Answers for Lesson 4-1, pp. 200–202 Exercises

1. $\angle CAB \cong \angle DAB$; $\angle C \cong \angle D$; $\angle ABC \cong \angle ABD$; $\overline{AC} \cong \overline{AD}$; $\overline{AB} \cong \overline{AB}$; $\overline{CB} \cong \overline{DB}$

2. $\angle GEF \cong \angle JHI$; $\angle GFE \cong \angle JIH$; $\angle EGF \cong \angle HJI$; $\overline{GE} \cong \overline{JH}$; $\overline{EF} \cong \overline{HI}$; $\overline{FG} \cong \overline{IJ}$

3. $\overline{BK}$ **4.** $\overline{CM}$ **5.** $\overline{ML}$ **6.** $\angle B$

7. $\angle C$ **8.** $\angle J$ **9.** $\triangle KJB$ **10.** $\triangle CLM$

11. $\triangle JBK$ **12.** $\triangle MCL$ **13.** E, K, G, N

14. $\overline{PO} \cong \overline{SI}$; $\overline{OL} \cong \overline{ID}$; $\overline{LY} \cong \overline{DE}$; $\overline{PY} \cong \overline{SE}$

15. $\angle P \cong \angle S$; $\angle O \cong \angle I$; $\angle L \cong \angle D$; $\angle Y \cong \angle E$

16. 33 in. **17.** 54 in. **18.** 105 **19.** 77

20. 36 in. **21.** 34 in. **22.** 75 **23.** 103

24. Yes; $\angle RTK \cong \angle UTK$, $\angle R \cong \angle U$ (Given) $\angle RKT \cong \angle UKT$ If two $\angle$s of a $\triangle$ are $\cong$ to two $\angle$s of another $\triangle$, the third $\angle$s are $\cong$. $\overline{TR} \cong \overline{TU}$, $\overline{RK} \cong \overline{UK}$ (Given) $\overline{TK} \cong \overline{TK}$ (Reflexive Prop. of $\cong$) $\triangle TRK \cong \triangle TUK$ (Def. of $\cong$ $\triangle$s)

25. No; the corr. sides are not $\cong$.

26. No; corr. sides are not necessarily $\cong$.

27. Yes; all corr. sides and $\angle$s are $\cong$.

28. $\overline{AB} \cong \overline{DC}$, $\overline{BC} \cong \overline{AD}$ are given. $\overline{AC} \cong \overline{AC}$ by the Refl. Prop. $\angle B \cong \angle D$ is given, and by the Alt. Int. $\angle$ Thm., $\angle BCA \cong \angle DAC$ and $\angle BAC \cong \angle DCA$. So $\triangle ABC \cong \triangle CDA$ by the def. of $\cong$ $\triangle$s.

29. B

30. $x = 15; t = 2$

31. 5

32. $m\angle A = m\angle D = 20$

33. $m\angle B = m\angle E = 21$

34. $BC = EF = 8$

35. $AC = DF = 19$

36. Answers may vary. Sample: It is important that $PACH \cong OLDE$ for the patch to completely fill the hole.

37. Answers may vary. Sample: She could arrange them in a neat pile and pull out the ones of like sizes.

38. $\triangle JYB \cong \triangle XCH$

39. $\triangle BCE \cong \triangle ADE$

40. $\triangle TPK \cong \triangle TRK$

41. $\triangle JLM \cong \triangle NRZ$; $\triangle JLM \cong \triangle ZRN$

42. Answers may vary. Sample: The die is a mold that is used to make items that are all the same size.

43. Answers may vary. Sample: $\triangle TKR \cong \triangle MJL$: $\overline{TK} \cong \overline{MJ}$; $\overline{TR} \cong \overline{ML}$; $\overline{KR} \cong \overline{JL}$; $\angle TKR \cong \angle MJL$; $\angle TRK \cong \angle MLJ$; $\angle KTR \cong \angle JML$

44. $\overline{PR} \cong \overline{TQ}$, $\overline{PS} \cong \overline{QS}$ (Given), $\overline{RS} \cong \overline{TS}$ (def. of bisect), $\angle PSR \cong \angle QST$ (Vert. ∠s are ≅.), $\angle SPR \cong \angle SQT$ (Alt. Int. ∠ Thm.), $\angle PRS \cong \angle QTS$ (If 2 ∠s of a △ are ≅ to 2 ∠s of another △, the third ∠s are ≅.) So $\triangle PRS \cong \triangle QTS$ by the def. of ≅ △s.

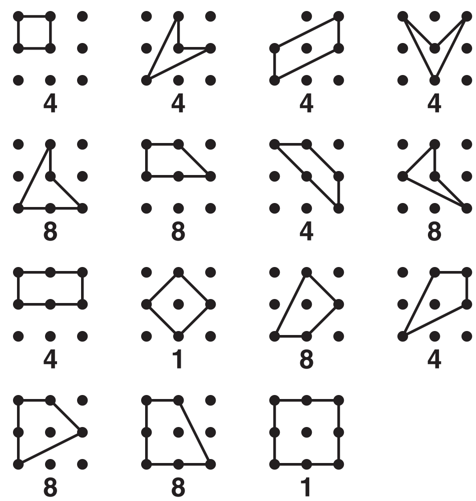
45. $\angle A \cong \angle D$, $\angle B \cong \angle E$ (Given), $m\angle A + m\angle B + m\angle C = 180$, $m\angle D + m\angle E + m\angle F = 180$ (△-∠ Sum Thm.), $m\angle A + m\angle B + m\angle C = m\angle D + m\angle E + m\angle F$ (Subst. Prop.), $m\angle D + m\angle E + m\angle C = m\angle D + m\angle E + m\angle F$ (Subst. Prop.), $m\angle C = m\angle F$ (Subtr.)

