, the line connecting the points where these arcs intersect contains the points that are equidistant from both endpoints. You know from the Converse of the Perpendicular Bisector Theorem (Thm. 6.2) that the set of points that are equidistant from both endpoints make up the perpendicular bisector of the given segment.

29. B

30. B

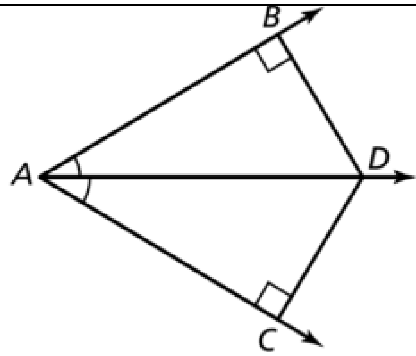
31. no; If the triangle is an isosceles triangle, then the angle bisector of the vertex angle will also be the perpendicular bisector of the base.

32.



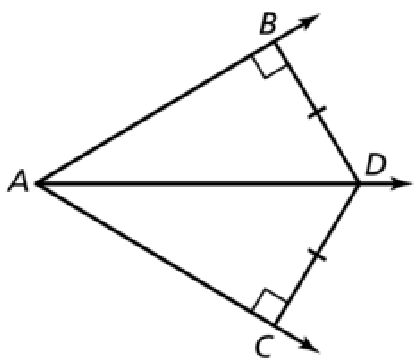
Given isosceles $\triangle ACB$, construct $\overleftrightarrow{CP}$ such that point P is on $\overline{AB}$ and $\overleftrightarrow{CP} \perp \overline{AB}$. So, $\angle CPB$ and $\angle CPA$ are right angles by the definition of perpendicular lines, and $\triangle CPB$ and $\triangle CPA$ are right triangles. Also, because $\overline{AC} \cong \overline{BC}$ and $\overline{CP} \cong \overline{CP}$ by the Reflexive Property of Congruence (Thm. 2.1), $\triangle CPB \cong \triangle CPA$ by the HL Congruence Theorem (Thm. 5.9). So, $\overline{AP} \cong \overline{BP}$ because corresponding parts of congruent triangles are congruent, which means that point P is the midpoint of $\overline{AB}$, and $\overleftrightarrow{CP}$ is the perpendicular bisector of $\overline{AB}$.

33. a.



If $\overrightarrow{AD}$ bisects $\angle BAC$, then by definition of angle bisector, $\angle BAD \cong \angle CAD$. Also, because $\overline{DB} \perp \overrightarrow{AB}$ and $\overline{DC} \perp \overrightarrow{AC}$, by definition of perpendicular lines, $\angle ABD$ and $\angle ACD$ are right angles, and congruent to each other by the Right Angles Congruence Theorem (Thm. 2.3). Also, $\overline{AD} \cong \overline{AD}$ by the Reflexive Property of Congruence (Thm. 2.1). So, by the AAS Congruence Theorem (Thm. 5.11), $\triangle ADB \cong \triangle ADC$. Because corresponding parts of congruent triangles are congruent, $DB = DC$. This means that point D is equidistant from each side of $\angle BAC$.

b.



STATEMENTS	REASONS
1. $\overline{DC} \perp \overrightarrow{AC}$, $\overline{DB} \perp \overrightarrow{AB}$, $BD = CD$	1. Given
2. $\angle ABD$ and $\angle ACD$ are right angles.	2. Definition of perpendicular lines
3. $\triangle ABD$ and $\triangle ACD$ are right triangles.	3. Definition of a right triangle
4. $\overline{BD} \cong \overline{CD}$	4. Definition of congruent segments
5. $\overline{AD} \cong \overline{AD}$	5. Reflexive Property of Congruence (Thm. 2.1)

34. **a.** Roosevelt School; Because the corner of Main and 3rd is exactly 2 blocks of the same length from each hospital, and the two streets are perpendicular, 3rd Street is the perpendicular bisector of the segment that connects the two hospitals. Because Roosevelt school is on 3rd Street, it is the same distance from both hospitals by the Perpendicular Bisector Theorem (Thm. 6.1).

b. no; Because the corner of Maple and 2nd Street is approximately the midpoint of the segment that connects Wilson School to Roosevelt School, and 2nd Street is perpendicular to Maple, 2nd Street is the perpendicular bisector of the segment connecting Wilson and Roosevelt Schools. By the contrapositive of the Converse of the Perpendicular Bisector Theorem (Thm. 6.2), the Museum is not equidistant from the two schools because it is not on 2nd Street.

35. **a.** $y = x$

b. $y = -x$

c. $y = |x|$

36. no; In spherical geometry, all intersecting lines meet in two points which are equidistant from each other because they are the two endpoints of a diameter of the circle.

37. Because $\overline{AD} \cong \overline{CD}$ and $\overline{AE} \cong \overline{CE}$, by the Converse of the Perpendicular Bisector Theorem (Thm. 6.2), both points D and E are on the perpendicular bisector of $\overline{AC}$. So, $\overleftrightarrow{DE}$ is the perpendicular bisector of $\overline{AC}$. So, if $\overline{AB} \cong \overline{CB}$, then by the Converse of the Perpendicular Bisector Theorem (Thm. 6.2), point B is also on $\overleftrightarrow{DE}$. So, points D, E, and B are collinear. Conversely, if points D, E, and B are collinear, then by the Perpendicular Bisector Theorem (Thm. 6.2), point B is also on the perpendicular bisector of $\overline{AC}$. So, $\overline{AB} \cong \overline{CB}$.

38. **a.** Because $\overline{YW}$ is on plane P, and plane P is a perpendicular bisector of $\overline{XZ}$ at point Y, $\overline{YW}$ is a perpendicular bisector of $\overline{XZ}$ by definition of a plane perpendicular to a line. So, by the Perpendicular Bisector Theorem (Thm. 6.1), $\overline{XW} \cong \overline{ZW}$.

b. Because $\overline{YV}$ is on plane P, and plane P is a perpendicular bisector of $\overline{XZ}$ at point Y, $\overline{YV}$ is a perpendicular bisector of $\overline{XZ}$ by definition of a plane perpendicular to a line. So, by the Perpendicular Bisector Theorem (Thm. 6.1), $\overline{XV} \cong \overline{ZV}$.

c. First, $\overline{WV} \cong \overline{WV}$ by the Reflexive Property of Congruence (Thm. 2.1). Then, because $\overline{XW} \cong \overline{ZW}$ and $\overline{XV} \cong \overline{ZV}$, $\triangle WVX \cong \triangle WVZ$ by the SSS Congruence Theorem (Thm. 5.8). So, $\angle VXW \cong \angle VZW$ because corresponding parts of congruent triangles are congruent.

39. isosceles

40. scalene

41. equilateral

42. acute

43. right

44. obtuse