Lesson 5.1

5.1 Checkpoint (pp. 234–235)

1. Because $DF \equiv AC$, you know that $DF = AC = 3$.
   Because $B \equiv E$, you know that $m \angle B = m \angle E = 28^\circ$.
   B; This statement matches up the corresponding vertices in order.

4. Yes; the congruent sides are marked on the diagram, so $\overline{XY} \equiv \overline{ZW}$, $\overline{XX} \equiv \overline{ZZ}$, and $\overline{YY} \equiv \overline{WW}$.
   $\angle XYZ \equiv \angle ZYW$ Vertical angles are congruent.
   $\angle Y \equiv \angle Z$ Alternate Interior Angles Theorem
   $\angle X \equiv \angle W$ Alternate Interior Angles Theorem
   Since all corresponding parts are congruent, $\triangle XYV \equiv \triangle ZWV$.

5.1 Guided Practice (p. 236)

1. corresponding angles
2. neither
3. corresponding sides
4. neither
5. $\angle F$
6. $\angle Z$
7. $\overline{ED}$
8. $\overline{YZ}$

9. $m \angle P = m \angle L = 105^\circ$
10. $m \angle M = m \angle Q = 45^\circ$
11. $QR = MN = 11.6$
12. $LN = PR = 8.5$
13. Yes; the congruent sides are marked on the diagram, so $\overline{FE} \equiv \overline{LK}$, $\overline{FG} \equiv \overline{LJ}$, and $\overline{GE} \equiv \overline{JK}$. Two pairs of congruent angles are also marked on the diagram, so $\angle E \equiv \angle K$ and $\angle G \equiv \angle J$. The third pair of corresponding angles are right angles and are congruent since all right angles are congruent. All corresponding parts are congruent, so $\triangle EFG \equiv \triangle KLM$.

5.1 Practice and Applications (pp. 236–239)

14. corresponding angles
15. neither
16. neither
17. corresponding sides
18. corresponding sides
19. corresponding angles
20. B; this statement matches the corresponding vertices in order.
21. $\angle R \equiv \angle N$
22. $\overline{LN} \equiv \overline{PR}$
23. $\angle RPQ \equiv \angle NLM$
24. $\overline{QP} \equiv \overline{ML}$
25. $\triangle MLN \equiv \triangle QRP$
26. $\triangle PRQ \equiv \triangle LNM$
27. yes
28. no
29. yes
30. yes
31. no
32. no
33. $\triangle P \equiv \triangle S$
34. $\triangle Q \equiv \triangle T$
35. $\triangle R \equiv \triangle U$
36. $\overline{PR} \equiv \overline{SU}$
37. $DF = AC = 5$;
38. $AB = DE = 14$;
   $m \angle B = m \angle E = 100^\circ$
39. $AB = DE = 6$;
39. $BC = EF = 5$;
   $m \angle F = m \angle C = 50^\circ$
41. C; this statement does not match up the corresponding vertices in order.
42. $\triangle A \equiv \triangle D$
43. $\overline{AB} \equiv \overline{DF}$
44. $\angle B \equiv \angle F$
45. $\overline{AC} \equiv \overline{DE}$
46. $\angle C \equiv \angle E$
47. $\overline{CB} \equiv \overline{EF}$
   Since all corresponding parts are congruent, $\triangle ABC \equiv \triangle DFE$. 
Chapter 5 continued

43. Corresponding Angles

\[ \angle J \equiv \angle P \quad TK \equiv PN \]
\[ \angle K \equiv \angle N \quad TL \equiv PM \]
\[ \angle L \equiv \angle M \quad KL \equiv NM \]

Since all corresponding parts are congruent, \( \triangle JKL \equiv \triangle PNM \).

44. The triangles are not congruent.

45. Corresponding Angles

\[ \angle BCA \equiv \angle DCE \quad \text{Vertical Angles Theorem} \]
\[ \angle B \equiv \angle D \quad \text{Alternate Interior Angles Theorem} \]
\[ \angle A \equiv \angle E \quad \text{Alternate Interior Angles Theorem} \]

46. Corresponding Angles

\[ \angle LM \equiv \angle LK \quad MJ \equiv KJ \]
\[ \angle ML \equiv \angle LK \quad MJ \equiv KJ \]
\[ \angle M \equiv \angle K \quad ML \equiv LJ \]

Since all corresponding parts are congruent, \( \triangle JML \equiv \triangle LKM \).

47. The triangles are not congruent.

48. Perpendicular lines intersect to form four right angles, and all right angles are congruent.

49. By the Base Angles Theorem, the base angles of an isosceles triangle are congruent, so \( \angle JGF \equiv \angle JHF \).

50. Yes; by the Reflexive Property of Congruence, \( \overline{FJ} \equiv \overline{FJ} \), so all three pairs of corresponding sides are congruent. By Exercises 48 and 49, all three pairs of corresponding angles are congruent.

51. \( \angle BAC \) and \( \angle DAE \) are congruent because of the Reflexive Property of Congruence.

52. No; the corresponding angles are congruent, but the corresponding sides are not congruent. That is, \( \overline{ED} \not\equiv \overline{CB} \), \( \overline{AE} \not\equiv \overline{AC} \), and \( \overline{AD} \not\equiv \overline{AB} \).

5.1 Standardized Test Practice (p. 239)

53. B

5.1 Mixed Review (p. 239)

54. Reflexive Property of Equality

55. Reflexive Property of Congruence

56. Symmetric Property of Congruence

57. Transitive Property of Equality

58. obtuse; \( 6^2 > 5^2 + 2^2 \)

59. acute; \( 10^2 < 5^2 + 9^2 \)

60. obtuse; \( 14^2 > 5^2 + 12^2 \)

5.1 Algebra Skills (p. 239)

61. 11.95

62. 3.72

63. 19.33

64. 0.74

65. 17.076

66. 3.222

Lesson 5.2

5.2 Activity (p. 240)

1. All triangles made with two pencils and a 45° angle appear to be congruent.

2. You need to show that the angle formed by the two known sides of one triangle is congruent to the angle formed by the two known sides of the other triangle.

5.2 Checkpoint (p. 244)

1. Statements Reasons

| 1. \( \overline{CB} \equiv \overline{CE} \) | 1. Given |
| 2. \( \overline{AC} \equiv \overline{EC} \) | 2. Given |
| 3. \( \angle BCA \equiv \angle ECD \) | 3. Vertical Angles Theorem |
| 4. \( \triangle BCA \equiv \triangle ECD \) | 4. SAS Congruence Postulate |

5.2 Guided Practice (p. 245)

1. \( \angle JKM \) 2. \( \angle J \) 3. \( \angle L \)

4. \( \angle KLM \) 5. \( \angle LKM \)

6. Yes; \( \triangle ABC \equiv \triangle DEC \) by the SAS Congruence Postulate because \( \overline{AC} \equiv \overline{DC} \), \( \angle ACB \equiv \angle DCE \), and \( \overline{BC} \equiv \overline{EC} \).

7. No; there is nothing in the diagram indicating that \( \angle FGH \equiv \angle HK \) or that \( \overline{FG} \equiv \overline{HK} \).

8. Yes; \( \triangle PQR \equiv \triangle SRQ \) by the SSS Congruence Postulate. By the Reflexive Property of Congruence, \( \overline{RQ} \equiv \overline{RQ} \), so all three pairs of corresponding sides are congruent.

5.2 Practice and Applications (pp. 245–249)

9. \( \angle ABD \) 10. \( \angle C \) 11. \( \angle C \)

12. \( \angle A \) 13. \( \angle BDC \) 14. \( \angle DBC \)

15. Yes; \( \triangle ABC \equiv \triangle DBE \) because all three pairs of corresponding sides of the triangles are congruent.

16. Yes; by the Reflexive Property of Congruence, \( \overline{KL} \equiv \overline{KL} \) so \( \triangle JKL \equiv \triangle JML \) because all three pairs of corresponding sides of the triangles are congruent.

17. No; there is no information about \( \overline{PS} \) and \( \overline{RS} \).

18. Yes; by the Reflexive Property of Congruence, \( \overline{SQ} \equiv \overline{SQ} \) so \( \triangle PQS \equiv \triangle QRS \) because two sides and the included angle of \( \triangle PQS \) are congruent to two sides and the included angle of \( \triangle QRS \).

19. No; the congruent angles are not included by the congruent sides.
Chapter 5 continued

20. Yes; by the Vertical Angles Theorem, $\angle JNK \equiv \angle MNL$ so $\triangle JNK \equiv \triangle MNL$ because two sides and the included angle of $\triangle JNK$ are congruent to two sides and the included angle of $\triangle MNL$.

21. No; the congruent angles are not included by the congruent sides.

22. Yes; $\triangle GHK \equiv \triangle JKH$ by the SAS Congruence Postulate because $GH \equiv JK$ (Given), $\angle GHK \equiv \angle JKH$ (Alternate Interior Angles Theorem), and $KH \equiv KH$ (Reflexive Property of Congruence).

23. Yes; $\triangle MNP \equiv \triangle PQM$ by the SSS Congruence Postulate because $MP \equiv PQ$ (Given), $MQ \equiv PN$ (Given), and $MP \equiv MP$ (Reflexive Property of Congruence).

24. Yes; $\triangle WXY \equiv \triangle XYZ$ by the SAS Congruence Postulate because $WX \equiv XY$ (Given), and $XZ \equiv XZ$ (Reflexive Property of Congruence).

