Benchmark Codes: MA.912.G.8.4

Lesson 10: Inductive Reasoning

Inductive reasoning is the process of arriving at a conclusion based on observations or results from a limited number of cases. Such observations and results can be gathered through measurements, calculations, or the senses. A conclusion reached by inductive reasoning is called a **conjecture**.

Using Inductive Reasoning

After collecting facts through observations and analyzing them, you can make a conjecture. By using inductive reasoning, you are stating that the pattern will continue.

Example

The following table shows the number of interior angles and the sum of their measures for polygons with 3, 4, 5, and 6 sides. Use inductive reasoning to make a conjecture about the relationship between the number of interior angles of a polygon and the sum of their measures.

Polygon	Number of Interior Angles	Sum of Measures of Interior Angles
Triangle	3	180°
Quadrilateral	4	360°
Pentagon	5	540°
Hexagon	6	720°

The sum of the interior angles of the polygons increases by 180° for each additional side. Therefore, the sum of the interior angles is equal to 180° times 2 less than the total number of sides. This can be represented as $180(n - 2)$, where n is the number of sides.

Practice

Directions: For questions 1 through 3, write a conjecture based on the circumstances.

1. Regina has earned an A on her last five math exams and has studied hard for her sixth.

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2. All of Krista's siblings are very talented musicians.

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3. That skateboarder has worked a flip into his last 11 ramp competitions.

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Directions: For questions 4 and 5, critique the given conjecture by using a ruler and a protractor to draw a counterexample.

4. Hope measures the angles of 10 pairs of congruent trapezoids. She conjectures that if two trapezoids have 4 pairs of congruent angles, then those two trapezoids must be congruent.

5. Larry measures the angles of 10 isosceles triangles. He conjectures that if two angles in a triangle are congruent, then the third angle must be obtuse.

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Validating a Conjecture

If a conjecture stands up to repeated inductive reasoning, it is considered **valid**. A valid conjecture is never true beyond all doubt. Rather, a conjecture is valid if no counterexample has been found after repeated testing.

Example

Emma makes the following conjecture: For each successive pair of consecutive integers, the difference between the expression $2n^2 - 1$ increases by 4. Emma is curious whether her conjecture is valid for numbers higher than 8.

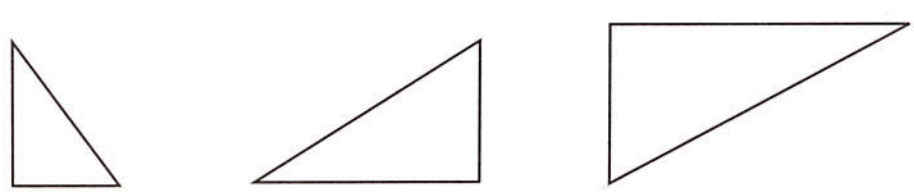
for $n = 8$, $2n^2 - 1 = 127$
for $n = 9$, $2n^2 - 1 = 161$ (difference = 34)
for $n = 10$, $2n^2 - 1 = 199$ (difference = 38)
for $n = 11$, $2n^2 - 1 = 241$ (difference = 42)
for $n = 12$, $2n^2 - 1 = 287$ (difference = 46)
for $n = 13$, $2n^2 - 1 = 337$ (difference = 50)
for $n = 14$, $2n^2 - 1 = 391$ (difference = 54)
for $n = 15$, $2n^2 - 1 = 449$ (difference = 58)

The difference between each pair of values increases by 4, so the conjecture is valid. But without a deductive solution, it is not absolutely proven.

Practice

1. Using measurement, Sally conjectures that the following three trapezoids are congruent. Use measurement to validate or invalidate her conjecture.

2. Sean conjectures that the following three triangles are similar. Use measurement to validate or invalidate his conjecture.



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