

LESSON
2.2

Practice A

For use with the lesson "Analyze Conditional Statements"

Rewrite the conditional statement in if-then form.

- You have a fever if your body temperature is 103°F .
- A deer is albino if it has white fur and pink eyes.
- I'll buy that CD for you if you want it.
- A pickup truck is a vehicle with a high utility value.

Write the converse, inverse, and contrapositive of the if-then statement.

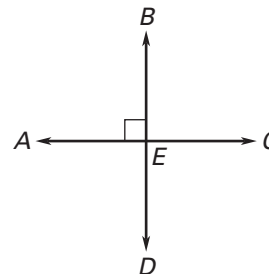
- If water is frozen, then its temperature is below 0°C .
- If $x + 3 = 5$, then $x = 2$.

For the given statement, write the if-then form, the converse, the inverse, and the contrapositive and indicate whether each statement is *true* or *false*.

- When it rains, it pours.
- Any four collinear points are coplanar.

Use the previous statements, the diagram, and the definitions or properties that you have learned to explain why the statement is true.

- $\overleftrightarrow{AC} \perp \overleftrightarrow{BD}$
- $\angle AEB$ and $\angle BEC$ are adjacent angles.
- $\angle AEB$ and $\angle BEC$ are a linear pair.
- $m\angle AEB + m\angle BEC = 180^{\circ}$
- $\angle BEC$ is a right angle.



LESSON
2.2**Practice A** *continued*
For use with the lesson "Analyze Conditional Statements"

Rewrite the definition as an if-then statement. Then write the converse of the if-then statement. Finally, write the definition as a biconditional statement.

14. The midpoint of a segment is a point that divides the segment into two congruent segments.
15. Two angles are complementary angles if the sum of their measures is 90° .
16. Adjacent angles are two angles that share a common vertex and side, but have no common interior points.
17. In an equilateral polygon, all sides are congruent.

Decide whether the statement is a valid definition.

18. If a polygon is both equilateral and equiangular, then the polygon is a regular polygon.
19. If a polygon is a square, then the polygon has four congruent sides.
20. If a figure is a line, then the figure has one dimension.
21. **Scuba Diving** The word scuba originated as an acronym for "Self Contained Underwater Breathing Apparatus." Here is a definition of scuba diving.

If a person is scuba diving, then the person is using independent breathing equipment to stay underwater for long periods of time.

Decide whether the converse, the inverse, and the contrapositive of this definition are *true* or *false*.

22. **Skydiving** The statement below describes one of the reasons that overconfidence in a novice skydiver can add danger to a jump.

If a skydiver attempts high speed maneuvers close to the ground, then the jump will have a high risk factor.

Decide whether the converse, the inverse, and the contrapositive of this statement are *true* or *false*. If false, *explain* why.

Lesson 2.1 Use Inductive Reasoning, continued

2. 2, 6, 18, 54, 162; Each number is three times the previous number.

3. 8, 12, 18, 27, 40.5, 60.75; Each number is 1.5 times the previous number.

4. 4, 7.5, 14.5, 28.5, 56.5, 112.5, 224.5, 448.5, 896.5, 1792.5, 3584.5; Each number is 2 times the previous number minus 0.5.

5. a. *Sample answers:*

$4 = 2 + 2$; $6 = 3 + 3$; $8 = 3 + 5$;
 $10 = 3 + 7$; $12 = 5 + 7$; $14 = 7 + 7$;
 $16 = 3 + 13$; $18 = 5 + 13$; $20 = 3 + 17$;
 $22 = 11 + 11$; $24 = 5 + 19$;
 $26 = 13 + 13$; $28 = 11 + 17$;
 $30 = 13 + 17$; $32 = 13 + 19$;
 $34 = 17 + 17$; $36 = 17 + 19$;
 $38 = 19 + 19$; $40 = 3 + 37$

b. *Sample answers:*

$7 = 3 + 2 \cdot 2$; $9 = 3 + 2 \cdot 3$;
 $11 = 5 + 2 \cdot 3$; $13 = 3 + 2 \cdot 5$;
 $15 = 5 + 2 \cdot 5$; $17 = 3 + 2 \cdot 7$;
 $19 = 5 + 2 \cdot 7$; $21 = 7 + 2 \cdot 7$

c. *Sample answers:*

True: $6 = 2 + 2 + 2$; $7 = 2 + 2 + 3$;
 $9 = 3 + 3 + 3$; $10 = 2 + 3 + 5$;
 $11 = 3 + 3 + 5$; $12 = 2 + 5 + 5$
 False: 3, 4, 5



b.

Points	2	3	4	5	6
Regions	2	4	8	16	?

c. The number of regions in a circle with n points on the circle is 2^{n-1} .

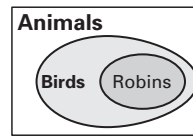
d. For 6 points, there are 30 regions formed. The conjecture made in part (c) is not true because $2^{6-1} = 32$.

Lesson 2.2 Analyze Conditional Statements

Teaching Guide

1. True; all of the beagles oval is within the dogs oval. 2. False. *Sample answer:* Part of the dogs oval is not in the beagles oval. 3. False. *Sample answer:* Part of the animals rectangle is not in the

dogs oval. 4. True; all of the dogs oval is in the animals rectangle. 5. *Sample answer:* The diagram shows all of the robins oval inside the birds oval. There are birds that are not in the robins oval.



Practice Level A

1. If your body temperature is 103°F , then you have a fever. 2. If a deer has white fur and pink eyes, then it is an albino. 3. If you want that CD, then I'll buy it for you. 4. If a vehicle is a pickup truck, then it has a high utility value.