25. Yes; $\triangle RST \equiv \triangle TUS$ by the SSS Congruence Postulate because $RS \equiv TS$ (Given), $RU \equiv TU$ (Given), and $SU \equiv SU$ (Reflexive Property of Congruence). Also, $\angle RST \equiv \angle TUS$ by the SAS Congruence Postulate because $RS \equiv TS$ (Given), $\angle RST \equiv \angle TUS$ (Base Angles Theorem), and $RU \equiv TU$ (Given).

26. No; there is no information about $\overline{AB}$ and $\overline{CB}$.

27. $\overline{AB} \equiv \overline{CD}$

28. $\angle ACB \equiv \angle CED$

29. To use the SAS Congruence Postulate, you need to know that $\overline{BC} \equiv \overline{EF}$.

30. To use the SSS Congruence Postulate, you need to know that $\overline{JK} \equiv \overline{ML}$. To use the SAS Congruence Postulate, you need to know that $\angle JKL \equiv \angle MKL$.

31. To use the SSS Congruence Postulate, you need to know that $\overline{PQ} \equiv \overline{QR}$. To use the SSS Congruence Postulate, you need to know that $\angle PQS \equiv \angle RSQ$.

32. Sample answer: Since $WXYZ$ is a square, all four sides of $WXYZ$ are congruent. $\overline{WX} \equiv \overline{XZ}$ by the Reflexive Property of Congruence, so $\triangle WXY \equiv \triangle YXZ$ by the SSS Congruence Postulate.

33. Sample answer: Since $\overline{AB} \parallel \overline{CD}$, $\angle ABC \equiv \angle DCB$ (Alternate Interior Angles Theorem), $\overline{AB} \parallel \overline{CD}$ (Given), and $\overline{CB} \parallel \overline{CB}$ (Reflexive Property of Congruence), so $\angle ABC \equiv \angle DCB$ by the SAS Congruence Postulate.

34. Statements Reasons
1. \( EF \equiv GH \) 1. Given
2. \( FG \equiv HE \) 2. Given
3. \( GE \equiv GE \) 3. Reflexive Prop. of Cong.
4. \( \triangle EFG \equiv \triangle GHE \) 4. SSS Congruence Postulate

35. Statements Reasons
1. \( SP \equiv TP \) 1. Given
2. \( \overline{PQ} \) bisects \( \angle SPT \) 2. Given
3. \( \angle SPQ \equiv \angle TPQ \) 3. Def. of angle bisector
4. \( \overline{PQ} \equiv \overline{PQ} \) 4. Reflexive Prop. of Cong.
5. \( \triangle SPQ \equiv \triangle TPQ \) 5. SAS Cong. Postulate

36. Statements Reasons
1. $\overline{AC} \equiv \overline{BC}$ 1. Given
2. $M$ is the midpoint of $\overline{AB}$. 2. Given
3. $\overline{AM} \equiv \overline{BM}$ 3. Definition of midpoint
4. $\overline{CM} \equiv \overline{CM}$ 4. Reflexive Prop. of Cong.
5. $\triangle ACM \equiv \triangle BCM$ 5. SSS Cong. Postulate

37. Maria should not have used the SAS Congruence Postulate because the congruent angles are not included by the congruent sides.

38. Statements Reasons
1. $\triangle ABD$ and $\triangle CBD$ are equilateral. 1. Given
2. $\overline{BD} \equiv \overline{BD}$ 2. Reflexive Prop. of Cong.
3. $\overline{BC} \equiv \overline{BD}$, $\overline{BA} \equiv \overline{BD}$ 3. Definition of equilateral
4. $\overline{BC} \equiv \overline{BD}$ 4. Transitive Prop. of Cong.
5. $\overline{DC} \equiv \overline{BD}$, $\overline{DA} \equiv \overline{BD}$ 5. Definition of equilateral
6. $\overline{DC} \equiv \overline{DA}$ 6. Transitive Prop. of Cong.
7. $\triangle ABD \equiv \triangle CBD$ 7. SSS Cong. Postulate

39. Statements Reasons
1. $\overline{XZ} \equiv \overline{YZ}$ 1. Given
2. $\overline{M}$ bisects $\angle YZM$. 2. Given
3. $\overline{YZM} \equiv \overline{XZM}$ 3. Def. of angle bisector
4. $\overline{ZM} \equiv \overline{ZM}$ 4. Reflexive Prop. of Cong.
5. $\angle ZMY \equiv \angle ZMX$ 5. SAS Cong. Postulate

5.2 Standardized Test Practice (p. 248)

40. C 41. G

5.2 Mixed Review (p. 248)

42. alternate exterior angles
43. same-side interior angles
44. corresponding angles
45. alternate interior angles
46. corresponding angles
47. same-side interior angles
48. no; $14 + 8 \geq 25$
49. yes; $20 + 10 > 28$, $20 + 28 > 10$, and $10 + 28 > 20$
50. no; $16 + 14 > 30$

5.2 Algebra Skills (p. 249)

51. $\sqrt{3} \approx 1.7$
52. $\sqrt{12} \approx 3.5$
53. $\sqrt{40} \approx 6.3$
54. $\sqrt{159} \approx 12.6$
55. $\sqrt{14.76} \approx 3.8$
56. $\sqrt{0.87} \approx 0.9$
57. $\sqrt{1.12} \approx 1.1$
58. $\sqrt{40.85} \approx 6.4$
Chapter 5 continued

Quiz 1 (p. 249)

1. $\angle R \equiv \angle C$
2. $\overline{AB} \equiv \overline{OP}$
3. $\triangle BAC \equiv \triangle POR$
4. $\triangle RPQ \equiv \triangle CBA$
5. $\triangle FEG \equiv \triangle XYZ$, $\angle EGF \equiv \angle YZX$, or $\triangle GFE \equiv \triangle XZY$
6. No; the congruent angles are not included by the congruent sides.
7. Yes; by the Reflexive Property of Congruence, $\overline{FG} \equiv \overline{FG}$.
The three sides of $\triangle DGF$ are congruent to the three sides of $\triangle EGF$, so $\triangle DGF \equiv \triangle EGF$ by the SSS Congruence Postulate.

Lesson 5.3

5.3 Geo-Activity (p. 250)

Step 5. The triangles are congruent.

5.3 Checkpoint (p. 253)

1. You can use the ASA Congruence Postulate when the corresponding sides are included between the corresponding angles.
2. No; based on the diagram, you know only that $\angle BAC \equiv \angle DCA$ (Alternate Interior Angles Theorem) and $\overline{AC} \equiv \overline{AC}$.
3. No; there is no information about any of the sides.
4. Yes; $\triangle KLP \equiv \triangle MLN$ by the AAS Congruence Theorem because $\angle P \equiv \angle N$ (Given), $\angle KLP \equiv \angle MLN$ (Vertical Angles Theorem), and $\overline{KL} \equiv \overline{ML}$ (Given).

5.3 Guided Practice (p. 253)

1. $\overline{FG}$ is included between $\angle F$ and $\angle G$.
2. $\overline{GH}$ is not included between $\angle F$ and $\angle G$.
3. $\overline{FH}$ is not included between $\angle H$ and $\angle G$.
4. $\overline{HG}$ is included between $\angle H$ and $\angle G$.
5. $\overline{AB} \equiv \overline{DE}$
6. $\angle A \equiv \angle D$
7. Yes; $\angle RST \equiv \angle TQR$ by the ASA Congruence Postulate because $\angle STR \equiv \angle QRT$ (Given), $\overline{RT} \equiv \overline{RT}$ (Reflexive Property of Congruence), and $\angle SRT \equiv \angle QTR$ (Given).
8. Yes; $\triangle KLM \equiv \triangle NML$ by the AAS Congruence Theorem because $\angle KLM \equiv \angle NML$ (Vertical Angles Theorem), $\angle KLM \equiv \angle NML$ (Given), and $\overline{JK} \equiv \overline{NM}$ (Given).
9. No; you would either need to know that $\angle A \equiv \angle D$ or $\angle C \equiv \angle F$.

5.3 Practice and Applications (pp. 254–256)

10. $\overline{AB}$ is not included between $\angle B$ and $\angle BCA$.

