Answers for 4.6

For use with pages 259–263

4.6 Skill Practice

1. congruent

2. *Sample answer:* You are unable to cross the river; measuring the distance across a lake.

3. $\triangle CBA$, $\triangle CBD$; SSS

4. $\triangle QPR$, $\triangle TPS$; SAS

5. $\triangle JKM$, $\triangle LKM$; HL

6. $\triangle CAD$, $\triangle BDA$; AAS

7. $\triangle JNH$, $\triangle KLG$; AAS

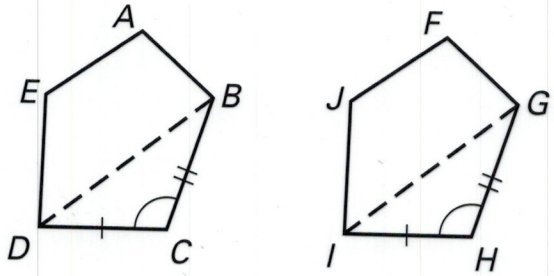
8. $\triangle VRT$, $\triangle QVW$; AAS

9. The angle is not the included angle; the triangles cannot be said to be congruent.

10. Show $\triangle VST \cong \triangle TUV$ by SSS since $\overline{VT} \cong \overline{TV}$ by the Reflexive Property of Congruence. Then $\angle S \cong \angle U$ because corresponding parts of congruent triangles are congruent.

11. Show $\triangle NML \cong \triangle PQL$ by AAS since $\angle NLM \cong \angle PLQ$ by the Vertical Angles Congruence Theorem. Then $\overline{LM} \cong \overline{LQ}$ because corresponding parts of congruent triangles are congruent.

12. Corresponding diagonals are corresponding sides of two congruent triangles.
Sample:



13. 20, 120, $\pm$ 6

14. B

15. Show $\triangle KFG \cong \triangle HGF$ by AAS, which gives you $\overline{HG} \cong \overline{KF}$. This along with $\angle FJK \cong \angle GJH$ by vertical angles gives you $\triangle FJK \cong \triangle GJH$.
Therefore $\angle 1 \cong \angle 2$.

16. $\triangle AEB \cong \triangle DEC$ by AAS which makes $\overline{EC} \cong \overline{EB}$, thus making $\triangle EBC$ an isosceles triangle, which proves $\angle 1 \cong \angle 2$.

17. Show $\triangle STR \cong \triangle QTP$ by ASA using the givens and vertical angles STR and QTP. Since $\overline{PT} \cong \overline{RT}$ and using vertical angles PTS and RTQ, $\triangle PTS \cong \triangle RTQ$ by SAS, which gives you $\angle 1 \cong \angle 2$.

18. $\overline{AC} \parallel \overline{FD}$ by the Perpendicular Transversal Theorem which gives you $\angle CED \cong \angle ECB$ and $\angle BEC \cong \angle ECD$. From this you have $m\angle CED + m\angle DCE = 90°$ making $m\angle 2 = 90°$. A similar argument follows for $\angle 1$.

19. Show $\triangle KNP \cong \triangle MNP$ by SSS. Now $\angle KPL \cong \angle MPL$ and $\overline{PL} \cong \overline{PL}$ leads to $\triangle LKP \cong \triangle LMP$ by SAS, which gives you $\angle 1 \cong \angle 2$.

20. Since $\triangle TVY \cong \triangle UXZ$ by SAS you have $\overline{YT} \cong \overline{ZU}$. Since $\overline{YT} \parallel \overline{ZU}$, you have $\angle YTW \cong \angle UZW$ and $\angle TYW \cong \angle ZUW$ by the Alternate Interior Angles Theorem, making $\triangle TYW \cong \triangle ZUW$ by ASA. Using corresponding parts and vertical angles, you have $\triangle TWU \cong \triangle ZWY$ by SAS, making $\angle 1 \cong \angle 2$.

