

LESSON
2.2**Practice B***For use with pages 81–87***Write an equivalent conditional statement in if-then form.**

1. It is time for dinner if it is 6 P.M.
2. There are 12 eggs if the carton is full.
3. An obtuse angle is an angle that measures more than 90° and less than 180° .
4. The car runs when there is gas in the tank.

Write the converse, inverse, and contrapositive of each statement.

5. If you like hockey, then you go to the hockey game.

6. If x is odd, then $3x$ is odd.

Decide whether the statement is *true* or *false*. If false, provide a counterexample.

7. The equation $4x - 3 = 12 + 2x$ has exactly one solution.
8. If $x^2 = 36$, then x must equal 18 or -18 .
9. If $m\angle A = 122^\circ$, then the measure of the supplement of $\angle A$ is 58° .
10. Two lines intersect in at most one point.

Write the converse of each true statement. If the converse is also true, combine the statements to write a true biconditional statement.

11. If an angle measures 30° , then it is acute.

12. If two angles are supplementary, then the sum of their measures is 180° .

13. If two circles have the same diameter, then they have the same circumference.

14. If an animal is a panther, then it lives in the forest.

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Rewrite the biconditional statement as a conditional statement and its converse.

15. Two lines are perpendicular if and only if they intersect to form right angles.
16. A point is a midpoint of a segment if and only if it divides the segment into two congruent segments.

Decide whether the statement is a valid definition.

17. If a number is divisible by 2 and 3, then it is divisible by 6.
18. If two angles have the same measure, then they are congruent.
19. If two angles are not adjacent, then they are vertical angles.

In Exercises 20–22, use the information in the table to write a definition for each type of saxophone.

Instrument	Frequency (cycles per second)	
	Lower limit (Hz)	Upper limit (Hz)
E-flat baritone saxophone	69	415
B-flat tenor saxophone	103	622
E-flat alto saxophone	138	830

20. E-flat baritone saxophone
21. B-flat tenor saxophone
22. E-flat alto saxophone

In Exercises 23 and 24, use the information in the table above and the answers to Exercise 20–22.

23. If the frequency of a saxophone was 95 Hz, what could you conclude?
24. If the frequency of a saxophone was 210 Hz, what could you conclude?

Lesson 2.1, continued

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

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 \angle 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 by the linear pair postulate.

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 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

1. If it is 6 P.M., then it is time for dinner. 2. If the carton is full, then there are 12 eggs. 3. 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. 5. 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; $x = \pm 6$ 9. 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

Lesson 2.2, continued

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

1. 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.

6. Easy come, easy go. **7.** Let sleeping dogs lie.

8. What you see is what you get.

9. 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 they are adjacent: false; inverse: If two angles are not adjacent, then they do not share a common side: false; contrapositive: If two angles do not share a common side, then they are not adjacent: true **11.** false; def. of opp. rays not satisfied because F does not lie between C and E

12. true; by def. of adj. \sphericalangle because they share vertex F and side \overline{FE} , but have no common interior points **13.** false; they are not adjacent, so def. of linear pair not satisfied

14. true; by def. of linear pair, because they are adjacent and their noncommon sides are opp. rays

15. false; $\angle CFE$ and $\angle DFE$ are supplementary, so the sum of their measures is 180° and because they are \cong , the measure of each is 90° .

16. true; by def. of perpendicular lines, because they intersect to form a rt. \angle **17.** A statement is a conditional statement if and only if it is a logical statement that has two parts, a hypothesis and a conclusion. **18.** A statement is a conjecture if and only if it is an unproven statement that is based on observations. **19.** A situation is a counterexample if and only if it represents a specific case for which a given conjecture is false. **20.** A figure is a polygon if and only if it is a closed plane figure that is formed by three or more sides, with each side intersecting exactly two other sides, one at each endpoint, so that no two sides with a common endpoint are collinear. **21.** valid

22. not valid: a regular polygon is not limited to exactly five sides. **23.** valid **24.** not valid: does not specify wind speed. **25.** not valid: does not specify that it must form over Atlantic Ocean.

26. not valid: does not specify that it must be a cyclone. **27.** not valid: does not specify that the cyclone must form in the tropics. **28.** valid

Review for Mastery

1. If-then: If the measure of an angle is 180° , then the angle is a straight angle. True.

Converse: If an angle is a straight angle, then the measure of the angle is 180° . True. **Inverse:** If the measure of an angle is not 180° , then the angle is not a straight angle. True. **Contrapositive:** If an angle is not a straight angle, then the measure of the angle is not 180° . True. **2. If-then:** If an animal is a cat, then it is a mammal. True.

Converse: If an animal is a mammal, then it is a cat. False. There are mammals that are not cats.

Inverse: If an animal is not a cat, then it is not a mammal. False. There are mammals that are not cats. **Contrapositive:** If an animal is not a mammal, then it is not a cat. True. **3.** True; Both angles are right angles, so the sum of their measures is 180° . **4.** False; The two lines do not intersect. **5.** Two angles are complementary