11. $\overline{AC}$ is included between $\angle BAC$ and $\angle BCA$.
12. $\overline{AC}$ is not included between $\angle DAC$ and $\angle D$.
13. $\overline{BC}$ is not included between $\angle CAB$ and $\angle B$.
14. ASA Congruence Postulate; two angles and the included side of $\triangle ABC$ are congruent to two angles and the included side of $\triangle DEF$.
15. AAS Congruence Theorem; two angles and a non-included side of $\triangle JLM$ are congruent to two angles and the corresponding non-included side of $\triangle PNM$.
16. ASA Congruence Postulate; two angles and the included side of $\triangle URS$ are congruent to two angles and the included side of $\triangle UTS$.
17. Yes; SAS Congruence Postulate; two sides and the included angle of $\triangle PQR$ are congruent to two sides and the included angle of $\triangle TSM$.
18. Yes; AAS Congruence Theorem; $\angle A \equiv \angle D$ (Given), $\angle BCA \equiv \angle BCD$ (Perpendicular lines form right angles, and all right angles are congruent.), and $\overline{BC} \equiv \overline{BC}$ (Reflexive Property of Congruence). So, $\triangle BCA \equiv \triangle BCD$.
19. Yes; ASA Congruence Postulate; $\angle S \equiv \angle T$ (Given), $\overline{SV} \equiv \overline{TV}$ (Given), and $\overline{SVR} \equiv \overline{TVU}$ (Vertical Angles Theorem). So, $\triangle SVR \equiv \triangle TVU$.
20. No; from the diagram, you know only that $\overline{FF} \equiv \overline{HH}$, $\overline{FG} \equiv \overline{HG}$, and $\angle EGF \equiv \angle JGH$ (Vertical Angles Theorem). The congruent angles are not included by the congruent sides.
21. Yes; SSS Congruence Postulate; $\overline{WX} \equiv \overline{ZX}$ (Given), $\overline{WY} \equiv \overline{ZY}$ (Given), and $\overline{WX} \equiv \overline{XY}$ (Reflexive Property of Congruence). So, $\triangle XWY \equiv \triangle XYZ$.
22. No; from the diagram, you know only that $\overline{NL} \equiv \overline{NL}$ (Reflexive Property of Congruence) and $\angle MNL \equiv \angle KLN$ (Alternate Interior Angles Theorem).
23. AAS Congruence Theorem; two angles and a non-included side of $\triangle KLM$ are congruent to two angles and the corresponding non-included side of $\triangle PQR$.
24. $\overline{AC} \equiv \overline{FD}$
25. $\angle K \equiv \angle Q$
26. $\overline{WZX} \equiv \overline{YXZ}$
27. $\angle C \equiv \angle D$
28. $\overline{CAB} \equiv \overline{DAB}$
29. $\overline{AC} \equiv \overline{AD}$
30. $\overline{BC} \equiv \overline{BD}$
31. Sample answer:
32. Sample answer:
Chapter 5 continued

33. Sample answer:

![Diagram of triangle with points P, Q, R, S, and T]

34. Statements Reasons
1. \( GF \equiv GL \) 1. Given
2. \( FH \parallel LR \) 2. Given
3. \( \angle F \equiv \angle L \) 3. Alt. Int. Angles Theorem
4. \( \angle HGF \equiv \angle KGL \) 4. Vertical Angles Theorem
5. \( \triangle FGH \equiv \triangle LGK \) 5. ASA Cong. Postulate

5.3 Standardized Test Practice (p. 256)

36. D

5.3 Mixed Review (p. 256)

37. \( 10^2 + b^2 = 18^2 \) 38. \( c^2 = 11^2 + 6^2 \)
\( 100 + b^2 = 324 \) \( c^2 = 121 + 36 \)
\( b^2 = 224 \) \( c^2 = 157 \)
\( b = \sqrt{224} \) \( c = \sqrt{157} \)
\( b \approx 15.0 \) \( c \approx 12.5 \)

39. \( 15^2 + a^2 = 26^2 \)
\( 225 + a^2 = 676 \)
\( a^2 = 451 \)
\( a = \sqrt{451} \)
\( a \approx 21.2 \)

40. \( \angle C \equiv \angle F \) 41. \( BA \equiv ED \) 42. \( \angle D \equiv \angle A \)
43. \( EF \equiv BC \) 44. \( \angle B \equiv \angle E \) 45. \( CB \equiv FE \)

5.3 Algebra Skills (p. 256)

46. \( \frac{1}{2} + 6 = \frac{1}{2} \times 6 = \frac{1}{1} \times \frac{1}{6} = \frac{1}{12} \)
47. \( \frac{4}{5} + 4 = 4 \times \frac{4}{5} = 4 \times \frac{1}{1} = \frac{4}{5} \)
48. \( \frac{1}{6} + \frac{2}{3} = \frac{1}{6} \times 2 = \frac{1}{1} \times \frac{2}{6} = \frac{1}{4} \)
49. \( \frac{5}{8} + \frac{5}{16} = \frac{5}{8} \times 2 = \frac{1}{1} \times \frac{5}{8} = \frac{1}{2} \)

50. \( \frac{7}{9} + \frac{2}{7} = \frac{7}{9} \times \frac{2}{7} = \frac{1}{1} \times \frac{2}{7} = \frac{1}{18} \)
51. \( \frac{3}{10} + \frac{12}{25} = \frac{3}{10} \times \frac{25}{25} = \frac{1}{1} \times \frac{25}{10} = \frac{5}{8} \)
52. \( 8 \div \frac{3}{4} = 8 \times 4 = \frac{32}{1} \times \frac{3}{3} = \frac{10}{3} \)
53. \( \frac{4}{11} + \frac{12}{12} = \frac{1}{1} \times \frac{1}{12} = \frac{1}{33} \)

Lesson 5.4

5.4 Checkpoint (p. 259)

1. Yes; HL Congruence Theorem; the hypotenuse and a leg of right \( \triangle ABC \) are congruent to the corresponding hypotenuse and a leg of right \( \triangle DEC \).
2. No; from the diagram, you know only that \( \text{SSS Congruence Postulate}, \text{SAS Congruence Postulate}, \text{or HL Congruence Theorem} \)

5.4 Guided Practice (p. 260)

1. hypotenuse 2. leg
3. leg 4. leg
5. hypotenuse 6. leg
7. Yes; all three sides of \( \triangle EDG \) are congruent to the three sides of \( \triangle GFE \) so the triangles are congruent by the SSS Congruence Postulate.
8. Yes; the hypotenuse and a leg of right \( \triangle MNQ \) are congruent to the hypotenuse and a leg of right \( \triangle QPM \), so the triangles are congruent by the HL Congruence Theorem.
9. No; both triangles are equilateral and equiangular, but there is no information about the lengths of the sides of the triangles.

5.4 Practice and Applications (pp. 260–263)

10. Yes; the hypotenuse and a leg of right \( \triangle ABC \) are congruent to the hypotenuse and a leg of right \( \triangle FED \).
11. Yes; \( \overline{CA} \equiv \overline{CA} \) (Reference Property of Congruence), so the hypotenuse and a leg of right \( \triangle JKL \) are congruent to the hypotenuse and a leg of right \( \triangle JML \).
12. No; there is no information about the lengths of the hypotenuses of the right triangles.
13. \( \overline{CA} \equiv \overline{ML} \)
14. SAS Congruence Postulate; since \( K \) is the midpoint of \( JM \), \( JK \equiv MK \). It is given that \( \angle JKL \) and \( \angle MKL \) are right angles, and all right angles are congruent by the Reflexive Property of Congruence \( \angle K \equiv \angle K \).
Chapter 5 continued

15. Yes; SAS Congruence Postulate; two sides and the included angle of \( \triangle ABC \) are congruent to two sides and the included angle of \( \triangle DEF \).

16. Yes; ASA Congruence Postulate; two angles and the included side of \( \triangle JKL \) are congruent to two angles and the included side of \( \triangle ZIX \).

17. No; the congruent angles are not included between the congruent sides, so there is not enough information to prove that the triangles are congruent.

18. Yes; SSS Congruence Postulate; \( \overline{FH} \equiv \overline{FH} \) (Reflexive Property of Congruence), so all three sides of \( \triangle FGH \) are congruent to the three sides of \( \triangle FHI \).

19. Yes; AAS Congruence Theorem; perpendicular lines form right angles, and all right angles are congruent, so \( \angle UTS \equiv \angle UTV \). Also, by the Reflexive Property of Congruence, \( \overline{UT} \equiv \overline{UT} \). Two angles and a non-included side of \( \triangle STU \) are congruent to two angles and the corresponding non-included side of \( \triangle VTU \).

20. Yes; AAS Congruence Theorem; perpendicular lines form right angles, and all right angles are congruent, so \( \angle A \equiv \angle D \). Also, vertical angles are congruent, so \( \angle ACB \equiv \angle DCE \). Two angles and a non-included side of \( \triangle ABC \) are congruent to two angles and the corresponding non-included side of \( \triangle DEC \).

21. Yes; HL Congruence Theorem; by the Reflexive Property of Congruence, \( \overline{DB} \equiv \overline{DB} \), so the hypotenuse and a leg of right \( \triangle ADB \) are congruent to the hypotenuse and corresponding leg of right \( \triangle CDB \).

22. Yes; ASA Congruence Postulate; \( \angle JKL \equiv \angle MLK \) and \( \angle JKL \equiv \angle KLM \) by the Alternate Interior Angles Theorem. \( \overline{LK} \equiv \overline{LK} \) by the Reflexive Property of Congruence. So, two angles and the included side of \( \triangle JKL \) are congruent to two angles and the included side of \( \triangle MLK \).

23. Yes; SAS Congruence Postulate; \( \overline{DF} \equiv \overline{DF} \) (Reflexive Property of Congruence), so two sides and the included angle of \( \triangle CDF \) are congruent to two sides and the included angle of \( \triangle EDF \).

24. Meghan is correct because it is given that \( \overline{AB} \equiv \overline{CD} \) and \( \overline{BC} \equiv \overline{DA} \), and by the Reflexive Property of Congruence, \( \overline{AC} \equiv \overline{AC} \). Keith is correct because two sides and the included angle of \( \triangle ABC \) are congruent to two sides and the included angle of \( \triangle CDA \). Angle C is correct because the hypotenuse \( \overline{AC} \) and a leg of right \( \triangle ABC \) are congruent to the hypotenuse and a leg of right \( \triangle CDA \).

25. Sample answer:

26. Sample answer:

27. Sample answer:

28. Sample answer:

29. \( \angle F \equiv \angle J \), ASA Congruence Postulate; or \( \angle G \equiv \angle L \), AAS Congruence Theorem; or \( \overline{GH} \equiv \overline{IK} \), SAS Congruence Postulate.