5. converse: If the temperature of water is below 0°C , then it is frozen; inverse: If water is not frozen, then its temperature is not below 0°C ; contrapositive: If the temperature of water is not below 0°C , then it is not frozen.

6. converse: If $x = 2$, then $x + 3 = 5$; inverse: If $x + 3 \neq 5$, then $x \neq 2$; contrapositive: If $x \neq 2$, then $x + 3 \neq 5$. 7. if-then: If it rains, then it pours; false; converse: If it pours, then it rains; true; inverse: If it doesn't rain, then it doesn't pour; true; contrapositive: If it doesn't pour, then it doesn't rain; false. 8. if-then: If four points are collinear, then they are coplanar; true; converse: If four points are coplanar, then they are collinear; false; inverse: If four points are not collinear, then they are not coplanar; false; contrapositive: If four points are not coplanar, then they are not collinear; true. 9. Because $\angle AEB$ is marked as a rt. \angle , the statement is true by the def. of perpendicular lines. 10. Because they share vertex E and side \overline{EB} , but have no common interior parts, the statement is true by the def. of adjacent \sphericalangle s. 11. The noncommon sides are opposite rays by definition, so the adjacent angles are a linear pair by definition.

12. The statement is true because the angles in a linear pair are supplementary angles and by the definition of supplementary angles.

13. Because $\angle AEB$ is a rt. \angle , its measure is 90° , which can be substituted in the statement in Exercise 12. 14. if-then: If a point is the midpoint of a segment, then the point divides the segment into two congruent segments; converse: If a point divides a segment into two congruent segments, then the point is the midpoint of the

Lesson 2.2 Analyze Conditional Statements, continued

segment; biconditional: A point is the midpoint of a segment if and only if it divides the segment into two congruent segments. **15.** if-then: If the sum of the measures of two angles is 90° , then the two angles are complementary angles; converse: If two angles are complementary angles, then the sum of their measures is 90° ; biconditional: Two angles are complementary angles if and only if the sum of their measures is 90° .

16. if-then: If two angles are adjacent angles, then they share a common vertex and side, but have no common interior points; converse: If two angles share a common vertex and side, but have no common interior points, then the angles are adjacent angles; biconditional: Two angles are adjacent angles if and only if they share a common vertex and side, but have no common interior points. **17.** if-then: If a polygon is an equilateral polygon, then all of its sides are congruent; converse: If all of the sides of a polygon are congruent, then the polygon is an equilateral polygon; biconditional: A polygon is an equilateral polygon if and only if all of its sides are congruent. **18.** valid **19.** not valid: the converse is not true **20.** not valid: the converse is not true **21.** converse: true; inverse: true; contrapositive: true **22.** converse: false; other factors could cause the high risk factor; inverse: false; other factors could cause a high risk factor; contrapositive: true

Practice Level B

- If it is 6 P.M., then it is time for dinner.
- If the carton is full, then there are 12 eggs.
- If an angle is obtuse, then it measures more than 90° and less than 180° . **4.** If there is gas in the tank, then the car will run.
- converse: If you go to the hockey game, then you like hockey; inverse: If you do not like hockey, then you do not go to the hockey game; contrapositive: If you do not go to the hockey game, then you do not like hockey. **6.** converse: If $3x$ is odd, then x is odd; inverse: If x is not odd, then $3x$ is not odd; contrapositive: If $3x$ is not odd, then x is not odd. **7.** true **8.** false; $x = \pm 6$
- true **10.** true **11.** If an angle is acute, then it measures 30° . **12.** converse: If the sum of the measures of two angles is 180° , then they are

supplementary; biconditional: Two angles are supplementary if and only if the sum of their measures is 180° . **13.** converse: If two circles have the same circumference, then they have the same diameter; biconditional: Two circles have the same circumference if and only if they have the same diameter. **14.** If an animal lives in the forest, then it is a panther. **15.** conditional statement: If two lines are perpendicular, then they intersect to form right angles; converse: If two lines intersect to form right angles, then the two lines are perpendicular.

16. conditional statement: If a point is a midpoint of a segment, then it divides the segment into two congruent segments; converse: If a point divides a segment into two congruent segments, then the point is the midpoint of the segment. **17.** yes **18.** yes **19.** No; the angles could be in a triangle. **20.** A saxophone that has a frequency of 69 cycles per second to 415 cycles per second is called an E-flat baritone saxophone. **21.** A saxophone that has a frequency of 103 cycles per second to 622 cycles per second is called a B-flat tenor saxophone. **22.** A saxophone that has a frequency of 138 cycles per second to 830 cycles per second is called an E-flat alto saxophone. **23.** The saxophone is an E-flat baritone saxophone. **24.** nothing; It could be any of the three saxophones.

Practice Level C

- If a car has leaking antifreeze, then it has a problem. **2.** If you don't have something nice to say, then don't say anything at all. **3.** If a dog is old, then you cannot teach it new tricks. **4.** If a blood vessel carries blood toward the heart, then it is a vein. **5.** Learn from your mistakes.
- Easy come, easy go. **7.** Let sleeping dogs lie.
- What you see is what you get.
- if-then: If a circle has a radius of r , then it has a circumference of $2\pi r$: true; converse: If a circle has a circumference of $2\pi r$, then it has a radius of r : true; inverse: If a circle does not have a radius of r , then it does not have a circumference of $2\pi r$: true; contrapositive: If a circle does not have a circumference of $2\pi r$, then it does not have a radius of r : true **10.** if-then: If two angles are adjacent, then they share a common side: true; converse: If two angles share a common side, then