ARE YOU READY? PAGE 71

1. B **2.** A
3. F **4.** C
5. D **6.** lin. pair
7. vert. $\measuredangle$s **8.** comp. $\measuredangle$s
9. natural, whole, integer, rational **10.** rational
11. integer, rational **12.** rational
13. rational **14.** whole, integer, rational
15. Possible answer: B **16.** Possible answer: $\overleftrightarrow{BD}$
17. Possible answer: $\overrightarrow{CA}$ **18.** Possible answer: $\overline{CD}$
19. Possible answer: plane $\mathcal{F}$

20. $8 + x = 5$
$-8 \quad -8$
$x = -3$

21. $6y = -12$
$\frac{6y}{6} = \frac{-12}{6}$
$y = -2$

22. $9 = 6s$
$\frac{9}{6} = \frac{6s}{6}$
$1.5 = s$

23. $p - 7 = 9$
$+7 \quad +7$
$p = 16$

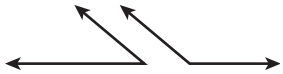
24. $\frac{z}{5} = 5$
$5\left(\frac{z}{5}\right) = 5(5)$
$z = 25$

25. $8.4 = -1.2r$
$\frac{8.4}{-1.2} = \frac{-1.2r}{-1.2}$
$-7 = r$

2-1 USING INDUCTIVE REASONING TO MAKE CONJECTURES, PAGES 74–79

CHECK IT OUT! PAGES 74–76

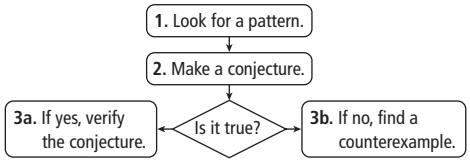
1. 0.0004 **2.** odd
3. Female whales are longer than male whales.
4a. Possible answer: $x = \frac{1}{2}$
b. Possible answer:



c. Jupiter or Saturn

THINK AND DISCUSS, PAGE 76

1. No; possible answer: a conjecture cannot be proven true just by giving examples, no matter how many.
2.



EXERCISES, PAGES 77–79

GUIDED PRACTICE, PAGE 77

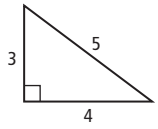
1. Possible answer: A conjecture is based on observation and is not true until proven true in every case.
2. September **3.** $\frac{4}{6}$
4.

5. even
6. $1 = 1$
$1 + 3 = 4$
$1 + 3 + 5 = 9$
$1 + 3 + 5 + 7 = 16$
Rule is n^2.
7. The number of bacteria doubles every 20 min.
8. Roosevelt was inaugurated at age 42.
9. The 3 pts. are collinear.
10. Possible answer: $x = -3$

PRACTICE AND PROBLEM SOLVING, PAGES 77–78

11. 5 P.M. **12.** 42
13.

14. $2 = 1(2)$
$2 + 4 = 6 = 2(3)$
$2 + 4 + 6 = 12 = 3(4)$
Rule is $n(n + 1)$.
15. $n - 1$
16. About $5\%(526) \approx 26$ students will participate.
17. Possible answer: $y = -1$
18. Possible Answer: $x = -1$
19. $m\angle 1 = m\angle 2 = 90°$
20. Each term is the square of the previous term; $16^2 = 256$, $256^2 = 65{,}536$
21. Possible answer: each term is the previous term multiplied by $\frac{1}{2}$; $\frac{1}{16}$, $\frac{1}{32}$.
22. The terms are multiples of 3 with alternating signs; -15, 18
23. $2n + 1$ **24.** T
25. F; possible answer: $n = 2$
26. F; possible answer:



27. T
28. Amount increases by about \$50 per day. Therefore, about \$300 + 2(\$50) = \$400 is raised during the 6th day.

29. $\frac{1}{11} = 0.\overline{09}$, $\frac{2}{11} = 0.\overline{18}$, $\frac{3}{11} = 0.\overline{27}$,…; fraction pattern is multiples of $\frac{1}{11}$, decimal pattern is repeating multiples of 0.09.

30. 6 = 3 + 3; 8 = 3 + 5; 10 = 3 + 7 or 5 + 5; 12 = 5 + 7; 14 = 3 + 11 or 7 + 7

31. 13 + 21 = 34; 21 + 34 = 55; 34 + 55 = 89; each term is the sum of the 2 previous terms.

32. The middle number is the mean of the other 2 numbers.

33. $2n - 1$ is odd

34. Feb. 19; possible answer: the weather or the whales' health

35. Possible answer: Even numbers are divisible by 2, but odd numbers are not. So the conjecture is true for even numbers but not necessarily for all numbers.

36a. 8 **b.** tenth day

TEST PREP, PAGE 79

37. C
For example, 2 − 4 is negative.

38. J
2 and 2 + 1 = 3 are both prime.

39. D
In 2010, 75 − 3(15) = 30 students predicted.

CHALLENGE AND EXTEND, PAGE 79

40.

x	$x^2 + x + 11$
1	13
2	17
3	23
4	31
5	41
6	53
7	67
8	83

Possible answer: prime numbers. $x = 10$

41. Seats are up for election 6 years and 12 years later. 6 is not divisible by 4, but 12 is; so seats are next up for election during a presidential election 12 years later.

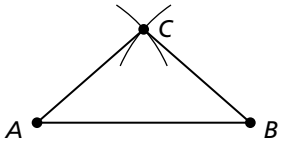
42a.

Week	Sit-ups
1	15
2	35
3	55
4	75
5	95
6	115
7	135
8	155
9	175
10	195

b. Week 8.

c. Rob does $20(n - 1) + 15$ or $20n - 5$ sit-ups during week n.

43.



$m\angle CAB = m\angle CBA$; $AC = CB$; possible answer: if a pt. is equidistant from the endpts. of a seg., then the 2 ∡ formed by connecting the pt. to the endpts. of the seg. are ≅.

SPIRAL REVIEW, PAGE 79

44. $y = 3x - 5$

8	$3(1) - 5$
8	$3 - 5$
8	-2 ✗

no

45. $y = 3x - 5$

−11	$3(-2) - 5$
−11	$-6 - 5$
−11	-11 ✓

yes

46. $y = 3x - 5$

4	$3(3) - 5$
4	$9 - 5$
4	4 ✓

yes

47. $y = 3x - 5$

0.5	$3(-3.5) - 5$
0.5	$-10.5 - 5$
0.5	-15.5 ✗

no

48. $A = s^2 = x^2$
$s = x$
$P = 4s = 4x$

49. $P = 2\ell + 2w$
$= 2x + 2(4x - 3)$
$= 10x - 6$

50. $P = 3s$
$= 3(x + 2)$
$= 3x + 6$

51. $A = \pi r^2 = 9\pi x^2$
$r^2 = 9x^2$
$r = 3x$
$C = 2\pi r$
$= 2\pi(3x) = 6\pi x$

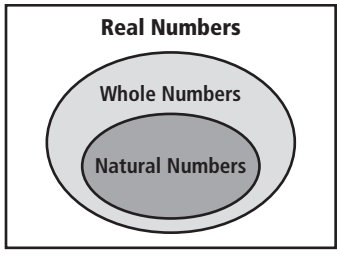
52. (−1, −1) → (−1, −1 + 2) = (−1, 1)
(0, 1) → (0, 1 + 2) = (0, 3)
(4, 0) → (4, 0 + 2) = (4, 2)

53. (−1, −1) → (−1 + 4, −1 − 1) = (3, −2)
(0, 1) → (0 + 4, 1 − 1) = (4, 0)
(4, 0) → (4 + 4, 0 − 1) = (8, −1)

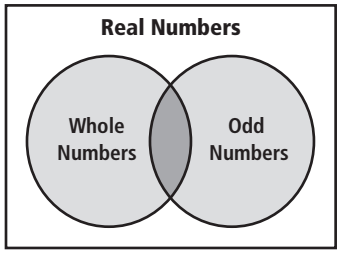
CONNECTING GEOMETRY TO NUMBER THEORY: VENN DIAGRAMS, PAGE 80

TRY THIS, PAGE 80

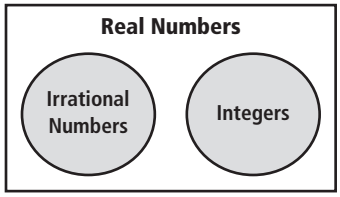
1.



2.



3.



2-2 CONDITIONAL STATEMENTS, PAGES 81–87

CHECK IT OUT! PAGES 81–83

1. Hypothesis: A number is divisible by 6.
Conclusion: The number is divisible by 3.

2. If 2 ∡ are comp., then they are acute.

3. F; possible answer: 7

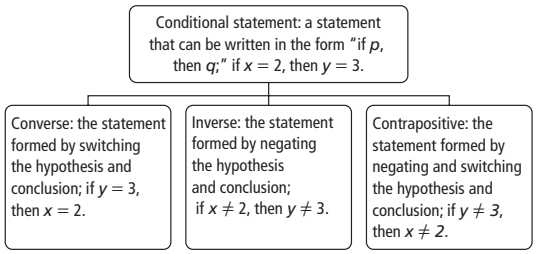
4. Converse: If an animal has 4 paws, then it is a cat; F.
Inverse: If an animal is not a cat, then it does not have 4 paws; F.
Contrapositive: If an animal does not have 4 paws, then it is not a cat; T.

THINK AND DISCUSS, PAGE 84

1. T; F **2.** T

3. Yes; possible answer: "If $x = 3$, then $2x = 6$" is true, and so is the conv. "If $2x = 6$, then $x = 3$."

4.



EXERCISES, PAGES 84–87

GUIDED PRACTICE, PAGE 84

1. converse **2.** logically equivalent

3. Hypothesis: A person is at least 16 years old.
Conclusion: The person can drive a car.

4. Hypothesis: A figure is a rectangle.
Conclusion: A figure is a parallelogram.

5. Hypothesis: $a - b < a$.
Conclusion: b is a positive number.

6. If a person is 18 years old, then that person is eligible to vote.

7. If $0 < a < b$, then $\left(\frac{a}{b}\right)^2 < \frac{a}{b}$.

8. If something is a rotation, then it is a transformation.

9. T

10. F; possible answer: $x = 2$ and $y = -4$

11. F; possible answer: April

12. Converse: If Brielle travels 10 mi in 20 min, then she drives at exactly 30 mi/h; F.
Inverse: If Brielle does not drive at exactly 30 mi/h, then she does not travel 10 mi in 20 min; F.
Contrapositive: If Brielle does not travel 10 mi in 20 min, then she does not drive at exactly 30 mi/h; T.