30. \( \overline{PQ} \equiv \overline{RS} \) or \( \overline{PS} \equiv \overline{RQ} \), HL Congruence Theorem; or \( \angle PQS \equiv \angle RSQ \) or \( \angle PSQ \equiv \angle RQS \), AAS Congruence Theorem.

31. \( \overline{WV} \equiv \overline{ZX} \), ASA Congruence Postulate; or \( \overline{WV} \equiv \overline{ZY} \), or \( \overline{WX} \equiv \overline{XY} \), AAS Congruence Theorem.

32. Statements | Reasons
---|---
1. \( \overline{BD} \equiv \overline{FD} \) | 1. Given
2. \( D \) is the midpoint of \( \overline{CE} \) | 2. Given
3. \( \overline{CD} \equiv \overline{ED} \) | 3. Definition of midpoint
4. \( \angle BCD \) and \( \angle FED \) are right angles. | 4. Given
5. \( \triangle BCD \) and \( \triangle FED \) are right triangles. | 5. Definition of right triangle
6. \( \triangle BCD \equiv \triangle FED \) | 6. HL Congruence Theorem

5.4 Standardized Test Practice (p. 262)

33. a. Sample answer: \( \overline{BD} \equiv \overline{BD} \) by the Reflexive Property of Congruence; the hypotenuse and a leg of right \( \triangle ABD \) are congruent to the hypotenuse and a leg of right \( \triangle CBD \), so \( \triangle ABD \equiv \triangle CBD \) by the HL Congruence Theorem.

b. Yes; Sample answer: It is given that \( \overline{AB} \equiv \overline{BC} \). By the Base Angles Theorem, \( \angle BAD \equiv \angle BCD \). Perpendicular lines form right angles, and all right angles are congruent, so \( \angle BDA \equiv \angle BDC \). Therefore, \( \triangle ABD \equiv \triangle CBD \) by the AAS Congruence Theorem.

c. Yes; Sample answer: You know that \( \triangle CEG \equiv \triangle FEG \) by the HL Congruence Theorem. It is given that the hypotenuse and a leg of right \( \triangle ABD \) are \( \equiv \) to the hypotenuse and a leg of right \( \triangle CEG \). So, \( \triangle ABD \equiv \triangle CEG \) by the HL Congruence Theorem. Since \( \triangle ABD \equiv \triangle CBD \), all four right triangles are congruent.

5.4 Mixed Review (p. 263)

34. \( m\angle 1 = 110^\circ \) by the Alternate Interior Angles Theorem; \( m\angle 2 = 180^\circ - 110^\circ = 70^\circ \) by the Same-Side Interior Angles Theorem (or by the Linear Pair Postulate).
Chapter 5 continued

35. \(m\angle 1 = 82^\circ\) by the Corresponding Angles Postulate; \(m\angle 2 = 82^\circ\) by the Alternate Exterior Angles Theorem (or by the Vertical Angles Theorem).

36. \(m\angle 1 = 180^\circ - 57^\circ = 123^\circ\) by the Linear Pair Postulate; \(m\angle 2 = 57^\circ\) by the Alternate Interior Angles Theorem.

37. Yes; AAS Congruence Theorem; two angles and a non-included side of \(\triangle ABC\) are congruent to two angles and a non-included side of \(\triangle DEF\).

38. No; \(\angle PQS \not\equiv \angle RSQ\) by the Alternate Interior Angles Theorem and \(\overline{SQ} \equiv \overline{SQ}\) by the Reflexive Property of Congruence, but the congruent angles are not included between the congruent sides.

39. Yes; AAS Congruence Theorem; \(\angle JLK \equiv \angle NLM\) by the Vertical Angles Theorem, so two angles and a non-included side of \(\triangle JKL\) are congruent to two angles and the corresponding non-included side of \(\triangle NML\).

5.4 Algebra Skills (p. 263)

40. \(2 \cdot 4 + 5 = 8 + 5 = 13\)

41. \(10 - 5 \cdot 2 = 10 - 10 = 0\)

42. \(3 + 4^2 - 11 = 3 + 16 - 11 = 19 - 11 = 8\)

43. \(7 \cdot 2 + 6 \cdot 3 = 14 + 18 = 32\)

44. \(3 \cdot 5 - 2 \cdot 7 = 15 - 14 = 1\)

45. \(5^2 - 10 \cdot 2 = 25 - 20 = 5\)

Quiz 2 (p. 263)

1. Yes; \(\angle NML \equiv \angle PMQ\) (Vertical Angles Theorem), \(\overline{NM} \equiv \overline{PM}\) (Given), and \(\angle LNM \equiv \angle QPM\) (All right angles are congruent.).

2. Yes; \(\angle NML \equiv \angle PMQ\) (Vertical Angles Theorem), \(\angle LNM \equiv \angle QPM\) (All right angles are congruent.) and \(\overline{LN} \equiv \overline{QP}\) (Given).

3. No; no information is given about the lengths of the hypotenuses.

4. No; no information is given about the third sides.

5. No; the congruent sides are not corresponding sides.

6. Yes; AAS Congruence Theorem; two angles and a non-included side of \(\triangle JKL\) are congruent to two angles and the corresponding non-included side of \(\triangle QRP\).

7. Yes; ASA Congruence Postulate; \(\overline{TU} \equiv \overline{TU}\) by the Reflexive Property of Congruence, so two angles and the included side of \(\triangle STU\) are congruent to two angles and the included side of \(\triangle VUT\).

8. Yes; HL Congruence Theorem; the hypotenuse and a leg of right \(\triangle HEF\) are congruent to the hypotenuse and a right leg of \(\triangle FGH\).

9. Yes; AAS Congruence Theorem; \(\angle RTS \equiv \angle UTV\) (Vertical Angles Theorem), \(\angle RST \equiv \angle VUT\) (Alternate Interior Angles Theorem), and \(\overline{RS} \equiv \overline{UV}\) (Given). So, two angles and a non-included side of \(\triangle RST\) are congruent to two angles and the corresponding non-included side of \(\triangle UVT\).

10. Yes; SSS Congruence Postulate; \(\triangle JML\) and \(\triangle JKL\) are equiangular and therefore equilateral. Because they share a common side (\(\overline{JL}\)) you know that all the sides of \(\triangle JML\) are congruent to all the sides of \(\triangle JKL\); or AAS Congruence Theorem because \(\overline{JL} \equiv \overline{JL}\) (Reflexive Property of Congruence), two angles and a non-included side of \(\triangle JML\) are congruent to two angles and the corresponding non-included side of \(\triangle JKL\); or ASA Congruence Postulate because \(\overline{JL} \equiv \overline{JL}\), two angles and the included side of \(\triangle JML\) are congruent to two angles and the included side of \(\triangle JKL\).

5.4 Technology Activity (p. 264)

1. Answers will vary, but \(\overline{BG} = \overline{BH}\).

2. \(\overline{AB} \equiv \overline{AB}\) and \(\overline{BG} \equiv \overline{BH}\)

3. \(\angle BAG \equiv \angle BAH\)

4. No; Sample answer: \(\triangle ABH\) and \(\triangle ABG\) have different shapes.

5. \(\triangle ABH\) and \(\triangle AGH\) are congruent.

6. There is no SSA Congruence Postulate because it is possible for two sides and a non-included angle of one triangle to be congruent to two sides and the corresponding non-included angle of another triangle without the two triangles being congruent.

Lesson 5.5

5.5 Checkpoint (p. 267)

1. SAS Congruence Postulate; \(\overline{AB} \equiv \overline{CA}\) (Given), \(\angle DAC \equiv \angle BCA\) (Alternate Interior Angles Theorem), and \(\overline{AC} \equiv \overline{AC}\) (Reflexive Property of Congruence). So, \(\triangle ADC \equiv \triangle CBA\) and the corresponding parts \(\overline{AB}\) and \(\overline{CD}\) are congruent.

2.

\(\triangle JKN \equiv \triangle JLM\) by the ASA Congruence Postulate, so the corresponding parts \(\overline{NJ}\) and \(\overline{ML}\) are congruent.

3.

In the original diagram, \(\overline{PR}\) and \(\overline{PR}\) are the same side, so \(\overline{PR} \equiv \overline{PR}\). \(\triangle PQR \equiv \triangle RSP\) by the AAS Congruence Theorem.
Chapter 5 continued

5.5 Guided Practice (p. 268)

1. Corresponding parts of congruent triangles are congruent.

2. B

3. When two parallel lines are cut by a transversal, alternate interior angles are congruent, so \( \angle VSU \equiv \angle TUS \) and \( \angle TSU \equiv \angle VUS \). Also, \( SU \equiv SU \) by the Reflexive Property of Congruence. \( \triangle STU \equiv \triangle UVS \) by the ASA Congruence Postulate and \( \angle STU \equiv \angle UVS \) since corresponding parts of congruent triangles are congruent.

4. \( \angle A \equiv \angle D \), \( \angle DBC \equiv \angle ACB \), and \( \overline{BC} \equiv \overline{BC} \). So, \( \triangle ABC \equiv \triangle DCB \) by the AAS Congruence Theorem and \( \overline{AB} \equiv \overline{DC} \) since corresponding parts of congruent triangles are congruent.

5. \( \overline{LN} \equiv \overline{LJ} \), \( \angle LNM \equiv \angle LJK \), and \( \angle L \equiv \angle L \). So, \( \triangle JKL \equiv \triangle MNL \) by the ASA Congruence Postulate and \( \angle J \equiv \angle M \) since corresponding parts of congruent triangles are congruent.

