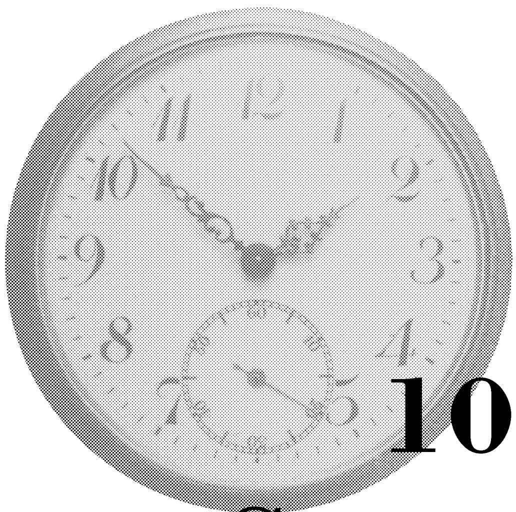

10-Minute Critical-Thinking Activities for Algebra

by

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Contents

To the Teacher

Critical-thinking skills include reasoning, predicting consequences, clarifying and assessing ideas, and judging the validity of an argument. Critical thinking in the mathematics classroom means finding patterns, solving problems in nontraditional settings, and analyzing change. We think of it as reasoning or thinking skills. Students who can think critically learn to examine results to "make sense of mathematics."

Algebra programs help students recognize and understand patterns, relations, and functions. Students learn to use algebraic symbols to represent and analyze mathematical questions. They learn to use mathematical models to understand quantitative relationships and to analyze change.

10-Minute Critical-Thinking Activities for Algebra is designed to

- promote problem solving and proportional reasoning
- develop basic mathematical concepts and skills
- encourage students to use patterns and analyze functions
- develop logical reasoning
- explore probability, statistics, and graphs

Students are asked to explain their reasoning and their problem-solving strategies. When students reflect on their problem solving, they develop mathematical and critical-thinking skills. They learn to assess the reasonableness of their answer, to consider other possible solutions, and to share their reasoning with other students. Students may discover other ways to solve a problem or more than one correct solution.

You and your students can take advantage of a *critical* 10 minutes every day. That adds up to 1,800 minutes a year, or about 40 additional mathematics classes over the course of a school year of 180 days! And who among us could not use eight more weeks of mathematics?

Part 1: Critical Thinking and Logic

As students sharpen and extend their skills, they learn to use inductive and deductive reasoning to formulate arguments. Thinking critically and reasoning logically are integral to doing mathematics.

In the first set of puzzles, students use Venn diagrams to describe and compare various elements of a problem. What these elements have in common or how they differ determines their placement in the overlapping circles. Students learn to read problems carefully to look for important information. They learn to distinguish the words *and, or, all,* and *only* to find solutions.

Students learn to read carefully and apply information from clues to solve matrix logic puzzles. It is a fun way to experience deductive reasoning.

