



UNDERSTAND

7. **Mathematical Representations** Abby notices that for the first twenty perfect squares, each square is either a multiple of 5, one less than a multiple of 5, or one more than a multiple of 5.

| | | | | |
|-----|-----|-----|-----|-----|
| 1 | 4 | 9 | 16 | 25 |
| 36 | 49 | 64 | 81 | 100 |
| 121 | 144 | 169 | 196 | 225 |
| 256 | 289 | 324 | 361 | 400 |

She writes the following statement.

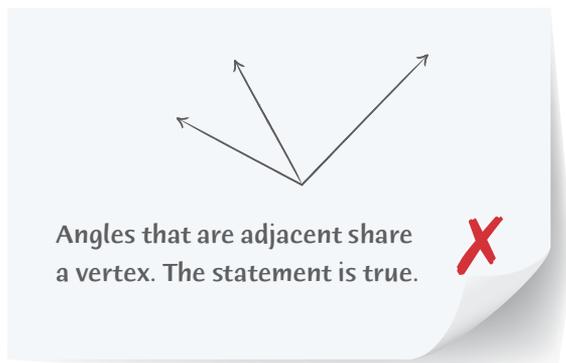
If n is a natural number, then n^2 can be written as $5k - 1$, $5k$, or $5k + 1$, where k is a whole number.

What type of statement did Abby make? Has she shown that her statement is true for all values of n ? Explain.

8. **Error Analysis** Danielle tests the following conjecture.

If two angles share a common vertex, then they are adjacent.

Her work is shown below. What error does Danielle make?



9. **Higher Order Thinking** Consider the following conjecture.

There are no prime numbers between 7,608 and 7,620.

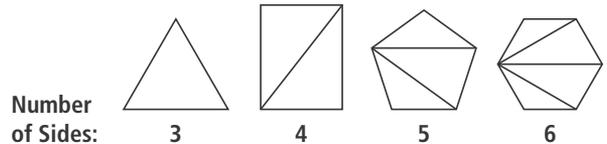
How could you show that this statement is true or false? Would it still be a conjecture if you do not find a counterexample? Explain.

PRACTICE

For each sequence, what appear to be the next three numbers? SEE EXAMPLE 1

10. 101, 89, 77, 65, ... 11. 9, 6, 4, $\frac{8}{3}$, ...

12. Observe the pattern made by the figures. Can you write a conjecture about the number of triangles formed by connecting one vertex of a polygon with n sides to each of the other vertices? SEE EXAMPLE 2



The table shows the number of students in the senior class and the number of students who have their driver's license. SEE EXAMPLE 3

| Year | 2014 | 2015 | 2016 | 2017 |
|--------------------|------|------|------|------|
| Total in Class | 341 | 367 | 309 | 382 |
| Total With License | 222 | 240 | 199 | 246 |

13. What pattern can you find between the number of seniors and the number who have a license?
14. The class of 2018 has 413 seniors. How many seniors in the class of 2018 do you think will have a driver's license?
15. Can you find a counterexample for the following statement? SEE EXAMPLE 4
- A trapezoid cannot have more than one right angle.
16. Support the following conjecture with 4 examples or disprove it with a counterexample. SEE EXAMPLE 5
- The quotient of two rational numbers is a rational number.

APPLY

17. **Model With Mathematics** Data from four identical trials on a new sleep herb are shown in the table.

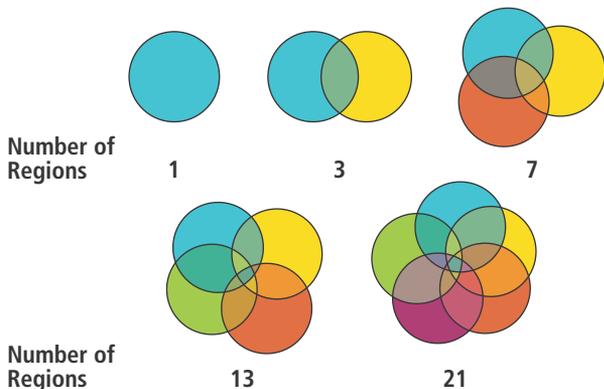
| Group | Number of Subjects | Number Who Reported Better Sleep |
|-------|--------------------|----------------------------------|
| A | 250 | 55 |
| B | 170 | 35 |
| C | 210 | 48 |
| D | 190 | 40 |

- a. What conjecture can you make about the effectiveness of the herb?
- b. The next trial will have 1,000 subjects. What is a reasonable prediction for the next trial?
18. **Make Sense and Persevere** Deshawn is given the following conjecture.

The first and third digits of a three-digit number are the same. If the second digit is equal to the sum of the first and third digits, then the number must be divisible by 11.

How can he determine whether the conjecture is true?

19. **Generalize** A graphic designer wants to know the number of regions that are formed when circles overlap in a particular way. Can she find a rule that describes how the number of regions increases when another circle is added to the design? How many regions would a design with 6 circles create?



ASSESSMENT PRACTICE

20. Consider the conjecture, "Any number divisible by 2 is also divisible by 4." Is each number a counterexample of the conjecture? Select Yes or No.

| | Yes | No |
|----|--------------------------|--------------------------|
| 12 | <input type="checkbox"/> | <input type="checkbox"/> |
| 19 | <input type="checkbox"/> | <input type="checkbox"/> |
| 22 | <input type="checkbox"/> | <input type="checkbox"/> |
| 28 | <input type="checkbox"/> | <input type="checkbox"/> |
| 30 | <input type="checkbox"/> | <input type="checkbox"/> |

21. **SAT/ACT** Which number is next in the following sequence?

1, 2, 2, 4, 8, 32,...

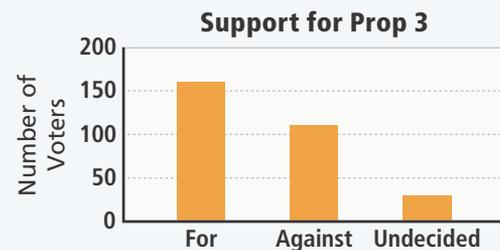
- (A) 64 (B) 84 (C) 106 (D) 256

22. **SAT/ACT** How many dots are in the n th term of the following sequence?



- (A) $n + 2$ (B) $2n + 1$
(C) $n^2 + 2$ (D) $n + 3$

23. **Performance Task** The graph shows data from a survey of 300 random voters on whether they support Proposition 3.



Part A Make a conjecture about the likelihood of Proposition 3 passing and explain your reasoning.

Part B If 7,500 people vote in the next election, how many people would you expect to vote for Proposition 3?