5.5 Practice and Applications (pp. 268–271)

6. Corresponding parts of congruent triangles are congruent.

7. \( \triangle ABC \equiv \triangle DBC \)

8. \( \triangle JKL \equiv \triangle NML \)

9. \( \triangle EDF \equiv \triangle ABC \)

10. In the original diagram, \( \overline{DB} \) and \( \overline{DB} \) are the same side, so \( \overline{DB} \equiv \overline{DB} \). \( \triangle ABD \equiv \triangle CDB \) by the SAS Congruence Postulate.

11. In the original diagram, \( \angle G \) and \( \angle G \) are the same angle, so \( \angle G \equiv \angle G \). \( \triangle EFG \equiv \triangle HJG \) by the AAS Congruence Theorem.

12. AAS Congruence Theorem; \( \angle C \equiv \angle F \), \( \angle CBA \equiv \angle FED \), and \( \overline{CA} \equiv \overline{FD} \), so \( \triangle ABC \equiv \triangle DEF \).

13. ASA Congruence Postulate; \( \angle GJH \equiv \angle KMH \) and \( \overline{HJ} \equiv \overline{HM} \). By the Reflexive Property of Congruence, \( \angle H \equiv \angle H \). So, \( \triangle GHJ \equiv \triangle KHM \).

14. Statements Reasons

1. \( \overline{AB} \equiv \overline{AE} \) 1. Given

2. \( \angle ACB \equiv \angle ADE \) 2. Given

3. \( \angle A \equiv \angle A \) 3. Reflexive Prop. of Cong.

4. \( \triangle ABC \equiv \triangle AED \) 4. AAS Congruence Theorem

5. \( \angle B \equiv \angle E \) 5. Corresponding parts of \( \equiv \) triangles are \( \equiv \).

15. Statements Reasons

1. \( \overline{AD} \equiv \overline{CD} \) 1. Given

2. \( \angle ABD \) and \( \angle CBD \) are right angles. 2. Given

3. \( \triangle ABD \equiv \triangle CBD \) are right triangles. 3. Def. of right triangle

4. \( \overline{BD} \equiv \overline{BD} \) 4. Reflexive Property of Cong.

5. \( \triangle ABD \equiv \triangle CBD \) 5. HL Congruence Theorem

6. \( \triangle A \equiv \triangle C \) 6. Corresponding parts of \( \equiv \) triangles are \( \equiv \).

16. Statements Reasons

1. \( \overline{JK} \parallel \overline{NM} \) 1. Given

2. \( \angle JKL \equiv \angle NML \) 2. Alternate Interior Angles Theorem

3. \( \overline{KL} \equiv \overline{ML} \) 3. Given

4. \( \angle JKL \equiv \angle NLM \) 4. Vertical Angles Theorem

5. \( \triangle JKL \equiv \triangle NML \) 5. ASA Congruence Postulate

6. \( \overline{JK} \equiv \overline{NM} \) 6. Corresponding parts of \( \equiv \) triangles are \( \equiv \).

17. Statements Reasons

1. \( \angle TRS \equiv \angle RTQ \) 1. Given

2. \( \angle RST \) and \( \angle TQR \) are right angles. 2. Given

3. \( \angle RST \equiv \angle TQR \) 3. All right angles are \( \equiv \).

4. \( \overline{RQ} \equiv \overline{TS} \) 4. Given

5. \( \overline{RQT} \equiv \overline{TSR} \) 5. AAS Congruence Theorem

6. \( \overline{QT} \equiv \overline{SR} \) 6. Corresponding parts of \( \equiv \) triangles are \( \equiv \).

18. Statements Reasons

1. \( \overline{UV} \equiv \overline{XY} \) 1. Given

2. \( \angle UVW \equiv \angle XYZ \) 2. Given

3. \( \overline{VW} \equiv \overline{YZ} \) 3. Given

4. \( \angle UVW \equiv \angle XYZ \) 4. SAS Congruence Postulate

5. \( \overline{WU} \equiv \overline{ZV} \) 5. Corresponding parts of \( \equiv \) triangles are \( \equiv \).

19. Statements Reasons

1. \( \overline{BD} \) and \( \overline{AE} \) bisect each other at \( C \). 1. Given

2. \( \overline{BC} \equiv \overline{DC} \) 2. Def. of segment bisector

3. \( \overline{AC} \equiv \overline{EC} \) 3. Def. of segment bisector

4. \( \angle BCA \equiv \angle DCE \) 4. Vertical Angles Theorem

5. \( \triangle ABC \equiv \triangle EDC \) 5. SAS Congruence Postulate

6. \( \angle A \equiv \angle E \) 6. Corresponding parts of \( \equiv \) triangles are \( \equiv \).
Chapter 5 continued

20. Statements Reasons

1. $\overline{JI} \equiv \overline{MK}$ 1. Given
2. $\overline{JK} \perp \overline{KL}, \overline{ML} \perp \overline{KL}$ 2. Given
3. $\angle JKL$ and $\angle MLK$ are right angles.
4. $\triangle JKL$ and $\triangle MLK$ are right triangles.
5. $\overline{KL} \equiv \overline{KL}$ 5. Reflexive Prop. of Cong.
6. $\triangle JKL \equiv \triangle MLK$ 6. HL Congruence Theorem
7. $\overline{JK} \equiv \overline{ML}$ 7. Corresponding parts of $\equiv$ triangles are $\equiv$.

21. ASA Congruence Postulate; $\angle LJK \equiv \angle PMN$ (Given), $\overline{JI} \equiv \overline{MP}$ (Segment Addition Postulate), and $\angle JKL \equiv \angle MPN$ (Corresponding Angles Theorem). Two angles and the included side of $\triangle JKL$ are congruent to two angles and the included side of $\triangle MNP$.

5.5 Standardized Test Practice (p. 271)

22. A 23. G

5.5 Mixed Review (p. 271)

24. $(x - 3)^2 = 25^2$
   \[x - 3 + 3 = 25 + 3\]
   \[x = 28\]
25. $3x^2 = 54^2$
   \[\frac{3x}{3} = \frac{54}{3}\]
   \[x = 18\]
26. $(6x - 1)^2 = (5x + 5)^2$
   \[6x - 1 - 5x = 5x + 5 - 5x\]
   \[x - 1 = 5\]
   \[x - 1 + 1 = 5 + 1\]
   \[x = 6\]
27. $x^2 + 48^2 = 90^2$
   \[x + 48 - 48 = 90 - 48\]
   \[x = 42\]
28. $(4x + 1)^2 + 37^2 = 90^2$
   \[4x + 38 = 90\]
   \[4x + 38 - 38 = 90 - 38\]
   \[4x = 52\]
   \[\frac{4x}{4} = \frac{52}{4}\]
   \[x = 13\]
29. $(8x + 2)^2 = 90^2$
   \[8x + 2 - 2 = 90 - 2\]
   \[8x = 88\]
   \[\frac{8x}{8} = \frac{88}{8}\]
   \[x = 11\]

5.5 Algebra Skills (p. 271)

30. $x + 5 = 8$
   \[x + 5 - 5 = 8 - 5\]
   \[x = 3\]
31. $7x = -63$
   \[\frac{7x}{7} = \frac{-63}{7}\]
   \[x = -9\]
32. $4x - 9 = 23$
   $4x - 9 + 9 = 23 + 9$
   \[11 + 3x = 32 - 11\]
   $4x = 32$
   \[\frac{4x}{4} = \frac{32}{4}\]
   \[3x = \frac{21}{3}\]
   \[x = 8\]
33. $11 + 3x = 32$
   $4x - 9 + 9 = 23 + 9$
   \[11 + 3x - 11 = 32 - 11\]
   $4x = 32$
   \[\frac{4x}{4} = \frac{32}{4}\]
   \[3x = \frac{21}{3}\]
   \[x = 8\]
34. $5x - 3x + 10 = 24$
   $2x + 10 = 24$
   \[3x - 8 = 19\]
   $2x + 10 - 10 = 24 - 10$
   $3x - 8 + 8 = 19 + 8$
   $2x = 14$
   \[\frac{2x}{2} = \frac{14}{2}\]
   \[3x = \frac{27}{3}\]
   \[x = 7\]
35. $x + 2x - 8 = 19$
   $2x + 10 = 24$
   $3x - 8 = 19$
   $2x + 10 - 10 = 24 - 10$
   $3x - 8 + 8 = 19 + 8$
   $2x = 14$
   \[\frac{2x}{2} = \frac{14}{2}\]
   \[3x = \frac{27}{3}\]
   \[x = 9\]

Lesson 5.6

5.6 Activity (p. 272)

1. $\overline{CM}$ is perpendicular to $\overline{AB}$ and $\overline{CM}$ bisects $\overline{AB}$.
2. Answers will vary, but $CA = CB, DA = DB, EA = EB,$ and $FA = FB$.
3. Any point on the perpendicular bisector of a segment is the same distance from the endpoints of the segment.

