Daily Warm-Ups
PRE-ALGEBRA
NCTM Standards

Betsy Berry, Ph.D.

Indiana University, Purdue University, Fort Wayne

Table of Contents

Introduction

I taught mathematics for many years at the middle- and high-school level. I know how precious every moment can be in a class period. The problems, exercises, activities, reflections, and writing prompts in this collection of warm-ups are just what I wish I had during those years. These warm-ups are organized in seven parts around selected concepts designated by the National Council of Teachers of Mathematics *Principles and Standards for School Mathematics:* Number Sense and Number Theory; Measurement; Understanding Patterns, Relations, and Functions; Understanding Algebraic Symbols; Developing Algebraic Thinking Through and for Mathematical Modeling; Analyzing Change in Various Contexts; and Data Analysis and Probability. The NCTM process standards, especially communication and representation, are also integrated within these activities.

The warm-ups address all the concepts and skills that can be considered pre-algebra within NCTM. The NCTM expectations within each topic area are for grades 6 through 8. Some problems address more than one standard or expectation, but have been placed in the respective section according to the topic area that I thought was best addressed by the activity.

The warm-ups are organized by standards rather than by level of difficulty. Use your judgement to select appropriate problems for your students. The problems are not meant to be done in consecutive order from the beginning of the book to the end. Some of these problems are stand-alone, some can launch a topic, some can be used for journal prompts, and some refresh students' skills and concepts. All are meant to enhance and complement pre-algebra instruction. They do so by providing resources for teachers for those short spaces of time of 5 to 15 minutes when class time might go unused.

—Betsy Berry, Ph.D.

About the CD-ROM

Daily Warm-Ups: Pre-Algebra, NCTM Standards is provided in two convenient formats: an easy-to-use, reproducible book and a ready-to-print PDF on a companion CD-ROM. You can photocopy or print activities as needed, or project them on a large screen via your computer.

The depth and breadth of the collection gives you the opportunity to pick and choose specific skills and concepts that correspond to your curriculum and instruction. The activities address all of the skills and concepts in the NCTM Standards considered pre-algebra. Use the table of contents and the information in the section introductions to help you select appropriate tasks.

Suggestions for use:

- Choose an activity to project or print out and assign.
- Select a series of activities. Print the selection to create practice packets for learners who need help with specific skills or concepts.

Part 1: Number Sense and Number Theory

National Council of Teachers of Mathematics: "Instructional programs from pre-kindergarten through grade 12 should enable all students to understand numbers, ways of representing numbers, relationships among numbers . . . understand meaning of operations and how they relate to one another, and compute fluently and make reasonable estimates."

Expectations

- Work flexibly with fractions, decimals, and percents to solve problems.
- Relate and compare different forms of representation for a relationship.
- Understand and use ratios and proportions to represent quantitative relationships.
- Compare and order fractions, decimals, and percents efficiently and find their approximate locations on a number line.
- Use factors, multiples, prime factorization, and relatively prime numbers to solve problems.
- Develop meaning for integers, and represent and compare quantities with them.
- Develop, analyze, and explain methods for solving problems involving proportions, such as scaling and finding equivalent ratios.

Where Do They Go?

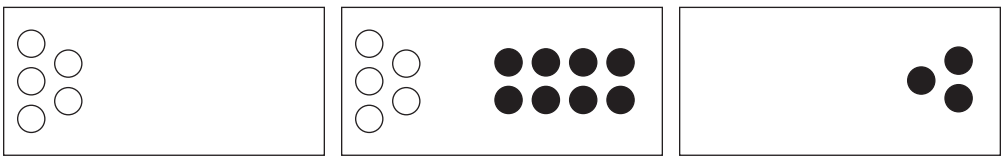
Using the number line below, show approximately where each number would fall. Explain your thinking.