PRACTICE AND PROBLEM SOLVING, PAGES 85–86

13. Hypothesis: An animal is a tabby.
Conclusion: The animal is a cat.

14. Hypothesis: Two lines intersect.
Conclusion: Four angles are formed.

15. Hypothesis: 8 oz of cereal cost $2.99.
Conclusion: 16 oz of cereal cost $5.98.

16. If a patient is ill, then you should monitor the patient's heart rate.

17. If the batter makes 3 strikes, then the batter is out.

18. If segs. are ≅, then they have equal measures.

19. T

20. F; by Post. 1-1-5, if 2 planes intersect, they do so in exactly 1 line.

21. T

22. Converse: If an event is unlikely to occur, then the probability of the event is 0.1; F.
Inverse: If the probability of an event is not 0.1, then the event is likely to occur; F.
Contrapositive: If an event is likely to occur, then the probability of the event is not 0.1; T.

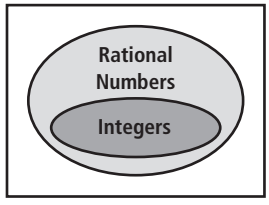
23. Converse: If the air temperature is 32°F or less, then freezing rain is falling; F.
Inverse: If freezing rain is not falling, then the air temperature is greater than 32°F; F.
Contrapositive: If the air temperature is greater than 32°F, then freezing rain is not falling; T

24. T **25.** T

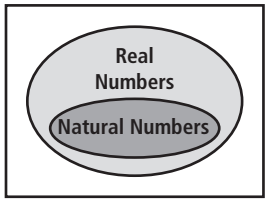
26. T **27.** F

28. T **29.** F

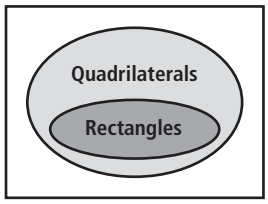
30.



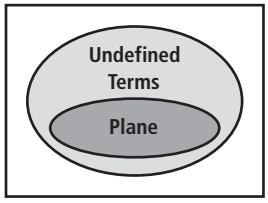
31.



32.



33.



34. If an animal is a dolphin, then it is a mammal.

35. If a person is a Texan, then the person is an American.

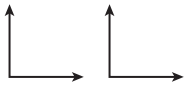
36. If $x < -4$, then $x < -1$.

37a. Hypothesis: Only you can find it.
Conclusion: Everything's got a moral.

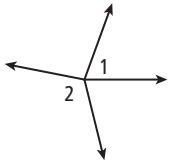
b. If only you can find it, then everything's got a moral.

38. $x = 5$

39. Possible answer:



40. Possible answer:



41. Possible answer: You did not go out in the sun.

42. If a mineral is calcite, then it has a hardness of 3; T.

43. If a mineral has a hardness less than 5, then it is not apatite; T.

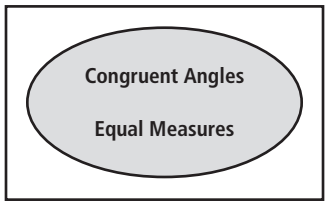
44. If a mineral is not apatite, then it has a hardness of less than 5; F.

45. If a mineral is not apatite, then it is calcite; F.

46. If a mineral has a hardness of 3, then it is not apatite; T.

47. If a mineral is calcite, then it has a hardness less than 5; T.

48. Converse: If 2 ∡ have the same measure, then they are ≅; T.
Inverse: If 2 ∡ are not ≅, then they do not have the same measure; T.
Contrapositive: If 2 ∡ do not have the same measure, then they are not ≅; T.



49. Possible answer: A conditional statement is false when the hypothesis is true and the conclusion is false. A conditional statement with a false hypothesis is always true because nothing has been guaranteed by the hypothesis.

TEST PREP, PAGE 86

50. C **51.** H

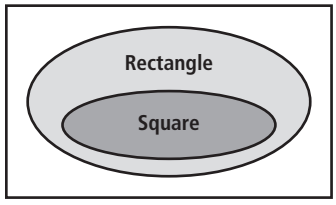
52. D **53.** J

CHALLENGE AND EXTEND, PAGE 87

54. No lines are pts. No pts. are lines.

55. Some students are adults. Some adults are students.

56a.



Possible answer: Figure A is not a rect., so it belongs outside the larger oval in the Venn diag. It cannot be inside the smaller oval, so it cannot be a square.

b. If a figure is not a rect., then it is not a square. By the contrapositve, since the figure is not a rect., it is not a square.

57. 3 true conditionals: $r \rightarrow q$, $q \rightarrow p$, and $r \rightarrow p$

SPIRAL REVIEW, PAGE 87

58. $y = x + 3$ **59.** $y = 2x + 1$

60. $y = \frac{5}{2}x - 4$ **61.** T

62. F; possible answer: acute ∡ measure less than 90°, so the sum of the measures of 2 acute ∡ must be less than 180°. Therefore, 2 acute ∡ cannot be supp.

63. T **64.** 13,131

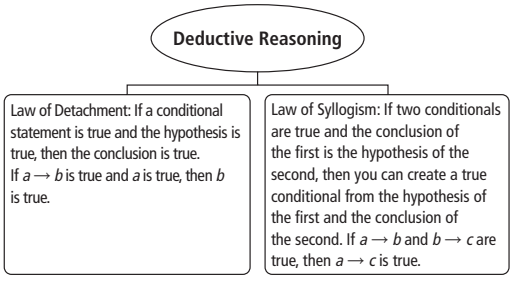
65. $\frac{2}{81}$ **66.** $5x^5$

2-3 USING DEDUCTIVE REASONING TO VERIFY CONJECTURES, PAGES 88–93

CHECK IT OUT! PAGES 88–90

1. The myth rests on a false premise, that eelskin wallets are made from electric eels. The conclusion is a result of deductive reasoning.
2. Hypothesis: A student passes his classes.
   Conclusion: The student is eligible to play sports.
   The given statement "Ramon passed his classes" matches the hypothesis of the given conditional. By the Law of Detachment, Ramon is eligible to play sports. The conjecture is valid.
3. Let p, q, and r represent the following:
   p: An animal is a mammal.
   q: An animal has hair.
   r: An animal is a dog.
   You are given that $p \rightarrow q$ and $r \rightarrow p$. Since p is the conclusion of the 2nd conditional and the hypothesis of the 1st conditional, you can conclude that $r \rightarrow q$. The conjecture is valid by the Law of Syllogism.
4. Conclusion: Polygon P is not a quad.

THINK AND DISCUSS, PAGE 90

1. Yes; the given information is false.
2. Possible answer: Using symbols instead of words forces you to look at the validity of the argument itself, without being distracted by the truth values of the individual statements.
3. 

EXERCISES, PAGES 91–93

GUIDED PRACTICE, PAGE 91

1. Possible answer: Inductive reasoning is based on a pattern of specific cases. Deductive reasoning is based on logical reasoning.
2. The conclusion is based on logical reasoning. It is a result of deductive reasoning.
3. The conclusion is based on logical reasoning. It is a result of deductive reasoning.
4. Hypothesis: You want to go on a field trip.
   Conclusion: You must have a signed permission slip.
   The given statement "Zola has a signed permission slip" matches the conclusion of a true conditional. But this does not mean the hypothesis is true. Zola could have a permission slip for another reason. The conclusion is not valid.
5. Hypothesis: The side lengths of a rect. are 3 ft and 4 ft.
   Conclusion: The rect.'s area is 12 ft^2.
   The given statement "A rect. has side lengths 3 ft and 4 ft" matches the hypothesis of the given conditional. By the Law of Detachment, the rect. has area 12 ft^2. The conjecture is valid.
6. Let p, q, and r represent the following:
   p: You fly from Texas to California.
   q: You travel from the central to the Pacific time zone.
   r: You gain two hours.
   You are given that $p \rightarrow q$ and $q \rightarrow r$. Since q is the conclusion of the 1st conditional and the hypothesis of the 2nd conditional, you can conclude that $p \rightarrow r$. The conjecture is valid by the Law of Syllogism.
7. Let p, q, and r represent the following:
   p: A figure is a square.
   q: A figure is a rectangle.
   r: A figure is a parallelogram.
   You are given that $p \rightarrow q$ and $p \rightarrow r$. The Law of Syllogism cannot be used to draw a conclusion since p is the hypothesis of both conditionals. Even though the conjecture $r \rightarrow q$ is true, the logic used to draw the conclusion is not valid.
8. Conclusion: Alex's car might not start.

PRACTICE AND PROBLEM SOLVING, PAGES 91–92

9. The conclusion is based on mathematical calculation. So it is the result of deductive reasoning.
10. Since the conclusion is based on a pattern of observation, it is a result of inductive reasoning.
11. Hypothesis: One integer is odd and another integer is even.
    Conclusion: The product of 2 integers is even.
    Statement "The product of 2 integers is 24" matches the conclusion of a true conditional. However, hypothesis is not necessarily true. For example, $6(4) = 24$. Conclusion is not valid.
12. Let p, q, and r represent the following:
    p: An element is an alkali metal.
    q: An element reacts with water.
    r: An element is in the 1st column of the periodic table.
    You are given that $p \rightarrow q$ and $r \rightarrow p$. Since p is the conclusion of the 2nd conditional and the hypothesis of the 1st conditional, you can conclude that $r \rightarrow q$. The conjecture is valid by the Law of Syllogism.
13. Conclusion: Dakota gets better grades in Social Studies.
14. If Cheetah-Net is 75 times as fast as dial-up, then dial-up is 75 times as slow as Cheetah-Net. Let c and d be the download times with Cheetah-Net and dial-up.
    $d = 75c$
    $18 = 75c$
    $\frac{18}{75} = \frac{75c}{75}$
    $c = 0.24$ min or 14.4 s
15. valid
16. invalid
17. valid
18. invalid

19. yes ($p \rightarrow q$ and $q \rightarrow r$, so $p \rightarrow r$);
no (counterexample: $x = 1$); because the 1st conditional is false (same counterexample)

20. A: comp. $\measuredangle$ are not necessarily adj., so they may not form a rt. $\angle$.

21. Possible answers: If Mary goes to the store, then I will go with her. Mary goes to the store. The conclusion "I will go with her" is valid by Law of Detachment. If Jon goes to the movies, then he will eat popcorn. If Jon eats popcorn, then he needs a drink. The conclusion "If Jon goes to the movies, then he will need a drink" is valid by Law of Syllogism.

22a. If a creature is a serpent, then it eats eggs.

b. No; possible answer: the Pigeon did not correctly apply Law of Detachment; "Alice eats eggs" matches conclusion of conditional, not hypothesis.

TEST PREP, PAGE 93

23. D **24.** H

25. 196 Hz
A G note is 3 octaves above low G. So its frequency is the frequency of low G, doubled 3 times.
$2\big(2\big(2(24.50)\big)\big) = 196$ Hz

CHALLENGE AND EXTEND, PAGE 93

26. Either Andre is less than 35 years old, or he is not a natural-born citizen. Possible answer: Since there are 3 criteria and he meets 1, he must not meet 1 of the other 2.

27a. If you live in San Diego then you live in the United States.

b. If you do not live in the United States, then you do not live in California. If you do not live in California, then you do not live in San Diego.

c. If you do not live in the United States, then you do not live in San Diego.

d. They are contrapositives of each other.