5.6 Checkpoint (p. 274)

1. $FH = HG$
   \[x + 3 = 2x + 1\]
   \[x + 3 - x = 2x + 1 - x\]
   \[3 = x + 1\]
   \[3 - 1 = x + 1 - 1\]
   \[2 = x\]
   \[FH = x + 3 = 2 + 3 = 5\]
Chapter 5 continued

2. \[ LM = MK \]
   \[ 4x = x + 15 \]
   \[ 4x - x = x + 15 - x \]
   \[ 3x = 15 \]
   \[ 3 \times \frac{15}{3} = 5 + 15 = 20 \]

3. \[ EF = GF \]
   \[ 2x + 5 = x + 10 \]
   \[ 2x + 5 - x = x + 10 - x \]
   \[ x + 5 = 10 \]
   \[ x + 5 - 5 = 10 - 5 \]
   \[ x = 5 \]
   \[ EF = 2x + 5 = 2(5) + 5 = 10 + 5 = 15 \]

5.6 Guided Practice (p. 276)

1. If a point is on the bisector of an angle, then it is equidistant from the two sides of the angle.

2. If \( D \) is on the perpendicular bisector of \( \overline{AB} \), then \( D \) is equidistant from \( A \) and \( B \).

3. \( AD = DC = 16 \)

4. \( EF = FG \)
   \[ x + 1 = 2x - 1 \]
   \[ x + 1 - x = 2x - 1 - x \]
   \[ 1 = x - 1 \]
   \[ 1 + 1 = x - 1 + 1 \]
   \[ 2 = x \]
   \[ EF = x + 1 = 2 + 1 = 3 \]

5. \( JM = ML = 12 \)

6. \( QR = QP \)
   \[ 3x + 8 = 5x \]
   \[ 3x + 8 - 3x = 5x - 3x \]
   \[ 8 = 2x \]
   \[ \frac{8}{2} = \frac{2x}{2} \]
   \[ 4 = x \]
   \[ QR = 3x + 8 = 3(4) + 8 = 12 + 8 = 20 \]

5.6 Practice and Applications (pp. 276–280)

7. \[ \text{Diagram} \]

8. \[ \text{Diagram} \]

9. Paige cannot assume that \( \overrightarrow{PC} \perp \overrightarrow{AC} \).

10. \[ CB = CA \]
11. \[ MJ = ML \]
   \[ x + 5 = 15 \]
   \[ x + 5 - 5 = 15 - 5 \]
   \[ x = 10 \]

12. \[ HE = HF \]
   \[ 3x = x + 4 \]
   \[ 3x - x = x + 4 - x \]
   \[ 2x = 4 \]
   \[ \frac{2x}{2} = \frac{4}{2} \]
   \[ x = 2 \]

13. \( \overline{BC} \equiv \overline{BD} \) by the Angle Bisector Theorem.

14. \[ m\angle JKM = m\angle LKM = 38^\circ \]

15. \[ SV = UV = 18 \]
16. \[ HG = FG = 14 \]

17. \[ LK = NK \]
   \[ x = 2x - 3 \]
   \[ x - x = 2x - 3 - x \]
   \[ 0 = x - 3 \]
   \[ 0 + 3 = x - 3 + 3 \]
   \[ 3 = x \]
   \[ LK = x = 3 \]

18. \[ PQ = RQ \]
   \[ x + 2 = 2x - 1 \]
   \[ x + 2 - x = 2x - 1 - x \]
   \[ 2 = x - 1 \]
   \[ 2 + 1 = x - 1 + 1 \]
   \[ 3 = x \]
   \[ PQ = x + 2 = 3 + 2 = 5 \]

19. \( AD = CD = 12; \)
   \[ BC = BA \]
   \[ 2x + 6 = 3x + 1 \]
   \[ 2x + 6 - 2x = 3x + 1 - 2x \]
   \[ 6 = x + 1 \]
   \[ 6 - 1 = x + 1 - 1 \]
   \[ 5 = x \]
   \[ BC = 2x + 6 = 2(5) + 6 = 10 + 6 = 16 \]

20. Perpendicular Bisector Theorem; Because \( \overline{DB} \) is perpendicular to and bisects \( \overline{AC} \), point \( D \) is on the perpendicular bisector of \( \overline{AC} \). So, \( D \) is equidistant from points \( A \) and \( C \).

21. Line \( l \) is the perpendicular bisector of the goal line \( (\overline{AC}) \).

22. \( \overrightarrow{BG} \) should bisect \( \angle ABC \) so that the goalkeeper is equidistant from the edges of the region that the goalkeeper is defending. By doing this, the goalkeeper minimizes the distance needed to reach the ball.
23. \( CG = AG = BG = 2 \)
24. \( VR = VQ = VP = 16 \)
25. \( GL \equiv LH \);
    \( FJ \equiv JG \); \( FF \equiv KH \);
    \( FM \equiv GM \equiv HM \)

26–28.

29. The fire station at point A; X is in the red region, which is the region closest to station A.
30. \( DA \equiv DB \); the measures of \( DA \) and \( DB \) are equal.
31. Yes; by the Perpendicular Bisector Theorem, if \( D \) lies on the perpendicular bisector of \( AB \), then \( DA \) and \( DB \) will always be congruent segments.

32. Statements Reasons
1. \( \overline{AD} \) is the perpendicular bisector of \( \overline{BC} \).
2. \( \overline{DB} \equiv \overline{DC} \)
3. \( \angle ADB \) and \( \angle ADC \) are right angles.
4. \( \angle ADB \equiv \angle ADC \)
5. \( \overline{AD} \equiv \overline{AD} \)
6. \( \triangle ADB \equiv \triangle ADC \)
7. \( \overline{AB} \equiv \overline{AC} \)
8. \( AB = AC \)

33. Statements Reasons
1. \( D \) is on the bisector of \( \angle BAC \).
2. \( \angle BAD \equiv \angle CAD \)
3. \( \overline{DB} \perp \overline{AB} \) and \( \overline{DC} \perp \overline{AC} \)
4. \( \angle DBA \) and \( \angle DCA \) are right angles.
5. \( \angle DBA \equiv \angle DCA \)
6. \( \overline{DA} \equiv \overline{DA} \)
7. \( \triangle ADB \equiv \triangle ADC \)
8. \( \overline{DB} \equiv \overline{DC} \)

5.6 Standardized Test Practice (p. 280)
34. \( B; SR = SP \)
\[ x = 2x - 3 \]
\[ x - x = 2x - 3 - x \]
\[ 0 = x - 3 \]
\[ 0 + 3 = x - 3 + 3 \]
\[ 3 = x \]
\[ SR = x = 3 \]
35. \( G; \ SP = RS \)
\[ 2x - 3 = x \]
\[ 2x - 3 - x = x - x \]
\[ x - 3 = 0 \]
\[ x - 3 + 3 = 0 + 3 \]
\[ x = 3 \]
\[ SP = 2x - 3 = 2(3) - 3 = 6 - 3 = 3 \]
36. D

5.6 Mixed Review (p. 280)
37. \( (5, 1) \rightarrow (5 + 3, 1 - 6) = (8, -5) \)
38. \( (-2, 3) \rightarrow (-2 + 3, 3 - 6) = (1, -3) \)
39. \( (-4, -4) \rightarrow (-4 + 3, -4 - 6) = (-1, -10) \)
40. \( (0, -6) \rightarrow (0 + 3, -6 - 6) = (3, -12) \)
41. \( (6, 2) \rightarrow (6 + 3, 2 - 6) = (9, -4) \)
42. \( (2, -5) \rightarrow (2 + 3, -5 - 6) = (5, -11) \)
43. \( (10, 12) \rightarrow (10 + 3, 12 - 6) = (13, 6) \)
44. \( (-1, -1) \rightarrow (-1 + 3, -1 - 6) = (2, -7) \)
45. SAS Congruence Postulate; \( \overline{DB} \equiv \overline{DB} \) (Reflexive Property of Congruence) and all right angles are congruent, so two sides and the included angle of \( \triangle ADB \) are congruent to two sides and the included angle of \( \triangle CDB \).
46. AAS Congruence Theorem; \( \overline{EF} \equiv \overline{EF} \) (Reflexive Property of Congruence), so two angles and a non-included side of \( \triangle HEF \) are congruent to two angles and the corresponding non-included side of \( \triangle GFE \).
47. ASA Congruence Postulate; vertical angles are congruent so two angles and the included side of \( \triangle JNK \) are congruent to two angles and the included side of \( \triangle LNM \).

5.6 Algebra Skills (p. 280)
48. \(-3, -0.3, 0, 0.3, 0.6, 3\)
49. \(-1.25, -0.75, -0.25, 0.25, 1.4\)
50. \(-4, -0.4, -0.1, 0, 0.1, 4.0\)
51. \(-3.9, -3.3, -3, 3.1, 3.5, 3.8\)
Chapter 5 continued

52. \(-1, -0.1, 0, 0.5, 0.55, 1, 1.1\)

53. \(-2.5, 1, 2.1, 3.2, 3.25, 5\)

54. \(4x + 3 = 11\)

\[
\begin{align*}
4x + 3 - 3 &= 11 - 3 \\
4x &= 8 \\
4x &= 8 \\
x &= 2
\end{align*}
\]

55. \(2y - 9 = -11\)

\[
\begin{align*}
2y - 9 + 9 &= -11 + 9 \\
2y &= -2 \\
2y &= -2 \\
y &= -1
\end{align*}
\]

56. \(5d - 35 = 90\)

\[
\begin{align*}
5d - 35 + 35 &= 90 + 35 \\
5d &= 125 \\
5d &= 125 \\
d &= 25
\end{align*}
\]

57. \(4a + 9a = 39\)

\[
\begin{align*}
13a &= 39 \\
13a &= 39 \\
a &= 3
\end{align*}
\]

58. \(x + 2 = 3x - 4\)

\[
\begin{align*}
x + 2 - x &= 3x - 4 - x \\
2 &= 2x - 4 \\
2 + 4 &= 2x - 4 + 4 \\
6 &= 2x \\
6 &= \frac{2x}{2} \\
3 &= x
\end{align*}
\]

59. \(4r - 2 = 5r + 6\)

\[
\begin{align*}
4r - 2 - 4r &= 5r + 6 - 4r \\
-2 &= r + 6 \\
-2 - 6 &= r + 6 - 6 \\
-8 &= r
\end{align*}
\]

60. \(q = 2q - 9\)

\[
\begin{align*}
q - 2q &= 2q - 9 - 2q \\
-q &= -9 \\
-1 &= -9 \\
q &= 9
\end{align*}
\]

61. \(2z + 5 = 4z - 1\)

\[
\begin{align*}
2z + 5 - 2z &= 4z - 1 - 2z \\
5 &= 2z - 1 \\
5 + 1 &= 2z - 1 + 1 \\
6 &= 2z \\
6 &= \frac{2z}{2} \\
3 &= z
\end{align*}
\]

62. \(10r + 10 = 12t\)

\[
\begin{align*}
10r + 10 - 10r &= 12t - 10r \\
10 &= 2t \\
\frac{10}{2} &= \frac{2t}{2} \\
5 &= t
\end{align*}
\]

Lesson 5.7

5.7 Activity (p. 281)

1. Answers will vary, but \(\overline{AX} = \overline{AX'}, \overline{ZB} = \overline{BZ'},\) and \(\overline{YC} = \overline{CY'}\).