21. The triangles are congruent by SSS.

22. The triangles are congruent by SSS.

23. Statements (Reasons)

1. $\angle T \cong \angle U$, $\angle Z \cong \angle X$, $\overline{YZ} \cong \overline{YX}$ (Given)
2. $\triangle TYZ \cong \triangle UYX$ (AAS)
3. $\angle TZY \cong \angle UYZ$ (Corr. parts of $\cong$ $\triangle$s are $\cong$.)
4. $m\angle TYZ = m\angle UYX$ (Definition of angle congruence)
5. $m\angle TYW + m\angle WYZ = m\angle TYZ$, $m\angle TYW + m\angle VYX = m\angle UYX$ (Angle Addition Postulate)
6. $m\angle TYW + m\angle WYZ = m\angle TYW + m\angle VYX$ (Transitive Property of Equality)
7. $m\angle WYZ = m\angle VYX$ (Subtraction Property of Equality)
8. $\angle WYZ \cong \angle VYX$ (Definition of angle congruence)

24. Statements (Reasons)

1. $\overline{FG} \cong \overline{HG} \cong \overline{JG} \cong \overline{KG}$, $\overline{JM} \cong \overline{KM} \cong \overline{LM} \cong \overline{NM}$ (Given)
2. $\angle FGJ \cong \angle HGK$, $\angle JML \cong \angle KMN$ (Vertical Angles Congruence Theorem)
3. $\triangle FGJ \cong \triangle HGK$, $\triangle JML \cong \triangle KMN$ (SAS)
4. $\overline{FJ} \cong \overline{HK}$, $\overline{JL} \cong \overline{KN}$ (Corr. parts of $\cong$ $\triangle$s are $\cong$.)
5. $FJ = HK$, $JL = KN$ (Definition of segment congruence)
6. $FJ + JL = HK + KN$ (Addition Property of Equality)
7. $FL = HN$ (Segment Addition Postulate)
8. $\overline{FL} \cong \overline{HN}$ (Definition of segment congruence)

25. Statements (Reasons)

1. $\angle PRU \cong \angle QVS$, $\overline{RS} \cong \overline{UV}$, $\angle TSU \cong \angle USW \cong \angle TUS \cong \angle SUW$ (Given)
2. $\overline{SU} \cong \overline{SU}$ (Reflexive Property of Congruence)
3. $SU = SU$, $RS = UV$ (Definition of segment congruence)
4. $RS + SU = SU + UV$ (Addition Property of Equality)
5. $RU = SV$ (Segment Addition Postulate)
6. $\overline{RU} \cong \overline{SV}$ (Definition of segment congruence)
7. $\triangle QSV \cong \triangle PUR$ (ASA)
8. $\overline{PU} \cong \overline{QS}$, $\angle RPU \cong \angle VQS$ (Corr. parts of $\cong$ $\triangle$s are $\cong$.)
9. $m\angle TSU + m\angle USW = m\angle TSW$, $m\angle TUS + m\angle SUW = m\angle TUW$ (Angle Addition Postulate)
10. $m\angle TSU = m\angle USW = m\angle TUS = m\angle SUW$ (Definition of angle congruence)
11. $m\angle TSU + m\angle TSU = m\angle TSW$, $m\angle TSU + m\angle TSU = m\angle TUW$ (Substitution Property of Equality)
12. $m\angle TSW = m\angle TUW$ (Transitive Property of Equality)
13. $\angle TSW \cong \angle TUW$ (Definition of angle congruence)
14. $\triangle PUX \cong \triangle QSY$ (ASA)

26. Statements (Reasons)

1. $\overline{AD} \cong \overline{GD} \cong \overline{FD} \cong \overline{BD}$ (Given)
2. $\angle ADC \cong \angle GDE$, $\angle FDC \cong \angle BDE$ (Vertical Angles Congruence Theorem)
3. $m\angle ADC = m\angle GDE$, $m\angle FDC = m\angle BDE$ (Definition of angle congruence)
4. $m\angle ADC + m\angle FDC = m\angle ADF$, $m\angle BDE + m\angle GDE = m\angle GDB$ (Angle Addition Postulate)
5. $m\angle ADC + m\angle FDC = m\angle GDB$ (Substitution Property of Equality)
6. $m\angle ADF = m\angle GDB$ (Transitive Property of Equality)
7. $\angle ADF \cong \angle GDB$ (Definition of angle congruence)
8. $\triangle ADF \cong \triangle GDB$ (SAS)
9. $\angle FAD \cong \angle BGD$ (Corr. parts of $\cong$ △s are $\cong$.)
10. $\triangle ADC \cong \triangle GDE$ (ASA)
11. $\overline{AC} \cong \overline{GE}$ (Corr. parts of $\cong$ △s are $\cong$.)