28. If Cassie goes, at least 3 people will go, contradicting the hypothesis. If either Hanna or Amy goes, then Marc will go, so by Law of Syllogism, Dallas will also go: again, at least 3 people. Therefore neither Cassie, Amy, or Hanna will go. By elimination, Marc and Dallas will go.

SPIRAL REVIEW, PAGE 93

29. $2(x + 5)$
$= 2x + 10$

30. $(4y + 6) - (3y - 5)$
$= 4y + 6 - 3y + 5$
$= y + 11$

31. $(3c + 4c) + 2(-7c + 7)$
$= 7c - 14c + 14$
$= -7c + 14$

32. $\left(\frac{1+4}{2}, \frac{2+5}{2}\right) = \left(\frac{5}{2}, \frac{7}{2}\right) = (2.5, 3.5)$

33. $\left(\frac{-3+0}{2}, \frac{6+1}{2}\right) = \left(-\frac{3}{2}, \frac{7}{2}\right) = (-1.5, 3.5)$

34. $\left(\frac{-2.5+2.5}{2}, \frac{9+(-3)}{2}\right) = \left(\frac{0}{2}, \frac{6}{2}\right) = (0, 3)$

35. Hypothesis: The fire alarm rings.
Conclusion: Everyone should exit the building.

36. Hypothesis: Two diffferent lines intersect.
Conclusion: Two lines intersect at exactly 1 pt.

37. Hypothesis: $\overline{AB} \cong \overline{CD}$
Conclusion: $AB = CD$

GEOMETRY LAB: SOLVE LOGIC PUZZLES, PAGES 94–95

TRY THIS, PAGE 94

1. Because no one else can own the bird and Fiona owns only 1 pet.

2.

	Danny	Frank	Jude	Kian
Ally	✗	✗	✗	✓
Emily	✗	✗	✓	✗
Misha	✓	✗	✗	✗
Tracy	✗	✓	✗	✗

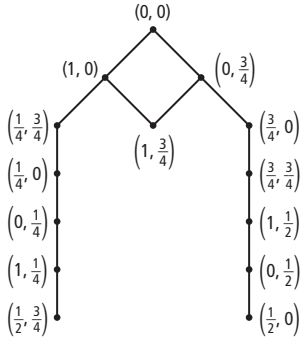
TRY THIS, PAGE 95

3. *WG* and *GC*; because the wolf will eat the goat and the goat will eat the cabbage.

4. 2 solutions; 7 steps each

5. Possible answer: You can see all solutions instead of just 1 possible solution.

6.



Possible answer: Fill 1-c cup. Fill $\frac{3}{4}$-c cup from 1-c cup. Empty $\frac{3}{4}$-c cup; have $\frac{1}{4}$ c in the 1-c cup. Transfer this to $\frac{3}{4}$-c cup, and fill 1-c cup. Fill $\frac{3}{4}$-c cup from 1-c cup, leaving $\frac{1}{2}$ c in the 1-c cup.

2-4 BICONDITIONAL STATEMENTS AND DEFINITIONS, PAGES 96–101

CHECK IT OUT! PAGES 96–98

1a. Let p and q represent the following:
p: An $\angle$ is acute.
q: An $\angle$'s measure is greater than 0° and less than 90°.
2 parts of biconditional $p \leftrightarrow q$ are $p \rightarrow q$ and $q \rightarrow p$.
Conditional: If an $\angle$ is acute, then its measure is greater than 0° and less than 90°.
Converse: If an $\angle$'s measure is greater than 0° and less than 90°, then the $\angle$ is acute.

b. Let x and y represent the following:
x: Cho is a member.
y: Cho has paid the $5 dues.
2 parts of biconditional $x \leftrightarrow y$ are $x \rightarrow y$ and $y \rightarrow x$.
Conditional: If Cho is a member, then he has paid the $5 dues.
Converse: If Cho has paid the $5 dues, then he is a member.

2a. Converse: If it is Independence Day, then the date is July 4.
Biconditional: It is July 4th if and only if it is Independence Day.

b. Converse: If pts. are collinear, then they lie on the same line.
Biconditional: Pts. lie on the same line if and only if they are collinear.

3a. Conditional: If an $\angle$ is a rt. $\angle$, then its measure is 90°. (T)
Converse: If an $\angle$'s measure is 90°, then it is a rt. $\angle$. (T)
Since conditional and converse are true, biconditional is true.

b. Conditional: $y = -5 \rightarrow y^2 = 25$; T
Converse: $y^2 = 25 \rightarrow y = -5$; F
If $y = 5$, then $y^2 = 25$, so converse is false.
Therefore biconditional is false.

4a. A figure is a quad. if and only if it is a 4-sided polygon.

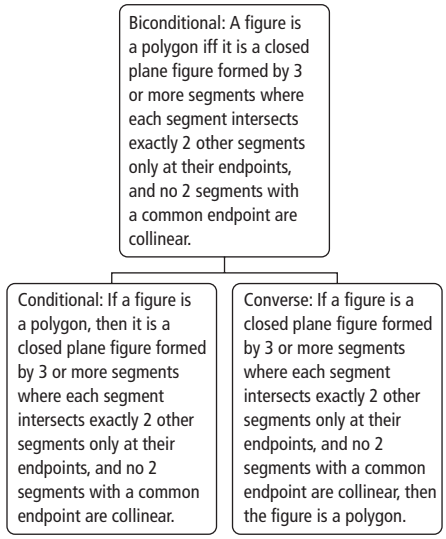
b. An $\angle$ is a straight $\angle$ if and only if its measure is 180°.

THINK AND DISCUSS, PAGE 98

1. Possible answer: Find truth values of conditional and converse that biconditional contains. If both are true, then biconditional is true.

2. A $\triangle$ has 3 sides and 3 vertices. A quad. has 4 sides and 4 vertices.

3.



EXERCISES, PAGES 99–101

GUIDED PRACTICE, PAGE 99

1. Possible answer: A biconditional statement contains the conditional and its converse. A conditional is not reversible, but a biconditional is.

2. Let p and q represent the following:
p: Perry can paint the entire living room.
q: Perry has enough paint.
2 parts of biconditional $p \leftrightarrow q$ are $p \rightarrow q$ and $q \rightarrow p$.
Conditional: If Perry can paint the entire living room, then he has enough paint.
Converse: If Perry has enough paint, then he can paint the entire living room.

3. Let p and q represent the following:
p: Your medicine will be ready by 5 P.M.
q: You drop your prescription off by 8 A.M.
2 parts of biconditional $p \leftrightarrow q$ are $p \rightarrow q$ and $q \rightarrow p$.
Conditional: If your medicine is ready by 5 P.M., then you dropped your prescription off by 8 A.M.
Converse: If you drop your prescription off by 8 A.M., then your medicine will be ready by 5 P.M.

4. Converse: If a student is in the tenth grade, then the student is a sophomore.
Biconditional: A student is a sophomore if and only if the student is in the tenth grade.

5. Converse: If 2 segs. are $\cong$, then they have the same length.
Biconditional: 2 segs. have the same length if and only if they are $\cong$.

6. Conditional: $xy = 0 \rightarrow x = 0$ or $y = 0$; T
Converse: $x = 0$ or $y = 0 \rightarrow xy = 0$; T
Since conditional and converse are true, biconditional is true.

7. Conditional: If a figure is a quad., then it is a polygon; T
Converse: If a figure is a polygon, then it is a quad.; F
A $\triangle$ is a polygon but not a quad., so converse is false.
Therefore, biconditional is false.

8. 2 lines are ∥ if and only if they are coplanar and never intersect.

9. An animal is a hummingbird if and only if it is a tiny, brightly colored bird with narrow wings, a slender bill, and a long tongue.

PRACTICE AND PROBLEM SOLVING, PAGES 99–100

10. Conditional: If 3 pts. are coplanar, then they lie in the same plane.
Converse: If 3 pts. lie in the same plane, then they are coplanar.

11. Conditional: If a ▱ is a rect., then it has 4 rt. ∡.
Converse: If a ▱ has 4 rt. ∡, then it is a rect.

12. Conditional: If a lunar eclipse occurs, then Earth is between the Sun and the Moon.
Converse: If Earth is between the Sun and the Moon, then a lunar eclipse occurs.

13. Converse: If it is the weekend, then today is Saturday or Sunday.
Biconditional: Today is Saturday or Sunday if and only if it is the weekend.

14. Converse: If Greg wins the race, then he has the fastest time.
Biconditional: Greg has the fastest time if and only if he wins the race.

15. Converse: If a △ is a rt. △, then it contains a rt. ∠.
Biconditional: A △ contains a rt. ∠ if and only if it is a rt. △

16. Conditional is true because a swimmer is an athlete. Converse is false because an athlete might not be a swimmer. Therefore, biconditional is false. Possible counterexample: Felipe could be a runner.

17. Conditional is true because if $2n$ is even, it is divisible by 2, so $\frac{2n}{2} = n$ is an integer. Converse is true because if n is an integer, then $2n$ is an integer divisible by 2, and so is even. Therefore, biconditional is true.

18. A figure is a ○ if and only if it is the set of all pts. that are a fixed dist. from a given pt.

19. A player is a catcher if and only if the player is positioned behind home plate and catches throws from the pitcher.

20. no; possible answer: $a = 3$, $b = -3$

21. yes ($x = 5$ is the solution of both equations)

22. no; possible answer: $y = -8$

23. no; possible answer: $x = -2$

24. An equil. △ is a △ with 3 ≅ sides.

25. A square is a quad. with 4 ≅ sides and 4 rt. ∡.

26. A cell is a white blood cell if and only if it defends the body against invading organisms by engulfing them or releasing antibodies.

27. Possible answer: A bicycle is a vehicle that moves along the ground but is not an automobile.

28. Possible answer: A computer is a machine that performs calculations but is not a calculator.

29. Possible answer: Definition does not say that the rays have a common endpt.

30. no

31. no

32. no

33. 5 (since $2\pi(5) = 10\pi$)

34. quad.

35. A statement is a biconditional if and only if it can be written in the form "p if and only if q."
Conditional: If a statement is a biconditional, then it can be written in the form "p if and only if q."
Converse: If a statement can be written in the form "p if and only if q," then it is a biconditional.
Since conditional and converse are true, biconditional is true.

36. Possible answer: If you write the def. as a biconditional, "A ray is an ∠ bisector iff it divides the ∠ into 2 ≅ ∡," then you can use it either forward or backward. If you know the ray is an ∠ bisector, then you can conclude that the 2 ∡ formed are ≅. If you know that 2 adj. ∡ formed by a ray are ≅, then you can conclude that the ray is an ∠ bisector.

37a. If I say it, then I mean it. If I mean it, then I say it.

b. Possible answer: The biconditional Alice implies is "I say it if and only if I mean it." This biconditional is not true. People often mean things without saying them or say things they don't mean.