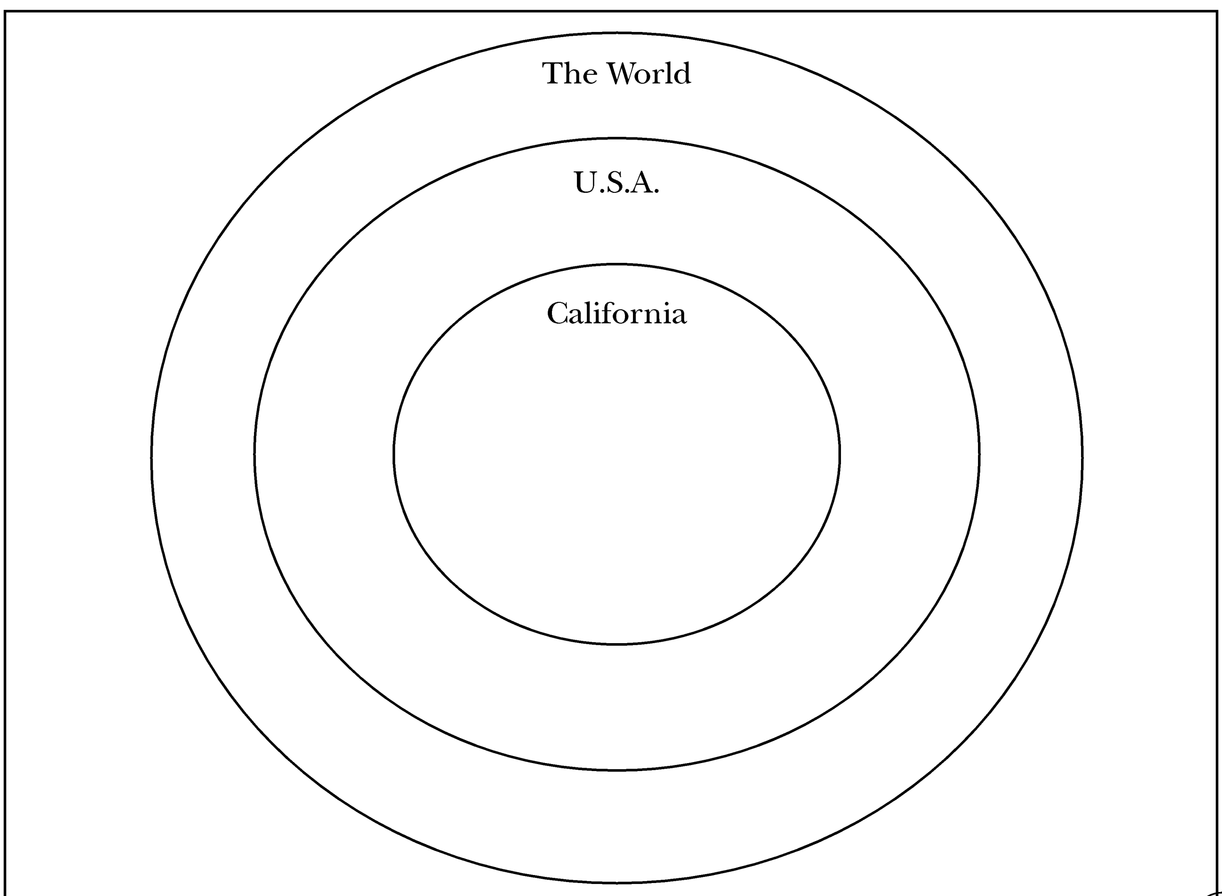
To solve any of the puzzles, students must be well organized and their thinking must be precise. They must learn to work methodically. These reasoning skills—the same as those required to solve any problem—are transferable to other areas.

Name ______________________________ Date ______________

Where Were They Born?

Place each of these celebrities in the circle that **best represents** the place he or she was born.

Rod Stewart, musician, England
Leonardo DiCaprio, actor, Hollywood
George Foreman, boxer, Texas
Andy Rooney, columnist, New York
Edward Teller, physicist, Hungary
Cameron Diaz, actor, San Diego
Oprah Winfrey, TV star, Mississippi
Marion Jones, athlete, Los Angeles
David Bowie, musician, England
Martin Luther King, Jr., civil rights leader, Georgia
Vidal Sassoon, hair stylist, England
Princess Caroline, Monaco
E.T., visitor from outer space



Name ______________________ Date ______________

Ladder Logic 1

Change the word at the top of each ladder into the word on the bottom. You can change one letter on each step, and each step has to contain a real word.

add
sum

---

less
more

Name ______________________ Date ______________

Ladder Logic 2

Change the word at the top of each ladder into the word at the bottom. You can change one letter on each step, and each step has to contain a real word.

black
white

nine
four

PART 3: Probability, Statistics, and Critical Thinking

Students are bombarded by data—in books and newspapers and on the Internet. If they don't understand how to organize and analyze data, they cannot make sense of it. Learning to judge the worth of statistical information and comprehend probability is central to the mathematics curriculum.