27. $\triangle ABC$, $\triangle NPQ$, $\triangle DEF$, and $\triangle GHJ$

4.6 Problem Solving

28. Because $\overline{CD} \perp \overline{DE}$ and $\overline{CD} \perp \overline{AC}$, $\angle D$ and $\angle C$ are congruent right angles. The vertical angles, $\angle DBE$ and $\angle CBA$, are congruent. So, $\triangle DBE \cong \triangle CBA$ by ASA. Then because corresponding parts of congruent triangles are congruent, $\overline{AC} \cong \overline{DE}$. So, you can find the distance AC across the canyon by measuring DE.

29. Statements (Reasons)

1. $\overline{PQ} \parallel \overline{VS}$, $\overline{QU} \parallel \overline{ST}$, $\overline{PQ} \cong \overline{VS}$ (Given)
2. $\angle QPU \cong \angle SVT$, $\angle QUP \cong \angle STV$ (Corresponding Angles Postulate)
3. $\triangle PQU \cong \triangle VST$ (AAS)
4. $\angle Q \cong \angle S$ (Corr. parts of $\cong$ △s are $\cong$.)

30. 11.2 m. *Sample answer:* $\triangle ABC \cong \triangle EDC$ thus $\overline{ED} \cong \overline{AB}$. Since $ED \approx 11.2$, then $AB \approx 11.2$.

31. A

32. Statements (Reasons)

1. $\overline{AB} \cong \overline{AC}$, $\overline{BG} \cong \overline{CG}$ (Given)
2. $\overline{AG} \cong \overline{AG}$ (Reflexive Property of Segment Congruence)
3. $\triangle ACG \cong \triangle ABG$ (SSS)
4. $\angle CAG \cong \angle BAG$ (Corr. parts of $\cong$ $\triangle$s are $\cong$.)
5. $\overrightarrow{AG}$ bisects $\angle A$. (Definition of angle bisector)

33. No; the given angle is not an included angle.

34. Yes; $\overline{AE} \cong \overline{CE}$ by Corr. parts of $\cong$ $\triangle$s are $\cong$, $\angle CEB \cong \angle ABE$ by the Right Angle Congruence Theorem and $\overline{BE} \cong \overline{BE}$ so $\triangle BAE \cong \triangle BCE$. By Corr. parts of $\cong$ $\triangle$s are $\cong$, $\overline{AB} \cong \overline{BC}$.

35. Yes; $\angle BDA \cong \angle BDC$, $\overline{AD} \cong \overline{CD}$ and $\overline{BD} \cong \overline{BD}$. By SAS, $\triangle ABD \cong \triangle CBD$. By Corr. parts of $\cong$ $\triangle$s are $\cong$, $\overline{AB} \cong \overline{BC}$.

36. a. *Sample answer:* $\overline{AB} \cong \overline{AB}$, $\angle BAC \cong \angle BAD$, $\angle ACB \cong \angle ADB$; AAS

b. *Sample answer:* $\triangle BAC \cong \triangle BAD$, therefore $\overline{BC} \cong \overline{BD}$.