TEST PREP, PAGE 101

38. A
$m\angle S \neq 80°$ but $\angle S$ is acute.

39. G

40. B
Converse is also true.

41. Conditional: If you get a traffic ticket, then you are speeding.
Converse: If you are speeding, then you will get a traffic ticket.
The biconditional is false because both statements are false. It is possible to get a traffic ticket for running a red light while not speeding. Also, it is possible to speed without getting a ticket.

CHALLENGE AND EXTEND, PAGE 101

42. The two ovals within Venn diagram will exactly overlap each other. If one condition is met then the other is necessarily met, which is true of the conditions in a good def.

43a. If an ∠ does not measure 105°, then the ∠ is not obtuse.

b. If an ∠ is not obtuse, then it does not measure 105°.

c. It is the contrapositive of the original.

d. F; the inverse is false, so the biconditonal formed is false.

44. T; It is given that conditional is true. Converse "If D is in int. of $\angle ABC$, then $m\angle ABD + m\angle DBC = m\angle ABC$" is true by ∠ Add. Post. Since conditional and its converse are true, biconditional is true.

45. Possible answer: $n = 2$ (since n is not divisible by 4, but $n^2 = 4$ is even.)

SPIRAL REVIEW, PAGE 101

46. The graph is shifted 5 units up and is wider than graph of parent function.

47. The graph is reflected across x-axis and shifted 1 unit down, and is narrower than graph of parent function.

48. $y = (x + 2)(x - 2)$
$= x^2 - 4$
The graph is shifted 4 units down.

49. T **50.** Y

51. S **52.** F; poss. answer: $n = 0$

53. F; poss. answer: $x = 2$ **54.** T

MULTI-STEP TEST PREP, PAGE 102

1. Alice is mad.

2. If you only walk long enough, then you're sure to get somewhere.

3. No; no hypothesis is known to be true, so Law of Detachment cannot be applied. No conclusion matches another hypothesis, so Law of Syllogism cannot be applied.

4. I breathe if and only if I sleep. This biconditional is made of 2 conditionals: If I breathe, then I sleep, and if I sleep, then I breathe. 2nd is true, but 1st is not. So biconditional is false.

READY TO GO ON? PAGE 103

1. 31 **2.** January

3. -1 **4.** #

5. Possible answer: A male lion weighs about 412.4 lb.

6. negative **7.** Possible answer: 6

8. Hypothesis: An ∠'s measure is 107°.
Conclusion: An ∠ is obtuse.

9. If a number is a whole number, then it is an integer.

10. If a figure is a square, then it is a rect.

11. If a figure is a square, then its diags. are ≅.

12. F; possible answer: an ∠ that measures 60°

13. T

14. Converse: If a number is divisible by 4, then it is even; T
Inverse: If a number is not even, then it is not divisible by 4; T
Contrapositive: If a number is not divisible by 4, then it is not even; F

15. Hypothesis: Sue finishes her science project.
Conclusion: Sue can go to the movie.
The given statement "Sue goes to the movie" matches the conclusion of a true conditional. But this does not mean the hypothesis is true. Sue could have gone to the movie on another night.
The conclusion is not valid.

16. Let p, q, and r represent the following.
p: 1 ∠ of a △ is 90°.
q: A △ is a rt. △.
r: A △'s acute ∠ measures are comp.
You are given that $p \rightarrow q$ and $q \rightarrow r$. Since q is the conclusion of the 1st conditional and the hypothesis of the 2nd conditional, you can conclude that $p \rightarrow r$, or that if 1 ∠ of a △ is 90°, then its acute ∠ measures are comp.

17. Converse: If the sum of 2 ∠ measures is 180°, then the ∡ are supp.
Biconditional: 2 ∡ are supp. if and only if the sum of their measures is 180°.

18. T

2-5 ALGEBRAIC PROOF, PAGES 104–109

CHECK IT OUT! PAGES 104–106

1.

$\frac{1}{2}t = -7$	Given equation
$2\left(\frac{1}{2}t\right) = 2(-7)$	Mult. Prop. of =
$t = -14$	Simplify.

2. 1 Understand the Problem
Answer will be temperature in °C.
Important information:
• $C = \frac{5}{9}(F - 32)$ • $F = 86°F$

2 Make a Plan
Subst. given information into formula and solve.

3 Solve

$C = \frac{5}{9}(F - 32)$	Given equation
$= \frac{5}{9}(86 - 32)$	Subst.
$= \frac{5}{9}(54)$	Simplify.
$= 30°C$	Simplify.

4 Look Back
Check answer by substituting it back into original formula.

$C = \frac{5}{9}(F - 32)$

$30 \stackrel{?}{=} \frac{5}{9}(86 - 32)$

$9(30) \stackrel{?}{=} 5(54)$

$270 = 270$ ✓

3. ∠ Add. Post.
Subst.
Simplify.
Subtr. Prop. of =
Add. Prop. of =

4a. Sym. Prop. of = **b.** Reflex. Prop. of =

c. Trans. Prop. of = **d.** Sym. Prop. of ≅

THINK AND DISCUSS, PAGE 107

1. Mult. Prop. of =

2. Use a ≅ symbol for geometric figures. Use an = sign for numbers.

3.

Property	Equality	Congruence
Reflexive	$1 = 1$	$\overline{AB} \cong \overline{AB}$
Symmetric	If $x = y$, then $y = x$.	If $\overline{AB} \cong \overline{BC}$, then $\overline{BC} \cong \overline{AB}$.
Transitive	If $x = 0$ and $0 = y$, then $x = y$.	If $\overline{AB} \cong \overline{BC}$ and $\overline{BC} \cong \overline{CD}$, then $\overline{AB} \cong \overline{CD}$.

EXERCISES, PAGES 107–109

GUIDED PRACTICE, PAGE 107

1. Possible answer: A proof is an argument that uses logic, definitions, and previously proven statements to show that a statement is always true.

2.
$y + 1 = 5$ Given equation
$-1 \quad -1$ Subtr. Prop. of =
$y = 4$ Simplify.

3.
$t - 3.2 = -8.3$ Given equation
$+3.2 \quad +3.2$ Add. Prop. of =
$t = -5.1$ Simplify.

4.
$2p - 30 = -4p + 6$ Given equation
$+4p \quad +4p$ Add. Prop. of =
$6p - 30 = 6$ Simplify.
$+30 \quad +30$ Add. Prop. of =
$6p = 36$ Simplify.
$\frac{6p}{6} = \frac{36}{6}$ Div. Prop. of =
$p = 6$ Simplify.

5.
$\frac{x+3}{-2} = 8$ Given equation
$(-2)\left(\frac{x+3}{-2}\right) = -2(8)$ Mult. Prop. of =
$x + 3 = -16$ Simplify.
$-3 \quad -3$ Subtr. Prop. of =
$x = -19$ Simplify.

6.
$\frac{1}{2}n = \frac{3}{4}$ Given equation
$2\left(\frac{1}{2}n\right) = 2\left(\frac{3}{4}\right)$ Mult. Prop. of =
$n = \frac{3}{2}$ Simplify.

7.
$0 = 2(r - 3) + 4$ Given equation
$0 = 2r - 2$ Distribute.
$+2 \quad +2$ Add. Prop. of =
$2 = 2r$ Simplify.
$\frac{2}{2} = \frac{2r}{2}$ Div. Prop. of =
$1 = r$ Simplify.
$r = 1$ Sym. Prop. of =

8. 1 Understand the Problem
Answer will be amount of fat in g.
Important information:
• $C = 9f + 90$ • $C = 102$ calories
2 Make a Plan
Subst. given information into formula and solve.
3 Solve
$C = 9f + 90$ Given equation
$102 = 9f + 90$ Subst.
$-90 \quad -90$ Subtr. Prop. of =
$12 = 9f$ Simplify.
$\frac{12}{9} = \frac{9f}{9}$ Div. Prop. of =
$\frac{4}{3} = f$ Simplify.
Cereal contains $\frac{4}{3}$ g of fat.
4 Look Back
Check answer by substituting it back into original formula.
$C = 9f + 90$
$102 \stackrel{?}{=} 9\left(\frac{4}{3}\right) + 90$
$90 \stackrel{?}{=} 12 + 90$
$102 = 102$ ✓

9. 1 Understand the Problem
Answer will be number of movie rentals.
Important information:
• $C = \$5.75 + \$0.89m$ • $C = \$11.98$
2 Make a Plan
Subst. given information into formula and solve.
3 Solve
$C = 5.75 + 0.89m$ Given equation
$11.98 = 5.75 + 0.89m$ Subst.
$-5.75 \quad -5.75$ Subtr. Prop. of =
$6.23 = 0.89m$ Simplify.
$\frac{6.23}{0.89} = m$ Div. Prop. of =
$7 = m$ Simplify.
Elias rented 7 movies.
4 Look Back
Check answer by substituting it back into original formula.
$C = 5.75 + 0.89m$
$11.98 \stackrel{?}{=} 5.75 + 0.89(7)$
$11.98 \stackrel{?}{=} 5.75 + 6.23$
$11.98 = 11.98$ ✓

10. Def. of ≅ segs.
Subst.
Subtr. Prop. of =
Subtr. Prop. of =
Div. Prop. of =

11. Seg. Add. Post.
Subst.
Subtr. Prop. of =
Add. Prop. of =
Div. Prop. of =

12. Reflex. Prop. of ≅

13. Trans. Prop. of =

14. Sym. Prop. of =

15. Trans. Prop. of ≅

PRACTICE AND PROBLEM SOLVING, PAGES 108–109

16.
$5x - 3 = 4(x + 2)$ Given equation
$5x - 3 = 4x + 8$ Distrib. Prop.
$x - 3 = 8$ Subtr. Prop. of =
$x = 11$ Add. Prop. of =

17. $1.6 = 2n$ Given equation
$0.5 = n$ Div. Prop. of =

18. $\frac{z}{3} - 2 = -10$ Given equation
$\frac{z}{3} = -8$ Add. Prop. of =
$z = -24$ Mult. Prop. of =

19. $-(h + 3) = 72$ Given equation
$-h - 3 = 72$ Distrib. Prop.
$-h = 75$ Add. Prop. of =
$h = -75$ Mult. Prop. of =

20. $9y + 17 = -19$ Given equation
$9y = -36$ Subtr. Prop. of =
$y = -4$ Div. Prop. of =

21. $\frac{1}{2}(p - 16) = 13$ Given equation
$p - 16 = 26$ Mult. Prop. of =
$p = 42$ Add. Prop. of =

22.
$T = 0.03c + 0.05b$ Given equation
$147 = 0.03c + 0.05(150)$ Subst.
$147 = 0.03c + 7.5$ Simplify.
$139.5 = 0.03c$ Subtr. Prop. of =
$4{,}650 = c$ Div. Prop. of =

4,650 bottles were collected.