46. $KL = 4; LM = 3; KM = 5$

47. 2; either (3, 1) or (3, −7)

48. a. 15

b.



1. **a.** Given

b. Reflexive

c. $\triangle JKM$

d. $\triangle LMK$

2. $\overline{IE} \cong \overline{GH}, \overline{EF} \cong \overline{HF}$: given. F is the midpoint of $\overline{GI}$; given. $\overline{IF} \cong \overline{FG}$ by the definition of midpoint. Therefore, $\triangle EFI \cong \triangle HFG$ by SSS.

3. It is given that $\overline{WZ} \cong \overline{ZS} \cong \overline{SD} \cong \overline{DW}$. $\overline{ZD} \cong \overline{ZD}$ by the Reflexive Property of Congruence. Therefore, $\triangle WZD \cong \triangle SDZ$ by SSS.

4. Yes; $\overline{OB} \cong \overline{OB}$ by Refl. Prop.; $\angle BOP \cong \angle BOR$ since all rt. ∠s are ≅; $\overline{OP} \cong \overline{OR}$ (Given); the △s are ≅ by SAS.

5. Yes; $\overline{AC} \cong \overline{DB}$ (Given); $\overline{AE} \cong \overline{CE}$ and $\overline{BE} \cong \overline{DE}$ (Def. of midpt.); $\angle AEB \cong \angle CED$ (vert. ∠s are ≅) $\triangle AEB \cong \triangle CED$ by SAS.

6. No; either $\overline{PQ} \cong \overline{QS}$ is needed for SSS, or $\angle T \cong \angle R$ for SAS.

7. Yes; since $\overline{AC} \cong \overline{AC}$ by the Refl. Prop., the △s are ≅ by SAS.

8. $\overline{LG} \cong \overline{MN}$

9. $\angle T \cong \angle V$ or $\overline{RS} \cong \overline{WU}$

10. $\overline{WV}, \overline{VU}$

11. $\angle W$

12. $\angle U, \angle V$

13. $\overline{WU}$

14. $\angle X$

15. $\overline{XZ}, \overline{YZ}$

16. Yes; $\triangle ACB \cong \triangle EFD$ by SAS.

17. Yes; $\triangle PVQ \cong \triangle STR$ by SSS.

18. $\angle AXN \cong \angle GXR$ (Vert. $\angle$s are $\cong$.), $\overline{AX} \cong \overline{GX}$ and $\overline{NX} \cong \overline{RX}$ (def. of midpoint), so $\triangle ANX \cong \triangle GRX$ by SAS.

19. A

20. $\triangle ANG \cong \triangle RWT$; SAS

21. $\triangle KLJ \cong \triangle MON$; SSS

22. Not possible; need $\angle H \cong \angle P$ or $\overline{DY} \cong \overline{TK}$.

23. $\triangle JEF \cong \triangle SVF$ or $\triangle JEF \cong \triangle SFV$; SSS

24. $\triangle BRT \cong \triangle BRS$; SSS

25. $\triangle PQR \cong \triangle NMO$; SAS

26. GK bisects $\angle JGM$, so $\angle JGK \cong \angle MGK$ (def. of bisect.). $\overline{GJ} \cong \overline{GM}$ (given), and $\overline{GK} \cong \overline{GK}$ (Reflexive Prop. of $\cong$). $\triangle GJK \cong \triangle GMK$ by SAS.

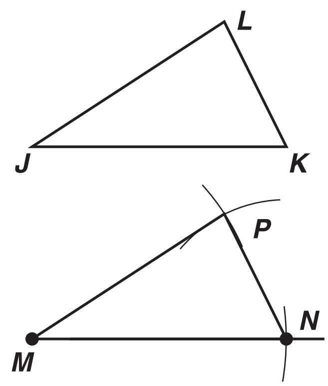
27. $\overline{AE}$ and $\overline{BD}$ bisect each other, so $\overline{AC} \cong \overline{CE}$ and $\overline{BC} \cong \overline{CD}$. $\angle ACB \cong \angle DCE$ because vert. $\angle$s are $\cong$. $\triangle ACB \cong \triangle ECD$ by SAS.

28. No; even though the $\angle$s are $\cong$, the sides may not be.

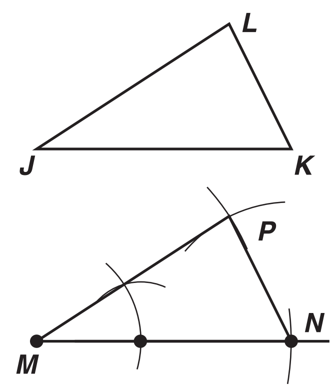
29. No; you would need $\angle H \cong \angle K$ or $\overline{GI} \cong \overline{JL}$.

30. yes; SAS

31.



32.



33. a–b. Answers may vary. Sample:

a. wallpaper designs; ironwork on a bridge; highway warning signs

b. $\cong$ △s produce a well-balanced, symmetric appearance. In construction, $\cong$ △s enhance designs. Highway warning signs are more easily identified if they are $\cong$.

34. $\angle ISP \cong \angle PSO$; $\triangle ISP \cong \triangle OSP$ by SAS.

35. $\overline{IP} \cong \overline{PO}$; $\triangle ISP \cong \triangle OSP$ by SSS.

36. Yes; $\triangle ADB \cong \triangle CBD$ by SAS; $\angle ADB \cong \angle DBC$ because if $\parallel$ lines, then alt. int. ∠s are $\cong$.