The activities in this chapter help students take a critical look at how to use the shape of the data (in graphs) to explain everyday occurrences. Students learn to understand probability and what it means to make valid statistical comparisons. The chapter opens with problems that make connections between geometry and probability: the greater the area, the greater the probability of occurence.

Students review fractions, number theory, and probability. They are encouraged to use their knowledge of combinations and permutations to think critically about advertising claims: How many choices are there? What are the chances of winning?

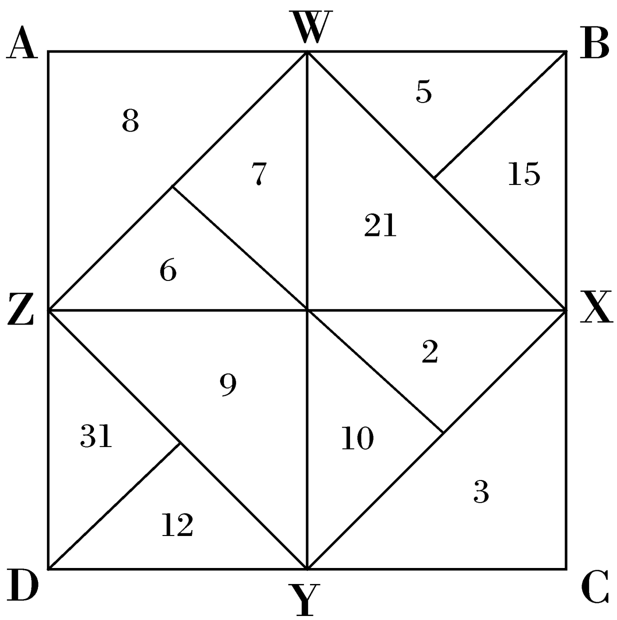
Each graph describes change over a period of time. Students learn that the shape of a graph tells a story.

Finally, students use real-world problems to explore probability.

Name ______________________ Date ______________

Hitting the Target 1

ABCD is a square. Use the diagram to answer the questions below.



Point W bisects $\overline{AB}$.

Point X bisects $\overline{BC}$.

Point Y bisects $\overline{DC}$.

Point Z bisects $\overline{AD}$.

If we threw darts at this target, what is the probability that we would hit

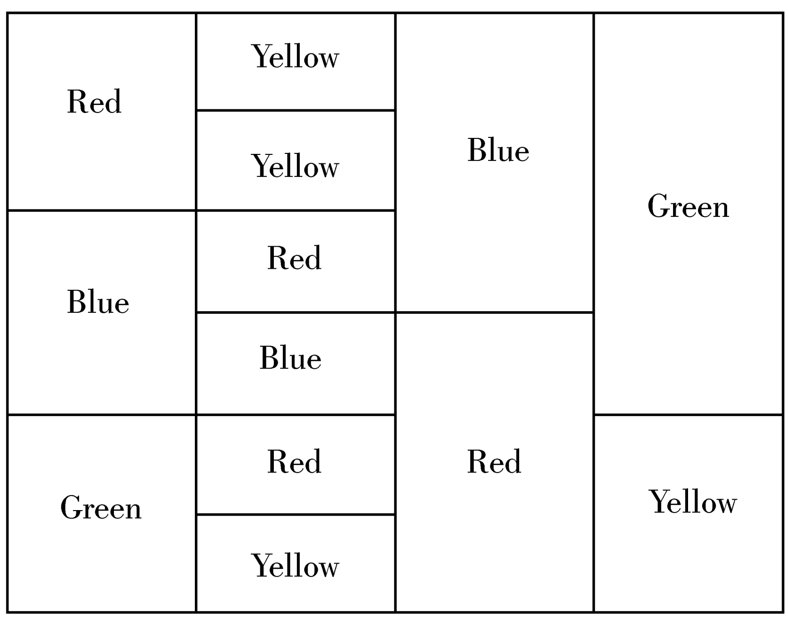
- an even number?
- a prime number?
- a number that is divisible by 3?
- a number that is divisible by both 3 and 9?
- a number that is divisible by 6?