23. ∠ Add. Post.
Subst.
Simplify.
Subtr. Prop. of =
Add. Prop. of =
Div. Prop. of =

24. ∠ Add. Post.
Subst.
Distrib. Prop.
Simplify.
Subtr. Prop. of =
Div. Prop. of =

25. Sym. Prop. of ≅

26. Reflex. Prop. of =

27. Trans. Prop. of =

28. Reflex. Prop. of ≅

29. Estimate:
$2(3x - 1) = 94$
$3x - 1 = 47$
$3x = 48$
$x = 16$

Equation:

$2(3.1x - 0.87) = 94.36$ Given equation
$3.1x - 0.87 = 47.18$ Div. Prop. of =
$3.1x = 48.05$ Add. Prop. of =
$x = 15.5$ Div. Prop. of =

Possible answer: The exact solution rounds to the estimate.

30. $3x - 1$

31. $\angle A \cong \angle T$

32. $\overline{NP} \cong \overline{BC}$

33. $\left(\frac{1 + x}{2}, \frac{y + 1}{2}\right) = (3, 5)$

$\frac{1 + x}{2} = 3$ Midpt. formula
$1 + x = 6$ Mult. Prop. of =
$x = 5$ Subtr. Prop. of =
$\frac{y + 1}{2} = 5$ Midpt. formula
$y + 1 = 10$ Mult. Prop. of =
$y = 9$ Subtr. Prop. of =

34.
$C = 35 + 21h + 1.1p$ Given equation
$169.5 = 35 + 21(3) + 1.1p$ Subst.
$169.5 = 98 + 1.1p$ Simplify.
$71.5 = 1.1p$ Subtr. Prop. of =
$65 = p$ Div. Prop. of =

Cost of parts was $65.

35a.
$C = 92.5 + 79.96 + 983 + 10{,}820x$ Given equation
$1{,}733.65 = 92.5 + 79.96 + 983 + 10{,}820x$ Subst.
$1{,}733.65 = 1{,}155.46 + 10{,}820x$ Simplify.
$578.19 = 10{,}820x$ Subtr. Prop. of =
$0.0534 \approx x$ Div. Prop. of =

Average cost of gas per mile is ≈ $0.05.

b. 1 gal costs $\approx$ 1 gal $\cdot \frac{32 \text{ mi}}{1 \text{ gal}} \cdot \frac{\$0.05}{1 \text{ mi}} \approx \$1.71$

36. Given $\overline{PR}$, you know from Reflex. Prop. of = that $PR = PR$. By def. of ≅ segs., $\overline{PR} \cong \overline{PR}$.
Given that $\overline{PR} \cong \overline{ST}$, you know from def. of ≅ segs. that $PR = ST$. By Sym. Prop. of =, $ST = PR$. By def. of ≅ segs., $\overline{ST} \cong \overline{PR}$.
Given that $\overline{AB} \cong \overline{CD}$ and $\overline{CD} \cong \overline{EF}$, you know from def. of ≅ segs. that $AB = CD$ and $CD = EF$. By Trans. Prop. of =, $AB = EF$. Therefore, $\overline{AB} \cong \overline{EF}$ by def. of ≅ segs.

37a.
$x + 15 \leq 63$ Given inequal.
$x \leq 48$ Subtr. Prop. of Inequal.

b.
$-2x > 36$ Given inequal.
$x < -18$ Div. Prop. of Inequal.

38. Possible answer: The conclusion of a deductive proof has been proven true in all cases, but a conjecture is based on observation and is not proven to be true.

TEST PREP, PAGE 109

39. B

40. H

41. D

42. 90°
$m\angle 1 + m\angle 2 + m\angle 3 = 180°$
$m\angle 1 + m\angle 1 + 2m\angle 1 = 180°$
$4m\angle 1 = 180°$
$m\angle 1 = 45°$
$m\angle 3 = 2m\angle 1$
$= 2(45) = 90°$

CHALLENGE AND EXTEND, PAGE 109

43.
$PR = PA + RA$ Seg. Add. Post.
$PA = QB, QB = RA$ Given
$PA = RA$ Trans. Prop. of =
$PR = PA + PA$ Subst.
$PA = 18$ Given
$PR = 18 + 18$ Subst.
$PR = 36$ in. Simplify.

44. Possible answer: You cannot add geometric figures.

45.
$7 - 3x > 19$ Given
$-3x > 12$ Subtr. Prop. of Inequal.
$x < -4$ Div. Prop. of Inequal.

SPIRAL REVIEW, PAGE 109

46. the interest rate the account earns

47. Check students' contructions.

48. Check students' contructions.

49. deductive reasoning **50.** inductive reasoning

2-6 GEOMETRIC PROOF, PAGES 110–116

CHECK IT OUT! PAGES 110–112

1. 1. Given
2. Def. of mdpt.
3. Given
4. Trans. Prop. of ≅

2a. ∠1 and ∠2 are supp., and ∠2 and ∠3 are supp.

b. m∠1 + m∠2 = m∠2 + m∠3

c. Subtr. Prop. of = **d.** ∠1 ≅ ∠3

3.

Statements	Reasons
1. ∠1 and ∠2 are comp., ∠2 and ∠3 are comp.	1. Given
2. m∠1 + m∠2 = 90°, m∠2 + m∠3 = 90°	2. Def. of comp. ∡
3. m∠1 + m∠2 = m∠2 + m∠3	3. Subst.
4. m∠2 = m∠2	4. Reflex. Prop. of =
5. m∠1 = m∠3	5. Subtr. Prop. of =
6. ∠1 ≅ ∠3	6. Def. of ≅ ∡

THINK AND DISCUSS, PAGE 113

1. the last step

2. Possible answer: so another person can follow your proof and you can verify that your logical reasoning is correct.

3. postulate; theorem; definition; property

4. 1. Write the conjecture to be proven. → 2. Draw a diagram to represent the hypothesis of the conjecture. → 3. State the given information and mark it on the diagram. → 4. State the conclusion of the conjecture in terms of the diagram. → 5. Plan your argument and prove the conjecture.

EXERCISES, PAGES 113–116

GUIDED PRACTICE, PAGE 113

1. statements; reasons **2.** theorem

3. 1. Given
2. Subst.
3. Simplify.
4. Add. Prop. of =
5. Simplify.
6. Def. of supp. ∡

4a. Def. of ≅ ∡ **b.** ∠1 and ∠2 are supp.

c. Subst. **d.** ∠1 and ∠3 are supp.

5.

Statements	Reasons
1. X is the mdpt. of $\overline{AY}$, Y is the mdpt. of $\overline{XB}$.	1. Given
2. $\overline{AX} \cong \overline{XY}$, $\overline{XY} \cong \overline{YB}$	2. Def. of mdpt.
3. $\overline{AX} \cong \overline{YB}$	3. Trans. Prop. of ≅

PRACTICE AND PROBLEM SOLVING, PAGES 114–115

6. 1. Given
2. Def. of ∠ bisector
3. Def. of ≅ ∡
4. Given
5. Subst.
6. ∠ Add. Post.
7. Subst.
8. Simplify.
9. Def. of rt. ∠

7a. m∠1 + m∠2 = 180°, m∠3 + m∠4 = 180°

b. Subst.

c. m∠1 = m∠4

d. Def. of ≅ ∡

8a. Def. of rt. ∠ **b.** m∠1 + m∠2 = m∠*BAC*

c. m∠2 = m∠3 **d.** Subst.

e. ∠1 and ∠3 are comp.

9.

Statements	Reasons
1. $\overline{BE} \cong \overline{CE}$, $\overline{DE} \cong \overline{AE}$	1. Given
2. $BE = CE$, $DE = AE$	2. Def. of ≅ segs.
3. $AE + BE = AB$, $CE + DE = CD$	3. Seg. Add. Post.
4. $DE + CE = AB$	4. Subst.
5. $\overline{AB} = \overline{CD}$	5. Subst.
6. $\overline{AB} \cong \overline{CD}$	6. Def. of ≅ segs.

10.

Statements	Reasons
1. ∠1 and ∠3 are comp., ∠2 and ∠4 are comp.	1. Given
2. m∠1 + m∠3 = 90°, m∠2 + m∠4 = 90°	2. Def. of comp. ∡
3. m∠1 + m∠3 = m∠2 + m∠4	3. Subst.
4. ∠ 3 ≅ ∠4	4. Given
5. m∠ 3 = m∠4	5. Def. of ≅ ∡
6. m∠ 1 = m∠2	6. Subtr. Prop. of =
7. ∠1 ≅ ∠2	7. Def. of ≅ ∡

11. m∠1 + 48° = 180°
m∠1 = 132°

12. m∠2 + 63° = 90°
m∠2 = 27°

13. m∠3 + 31° = 90°
m∠3 = 59°

14. ≅ Supps. Thm.

15. Possible answer: because the ∡ can be supp. or comp. to the same ∠ or to 2 ≅ ∡.

16. sometimes **17.** sometimes

18. sometimes **19.** never

20. $4n + 5 + 8n - 5 = 180$
$12n = 180$
$n = 15$

21. $9x - 6 = 8.5x + 2$
$9x = 8.5x + 8$
$0.5x = 8$
$x = 16$

22. $4z + 3z + 6 = 90$
$7z + 6 = 90$
$7z = 84$
$z = 12$

23. Possible answer: A thm. and a post. are both true statements of geometric facts. They are different because a post. is assumed to be true, while a thm. must be proven to be true.

24a. Given: Y is mdpt. of $\overline{AC}$. X is the mdpt. of $\overline{AB}$.
Prove: $XY = \frac{1}{2}BC$

b. Given: $\angle C$ is a rt. $\angle$.
Prove: $\angle A$ and $\angle B$ are comp.

c. Given: $\angle C$ is a rt. $\angle$.
Prove: $(AB)^2 = (AC)^2 + (BC)^2$

TEST PREP, PAGE 116

25. C **26.** G

27. D

CHALLENGE AND EXTEND, PAGE 116

28.

Statements	Reasons
1. $m\angle LAN = 30°$	1. Given
2. $m\angle 1 + m\angle 2 = m\angle LAN$	2. $\angle$ Add. Post.
3. $m\angle 1 + m\angle 2 = 30°$	3. Subst.
4. $m\angle 1 = 15°$	4. Given
5. $15° + m\angle 2 = 30°$	5. Subst.
6. $m\angle 2 = 15°$	6. Subtr. Prop. of =
7. $m\angle 1 = m\angle 2$	7. Trans. Prop. of =
8. $\angle 1 \cong \angle 2$	8. Def. of $\cong$ $\measuredangle$
9. $\overrightarrow{AM}$ bisects $\angle LAN$.	9. Def. of $\angle$ bisector

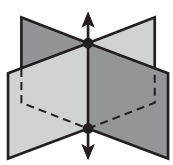
29. Step 1 Find a.
$2a + 3.5 = 2.5a - 5$
$2a + 8.5 = 2.5a$
$8.5 = 0.5a$
$17 = a$
Step 2 Find $\angle$ measures.
$2a + 3.5 = 2(17) + 3.5 = 37.5°$
$3a + 1.5 = 3(17) + 1.5 = 52.5°$
$2.5a - 5 = 2.5(17) - 5 = 37.5°$

30. Step 1 Find x.
$4x^2 - 6 + (-2x^2 + 19x) = 180$
$2x^2 + 19x - 6 = 180$
$2x^2 + 19x - 186 = 0$
$(x - 6)(2x + 31) = 0$
$x = 6$ (since $-2x^2 + 19x > 0$)
Step 2 Find $\angle$ measures.
$4x^2 - 6 = 4(6)^2 - 6 = 138°$
$-2x^2 + 19x = -2(6)^2 + 19(6) = 42°$

SPIRAL REVIEW, PAGE 116

31. $\frac{60}{250} = 0.24 = 24\%$ **32.** $2(14) = 28$ tires

33. Possible answer:



34. Possible answer:

35. Sym. Prop. of $\cong$ **36.** Trans. Prop. of =

GEOMETRY LAB: DESIGN PLANS FOR PROOFS, PAGE 117

ACTIVITY, PAGE 117

6.