2. \(\overline{AX} = \overline{AX'}, \overline{ZB} = \overline{BZ'},\) and \(\overline{YC} = \overline{CY'};\) each pair of segments is congruent.

3. \(90°; 90°; 90°;\) the measure of each angle is \(90°\).

4. The fold line is the perpendicular bisector of each segment.

5.7 Checkpoint (pp. 283–285)

1. yes; the x-axis
2. no
3. yes; the y-axis
4. The figure has one line of symmetry.
5. The figure has two lines of symmetry.

6. The figure has four lines of symmetry.

5.7 Guided Practice (p. 286)

1. A figure in the plane has a line of symmetry if the figure can be reflected onto itself by a reflection in the line.

2. No; the orientation of the image is not reversed.

3. Yes; all three properties of a reflection are met.

4. Yes; all three properties of a reflection are met.

5. The flower has three lines of symmetry.
6. The flower has two lines of symmetry.
Chapter 5 continued

7. The flower has five lines of symmetry.

5.7 Practice and Applications (pp. 286–290)

8. Yes; all three properties of a reflection are met.
9. Yes; all three properties of a reflection are met.
10. No; the orientation is not reversed.
11. The grid shows a reflection in the y-axis.
12. The grid shows neither a reflection in the x-axis, nor a reflection in the y-axis.
13. The grid shows a reflection in the x-axis.
14. \(GH\) is a reflection of \(AB\) in the x-axis; point \(G\) corresponds to \(A\); point \(H\) corresponds to \(B\).
15. \(CD\) is a reflection of \(AB\) in the y-axis; point \(C\) corresponds to \(A\); point \(D\) corresponds to \(B\).
16. Coordinates of \(AB\): \((-3, 1), (-1, 3)\).
   Coordinates of \(GH\): \((-3, -1), (-1, -3)\).
   The coordinates are alike in that the x-coordinate of each original point is the same as the x-coordinate of the image point. The coordinates are different in that the y-coordinate of each original point is the opposite of the y-coordinate of the image point.
17.

18.

19.

20. All three triangles in sections \(B\) and \(D\) are reflections of the triangle in section \(A\). Each fold in the paper is a line of symmetry.

21. No; the right side of the guitar is not the same as the left side.

22. yes
24. The figure has five lines of symmetry.
25. The figure has four lines of symmetry.

26. The figure has two lines of symmetry.

27. All the lines of symmetry are shown.
28. no; 29. no;

30.

31. The letters \(b\) and \(d\) are reflections of each other, and \(p\) and \(q\) are reflections of each other.

32. One line of symmetry: \(\therefore\), \(\therefore\), \(\therefore\), and \(\therefore\); Two lines of symmetry:

33. yes; 34. no 35. yes; 36. yes;
Chapter 5 continued

37. \( m\angle A = \frac{180^\circ}{n} = \frac{180^\circ}{4} = 45^\circ \)

38. \( m\angle A = \frac{180^\circ}{n} = \frac{2}{2} = 90^\circ \)

39. \( m\angle A = \frac{180^\circ}{3} = 60^\circ \)

40. \( AB = |3 - 1| = 2, DE = |-3 - (-1)| = |-2| = 2; \)

\( AC = |6 - 2| = 4, DF = |6 - 2| = 4; \)

\( BC = \sqrt{(6 - 2)^2 + (1 - 3)^2} = \sqrt{4^2 + (-2)^2} = \sqrt{20}, \)

\( EF = \sqrt{(6 - 2)^2 + (1 - (-3))^2} = \sqrt{4^2 + 2^2} = \sqrt{20}; \)

By the SSS Congruence Postulate, \( \triangle ABC \cong \triangle DEF. \)

41. \( AB = |1 - 3| = |-2| = 2, \)

\( DE = |-1 - (-3)| = |2| = 2; \)

\( AC = |4 - 1| = 3, \)

\( DF = |-4 - (-1)| = |-3| = 3; \)

\( BC = \sqrt{(3 - 1)^2 + (4 - 1)^2} = \sqrt{2^2 + 3^2} = \sqrt{13}, \)

\( EF = \sqrt{(-4 - (-1))^2 + (-3 - (-1))^2} = \sqrt{(-3)^2 + (-2)^2} = \sqrt{13}; \)

By the SSS Congruence Postulate, \( \triangle ABC \cong \triangle DEF. \)

5.7 Standardized Test Practice (p. 289)

42. C

43. G:

5.7 Mixed Review (p. 290)

44. \( x^\circ = 105^\circ \)

\( x = 105 \)

45. \( (x + 10)^\circ = 82^\circ \)

\( x + 10 - 10 = 82 - 10 \)

\( x = 72 \)

46. \( (3x - 1)^\circ = 92^\circ \)

\( 3x - 1 + 1 = 92 + 1 \)

\( 3x = 93 \)

\( \frac{3x}{3} = \frac{93}{3} \)

\( x = 31 \)

47. \( m\angle 1 + 38^\circ + 75^\circ = 180^\circ \)

\( m\angle 1 + 113^\circ = 180^\circ \)

\( m\angle 1 + 113^\circ - 113^\circ = 180^\circ - 113^\circ \)

\( m\angle 1 = 67^\circ \)

48. \( m\angle 1 + 51^\circ + 30^\circ = 180^\circ \)

\( m\angle 1 + 81^\circ = 180^\circ \)

\( m\angle 1 + 81^\circ - 81^\circ = 180^\circ - 81^\circ \)

\( m\angle 1 = 99^\circ \)

49. \( m\angle 1 + 44^\circ + 90^\circ = 180^\circ \)

\( m\angle 1 + 134^\circ = 180^\circ \)

\( m\angle 1 + 134^\circ - 134^\circ = 180^\circ - 134^\circ \)

\( m\angle 1 = 46^\circ \)

5.7 Algebra Skills

50. 2348 < 2384

51. -5 > -7

52. 19.1 > 19.01

53. -11.2 > -11.238

54. 0.065 > 0.056

55. 1.011 < 1.11

Quiz 3 (p. 290)

1. AAS Congruence Postulate

2. \( DC = AD = 2 \)

3. \( ML = MJ = 9; \)

\( JK = LK = 25 \)

4. \( AB = CD \)

\( 3x + 4 = 2x + 7 \)

\( 3x + 4 - 2x = 2x + 7 - 2x \)

\( x + 4 = 7 \)

\( x + 4 - 4 = 7 - 4 \)

\( x = 3 \)

\( AB = 3x + 4 = 3(3) + 4 = 13 \)

5. The figure has one line of symmetry.

6. The figure has two lines of symmetry.

7. The figure has three lines of symmetry.

Chapter 5 Summary and Review (pp. 291–295)