37. Yes; $\triangle ABC \cong \triangle CDA$ by SAS; $\angle DAC \cong \angle ACB$ because if $\parallel$ lines, then alt. int. ∠s are $\cong$.

38. **1.** $\overline{FG} \parallel \overline{KL}$ (Given)

2. $\angle GFK \cong \angle FKL$ (If $\parallel$ lines, then alt. int. ∠s are $\cong$.)

3. $\overline{FG} \cong \overline{KL}$ (Given)

4. $\overline{FK} \cong \overline{FK}$ (Reflexive Prop. of $\cong$)

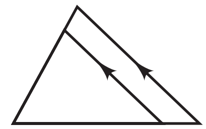
5. $\triangle FGK \cong \triangle KLF$ (SAS)

39. $\overline{AM} \cong \overline{MB}$ because M is the midpt. of $\overline{AB}$. $\angle B \cong \angle AMC$ because all right ∠s are $\cong$. $\overline{CM} \cong \overline{DB}$ is given. $\triangle AMC \cong \triangle MBD$ by SAS.

40. $HG = HK + KG$ and $KL = KG + GL$ by the Seg. Add. Post. Since $HK = GL$, use subst. twice to get $HG = GL + KG = KL$. So $\overline{HG} \cong \overline{KL}$ and the △s are $\cong$ by SSS.

41. $\triangle MNO \cong \triangle OLM$ by SAS. Therefore $\angle NMO \cong \angle LOM$ by def. of $\cong$ △s, so $\overline{MN} \parallel \overline{LO}$ by the Conv. of the Alt. Int. ∠s Thm.

42. Answers may vary. Sample:



43. **a.** No; the angles are not necessarily $\cong$.

b. No; sample explanation: the $\measuredangle$s can be changed without changing the side lengths.

c. Answers may vary. Sample: a diagonal

Answers for Lesson 4-3, pp. 215–218 Exercises

1. $\triangle PQR \cong \triangle VXW$

2. $\triangle ACB \cong \triangle EFD$

3. $\overline{RS}$

4. $\angle N$ and $\angle O$

5. **a.** Reflexive

b. ASA

6. $\angle BAC \cong \angle DAC$ (given)

$\overline{AC} \perp \overline{BD}$ (given)

$\overline{AC} \cong \overline{AC}$ (Reflex. Prop. $\cong$)

$\angle DCA \cong \angle BCA$ (rt. $\angle$s are $\cong$)

$\triangle ABC \cong \triangle ADC$ (ASA)

7. $\overline{QR} \cong \overline{TS}$ (given)

$\overline{QR} \parallel \overline{ST}$ (given)

$\angle TQR \cong \angle QTS$ (Alt. Int. $\angle$s Thm.)

$\angle QTR \cong \angle TQS$ (Alt. Int. $\angle$s Thm.)

$\triangle QRT \cong \triangle TSQ$ (AAS)

8. **a.** $\angle UWV$

b. $\overline{UW}$

c. right

d. Reflexive

9. It is given that $\angle UWT$ and $\angle UWV$ are right $\angle$s and that $\angle T \cong \angle V$. $\angle UWT \cong \angle UWV$ since all right $\angle$s are congruent. $\overline{UW} \cong \overline{UW}$ by the Reflexive Property of Congruence, so $\triangle UWT \cong \triangle UWV$ by AAS.

10. **a.** Vert. $\angle$s are $\cong$.

b. Given

c. $\overline{TQ} \cong \overline{QR}$

d. AAS

11. 1. $\angle V \cong \angle Y$ (given)

2. $\overline{WZ}$ bisects $\angle VWY$ (given)

3. $\overline{WZ} \cong \overline{WZ}$ (Refl. Prop. $\cong$)

4. $\triangle VWZ \cong \triangle YWZ$ (AAS)

12. $\overline{PQ} \perp \overline{QS}$, $\overline{RS} \perp \overline{QS}$ (given)

T is the midpoint of $\overline{PR}$ (given)

$\overline{PT} \cong \overline{RT}$ (def. of midpt.)

$\angle PTQ \cong \angle RTS$ (vert. $\angle$s $\cong$)

$\triangle PQT \cong \triangle RST$ (AAS)

13. $\triangle PMO \cong \triangle NMO$; ASA

14. $\triangle UTS \cong \triangle RST$; AAS

15. $\triangle ZVY \cong \triangle WVY$; AAS

16. D

17. Yes; if 2 $\angle$s of a $\triangle$ are $\cong$ to 2 $\angle$s of another $\triangle$, then the 3rd $\angle$s are $\cong$. So, an AAS proof can be rewritten as an ASA proof.

18. $\angle FDE \cong \angle GHI$; $\angle DFE \cong \angle HGI$

19. No; you also need one pair of corres. sides $\cong$.

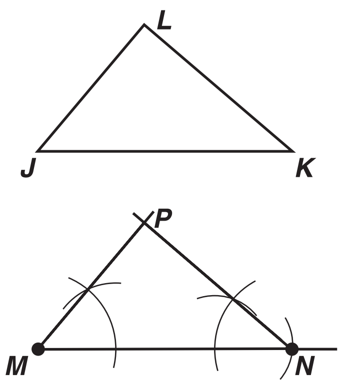
20. $\triangle MON \cong \triangle QOP$ by AAS, since $\angle MON$ and $\angle QOP$ are $\cong$ vert. $\angle$s.

21. $\triangle FGJ \cong \triangle HJG$ by AAS, since $\angle FGJ \cong \angle HJG$ because when lines are $\parallel$, then alt. int. $\angle$s are $\cong$, and $\overline{GJ} \cong \overline{GJ}$ by the Reflexive Prop. of $\cong$.