Statements	Reasons
1. $\angle AXB \cong \angle CXD$	1. Given
2. $m\angle AXB = m\angle CXD$	2. Def. of $\cong$ $\measuredangle$
3. $m\angle BXC = m\angle BXC$	3. Reflex. Prop. of =
4. $m\angle AXB + m\angle BXC = m\angle CXD + m\angle BXC$	4. Add. Prop. of =
5. $m\angle AXB + m\angle BXC = m\angle AXC$ $m\angle BXC + m\angle CXD = m\angle BXD$	5. $\angle$ Add. Post.
6. $m\angle AXC = m\angle BXD$	6. Subst.
7. $\angle AXC \cong \angle BXD$	7. Def. of $\cong$ $\measuredangle$

TRY THIS, PAGE 117

1. Possible answer: A plan for a proof is less formal than a proof. A formal proof presents every logical step in detail, but a plan describes only the key logical steps.

2. Plan: Use the def. of $\angle$ bisector to show that $m\angle 1 = m\angle 2$. Then use $\angle$ Add. Post. and subst. to show that $2m\angle 1 = m\angle ABC$.
2-column proof:

Statements	Reasons
1. $\overrightarrow{BD}$ bisects $\angle ABC$.	1. Given
2. $\angle 1 \cong \angle 2$	2. Def. of $\angle$ bis.
3. $m\angle 1 = m\angle 2$	3. Def. of $\cong$ $\measuredangle$
4. $m\angle 1 + m\angle 2 = m\angle ABC$	4. $\angle$ Add. Post.
5. $m\angle 1 + m\angle 1 = m\angle ABC$	5. Subst.
6. $2m\angle 1 = m\angle ABC$	6. Simplify.

3. Plan: Since $\angle LXN$ is a rt. $\angle$, its measure is 90°. By the $\angle$ Add. Post., $m\angle 1 + m\angle 2 = m\angle LXN$. So by subst., $m\angle 1 + m\angle 2 = 90°$, which means that $\angle 1$ and $\angle 2$ are comp.
2-column proof:

Statements	Reasons
1. $\angle LXN$ is a rt. $\angle$.	1. Given
2. $m\angle LXN = 90°$	2. Def. of rt. $\angle$
3. $m\angle 1 + m\angle 2 = m\angle LXN$	3. $\angle$ Add. Post.
4. $m\angle 1 + m\angle 2 = 90°$	4. Subst.
5. $\angle 1$ and $\angle 2$ are comp.	5. Def. of comp. $\measuredangle$

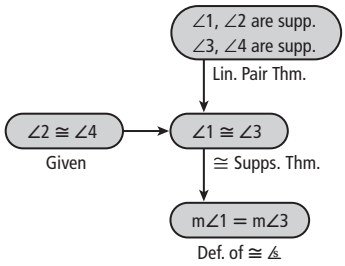
2-7 FLOWCHART AND PARAGRAPH PROOFS, PAGES 118–125

CHECK IT OUT! PAGES 119–121

1.

Statements	Reasons
1. $RS = UV$, $ST = TU$	1. Given
2. $RS + ST = TU + UV$	2. Add. Prop. of =
3. $RS + ST = RT$, $TU + UV = TV$	3. Seg. Add. Post.
4. $RT = TV$	4. Subst.
5. $\overline{RT} \cong \overline{TV}$	5. Def. of $\cong$ segs.

2.



3.

Statements	Reasons
1. ∠*WXY* is a rt. ∠.	1. Given
2. m∠*WXY* = 90°	2. Def. of rt. ∠
3. m∠2 + m∠3 = m∠*WXY*	3. ∠ Add. Post.
4. m∠2 + m∠3 = 90°	4. Subst.
5. ∠1 ≅ ∠3	5. Given
6. m∠1 = m∠3	6. Def. of ≅ ∡
7. m∠2 + m∠1 = 90°	7. Subst.
8. ∠1 and ∠2 are comp.	8. Def. of comp. ∡

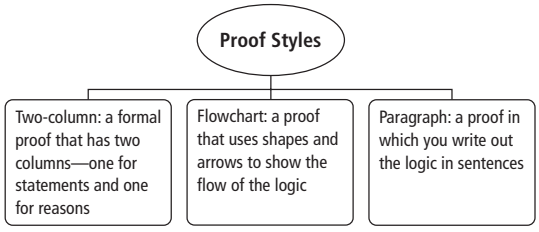
4. It is given that ∠1 ≅ ∠4. By Vert. ∡ Thm., ∠1 ≅ ∠2 and ∠3 ≅ ∠4. By Trans. Prop. of ≅ (twice), ∠2 ≅ ∠4, and ∠2 ≅ ∠3.

THINK AND DISCUSS, PAGE 122

1. Possible answer: There may be more than one thm. that you can apply to a proof, and the steps in a proof may sometimes be written in a different order.

2. Answers will vary.

3.



EXERCISES, PAGES 122–125

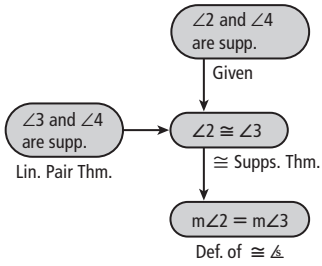
GUIDED PRACTICE, PAGES 122–123

1. flowchart **2.** paragraph

3.

Statements	Reasons
1. ∠1 ≅ ∠2	1. Given
2. ∠1 and ∠2 are supp.	2. Lin. Pair Thm.
3. ∠1 and ∠2 are rt. ∡	3. ≅ ∡ supp. → rt. ∡

4.



5.

Statements	Reasons
1. ∠2 ≅ ∠4	1. Given
2. ∠1 ≅ ∠2, ∠3 ≅ ∠4	2. Vert. ∡ Thm.
3. ∠1 ≅ ∠4	3. Trans. Prop. of ≅
4. ∠1 ≅ ∠3	4. Trans. Prop. of ≅

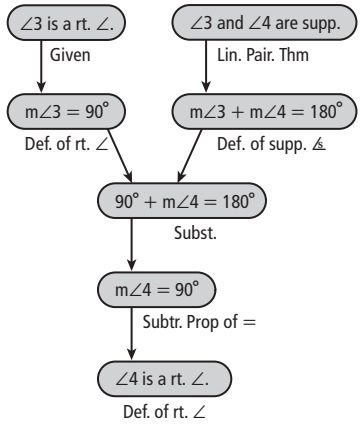
6. It is given that $\overrightarrow{BD}$ bisects ∠*ABC*, so ∠1 ≅ ∠2 by def. of ∠ bis. By Vert. ∡ Thm., ∠1 ≅ ∠4 and ∠2 ≅ ∠3. By Trans. Prop. of ≅, ∠4 ≅ ∠2, and thus ∠4 ≅ ∠3. Therefore $\overrightarrow{BG}$ bisects ∠*FBH* by def. of ∠ bis.

PRACTICE AND PROBLEM SOLVING, PAGES 123–125

7.

Statements	Reasons
1. *B* is mdpt. of $\overline{AC}$.	1. Given
2. $\overline{AB} \cong \overline{BC}$	2. Def. of mdpt.
3. *AB* = *BC*	3. Def. of ≅ segs.
4. *AD* + *DB* = *AB*, *BE* + *EC* = *BC*	4. Seg. Add. Post.
5. *AD* + *DB* = *BE* + *EC*	5. Subst.
6. *AD* = *EC*	6. Given
7. *DB* = *BE*	7. Subtr. Prop. of =

8.



9.

Statements	Reasons
1. ∠1 ≅ ∠4	1. Given
2. ∠1 ≅ ∠2	2. Vert. ∡ Thm.
3. ∠4 ≅ ∠2	3. Trans. Prop. of ≅
4. m∠4 = m∠2	4. Def. of ≅ ∡
5. ∠3 and ∠4 are supp.	5. Lin. Pair Thm.
6. m∠3 + m∠4 = 180°	6. Def. of supp. ∡
7. m∠3 + m∠2 = 180°	7. Subst.
8. ∠2 and ∠3 are supp.	8. Def. of supp. ∡

10. Since ∠1 and ∠2 are comp., m∠1 + m∠2 = 90°. ∠1 ≅ ∠3 by Vert. ∡ Thm. Thus m∠1 = m∠3. By subst., m∠2 + m∠3 = 90°, so ∠2 and ∠3 are comp.

11. 13 cm; by conv. of the Common Segs. Thm.

12. 90°; ≅ ∡ supp. → rt. ∡

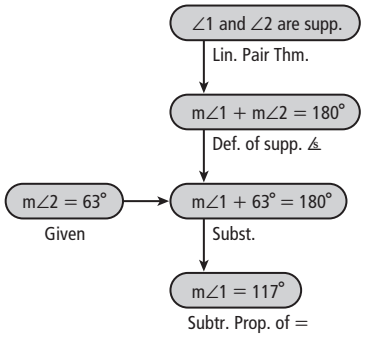
13. 37°; By Vert. ∡ Thm.

14. By the Common Segs. Thm.,
$2x + 4 = 5x - 2$
$6 = 3x$
$x = 2$

15. By the Vert. ∡ Thm.,
$11y = 121$
$y = 11$

16. By the Vert. ∡ Thm.,
$2x + 40 = 5x + 16$
$24 = 3x$
$x = 8$

17. A; diagram is marked with Prove information instead of Given information.

18.


19. Possible answer: Both ∡ adj. to given rt. ∠ must be rt. ∡ because they form lin. pairs with the given ∠. The fourth ∠ is a vert. ∠ of given ∠, so it, too, is a rt. ∠. Since all 4 ∡ are rt. ∡, they are all ≅ by Rt. ∡ ≅ Thm.