37. Statements (Reasons)

1. $\overline{MN} \cong \overline{KN}$, $\angle PMN \cong \angle NKL$ (Given)
2. $\angle MNP \cong \angle KNL$ (Vertical Angles Congruence Theorem)
3. $\triangle PMN \cong \triangle LKN$ (ASA)
4. $\overline{MP} \cong \overline{KL}$, $\angle MPJ \cong \angle KLQ$ (Corr. parts of $\cong$ $\triangle$s are $\cong$.)
5. $\overline{MJ} \cong \overline{PN}$, $\overline{KQ} \cong \overline{LN}$ (Given in diagram)
6. $\angle KQL$ and $\angle MJP$ are right angles. (Perpendicular lines intersect to form four right angles.)
7. $\angle KQL \cong \angle MJP$ (Right Angles Congruence Theorem)
8. $\triangle MJP \cong \triangle KQL$ (AAS)
9. $\angle 1 \cong \angle 2$ (Corr. parts of $\cong$ $\triangle$s are $\cong$.)

38. Statements (Reasons)

1. $\overline{TS} \cong \overline{TV}, \overline{SR} \cong \overline{VW}$ (Given)
2. $TS = TV$, $SR = VW$ (Definition of segment congruence)
3. $TS + SR = TR$, $TV + VW = TW$ (Segment Addition Postulate)
4. $TV + SR = TR$, $TV + SR = TW$ (Substitution Property of Equality)
5. $TR = TW$ (Transitive Property of Equality)
6. $\overline{TR} \cong \overline{TW}$ (Definition of segment congruence)
7. $\angle RTV \cong \angle WTS$ (Reflexive Property of Congruence)
8. $\triangle RTV \cong \triangle WTS$ (SAS)
9. $\overline{RV} \cong \overline{WS}$ (Corr. parts of $\cong$ $\triangle$s are $\cong$.)
10. $\overline{SV} \cong \overline{VS}$ (Reflexive Property of Congruence)
11. $\triangle RSV \cong \triangle WVS$ (SSS)
12. $\angle VSW \cong \angle SVR$, $\angle TSW \cong \angle TVR$ (Corr. parts of $\cong$ $\triangle$s are $\cong$.)
13. $m\angle VSW = m\angle SVR$, $\angle TSW \cong \angle TVR$ (Definition of angle congruence)
14. $m\angle 1 + m\angle VSW = m\angle TSW$, $m\angle 2 + m\angle SVR = m\angle TVR$ (Angle Addition Postulate)
15. $m\angle 1 + m\angle VSW = m\angle 2 + m\angle SVR$ (Transitive Property of Equality)
16. $m\angle 1 + m\angle VSW = m\angle 2 + m\angle VSW$ (Substitution Property of Equality)
17. $m\angle 1 = m\angle 2$ (Subtraction Property of Equality)
18. $\angle 1 \cong \angle 2$ (Definition of angle congruence)

39. Statements (Reasons)

1. $\overline{BA} \cong \overline{BC}$, D and E are midpoints, $\angle A \cong \angle C$, $\overline{DF} \cong \overline{EF}$. (Given)
2. $\overline{BD} \cong \overline{DA}$, $\overline{BE} \cong \overline{EC}$ (Definition of midpoint)
3. $BD = DA$, $BE = EC$ (Definition of segment congruence)
4. $BD + DA = BE + EC$ (Segment Addition Postulate)
5. $BD + BD = BE + BE$, $DA + DA = EC + EC$ (Substitution Property of Equality)

39. (cont.)

Statements (Reasons)

6. $2BD = 2BE$, $2DA = 2EC$ (Simplify.)

7. $BD = BE$, $DA = EC$ (Division Property of Equality)

8. $\overline{BD} \cong \overline{BE}$, $\overline{DA} \cong \overline{EC}$ (Definition of segment congruence)

9. Construct $\overline{BJ}$ containing point F. (Construction)

10. $\overline{BF} \cong \overline{BF}$ (Reflexive Property of Congruence)

11. $\triangle BFD \cong \triangle BFE$ (SSS)

12. $\angle BFE \cong \angle BFD$, $\angle BEF \cong \angle BDF$ (Corr. parts of $\cong$ $\triangle$s are $\cong$.)