22. $\triangle AEB \cong \triangle BCD$ by ASA, since $\angle EAB \cong \angle DBC$ because $\parallel$ lines have $\cong$ corr. $\angle$s.

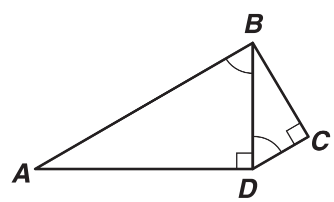
23. $\triangle BDH \cong \triangle FDH$ by ASA since $\angle BDH \cong \angle FDH$ by def. of $\angle$ bis. and $\overline{DH} \cong \overline{DH}$ by the Reflexive Prop. of $\cong$.

24.



25. $\overline{AB} \parallel \overline{DC}$, $\overline{AD} \parallel \overline{BC}$ (Given), $\angle DAC \cong \angle BCA$ (Alt. Int. $\angle$s Thm.), $\angle ACD \cong \angle CAB$ (Alt. Int. $\angle$s Thm.), $\overline{AC} \cong \overline{AC}$ (Reflexive Prop.), so $\triangle ABC \cong \triangle CDA$ by ASA.

26. Answers may vary. Sample:



27. **a.** Check students' work.

b. Answers may vary; most likely ASA.

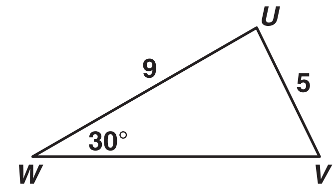
28. $\triangle AEB \cong \triangle CED$, $\triangle BEC \cong \triangle DEA$, $\triangle ABC \cong \triangle CDA$, $\triangle BAD \cong \triangle DCB$

29. $\triangle AEB \cong \triangle CED$, $\triangle BEC \cong \triangle DEA$, $\triangle ABC \cong \triangle CDA$, $\triangle ABD \cong \triangle DCA$, $\triangle BAD \cong \triangle DCB$, $\triangle ABD \cong \triangle DCB$, $\triangle CBA \cong \triangle DAB$, $\triangle BCD \cong \triangle ADC$

30. They are $\angle$ bisectors; ASA.

31. $\frac{13}{20}$

32.



1. SAS; $\triangle KLJ \cong \triangle OMN$; $\angle K \cong \angle O$; $\angle J \cong \angle N$; $\overline{JK} \cong \overline{NO}$
2. $\triangle ABD \cong \triangle CBD$ by ASA because $\overline{BD} \cong \overline{BD}$ by Reflexive Prop. of $\cong$; $\overline{AB} \cong \overline{CB}$ by CPCTC.
3. $\triangle MOE \cong \triangle REO$ by SSS because $\overline{OE} \cong \overline{OE}$ by Reflexive Prop. of $\cong$; $\angle M \cong \angle R$ by CPCTC.
4. **a.** SSS

   b. CPCTC
5. The $\triangle$s are $\cong$ by SAS so the distance across the sinkhole is 26.5 yd by CPCTC.
6. $\angle SPT = \angle OPT$, $\overline{SP} \cong \overline{OP}$ (Given), $\overline{PT} \cong \overline{PT}$ (Reflexive Prop.), $\triangle SPT \cong \triangle OPT$ (SAS), $\angle S = \angle O$ (CPCTC)
7. $\overline{YT} \cong \overline{YP}$, $\angle C \cong \angle R$, $\angle T \cong \angle P$ (Given), $\angle CYT \cong \angle RYP$ (If 2 $\angle$s of a $\triangle$ are $\cong$ to 2 $\angle$s of another, the 3rd $\angle$s are $\cong$.), $\triangle CYT \cong \triangle RYP$ (ASA), $\overline{CT} \cong \overline{RP}$ (CPCTC)
8. $\angle PKL \cong \angle QKL$ by def. of $\angle$ bisect, and $\overline{KL} \cong \overline{KL}$ by Reflexive Prop. of $\cong$, so the $\triangle$s are $\cong$ by SAS.
9. $\overline{KL} \cong \overline{KL}$ by Reflexive Prop. of $\cong$; $\overline{PL} \cong \overline{LQ}$ by Def. of $\perp$ bis.; $\angle KLP \cong \angle KLQ$ by Def. of $\perp$; the $\triangle$s are $\cong$ by SAS.
10. $\angle KLP \cong \angle KLQ$ because all rt $\angle$s are $\cong$; $\overline{KL} \cong \overline{KL}$ by Reflexive Prop. of $\cong$; and $\angle PKL \cong \angle QKL$ by def. of bisect; the $\triangle$s are $\cong$ by ASA.
11. $\angle QPS \cong \angle RSP$, $\angle Q \cong \angle R$ (Given), $\angle QSP \cong \angle RPS$ (If 2 $\angle$s of a $\triangle$ are $\cong$ to 2 $\angle$s of another, the 3rd $\angle$s are $\cong$.), $\overline{PS} \cong \overline{PS}$ (Reflexive Prop.), $\triangle QPS \cong \triangle RSP$ (ASA), $\overline{PQ} \cong \overline{SR}$ (CPCTC)

12. Yes; $\triangle ABD \cong \triangle CBD$ by SSS so $\angle A \cong \angle C$ by CPCTC.

13. a. $\overline{AP} \cong \overline{PB}$; $\overline{AC} \cong \overline{BC}$

b. The diagram is constructed in such a way that the △s are $\cong$ by SSS. $\angle CPA \cong \angle CPB$ by CPCTC. Since these ∠s are $\cong$ and suppl., they are right ∠s. Thus, $\overleftrightarrow{CP}$ is $\perp$ to ℓ.