1. $\sqrt{96}$
2. $\sqrt{35}$
3. $\sqrt{24}$
4. $\sqrt{17}$

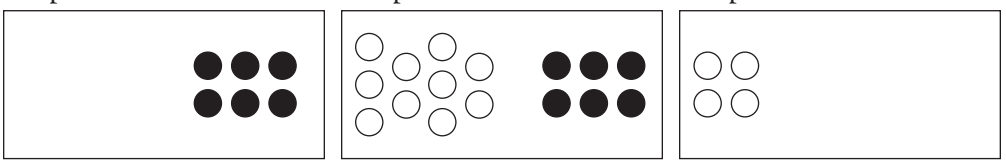
Chip-Board Integers I

Andrew and Brittany are exploring integers using several different models. They are drawing representations using black and white circular chips. The white chips represent positive numbers. The black chips represent negative numbers. Write a number sentence to symbolize each set of chip boards that they have drawn.

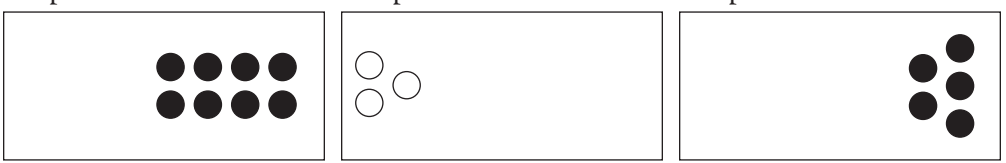
1. Chip board 1 Chip board 2 Chip board 3



2. Chip board 1 Chip board 2 Chip board 3



3. Chip board 1 Chip board 2 Chip board 3



Part 2: Measurement

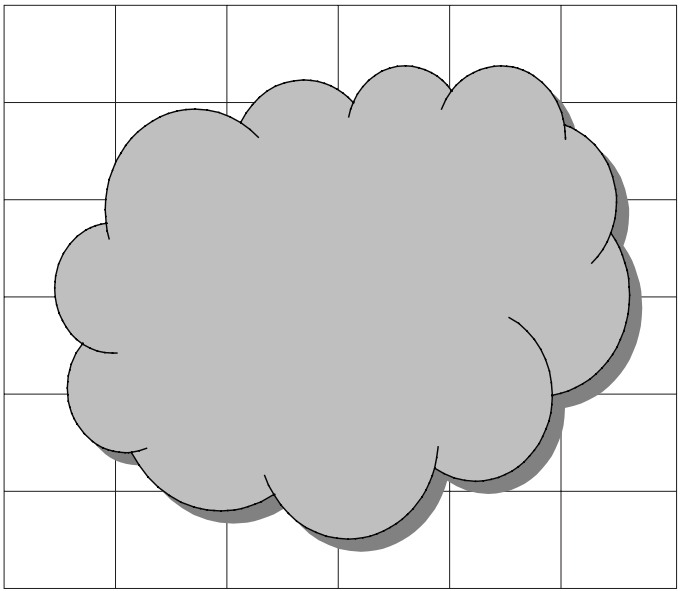
National Council of Teachers of Mathematics: "Instructional programs from pre-kindergarten through grade 12 should enable all students to understand measurable attributes of objects and the units, systems, and processes of measurement . . . and apply appropriate techniques, tools, and formulas to determine measurements."

Expectations

- Understand relationships among units and convert from one unit to another within the same system.
- Understand, select, and use units of appropriate size and type to measure angles, perimeter, area, surface area, and volume.
- Develop and use formulas to determine the circumference of circles and the area of triangles, parallelograms, trapezoids, and circles, and develop strategies to find the area of more complex shapes.
- Develop strategies to determine the surface area and volume of selected prisms, pyramids, and cylinders.
- Solve problems involving scale factors, using ratio and proportion.
- Solve simple problems involving rates and derived measurements for such attributes as velocity and density.

