Daily Warm-Ups
GEOMETRY
NCTM Standards

Jillian Gregory

Table of Contents

Introduction

The first few minutes of each class period are critical, as they set the tone for the entire lesson. Set your class on the right path with these warm-up problems, prompts, and brain benders. You can avoid wasted time by engaging your students from the minute they step in the classroom.

The warm-ups are organized in four parts based on the Geometry standards and expectations from the National Council of Teachers of Mathematics *Principles and Standards for School Mathematics*.

The standards for grades 9–12 include the following:

- Analyze characteristics and properties of two- and three-dimensional geometric shapes and develop mathematical arguments about geometric relationships.
- Specify locations and describe spatial relationships using coordinate geometry and other representational systems.
- Apply transformations and use symmetry to analyze mathematical situations.
- Use visualization, spatial reasoning, and geometric modeling to solve problems.

Each warm-up can be classified under more than one standard and several expectations within each standard. For ease of use, the warm-ups have been categorized under the standard that best represents the goal of the problem.

As a teacher, you can pick and choose the warm-ups you need each day based on your lesson plan. Therefore, the order in which you use the problems is at your discretion.

These warm-ups are a springboard to an engaging learning environment that will guarantee future success for your students.

About the CD-ROM

Daily Warm-Ups: Geometry, 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 NCTM Standards for Geometry. Use the table of contents and the information on the title pages for each part 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: Two- and Three-Dimensional Shapes

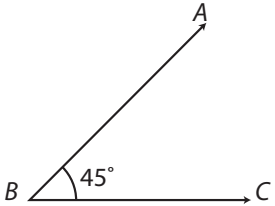
National Council of Teachers of Mathematics: "Analyze characteristics and properties of two- and three-dimensional geometric shapes and develop mathematical arguments about geometric relationships."

Expectations

- Analyze properties and determine attributes of two- and three-dimensional objects.
- Explore relationships (including congruence and similarity) among classes of two- and three-dimensional geometric objects, make and test conjectures about them, and solve problems involving them.
- Establish the validity of geometric conjectures using deduction, prove theorems, and critique arguments made by others.
- Use trigonometric relationships to determine lengths and angle measures.

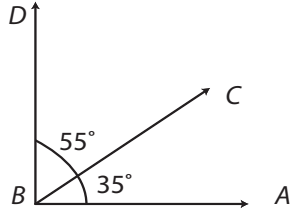
Vertex of an Angle

An **angle** is a plane figure formed by two rays that share a common endpoint. In the figure below, ray A and ray C share a common endpoint. The **vertex** of an angle is the point at which the two sides of the angle meet. The vertex is point B. This angle is written in notation form as $\angle ABC$ or $\angle CBA$.



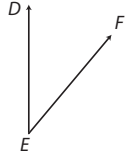
It is important to write the points on the angle in the appropriate order. Since B is the vertex in the angle on the left, it must be written in between points A and C.

The vertex of each angle on the right is B. The angles can be written as $\angle ABC$ or $\angle CBA$ and $\angle CBD$ or $\angle DBC$.

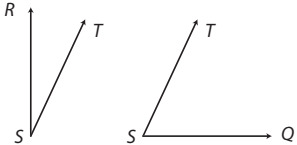


Name all the angles in each figure below.

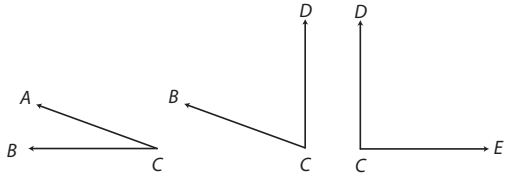
1.



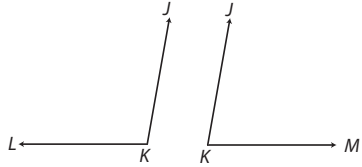
2.



3.



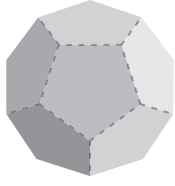
4.

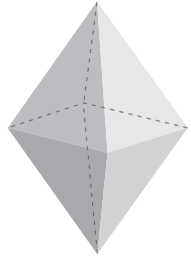


Properties of Polyhedrons

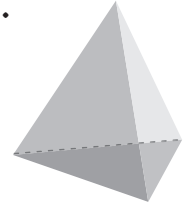
A **polyhedron** is a solid bounded by plane regions. The faces of the solid are polygons. The faces meet at common segments called **edges.** The edges have endpoints known as **vertices** of the polyhedron.

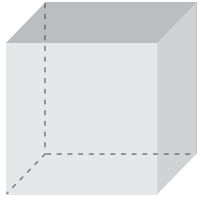
A regular polyhedron is a convex polyhedron whose faces are congruent regular polygons. The polygons are arranged in such a way that adjacent faces form congruent dihedral angles. Below are some examples of polyhedrons.