14. Explanations may vary. Sample: The error is in line 4. You cannot say $\overline{AD} \cong \overline{CD}$ by the definition of bisect. $\overline{BD}$ is given to be an angle bisector, not a segment bisector. Replace line 4 with:

4. $\overline{BD} \cong \overline{BD}$	4. $\cong$ is reflexive.

15. $\overline{BA} \cong \overline{BC}$ is given; $\overline{BD} \cong \overline{BD}$ by the Reflexive Prop. of $\cong$ and since $\overline{BD}$ bisects $\angle ABC$, $\angle ABD \cong \angle CBD$ by def. of an $\angle$ bisector; thus, $\triangle ABD \cong \triangle CBD$ by SAS; $\overline{AD} \cong \overline{DC}$ by CPCTC so $\overline{BD}$ bisects $\overline{AC}$ by def. of a bis.; $\angle ADB \cong \angle CDB$ by CPCTC and $\angle ADB$ and $\angle CDB$ are suppl.; thus, $\angle ADB$ and $\angle CDB$ are right ∠s and $\overline{BD} \perp \overline{AC}$ by def. of $\perp$.

16. Since ℓ bisects $\overline{AB}$ at C, $\overline{AC} \cong \overline{BC}$. $\overline{PC} \cong \overline{PC}$ by the Reflexive Prop. and $\angle ACP \cong \angle BCP$ because they are rt. ∠s. So $\triangle PCA \cong \triangle PCB$ by SAS and $PA = PB$ by CPCTC.

17. $\triangle ABX \cong \triangle ACX$ by SSS, so $\angle BAX \cong \angle CAX$ by CPCTC. Thus $\overrightarrow{AX}$ bisects $\angle BAC$ by the def. of $\angle$ bisector.

18. Prove $\triangle ABE \cong \triangle CDF$ by SAS since $\overline{AE} \cong \overline{FC}$ by subtr.

19. Prove $\triangle KJM \cong \triangle QPM$ by ASA since $\angle P \cong \angle J$ and $\angle K \cong \angle Q$ by alt. int. ∠s are $\cong$.

20. **1.** $\overline{PR} \parallel \overline{MG}$; $\overline{MP} \parallel \overline{GR}$ (Given)

2. Draw $\overline{PG}$. (2 pts. determine a line.)

3. $\angle RPG \cong \angle PGM$ and $\angle RGP \cong \angle GPM$ (If $\parallel$ lines, then alt. int. $\measuredangle$s are $\cong$.)

4. $\triangle PGM \cong \triangle GPR$ (ASA). A similar proof can be written if diagonal $\overline{RM}$ is drawn.

21. Since $\triangle PGM \cong \triangle GPR$ (or $\triangle PMR \cong \triangle GRM$), then $\overline{PR} \cong \overline{MG}$ and $\overline{MP} \cong \overline{GR}$ by CPCTC.

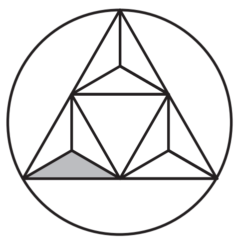
Answers for Lesson 4-5, pp. 230–233 Exercises

1. $\overline{VX}$; Conv. of the Isosc. △ Thm.
2. $\overline{UW}$; Conv. of the Isosc. △ Thm.
3. $\overline{VY}$; $VT = VX$ (Ex. 1) and $UT = YX$ (Ex. 2), so $VU = VY$ by the Subtr. Prop. of =.
4. Answers may vary. Sample: $\angle VUY$; ∠s opp. ≅ sides are ≅.
5. $x = 80$; $y = 40$
6. $x = 40$; $y = 70$
7. $x = 38$; $y = 4$
8. 150; 15
9. 24, 48, 72, 96, 120
10. 64
11. $2\frac{1}{2}$
12. 42
13. 35
14. 70
15. **a.** $\overline{KM}$
    b. $\overline{KM}$
    c. By construction
    d. Def. of segment bisector
    e. Reflexive Prop. of ≅
    f. SSS
    g. CPCTC

16. **a.** $\overline{RS}$

b. $\overline{RS}$

Statements	Reasons
1. $\overline{RS}$ bisects $\angle PRQ$	1. Given
2. ∠PRS ≅ ∠QRS	2. Def. of bisector
3. $\angle P \cong \angle Q$	3. Given
4. $\overline{RS} \cong \overline{RS}$	4. Reflexive Prop. of ≅
5. $\triangle PRS \cong \triangle QRS$	5. AAS
6. $\overline{PR} \cong \overline{QR}$	6. CPCTC

17. **a.** 

30, 30, 120

b. 5; 30, 60, 90, 120, 150

18. Answers may vary. Sample: Corollary to Thm. 4-3: Since $\overline{XY} \cong \overline{YZ}$, $\angle X \cong \angle Z$ by Thm. 4-3. $\overline{YZ} \cong \overline{ZX}$, so $\angle Y \cong \angle X$ by Thm. 4-3 also. By the Trans. Prop., $\angle Y \cong \angle Z$, so $\angle X \cong \angle Y \cong \angle Z$. Corollary to Thm. 4-4: Since $\angle X \cong \angle Z$, $\overline{XY} \cong \overline{YZ}$ by Thm. 4-4. $\angle Y \cong \angle X$, so $\overline{YZ} \cong \overline{ZX}$ by Thm. 4-4 also. By the Trans. Prop., $\overline{XY} \cong \overline{ZX}$, so $\overline{XY} \cong \overline{YZ} \cong \overline{ZX}$.

