LESSON 4.4 **Exercise Set A**

MM1G2a Use conjecture, inductive reasoning, deductive reasoning, counterexamples, and indirect proof as appropriate.

Determine if statement (3) follows from statements (1) and (2) by either the Law of Detachment or the Law of Syllogism. If it does, state which law was used. If it does not, write invalid.

1. (1) If an angle measures more than 90°, then it is not acute.

(2) $m\angle ABC = 120°$

(3) $\angle ABC$ is not acute.

2. (1) All 45° angles are congruent.

(2) $\angle A \cong \angle B$

(3) $\angle A$ and $\angle B$ are 45° angles.

3. (1) If you order the apple pie, then it will be served with ice cream.

(2) Matthew ordered the apple pie.

(3) Matthew was served ice cream.

4. (1) If you wear the school colors, then you have school spirit.

(2) If you have school spirit, then the team feels great.

(3) If you wear the school colors, then the team will feel great.

5. (1) If you eat too much turkey, then you will get sick.

(2) Kinsley got sick.

(3) Kinsley ate too much turkey.

6. (1) If $\angle 2$ is acute, then $\angle 3$ is obtuse.

(2) If $\angle 3$ is obtuse, then $\angle 4$ is acute.

(3) If $\angle 2$ is acute, then $\angle 4$ is acute.

In Exercises 7–9, decide whether *inductive* or *deductive* reasoning is used to reach the conclusion. *Explain* your reasoning.

7. Angela knows that Walt is taller than Peter. She also knows that Peter is taller than Natalie. Angela reasons that Walt is taller than Natalie.

8. Josh knows that Brand X computers cost less than Brand Y computers. All other brands that Josh knows of cost less than Brand X. Josh reasons that Brand Y costs more than all other brands.

9. For the past three Wednesdays, the cafeteria has served macaroni and cheese for lunch. Dana concludes that the cafeteria will serve macaroni and cheese for lunch this Wednesday.

10. If you live in Nevada and are between the ages of 16 and 18, then you must take driver's education to get your license. Anthony lives in Nevada, is 16 years old, and has his driver's license. Therefore, Anthony took driver's education. Decide whether *inductive* or *deductive* reasoning is used to reach the conclusion. *Explain* your reasoning.

In Exercises 11–14, state whether the argument is valid. *Explain* your reasoning.

11. Jeff knows that if he does not do his chores in the morning, he will not be allowed to play video games later the same day. Jeff does not play video games on Saturday afternoon. So, Jeff did not do his chores on Saturday morning.

12. Katie knows that all sophomores take driver education in her school. Brandon takes driver education. So, Brandon is a sophomore.

13. If Casey is elected, the income tax will be increased. The income tax was increased. So, Casey was elected.

14. If you study every day, then you will receive good grades. If you receive good grades, then you will get a good job. So, if you study every day, then you will get a good job.

In Exercises 15–18, use the true statements below to determine whether you know the conclusion is *true* or *false*. *Explain* your reasoning.

If Dan goes shopping, then he will buy a pretzel.

If the mall is open, then Jodi and Dan will go shopping.

If Jodi goes shopping, then she will buy a pizza.

The mall is open.

15. Dan bought a pizza.

16. Jodi and Dan went shopping.

17. Jodi bought a pizza.

18. Jodi had some of Dan's pretzel.

19. Robotics Because robots can withstand higher temperatures than humans, a fire-fighting robot is under development. Write the following statements about the robot in order. Then use the Law of Syllogism to complete the statement, "If there is a fire, then __?__."

    A. If the robot sets off the fire alarm, then it concludes there is a fire.

    B. If the robot senses high levels of smoke and heat, then it sets off a fire alarm.

    C. If the robot locates the fire, then the robot extinguishes the fire.

    D. If there is a fire, then the robot senses high levels of smoke and heat.

    E. If the robot concludes there is a fire, then it locates the fire.

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LESSON 4.4 **Exercise Set B**

MM1G2a   Use conjecture, inductive reasoning, deductive reasoning, counterexamples, and indirect proof as appropriate.

Write the statement that follows from the given statements. Indicate whether the *Law of Detachment* or the *Law of Syllogism* is used.

1. If Dr. Klein is well-rested for a surgical procedure, then she operates with precision. Dr. Klein got plenty of sleep to prepare for today's operation.

2. If we don't make any stops, then we'll make it to the stadium by 12:30 P.M. If we make it to the stadium by that time, then we should be in time to see the kickoff.