1. When two figures are congruent, their corresponding sides and their corresponding angles are congruent.
2. A proof is a convincing argument that shows why a statement is true.
3. If a point is on the perpendicular bisector of a segment, then it is equidistant from the endpoints of the segment.
4. If a point is on the angle bisector of an angle, then it is equidistant from the two sides of the angle.
5. A reflection is a transformation that creates a mirror image.
6. neither
7. corresponding sides
8. corresponding angles
9. neither
10. neither
11. corresponding angles
12. Yes; \( \triangle DEF \cong \triangle ACB \) by the SAS Congruence Postulate because it is given that \( \overline{DE} \cong \overline{AC} \), \( \angle E \cong \angle C \), and \( \overline{EF} \cong \overline{CB} \).
13. Yes; \( \triangle PTQ \cong \triangle RTS \) by the SAS Congruence Postulate because \( \overline{PT} \cong \overline{RT} \) (Given), \( \angle PTQ \cong \angle RTS \) (Vertical Angles Theorem), and \( \overline{ST} \cong \overline{QT} \) (Given).
14. Yes; \( \triangle PQR \cong \triangle PSR \) by the SSS Congruence Postulate because \( \overline{PQ} \cong \overline{PS} \) (Given), \( \overline{QR} \cong \overline{SR} \) (Given), and \( \overline{PR} \cong \overline{PR} \) (Reflexive Property of Congruence).
15. \( \angle S \cong \angle X \)
16. \( \overline{AB} \cong \overline{FG} \)
17. \( \angle JKM \cong \angle LMK \)
18. Statements | Reasons
--- | ---
1. \( \angle UZV \) and \( \angle XYW \) are right angles. | 1. Given
2. \( \triangle UZV \) and \( \triangle XYW \) are right triangles. | 2. Definition of right triangle
3. \( \overline{UV} \cong \overline{XW} \) | 3. Given
4. \( \overline{UZ} \cong \overline{XY} \) | 4. Given
5. \( \triangle UZV \cong \triangle XYW \) | 5. HL Congruence Theorem
19. HL Congruence Theorem
20. AAS Congruence Theorem
21. AAS Congruence Theorem
22. Statements | Reasons
--- | ---
1. \( \angle C \) and \( \angle D \) are right angles. | 1. Given
2. \( \triangle ABC \) and \( \triangle BAD \) are right triangles. | 2. Definition of right triangle
3. \( \overline{AC} \cong \overline{BD} \) | 3. Given
4. \( \overline{AB} \cong \overline{AB} \) | 4. Reflexive Prop. of Cong.
5. \( \triangle ABC \cong \triangle BAD \) | 5. HL Congruence Theorem
6. \( \angle CBA \cong \angle DAB \) | 6. Corresponding parts of \( \cong \) triangles are \( \cong \).
23. Statements | Reasons
--- | ---
1. \( \angle JMN \) and \( \angle JKL \) are right angles. | 1. Given
2. \( \angle JMN \equiv \angle JKL \) | 2. All right angles are \( \equiv \).
3. \( \angle J \equiv \angle J \) | 3. Reflexive Prop. of Cong.
4. \( \overline{MN} \equiv \overline{KL} \) | 4. Given
5. \( \triangle JMN \equiv \triangle JKL \) | 5. AAS Congruence Theorem
6. \( \overline{JM} \equiv \overline{JK} \) | 6. Corresponding parts of \( \equiv \) triangles are \( \equiv \).
24. Statements | Reasons
--- | ---
1. \( \angle Q \) and \( \angle S \) are right angles. | 1. Given
2. \( \angle Q \equiv \angle S \) | 2. All right angles are \( \equiv \).
3. \( \overline{QRP} \equiv \overline{SRT} \) | 3. Vertical Angles Theorem
4. \( \overline{PR} \equiv \overline{TR} \) | 4. Given
5. \( \triangle QRP \equiv \triangle SRT \) | 5. AAS Congruence Theorem
6. \( \overline{QR} \equiv \overline{SR} \) | 6. Corresponding parts of \( \equiv \) triangles are \( \equiv \).
25. \( JM = LM = 3 \)
26. \( QR = QP \)
\[ 2x - 1 = x + 4 \]
\[ 2x - 1 - x = x + 4 - x \]
\[ x - 1 = 4 \]
\[ x = 5 \]
\[ QR = 2x - 1 = 2(5) - 1 = 9 \]
27. \( XY = ZY \)
\[ 3x + 4 = 6x + 1 \]
\[ 3x + 4 - 3x = 6x + 1 - 3x \]
\[ 4 = 3x + 1 \]
\[ 4 - 1 = 3x + 1 - 1 \]
\[ 3 = 3x \]
\[ \frac{3}{3} = \frac{3x}{3} \]
\[ 1 = x \]
\[ XY = 3x + 4 = 3(1) + 4 = 7 \]
28. Yes; all three properties of a reflection are met; one line of symmetry.
29. No; the orientation is not reversed; one line of symmetry.
30. Yes; all three properties of a reflection are met; no lines of symmetry.
31. Sample answer:
Chapter 5 continued

Chapter 5 Chapter Test (p. 296)

1. \( \overline{RS} \cong \overline{XY}, \overline{ST} \cong \overline{YZ}, \overline{TR} \cong \overline{ZX} \),
   \( \angle R \cong \angle X, \angle S \cong \angle Y, \angle T \cong \angle Z; \)
   \( \triangle RST \cong \triangle XYZ, \triangle STR \cong \triangle YZX, \)
   \( \triangle TRS \cong \triangle ZXY, \triangle SRT \cong \triangle YXZ. \)

2. \( m\angle L = m\angle U = 46^\circ \)

3. \( TU = KL = 10 \)

4. SSS Congruence Postulate; \( BC \cong \overline{BC} \) (Reflexive Property of Congruence), so all three sides of \( \triangle ABC \) are congruent to all three sides of \( \triangle DBC \).

5. HL Congruence Theorem; by the Reflexive Property of Congruence, \( \overline{HF} \cong \overline{HF} \), so the hypotenuse and leg of right \( \triangle HFE \) are congruent to the hypotenuse and corresponding leg of \( \triangle HFG \).

6. Yes; vertical angles are congruent, so the triangles are congruent by the AAS Congruence Theorem.

7. Yes; vertical angles and alternate interior angles are congruent, so the triangles are congruent by the AAS Congruence Theorem.

8. Statements | Reasons
   --|---
   1. \( BC \cong DC \) | 1. Given
   2. \( \angle B \) and \( \angle D \) are right angles. | 2. Given
   3. \( \angle B \cong \angle D \) | 3. Right angles are \( \cong \).
   4. \( \angle ACB \cong \angle ECD \) | 4. Vertical Angles Theorem
   5. \( \triangle ABC \cong \triangle EDC \) | 5. ASA Cong. Postulate
   6. \( AB \cong ED \) | 6. Corresponding parts of \( \cong \) triangles are \( \cong \).

9. \( PR = PQ \)
   \[ \begin{align*}
   2x &= 8 \\
   2x &= 8 \\
   x &= 4 \\
   PR &= 2x = 2(4) = 8
   \end{align*} \]

10. \( ST = UT \)
    \[ \begin{align*}
    5x &= 2x + 3 \\
    5x - 2x &= 2x + 3 - 2x \\
    3x &= 3 \\
    3x &= 3 \\
    x &= 1 \\
    ST &= 5x = 5(1) = 5
    \end{align*} \]

11. No; the orientation of the figure is not reversed.

12. The figure has two lines of symmetry.

13. The figure has four lines of symmetry.

Chapter 5 Standardized Test (p. 297)


4. \( F; \quad AD = CD \)
   \[ \begin{align*}
   4x - 3 &= 2x + 3 \\
   4x - 3 &= 2x + 3 - 3 \\
   2x &= 6 \\
   2x &= 6 \\
   x &= 3
   \end{align*} \]

5. \( C; \quad AD = 4x - 3 = 4(3) - 3 = 12 - 3 = 9 \)

6. J;

7. \[ \begin{align*}
   A & \quad B & \quad C \\
   A' & \quad B' & \quad C'
   \end{align*} \]

8. \( A' \) is \( (2, -2); \) \( B' \) is \( (3, -4); \) \( C' \) is \( (5, -1). \)

9. The \( x \)-coordinate of each vertex in the original triangle is the same as the \( x \)-coordinate of the vertex in the reflected triangle. The \( y \)-coordinate of each vertex in the original triangle is the opposite of the \( y \)-coordinate of the vertex in the reflected triangle.

Chapter 5 Algebra Review (p. 299)

1. \( 3x + 2y = 13 \)
   \[ \begin{align*}
   3(3) + 2(2) &\not\equiv 13 \\
   9 + 4 &\not\equiv 13 \\
   13 &= 13
   \end{align*} \]

2. \( 5x - 4y = 4 \)
   \[ \begin{align*}
   5(0) - 4(-1) &\equiv 4 \\
   0 - (-4) &\equiv 4 \\
   4 &= 4
   \end{align*} \]

(3, 2) lies on the line.  (0, -1) lies on the line.
3. \(y = 3x - 8\)
   \[4 \perp 3(-4) - 8\]
   \[4 \perp -12 - 8\]
   \[4 \neq -20\]
   \((-4, 4)\) does not lie on the line.

4. \(-x + 6y = -2\)
   \[-(4) + 6(1) \perp -2\]
   \[-4 + 6 \perp -2\]
   \[2 \neq -2\]
   \((4, 1)\) does not lie on the line.

5. \[x - 7y = 5\]
   \[\begin{align*}
   (-5) - 7(0) & \neq 5 \\
   -5 & \neq 5
   \end{align*}\]
   \((-5, 0)\) does not lie on the line.

6. \[2x - 4y = -2\]
   \[2(-1) - 4(-1) \neq -2\]
   \[-2 + 4 \neq -2\]
   \[2 \neq -2\]
   \((-1, -1)\) does not lie on the line.

7. slope = \[\frac{y_2 - y_1}{x_2 - x_1} = \frac{7 - 1}{8 - 3} = \frac{6}{5}\]

8. slope = \[\frac{y_2 - y_1}{x_2 - x_1} = \frac{-5 - 4}{3 - 3} = \frac{-9}{0} = \text{not defined}\]

9. slope = \[\frac{y_2 - y_1}{x_2 - x_1} = \frac{1 - (-6)}{-1 - 6} = \frac{7}{-7} = -1\]

10. slope = \[\frac{y_2 - y_1}{x_2 - x_1} = \frac{8 - 1}{-2 - (-5)} = \frac{7}{3}\]

11. slope = \[\frac{y_2 - y_1}{x_2 - x_1} = \frac{4 - 4}{4 - (-1)} = \frac{0}{5} = 0\]

12. slope = \[\frac{y_2 - y_1}{x_2 - x_1} = \frac{6 - (-4)}{2 - (-2)} = \frac{10}{4} = \frac{5}{2}\]