19. C

20. $x = 60; y = 30$

21. $x = 36; y = 36$

22. $x = 30; y = 120$

23. Two sides of a $\triangle$ are $\cong$ if and only if the $\angle$s opp. those sides are $\cong$.

24. 80, 80, 20; 80, 50, 50

25. **a.** isosc. $\triangle$s

b. 900 ft; 1100 ft

c. The tower is the $\perp$ bis. of the base of each $\triangle$.

26. No; the $\triangle$ can be positioned in ways such that the base is not on the bottom.

27. 45; they are = and have sum 90.

28. $\angle A \cong \angle D$ by the Isos. $\triangle$ Thm. $\triangle ABE \cong \triangle DCE$ by SAS.

29. $\overline{AC} \cong \overline{CB}$ and $\angle ACD \cong \angle DCB$ are given. $\overline{CD} \cong \overline{CD}$ by the Refl. Prop. of $\cong$, so $\triangle ACD \cong \triangle BCD$ by SAS. So $\overline{AD} \cong \overline{DB}$ by CPCTC, and $\overline{CD}$ bisects $\overline{AB}$. Also $\angle ADC \cong \angle BDC$ by CPCTC, $m\angle ADC + m\angle BDC = 180$ by $\angle$ Add. Post., so $m\angle ADC = m\angle BDC = 90$ by the Subst. Prop. So $\overline{CD}$ is the $\perp$ bis. of $\overline{AB}$.

30. $m = 36; n = 27$

31. $m = 60; n = 30$

32. $m = 20; n = 45$

33. (0, 0), (4, 4), (−4, 0), (0, −4), (8, 4), (4, 8)

34. (5, 0); (0, 5); (−5, 5); (5, −5); (0, 10); (10, 0)

35. (5, 3); (2, 6); (2, 9); (8, 3); (−1, 6); (5, 0)

36. **a.** 25

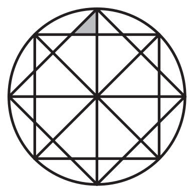
b. 40; 40; 100

c. Obtuse isosc. $\triangle$; 2 of the $\angle$s are $\cong$ and one $\angle$ is obtuse.

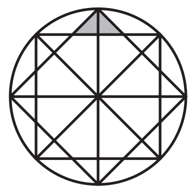
37. The $\perp$ bis. of the base of an isosc. $\triangle$ is the bis. of the vertex $\angle$; given isosc. $\triangle ABC$ with $\perp$ bis. $\overline{CD}$, $\angle ADC \cong \angle BDC$ and $\overline{AD} \cong \overline{DB}$ by def. of $\perp$ bis. Since $\overline{CD} \cong \overline{CD}$ by Refl. Prop., $\triangle ACD \cong \triangle BCD$ by SAS. So $\angle ACD \cong \angle BCD$ by CPCTC, and $\overline{CD}$ bisects $\angle ACB$.

38. **a.** 5

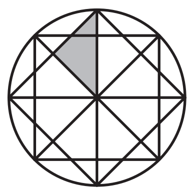
b.



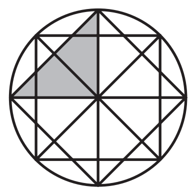
16



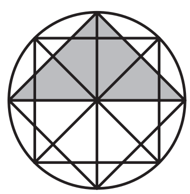
8



16



8



8

39. $0 <$ measure of base $\angle < 45$

40. $45 <$ measure of base $\angle < 90$

1. $\triangle ABC \cong \triangle DEF$ by HL. Both $\triangle$s are rt. $\triangle$s, $\overline{AC} \cong \overline{DF}$, and $\overline{CB} \cong \overline{FE}$.

2. $\triangle LMP \cong \triangle OMN$ by HL. Both $\triangle$s are rt. $\triangle$s because vert. $\angle$s are $\cong$; $\overline{LP} \cong \overline{NO}$, and $\overline{LM} \cong \overline{OM}$.

3. $\angle T$ and $\angle Q$ are rt. $\angle$s.

4. $\overline{RX} \cong \overline{RT}$ or $\overline{XV} \cong \overline{TV}$

5. **a.** $\cong$ suppl. $\angle$s are rt. $\angle$s

   b. Def. of rt. $\triangle$

   c. Given

   d. Reflexive Prop. of $\cong$

   e. HL

6. Given that $\angle D$ and $\angle B$ are right $\angle$s, $\triangle ADC$ and $\triangle CBA$ are right $\triangle$s by the def. of rt. $\triangle$. $\overline{AC} \cong \overline{AC}$ by the Reflexive Prop. of $\cong$, and $\overline{AD} \cong \overline{CB}$ is given. Therefore, $\triangle ADC \cong \triangle CBA$ by HL.

7. **a.** Given

   b. Def. of $\perp$

   c. $\triangle MLJ$ and $\triangle KJL$ are rt. $\triangle$s.

   d. Given

   e. $\overline{LJ} \cong \overline{LJ}$

   f. HL

8. Given that $\overline{HV} \perp \overline{GT}$ and $\overline{GH} \cong \overline{TV}$, then $\triangle IGH$ and $\triangle ITV$ are right $\triangle$s by the def. of rt. $\triangle$. It is given that I is the midpoint of $\overline{HV}$, so $\overline{HI} \cong \overline{VI}$ by the def. of midpt. Therefore, $\triangle IGH \cong \triangle ITV$ by the HL Thm.

9. HL; each rt. $\triangle$ has a $\cong$ hyp. and side.

10. $x = 3; y = 2$

11. $x = -1; y = 3$

12. whether the 7-yd side is the hyp. or a leg

13. It is given that $\overline{RS} \cong \overline{TU}$, $\overline{RS} \perp \overline{ST}$, $\overline{TU} \perp \overline{UV}$, and that T is the midpoint of $\overline{RV}$. $\triangle RST$ and $\triangle TUV$ are both right triangles by the definition of a right triangle. $\overline{RT} \cong \overline{TV}$ by the definition of midpoint. Therefore, $\triangle RST \cong \triangle TUV$ by HL.