3. In a recreational basketball league, if a player receives two technical fouls in one game, then the player is ejected from the game. If a player is ejected from a game, then the player has to sit out the following game.

4. If the accused suspect has a valid alibi, then the police will not hold him. The crime occurred at 9:32 A.M. The suspect's place of business confirms that he was working with 22 other people from 7:00 A.M. to 4:00 P.M. on the same day.

5. Even when firefighters follow all relevant safety procedures, if they enter a burning building, then there is significant danger involved. A group of firefighters enters a burning warehouse to look for people.

6. The store manager knows that if tomorrow's sale is not advertised in the newspaper, then the store will lose money. If the newspaper does not receive the order for the advertisement soon enough, then they will not be able to put it in tomorrow's newspaper.

Use deductive reasoning along with one of the laws of logic to write the statement that follows from the given statements. Indicate whether the *Law of Detachment* or the *Law of Syllogism* is used.

7. If a company's taxable income is reduced by $10,000, then it will go into a lower tax bracket. If the company contributes money to a certain charity, then it will reduce its taxable income by 50% of the amount contributed.

8. If you park a car on a hill, then you should set the parking brake. You park the car facing down a steep grade on a busy street.

9. If you take the absolute value of a positive number, then the value of the result is the number. You take the absolute value of a perfect square.

10. If the ice on a lake becomes brittle, it may not be safe to walk on the ice for up to 24 hours. If there is a large, rapid decrease in air temperature, then the lake ice becomes brittle.

11. If an object has a greater volume than an equivalent mass of water, then the object will float in water. A ball has three times the volume of an equivalent mass of water.

12. If a car is moving at a speed of 50 miles per hour, then it takes 175 feet to stop the car on average. The car is traveling at 50 miles per hour when another vehicle pulls directly into its path.

Exercise Set B *(continued)*

Decide whether *inductive* or *deductive* reasoning is used to reach the conclusion. *Explain* your reasoning.
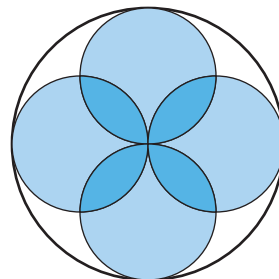
13. You diet for 3 weeks and lose 3 pounds. You conclude that you can lose 20 more pounds in the next 20 weeks.

14. You use the rise of 8.1 and the run of 2.7 between two points on a line in the coordinate plane to conclude that the slope of the line is 3.

15. It is the last day of the month and you want to buy a new jacket. Because you always run out of money by the end of the month, you conclude that there is not enough money in your checking account for the jacket.

16. Multiple Representations The points $(-2, -1)$, $(-1, 1)$, and $(0, 3)$ lie on a line.

    a. Making a Table Copy and complete the table below to find two additional points that lie on the line. Does this method use inductive or deductive reasoning?

x-coordinate	−2	−1	0	1	2
y-coordinate	−1	1	3	?	?

    b. Writing an Equation Use the given points to write an equation for the line. Then use the equation to find two additonal points that lie on the line. Does this method use inductive or deductive reasoning?
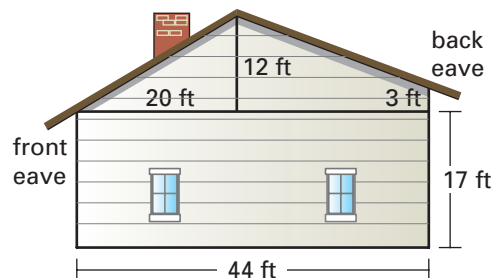
In Exercises 17 and 18, use the figure at the right.

17. Based on the appearance of the circles in the figure, use inductive reasoning to make a conjecture about how the area of one circle compares to the area of another circle with a radius that is twice as long.

18. Use deductive reasoning and the formula for the area of a circle to determine whether your conjecture in Exercise 17 is correct.

In Exercises 19 and 20, use the following information.

A roofing crew is replacing the roof on the house shown in the diagram. Safety guidelines call for a catch platform to be installed below the working area of a roof if it is more than 20 feet from the ground to the eave, or if it is more than 16 feet from the ground to the eave and the pitch rises more than 4 inches for each run of 12 inches. In either case, a catch platform is *not* required if each worker wears a safety belt attached to an approved lifeline.

19. What safety precautions are required on the front roof? *Explain* your reasoning.

20. What safety precautions are required on the back roof? *Explain* your reasoning.

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