Blob Area

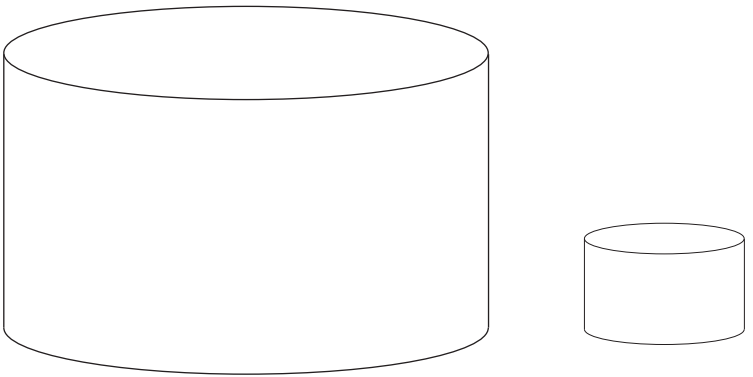
Zoe has created the picture below using her computer. Her grid consists of squares with 1-inch sides. Estimate the area of the blob Zoe has drawn on her grid.



42

Comparing Cylinders

Two cylinders are pictured below. All the dimensions of cylinder *A* are 3 times the dimensions of cylinder *B*.



56

1. What is the ratio of the radius of cylinder *A* to the radius of cylinder *B*?
2. What is the ratio of the height of cylinder *A* to the height of cylinder *B*?
3. What is the ratio of the surface area of cylinder *A* to the surface area of cylinder *B*?
4. What is the ratio of the volume of cylinder *A* to the volume of cylinder *B*?

Part 6: Analyzing Change in Various Contexts

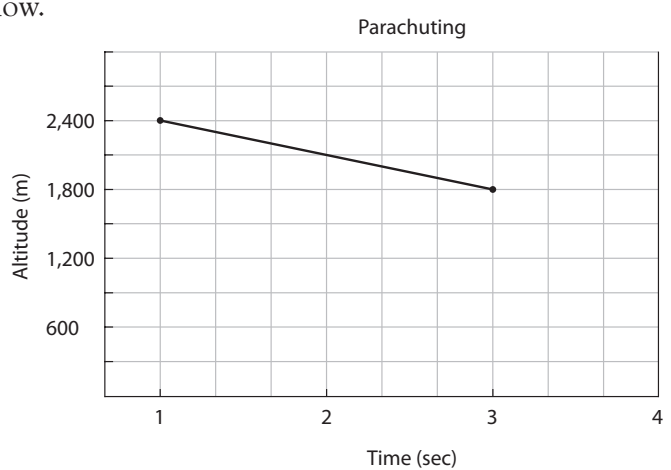
National Council of Teachers of Mathematics: "Instructional programs from pre-kindergarten through grade 12 should enable all students to analyze change in various contexts."

Expectations

- Use graphs to analyze the nature of changes in quantities in linear relationships.

Parachuting Down

Cecelia took her first parachute jump lesson last weekend. Her instructor gave her the graph below that shows her change in altitude in meters during a 2-second interval. Use the graph to answer the questions that follow.



150

1. What is the slope of the line segment?
2. Estimate Cecelia's average rate of change in altitude in meters per second.
3. Give the domain and range for this graph.

DVD Rentals

Rosa's parents just bought a new DVD player for the family. Rosa's mom asked her to research rental prices for DVDs online. More Movies has a yearly membership package. Rosa found the following table of prices on the company's web site.

More Movies DVD Rental-Membership Packages

Number of videos rented	0	5	10	15	20	25	30
Total cost	$30	$35	$40	$45	$50	$55	$60

On the Deluxe DVD Rentals web site, Rosa found that there was no membership package offered. She made the graph on the right to show how the cost at Deluxe DVD Rentals is related to the number of videos rented.

If both rental services have a comparable selection of DVDs and Rosa's family will watch on average about two movies a month, which service should they choose? Explain how Rosa's family might decide which service to use. Using the information about each service, describe the pattern of change relating the number of DVDs rented to the total cost.