14. 1. $\overline{JM} \cong \overline{WP}$ (given)

2. $\overline{JP} \parallel \overline{MW}$ (given)

3. $\overline{JP} \perp \overline{PM}$ (given)

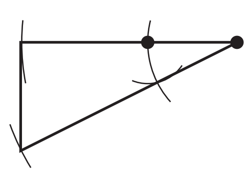
4. $\triangle JPM$ and $\triangle PMW$ are rt. $\triangle$s (def. of rt. $\triangle$)

5. $\overline{PM} \cong \overline{PM}$ (Reflex. Prop. of $\cong$)

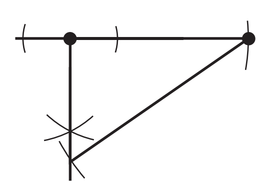
6. $\triangle JPM \cong \triangle PMW$ (HL)

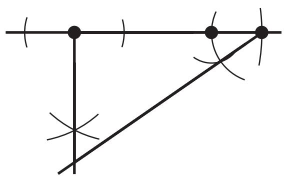
15. $\overline{PS} \cong \overline{PT}$ so $\angle S \cong \angle T$ by the Isosc. $\triangle$ Thm. $\angle PRS \cong \angle PRT$. $\triangle PRS \cong \triangle PRT$ by AAS.

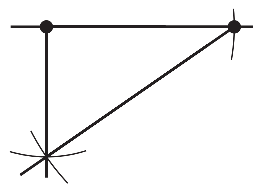
16.



17.



18. 

19. 

20. **1.** $\overline{EB} \cong \overline{DB}$; $\angle A$ and $\angle C$ are rt. $\angle$s. (Given)

2. $\triangle BEA$ and $\triangle BDC$ are rt. $\triangle$s. (Def. of rt. $\triangle$)

3. B is the midpt. of $\overline{AC}$. (Given)

4. $\overline{AB} \cong \overline{BC}$ (Def. of midpt.)

5. $\triangle BEA \cong \triangle BDC$ (HL)

21. **1.** $\overline{LO}$ bisects $\angle MLN$, $\overline{OM} \perp \overline{LM}$, $\overline{ON} \perp \overline{LN}$, (Given)

2. $\angle M$ and $\angle N$ are rt. $\angle$s (Def. of $\perp$)

3. $\angle MLO \cong \angle NLO$ (Def. of $\angle$ bis.)

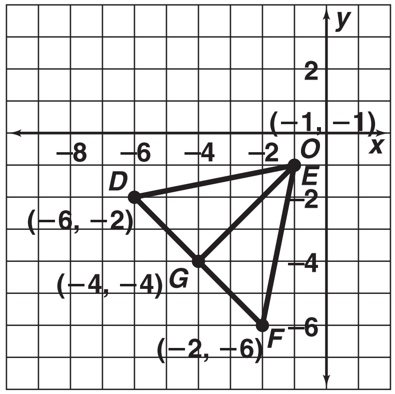
4. $\angle M \cong \angle N$ (All rt. $\angle$s are $\cong$.)

5. $\overline{LO} \cong \overline{LO}$ (Reflexive Prop. of $\cong$)

6. $\triangle LMO \cong \triangle LNO$ (AAS)

22. Answers may vary. Sample: Measure 2 sides of the $\triangle$ formed by the amp. and the platform's corner. Since the $\triangle$s will be $\cong$ by HL or SAS, the $\angle$s are the same.

23. a.



b. slope of $\overline{DG} = -1$; slope of $\overline{GF} = -1$; slope of $\overline{GE} = 1$

c. $\angle EGD$ and $\angle EGF$ are rt. ∠s.

d. $DE = \sqrt{26}$; $FE = \sqrt{26}$

e. $\triangle EGD \cong \triangle EGF$ by HL. Both △s are rt. △s, $\overline{DE} \cong \overline{FE}$, and $\overline{EG} \cong \overline{EG}$.

24. An HA Thm. is the same as AAS with AAS corr. to the rt. ∠, an acute ∠, and the hyp.

25. Since $\overline{BE} \perp \overline{EA}$ and $\overline{BE} \perp \overline{EC}$, $\triangle AEB$ and $\triangle CEB$ are both rt. △s. $\overline{AB} \cong \overline{BC}$ because $\triangle ABC$ is equilateral, and $\overline{BE} \cong \overline{BE}$. $\triangle AEB \cong \triangle CEB$ by HL.

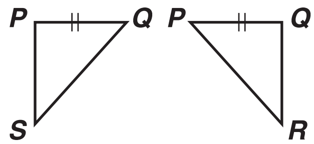
26. No; $\overline{AB} \cong \overline{CB}$ because $\triangle AEB \cong \triangle CEB$, but $\overline{AC}$ doesn't have to be ≅ to $\overline{AB}$ or to $\overline{CB}$.

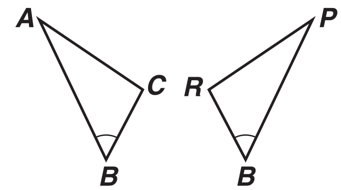
Answers for Lesson 4-7, pp. 243–245 Exercises

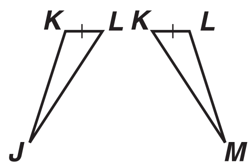
1. $\angle M$

2. $\overline{DF}$

3. $\overline{XY}$

4. 