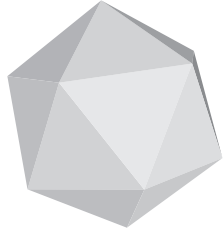
dodecahedron 

octahedron 

Give the specific name for each regular polyhedron below.

1. 

2. 

3. 

Part 2: Coordinate Geometry

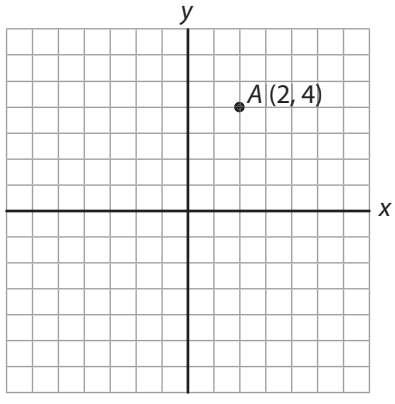
National Council of Teachers of Mathematics: "Specify locations and describe spatial relationships using coordinate geometry and other representational systems."

Expectations

- Use Cartesian coordinates and other coordinate systems, such as navigational, polar, or spherical systems, to analyze geometric situations.
- Investigate conjectures and solve problems involving two- and three-dimensional objects represented with Cartesian coordinates.

Points

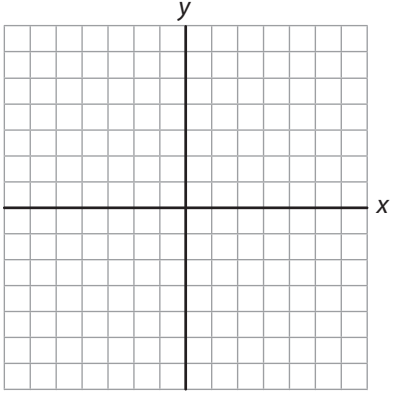
A point has location, but not size. A point is represented by a dot and an uppercase letter. Points can be located in the Cartesian coordinate system and are written as (x, y). Look at the example below. The ordered pair for point A is $(2, 4)$.

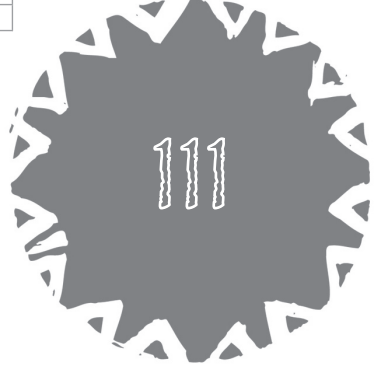


Example

Remember, the order of the coordinates matters.
For example, point $(2, 4)$ is not the same as point $(4, 2)$.

Plot the following points on the grid below:
$A(4, 3)$, $B(6, 6)$, $C(-1, 5)$, $D(-2, -4)$

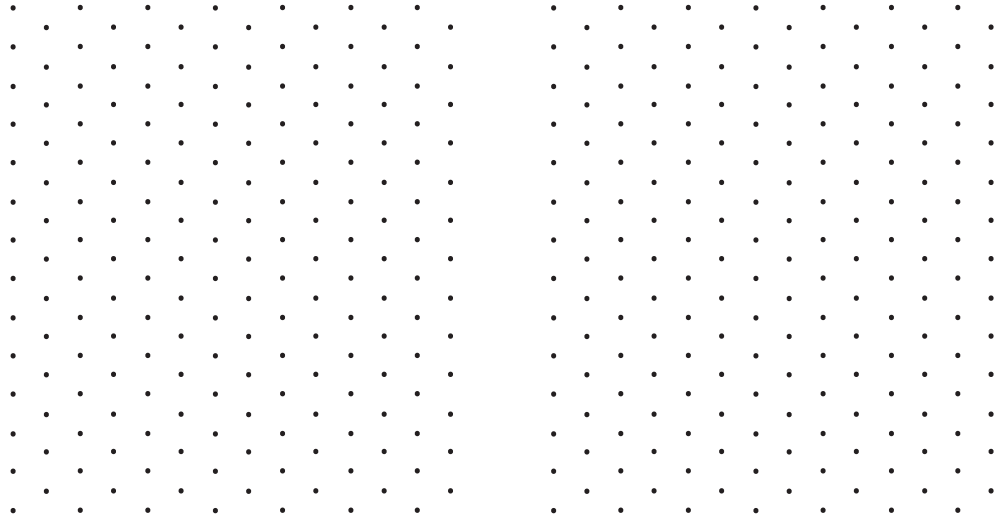




Graphing Solids

Use the isometric dot area below to sketch each solid.

1. a triangular prism with 3-4-5 right triangles as bases and a height of 6 units
2. a cube with an edge length of 5 units



Part 3: Transformations and Symmetry

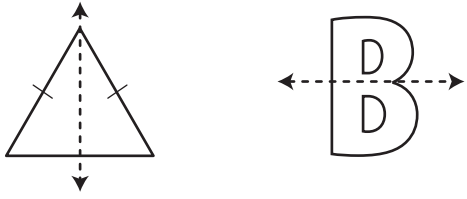
National Council of Teachers of Mathematics: "Apply transformations and use symmetry to analyze mathematical situations."