20. Answers will vary.

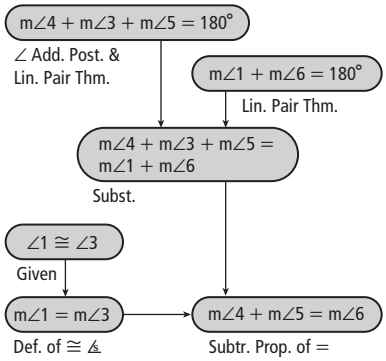
TEST PREP, PAGE 125

21. C
∠5 and ∠8 are vert. ∡.

22. H
$m\angle 2 = 90 + 38 = 128°$

23. D

CHALLENGE AND EXTEND, PAGE 125

24.


25.

Statements	Reasons
1. $\angle AOC \cong \angle BOD$	1. Given
2. $m\angle AOC = m\angle BOD$	2. Def. of ≅ ∡
3. $m\angle AOB + m\angle BOC = m\angle AOC$, $m\angle BOC + m\angle COD = m\angle BOD$	3. ∠ Add. Post.
4. $m\angle AOB + m\angle BOC = m\angle BOC + m\angle COD$	4. Subst.
5. $m\angle BOC = m\angle BOC$	5. Reflex. Prop. of =
6. $m\angle AOB = m\angle COD$	6. Subtr. Prop. of =
7. $\angle AOB \cong \angle COD$	7. Def. of ≅ ∡

26. It is given that ∠2 and ∠5 are rt. ∡. By Rt. ∠ ≅ Thm., ∠2 ≅ ∠5. By def. of ≅ ∡, m∠2 = m∠5. It is also given that m∠1 + m∠2 + m∠3 = m∠4 + m∠5 + m∠6. By Subtr. Prop. of =, m∠1 + m∠3 = m∠4 + m∠6. ∠3 ≅ ∠6 by Vert. ∡ Thm. By def. of ≅ ∡, m∠3 = m∠6. By Subtr. Prop. of =, m∠1 = m∠4. So by def. of ≅ ∡, ∠1 ≅ ∠4.

27. **Step 1** Find x and y.
By Vert. ∡ Thm.,
$3x + 1 = 6y + x - 6$
$2x = 6y - 7$
$x = 3y - 3.5$

By def. of supp. ∡,
$3x + 1 + 2x + 2y + 1 = 180$
$5x + 2y = 178$
$5(3y - 3.5) + 2y = 178$
$15y - 17.5 + 2y = 178$
$17y = 195.5$
$y = 11.5$

$x = 3y - 3.5 = 3(11.5) - 3.5 = 31$
Step 2 Find ∠ measures.
$3x + 1 = 3(31) + 1 = 94°$
$2x + 2y + 1 = 2(31) + 2(11.5) + 1 = 86°$
$6y + x - 6 = 6(11.5) + 31 - 6 = 94°$
m(4th ∠) = m(2nd ∠) = 86°

SPIRAL REVIEW, PAGE 125

28.
$y = 2x + 14$
$-6x + 18 = 2x + 14$
$18 = 8x + 14$
$4 = 8x$
$\frac{1}{2} = x$
$y = 2x + 14$
$= 2\left(\frac{1}{2}\right) + 14 = 15$
$\left(\frac{1}{2}, 15\right)$

29.
$7x - y = -33$
$3x + y = -7$
$10x = -40$
$x = -4$
$3x + y = -7$
$3(-4) + y = -7$
$-12 + y = -7$
$y = 5$
$(-4, 5)$

30.
$2(-x + 3y = 10)$
$+ 2x + y = 8$
$-2x + 6y = 20$
$+ 2x + y = 8$
$7y = 28$
$y = 4$
$-x + 3y = 10$
$-x + 3(4) = 10$
$-x + 12 = 10$
$-x = -2$
$x = 2$
(2, 4)

31–34. Check students' drawings.

35. Converse: If a positive integer is a composite number, then it has more than 2 factors.
Biconditional: A positive integer has more than 2 factors if and only if it is a composite number.

36. Converse: If a quad. has exactly 1 pair of || sides, then it is a trapezoid.
Biconditional: A quad. is a trapezoid if and only if it has exactly 1 pair of || sides.

MULTI-STEP TEST PREP, PAGE 126

1. $75° \le x \le 90°$

2. $75 \le x \le 90$
$180 - 75 \ge 180 - x \ge 180 - 90$
$105 \ge y \ge 90$
$90° \le y \le 105°$

3.

Statements	Reasons
1. $m\angle 2 = 145°$	1. Given
2. $\angle 1$ and $\angle 2$ are supp.	2. Lin. Pair Thm.
3. $m\angle 1 + m\angle 2 = 180°$	3. Def. of supp. $\measuredangle$
4. $m\angle 1 + 145° = 180°$	4. Subst.
5. $m\angle 1 = 35°$	5. Subtr. Prop. of =
6. $\angle 1 \cong \angle 3$	6. Vert. $\measuredangle$ Thm.
7. $m\angle 1 = m\angle 3$	7. Def. of $\cong$ $\measuredangle$
8. $m\angle 3 = 35°$	8. Trans. Prop. of =
9. $m\angle 1 < 75°$ and $m\angle 3 < 75°$	9. Def. of Inequal.

4. A surveyor found that $m\angle 2 = 145°$. Since $\angle 1$ and $\angle 2$ are supp. by Lin. Pair Thm., $m\angle 1 + m\angle 2 = 180°$ by def. of supp. $\measuredangle$. By using subst. and Subtr. Prop. of =, we can conclude that $m\angle 1 = 35°$. By Vert. $\measuredangle$ Thm., $\angle 1 \cong \angle 3$, so their measures are =. Therefore, $m\angle 3 = 35°$ by Trans. Prop. of =. Since $35° < 75°$, we can conclude that $m\angle 1 < 75°$ and $m\angle 3 < 75°$. Thus $\measuredangle$ in the intersection do not meet safety guidelines of U.S. Department of Transportation, and intersection should be reconstructed.

READY TO GO ON? PAGE 127

1. $m - 8 = 13$ Given equation
$m = 21$ Add. Prop. of =

2. $4y - 1 = 27$ Given equation
$4y = 28$ Add. Prop. of =
$y = 7$ Div. Prop. of =

3. $-\frac{x}{3} = 2$ Given equation
$-x = 6$ Mult. Prop. of =
$x = -6$ Div. Prop. of =

4. Sym. Prop. of =

5. Reflex. Prop. of $\cong$

6. Trans. Prop. of $\cong$

7. Trans. Prop. of =

8a. Given (given information)

b. $\angle 1$ and $\angle 3$ are supp. (deduce from line 1)

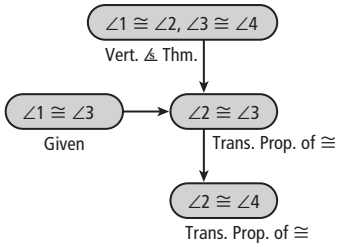
c. Reflex. Prop. of $\cong$ (reason why $\angle 3 \cong \angle 3$)

d. $\angle 1 \cong \angle 4$ (apply $\cong$ Supps. Thm. to lines 2 and 3)

9.

Statements	Reasons
1. $\overline{AB} \cong \overline{EF}$	1. Given
2. $AB = EF$	2. Def. of $\cong$ segs.
3. $EF = AB$	3. Sym. Prop. of =
4. $\overline{EF} \cong \overline{AB}$	4. Def. of $\cong$ segs.

10.



11. It is given that $\angle 1 \cong \angle 3$. By Vert. $\measuredangle$ Thm., $\angle 1 \cong \angle 2$ and $\angle 3 \cong \angle 4$. By Trans. Prop. of $\cong$, $\angle 2 \cong \angle 3$ and thus $\angle 2 \cong \angle 4$.

STUDY GUIDE: REVIEW, PAGES 130–133

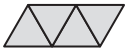
1. theorem

2. deductive reasoning

3. counterexample

4. conjecture

LESSON 2-1, PAGE 130

5. The rightmost △ is duplicated, rotated 180°, and shifted right. The next two items are  and 

6. Each term is $\frac{1}{6}$ greater than previous one. The next two terms are $\frac{5}{6}$ and 1.

7. The white section is halved. If the white section is a rect. but not a square, it is halved horiz. and the upper portion is colored yellow. If the white section is a square, it is halved vert. and the left portion is colored yellow. The next 2 items are  and 

8. odd

9. positive

10. F; 0 is a whole number but not a natural number

11. T

12. T

13. F; during a leap year, there are 29 days in February.

14. Check students' constructions. Possible answer: The 3 ∠ bisector of a △ intersect at the int. of △.

LESSON 2-2, PAGE 131

15. If it is Monday, then it is a weekday.

16. If something is a lichen, then it is a fungus.

17. T

18. F; possible answer: $\sqrt{2}$ and $\sqrt{2}$

19. Converse: If $m\angle X = 90°$, then $\angle X$ is a rt. ∠; T
Inverse: If $\angle X$ is not a rt. ∠, then $m\angle X \neq 90°$; T
Contrapositive: If $m\angle X \neq 90°$, then $\angle X$ is not a rt. ∠; T

20. Converse: If $x = 2$, then x is a whole number; T
Inverse: If x is not a whole number, then $x \neq 2$; T
Contrapositive: If $x \neq 2$, then x is not a whole number; F

LESSON 2-3, PAGE 131

21. Let p, q, r, and s be the following;
p: The team practices, beginning at 8 A.M. on weekdays and at 12 noon on Saturday.
q: Sue swims, beginning at 8 A.M. on weekdays and at 12 noon on Saturday.
r: The pool opens at 8 A.M. on weekdays and at 12 noon on Saturday.
Using symbols, given information is $p \rightarrow q$, $r \rightarrow p$, and r. By Law of Detachment, p is valid, so conjecture is not valid.

22. Using symbols, given information is $p \rightarrow q$, $r \rightarrow p$, and r. By Law of Syllogism, $r \rightarrow q$, and by Law of Detachment, q is valid; so conjecture is valid.

23. Using symbols, given information is $p \rightarrow q$, $r \rightarrow p$, and r. By Law of Detachment, p is valid, so conjecture is not valid.

24. Let p be hypothesis: Cost of Sara's call is \$2.57
Let q be conclusion: Sara's call lasted 7 min.
$2.57 = 2.15 + 0.07x$
$0.42 = 0.07x$
$x = 6$
$x + 1 = 7$
So $p \rightarrow q$. Since statement "Cost of Sara's call is \$2.57." matches hypothesis, can conclude that Sara's call lasted 7 min.

25. Let p be hypothesis: Paolo's call lasts 10 min.
Let q be conclusion: Cost of Paolo's call is \$2.78.
$2.15 + 0.07(10 - 1) = 2.78$
So $p \rightarrow q$. Since statement "Paolo's call lasts 10 min." matches hypothesis, can conclude that cost of Paolo's call is \$2.78.

26. No conclusion; the number and lengths of calls are unknown.

LESSON 2-4, PAGE 132

27. yes

28. no; $x = 2$

29. no; seg. with endpts. (3, 7) and (−5, −1)

30. yes

31. comp.