5. 

6 

7. **a.** Given

b. Reflexive Prop. of $\cong$

c. Given

d. AAS

e. CPCTC

8. Plan: Two pairs of sides are $\cong$. The third sides are the same segment. Use SSS.

Proof: It is given that $\overline{RS} \cong \overline{UT}$ and $\overline{RT} \cong \overline{US}$. $\overline{ST} \cong \overline{ST}$ by the Reflex. Prop. of $\cong$. $\triangle RST \cong \triangle UTS$ by SSS.

9. Plan: Two sides and two angles are $\cong$. The other included sides are the same segment. Use SAS.

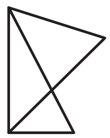
Proof: It is given that $\overline{QD} \cong \overline{UA}$ and $\angle QDA \cong \angle UAD$. $\overline{DA} \cong \overline{DA}$ by the Reflex. Prop. of $\cong$. $\triangle QDA \cong \triangle UAD$ by SAS.

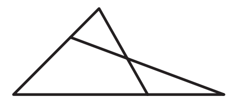
10. $\triangle QET \cong \triangle QEU$ by SAS if $\overline{QT} \cong \overline{QU}$. $\overline{QT}$ and $\overline{QU}$ are corr. parts of $\triangle QTB$ and $\triangle QUB$ which are $\cong$ by ASA.

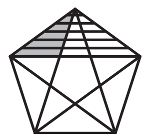
Answers for Lesson 4-7, pp. 243–245 Exercises (cont.)

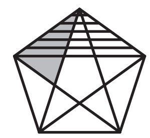
11. $\triangle ADC \cong \triangle EDG$ by ASA if $\angle A \cong \angle E$. $\angle A$ and $\angle E$ are corr. parts in $\triangle ADB$ and $\triangle EDF$, which are $\cong$ by SAS.

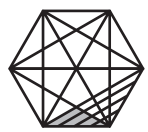
12–15. Answers may vary. Samples are given.

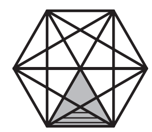
12. 

13. 

14. a. 

b. 

15. a. 

b. 

16. B

17. **1.** $\overline{AC} \cong \overline{EC}; \overline{CB} \cong \overline{CD}$(Given)

2. $\angle C \cong \angle C$ (Reflexive Prop. of $\cong$)

3. $\triangle ACD \cong \triangle ECB$ (SAS)

4. $\angle A \cong \angle E$ (CPCTC)

18. $\overline{PQ} \cong \overline{RQ}$ and $\angle PQT \cong \angle RQT$ by Def. of $\perp$ bisector. $\overline{QT} \cong \overline{QT}$ so $\triangle PQT \cong \triangle RQT$ by SAS. $\angle P \cong \angle R$ by CPCTC. $\overline{QT}$ bisects $\angle VQS$ so $\angle VQT \cong \angle SQT$ and $\angle PQT$ and $\angle RQT$ are both rt. $\angle$s. So $\angle VQP \cong \angle SQR$ since they are compl. of $\cong$ $\angle$s. $\triangle PQV \cong \triangle RQS$ by ASA so $\overline{QV} \cong \overline{QS}$ by CPCTC.

19. $m\angle 1 = 56; m\angle 2 = 56; m\angle 3 = 34; m\angle 4 = 90; m\angle 5 = 22;$ $m\angle 6 = 34; m\angle 7 = 34; m\angle 8 = 68; m\angle 9 = 112$

20. $\triangle ABC \cong \triangle FCG$; ASA

21. $\overline{TD} \cong \overline{RO}$ if $\triangle TDI \cong \triangle ROE$ by AAS. $\angle TID \cong \angle REO$ if $\triangle TEI \cong \triangle RIE$. $\triangle TEI \cong \triangle RIE$ by SSS.

22. $\overline{AE} \cong \overline{DE}$ if $\triangle AEB \cong \triangle DEC$ by AAS. $\overline{AB} \cong \overline{DC}$ and $\angle A \cong \angle D$ since they are corr. parts of $\triangle ABC$ and $\triangle DCB$, which are $\cong$ by HL.

23. **a.** $\overline{AD} \cong \overline{BC}$; $\overline{AB} \cong \overline{DC}$; $\overline{AE} \cong \overline{EC}$; $\overline{DE} \cong \overline{EB}$

b. Use $\overline{DB} \cong \overline{DB}$ (refl.) and alt. int. $\angle$s to show $\triangle ADB \cong \triangle CBD$ (ASA). $\overline{AB} \cong \overline{DC}$ and $\overline{AD} \cong \overline{BC}$ (CPCTC). $\triangle AEB \cong \triangle CED$ (ASA) and $\triangle AED \cong \triangle CEB$ (ASA). Then $\overline{AE} \cong \overline{EC}$ and $\overline{DE} \cong \overline{EB}$ (CPCTC).

24. $\triangle ACE \cong \triangle BCD$ by ASA; $\overline{AC} \cong \overline{BC}$, $\angle A \cong \angle B$ (Given) $\angle C \cong \angle C$ (Reflexive Prop. of $\cong$) $\triangle ACE \cong \triangle BCD$ (ASA)

25. $\triangle WYX \cong \triangle ZXY$ by HL; $\overline{WY} \perp \overline{YX}$, $\overline{ZX} \perp \overline{YX}$, $\overline{WX} \cong \overline{ZY}$ (Given) $\angle WYX$ and $\angle ZXY$ are rt. $\angle$s (Def. of $\perp$) $\overline{XY} \cong \overline{XY}$ (Reflexive Prop. of $\cong$) $\triangle WYX \cong \triangle ZXY$ (HL)