13. $\angle BFE \cong \angle GFJ$, $\angle BFD \cong \angle HFJ$ (Vertical Angles Congruence Theorem)

14. $\angle GFJ \cong \angle HFJ$ (ASA)

15. $\overline{FJ} \cong \overline{FJ}$ (Reflexive Property of Segment Congruence)

16. $\angle BEF$ and $\angle CEG$, $\angle BDF$ and $\angle ADH$ form linear pairs. (Transitive Property of Equality)

17. $\angle CEG \cong \angle ADH$ (Congruent Supplements Theorem)

18. $\triangle CEG \cong \triangle ADH$ (ASA)

19. $\angle EGJ \cong \angle DHJ$ (Corr. parts of $\cong$ $\triangle$s are $\cong$.)

20. $\triangle GFJ \cong \triangle HFJ$ (AAS)

21. $\overline{FG} \cong \overline{FH}$ (Corr. parts of $\cong$ $\triangle$s are $\cong$.)

40. Statements (Reasons)

1. $\overline{AB} \parallel \overline{EC}$, $\overline{AC} \parallel \overline{ED}$, $\overline{AB} \cong \overline{ED}$, $\overline{AC} \cong \overline{EC}$ (Given)

2. $\angle DEC \cong \angle ECA$, $\angle ECA \cong \angle BAC$ (Alternate Interior Angles Congruence Theorem)

3. $\angle DEC \cong \angle BAC$ (Transitive Property of Angle Congruence)

4. $\triangle DEC \cong \triangle BAC$ (SAS)

5. $\overline{BC} \cong \overline{CD}$, $\angle BCA \cong \angle DCE$ (Corr. parts of $\cong$ $\triangle$s are $\cong$.)

6. $m\angle BAC = m\angle DCE$ (Definition of congruent angles)

7. $m\angle BCA + m\angle ACE = m\angle DCE + m\angle ACE$ (Addition Property of Equality)

8. $m\angle BCE = m\angle DCA$ (Angle Addition Postulate)

9. $\angle BCE \cong \angle DCA$ (Definition of congruent angles)

40. (cont.)

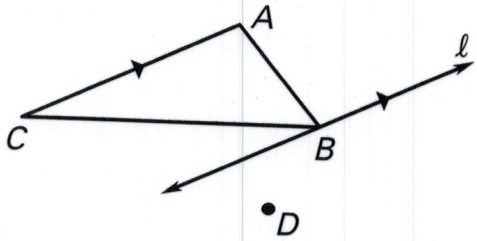
Statements (Reasons)

10. $\triangle BCE \cong \triangle DCA$ (SAS)

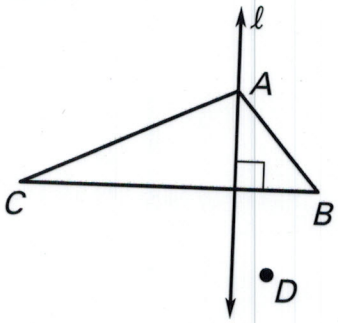
11. $\overline{AD} \cong \overline{EB}$ (Corr. parts of $\cong$ $\triangle$s are $\cong$.)

4.6 Mixed Review

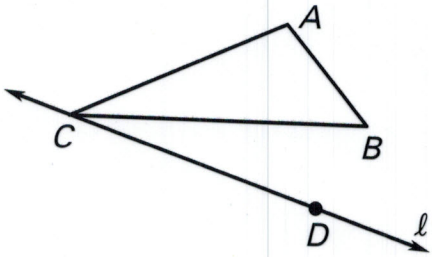
41. one



42. one



43. one



44. 18°, 72°, 90°; right triangle

45. 23°, 115°, 42°; obtuse triangle

46. 28°, 66°, 86°; acute triangle

Quiz

1) SAS

2) HL

3) AAS

4)

①	① Given
② $\overline{AC} \cong \overline{AC}$	② Ref P.O.C
③ $\triangle \cong \triangle$	③ SAS $\triangle \cong$ post

5)

①	① Given
② $\angle WXV \cong \angle ZXY$	② Vert. $\angle$ Thm
③ $\triangle \cong \triangle$	③ AAS $\triangle \cong$ Thm

6) Use Vert $\angle$s thm & AAS to show $\triangle QPL \cong \triangle NML$. Use CPCTC to show $\overline{QL} \cong \overline{NL}$