Expectations

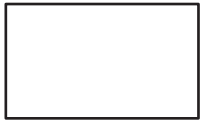
- Understand and represent translations, reflections, rotations, and dilations of objects in the plane by using sketches, coordinates, vectors, function notation, and matrices.
- Use various representations to help understand the effects of simple transformations and their compositions.

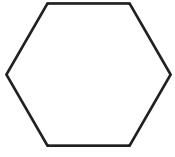
Line Symmetry

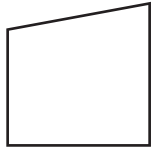
An isosceles triangle has a vertical line of symmetry. The letter *B*, however, has a horizontal line of symmetry.



For each figure, find the number of lines of symmetry. If possible, draw the lines of symmetry on the figure.

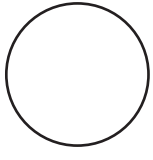
1. 

3. 

5. 

2. 

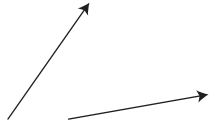
4. 

6. 

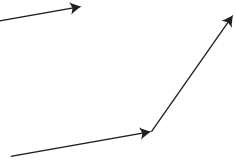
Adding Vectors

The sum of two vectors is called the **resultant.** Vectors can be added geometrically. Look at the example below.

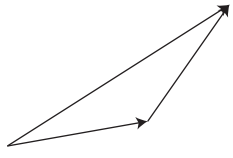
Example



- Add the vectors on the right using the triangle method.

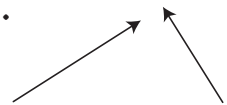


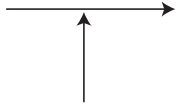
- Connect the initial point of the first vector with the terminal point of the second vector.

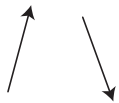


- Construct the sum of the two vectors from the initial point of the second vector with the terminal point of the first vector.

Find the sum of the two vectors.

1. 

2. 

3. 

Part 4: Visualization, Spatial Reasoning, and Geometric Modeling

National Council of Teachers of Mathematics: "Use visualization, spatial reasoning, and geometric modeling to solve problems."

Expectations

- Draw and construct representations of two- and three-dimensional geometric objects using a variety of tools.
- Visualize three-dimensional objects from different perspectives and analyze their cross sections.
- Use vertex-edge graphs to model and solve problems.
- Use geometric models to gain insights into, and answer questions in, other areas of mathematics.
- Use geometric ideas to solve problems in, and gain insights into, other disciplines and other areas of interest such as art and architecture.

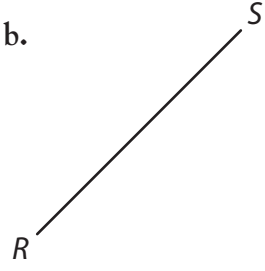
Lines

A **line** is an infinite set of points. Lines are assumed to be straight. The distance between any two points on a line can be measured. The symbol for a line is $\longleftrightarrow$, which is placed above the name of the line. For example, line *CD* is written as $\overleftrightarrow{CD}$.

1. Write the name of each line in symbolic form. Then use a ruler to measure the length of the line in inches.

a.

b.



c.

2. Construct each line from the information given.

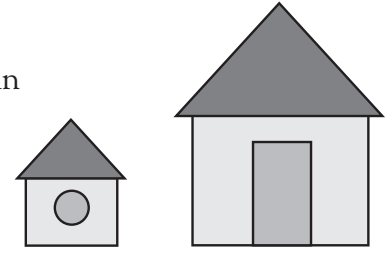
a. $\overleftrightarrow{GH}$ = 12 cm

b. $\overleftrightarrow{AB}$ = 5.5 cm

c. $\overleftrightarrow{LO}$ = 16.2 cm

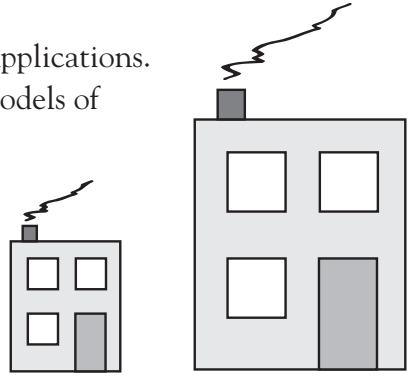
Scale Models

A **scale model** is a representation of an object that is smaller or larger than the actual size of the object. A birdhouse or doghouse is an example of a scale model of a human house.



Scale models have many real-world applications. For example, architects build scale models of the buildings they design.

Scale models are created through similar polygons.



List at least three examples of scale models used in the real world.