32. positive

33. greater than 50 mi/h

34. $4s$

LESSON 2-5, PAGE 132

35.
$\frac{m}{-5} + 3 = -4.5$ Given equation
$\frac{m}{-5} = -7.5$ Subtr. Prop. of =
$m = 37.5$ Mult. Prop. of =

36.
$-47 = 3x - 59$ Given equation
$12 = 3x$ Add. Prop. of =
$4 = x$ Div. Prop. of =

37. Reflex. Prop. of =

38. Sym. Prop. of ≅

39. Trans. Prop. of =

40. figure $ABCD$

41. $m\angle 5 = m\angle 2$

42. $\overline{CD} \cong \overline{EF}$

43.
$I = Prt$ Given equation
$4200 = P(0.06)(4)$ Subst.
$4200 = P(0.24)$ Simplify.
$\$17{,}500 = P$ Div. Prop. of =

LESSON 2-6, PAGE 133

44.
1. Given
2. Def. of comp. ∡
3. Given
4. Def. of ≅ ∡
5. Subst.
6. Def. of comp. ∡

45a. Given

b. $TU = UV$

c. $SU + UV = SV$

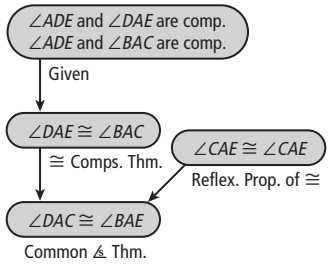
d. Subst.

46. Think: Use def. of supp. ∡.
$z - 2 + 2 + 7z = 180$
$8z = 180$
$z = 22.5$

47. Think: Use def. of comp. ∡.
$3x + 2x + 5 = 90$
$5x = 85$
$x = 17$

LESSON 2-7, PAGE 133

48.



49. It is given that $\angle ADE$ and $\angle DAE$ are comp. and $\angle ADE$ and $\angle BAC$ are comp. By ≅ Comps. Thm., $\angle DAE \cong \angle BAC$. By Reflex. Prop. of ≅, $\angle CAE \cong \angle CAE$. By Common ∡ Thm., $\angle DAC \cong \angle BAE$.

50. $w = 45$; by Vert. ∡ Thm.

51. $x = 45$; since ≅ ∡ supp. → rt. ∡

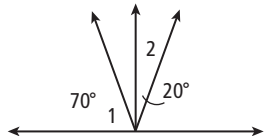
CHAPTER TEST, PAGE 134

1.

2. 5

3. even

4. Possible answer: $\angle 1$ and $\angle 2$ are comp. but not adj.

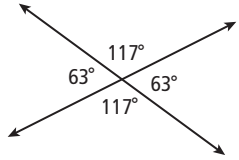


5. Hypothesis: It rains.
Conclusion: The show is cancelled.

6. If 2 lines are ||, then they do not intersect.

7. F;

8. T



9. Converse: If you live in Kentucky, then you live in the United States; T

10. Inverse: If you do not live in the United States, then you do not live in Kentucky; T

11. Contrapositive: If you do not live in Kentucky, then you do not live in the United States; F

12. Let p, q, and r be the following:
p: it is colder than 50°F.
q: Tom wears a sweater.
r: it is 46°F today.
You are given that $p \rightarrow q$ and that r is true. You also know that $r \rightarrow p$, By Law of Detachment, q is true, so conjecture is valid.

13. Let p, q, and r be the following:
p: A figure is a square.
q: A figure is a quad.
r: A figure is a polygon.
You are given that $p \rightarrow q$ and $q \rightarrow r$. By Law of Syllogism, $p \rightarrow r$. The statement "Figure ABCD is a square" matches p, so by Law of Detachment, r is true for figure $ABCD$. Therefore, figure $ABCD$ is a polygon.

14. Conditional: If Chad works on Saturday, then he gets paid overtime.
Converse: If Chad gets paid overtime, he will work on Saturday.

15. F; A, B, and C with B not between A and C

16.

$8 - 5s = 1$	Given equation
$-5s = -7$	Subtr. Prop. of =
$s = 1.4$	Div. Prop. of =

17.

$0.4t + 3 = 1.6$	Given equation
$0.4t = -1.4$	Subtr. Prop. of =
$t = -3.5$	Div. Prop. of =

18.

$38 = -3w + 2$	Given equation
$36 = -3w$	Subtr. Prop. of =
$-12 = w$	Div. Prop. of =

19. Trans. Prop. of =

20. Reflex. Prop. of =

21. Trans. Prop. of ≅

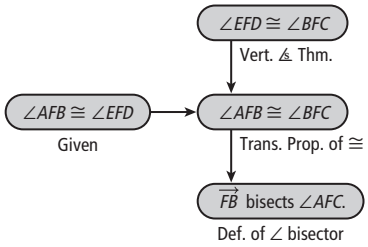
22. Sym. Prop. of ≅

23.

Statements	Reasons
1. $\angle AFB \cong \angle EFD$	1. Given
2. $\angle EFD \cong \angle BFC$	2. Vert. ∡ Thm.
3. $\angle AFB \cong \angle BFC$	3. Trans. Prop. of ≅
4. $\overrightarrow{FB}$ bisects $\angle AFC$.	4. Def. of ∠ bisector

24. It is given that $\angle AFB \cong \angle EFD$. By Vert. ∡ Thm., $\angle EFD \cong \angle BFC$. Therefore, $\angle AFB \cong \angle BFC$ by Trans. Prop. of ≅. So $\overrightarrow{FB}$ bisects $\angle AFC$. by Def. of ∠ bisector.

25.



COLLEGE ENTRANCE EXAM PRACTICE, PAGE 135

1. C
Think: Use (def. of ≅ ∡ and) Vert. ∡ Thm. to get 2nd equation.

$m\angle 1 = m\angle 2$	$m\angle 1 = m\angle 5$
$60 = 3x$	$60 = x + y$
$x = 20$	$60 = 20 + y$
	$y = 40$

2. E
I and III contained in biconditional; II is contrapositive of I

3. D
Contrapositive of "If p, then q" is "If $\sim q$, then $\sim p$."

4. C
Use the Pyth. Thm.
$DE^2 = 3^2 + 2^2$
$= 9 + 4 = 13$
$DE = \sqrt{13}$

5. B
A is never true, C, D, and E are only sometimes true.

Solutions Key

Problem Solving On Location

CHAPTER 2, PAGES 140–141

THE MYRTLE BEACH MARATHON , PAGE 140

1. Both given rates are equivalent to 7.8 mi/h; time to complete marathon: $(7.8)(26) = 202.8$ min $\approx 3\frac{1}{3}$ h.

2. There are 5 pts. with medical station and portable toilets: at 6 mi, 12 mi, 18 mi, 24 mi, and 26 mi.

3. Let x and y be distances from HQ to viewing stand and from viewing stand to 29th Ave. N.
Given information: $x + y = 3.25y$, so $x = 2.25y$.
From map,
$1.7 + x + y = 4.3$
$3.25y = 2.6$
$y = 0.8$
$x = 2.25y$
$= 2.25(0.8) = 1.8$ mi

SOUTH CAROLINA'S WATERFALLS , PAGE 141

1. Waterfalls < 100 ft with 1-way trail length ≥ 1.5 mi: Mill Creek Falls or Yellow Branch Falls

2a. F; round-trip hike to Mill Creek Falls is > 4 mi, but falls are < 400 ft tall

b. F; If you hike to Raven Cliff, then you have seen a waterfall that is ≥ 200 ft tall.

c. T

3. Let height of middle falls be x.
$x + x + (x + 15) = 120$
$3x = 105$
$x = 35$
Heights are 35 ft, 35 ft, and $35 + 15 = 50$ ft.

CHAPTER 4, PAGES 294–295

THE QUEEN'S CUP, PAGE 294

1. Think: Calculate new bearing at each change of direction.
At A: $50° + 43° = 93°$, so new bearing is S 43° E.
At C: $43° + 62° = 105°$, so new bearing is N 62° E.
At E: $62° + 20° = 82°$, so new bearing is S 20° E.

2. Speed over first 49 mi is about 10 mi/h. So race distance (about 80 mi) should take about 8 h.

3. Yes; there is enough information to find $m\angle MXY$ (101°). MX and MY are know, so a unique $\triangle MXY$ is determined by SAS.

THE AIR ZOO, PAGE 295

1. Think: 7-month data will give most reliable mean painting rate. Use proportions.
$$\frac{n}{28{,}800} = \frac{7}{18{,}327}$$
$$n = \frac{7}{18{,}327}(28{,}800) \approx 11 \text{ mo}$$

2. $m\angle DGF = m\angle EFG = 29°$ (Alt. Int. $\angle$)
$m\angle EGF = m\angle DGF = 29°$ (bisected $\angle$)
$m\angle FEG = 180 - (29 + 29)$
$= 180 - 58 = 122°$
$m\angle AEG = 180 - m\angle FEG = 58°$

3. Think: Solve a Simpler Problem. From diagram, $d + 150 = 1000$, so $d = 850$ ft.

CHAPTER 6, PAGES 448–449

HANDMADE TILES, PAGE 448

1. Height of tile is $h = \frac{1}{2}(4) = 2$ in.; base is $b = 6$ in.; overlap width is $x = 2\sqrt{3}$ in.
Can cut mn tiles, for greatest m and n such that $mb + x \leq 40$ and $nh \leq 12$. So $m \leq \frac{1}{6}\left(40 - 2\sqrt{3}\right) \approx 6.1$ and $n \leq \frac{12}{2} = 6$. Therefore $m = n = 6$, so $(6)(6) = 36$ tiles can be cut.

2. Inside boundary of rect. must be 25 in. by 49 in. Shorter bases of tiles meet at corners; so if $2m + 1$ tiles fit along 25-in. side,
$(m + 1)(1) + m(3) = 25$
$4m + 1 = 25$
$4m = 24$
$m = 6$
So $2(6) + 1 = 13$ tiles fit along each 25-in. side.
Similarly, if $2n + 1$ tiles fit along 49-in. side,
$(n + 1)(1) + n(3) = 49$
$4n + 1 = 49$
$4n = 48$
$n = 12$
So $2(12) + 1 = 25$ tiles fit along each 49-in. side.
Total number of tiles $= 2(13) + 2(25) = 76$ tiles.

3. Let a and b be shorter and longer half-diagonal lengths, so $2a = b$. Each $\triangle$ formed by diags. is a rt. $\triangle$ with sides a, $2a$, and 7, such that
$a^2 + (2a)^2 = 7^2$
$5a^2 = 49$
$a^2 = 9.8$
$a = \sqrt{9.8}$
Diag. lengths are $2\sqrt{9.8} \approx 6.26$ cm and $4\sqrt{9.8} \approx 12.52$ cm.

THE MILLENNIUM FORCE ROLLER COASTER, PAGE 449

1. $\ell = 310\sqrt{2} \approx 438.4$ ft

2. $\ell = vt$
$438.4 \approx 20t$
$t \approx 22$ s