Name ______________________________ Date ________________

Hitting the Target 2

This is a game board for a dart game. Four different players each choose one of the colors: red, yellow, green, or blue. When they hit their target color, they receive a point. If they hit an opponent's color, then the opponent gets the point.

- What is the probability that red will win? Yellow? Green? Blue?
- Is this game fair? Why or why not?
- How could you change the rules to make this a fair game?



PART 5: Patterns, Functions, and Critical Thinking

Mathematics is the study of patterns. As students develop the ability to generalize, color patterns progress to number patterns and sequences. Students learn to predict the *n*th term of a sequence.

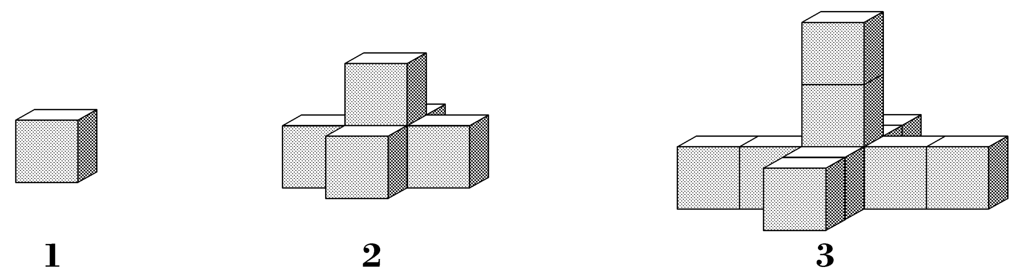
The problems in this chapter help students learn to use tables, graphs, words, and even rules to represent and analyze patterns. Some of the sequences have a twist—students look at a Fibonnaci-type sequence and use the pattern to develop a rule for all sequences of that type.

Number patterns, known as figurate numbers because their arrangements form polygons, can be quite challenging for students. Other problems in this chapter use geometric shapes to develop a pattern that can be generalized to a rule. Students are encouraged to use proportional reasoning and what they know to solve problems. By predicting the shape of a graph and then producing the graph, students learn how graphs and charts supply information and explain mathematical relationships.

Name ______________________ Date ______________

Building Blocks 1

We have built three simple structures using blocks. The number of blocks needed to build each one has been filled in on the table below.



Structure	1	2	3	4	5	20	100	*n*
Number of Blocks	1	6	11					

- What would the 4th and 5th structures look like? How many blocks would you need to build them? Complete the table. Do you see a pattern?

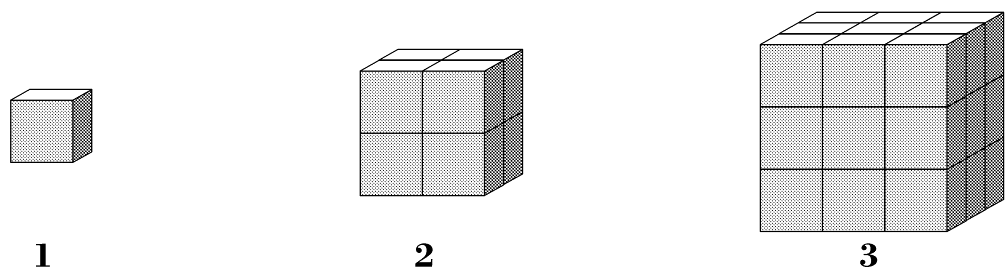
- Could you use this pattern to help you find how many blocks would be needed to build the 20th structure? the 100th structure? the *n*th structure?

- Explain your reasoning.

Name ______________________ Date ______________

Building Blocks 2

We have built three simple structures using blocks. The number of blocks needed to build each one has been filled in on the table below.



Structure	1	2	3	4	5	20	100	*n*
Number of Blocks	1	8	27					

- What would the 4th and 5th structures look like? How many blocks would you need to build them? Complete the table. Do you see a pattern?
- Could you use this pattern to help you find how many blocks would be needed to build the 20th structure? the 100th structure? the *n*th structure?
- Explain your reasoning.