COMMON CORE COLLABORATIVE GEOMETRY CARDS

Grades 6–8

MEANINGFUL TASKS

by Kit Norris

TEACHER'S PAGE

GRADE LEVEL	6
TASK	Constructing Cubes
COMMON CORE STATE STANDARDS ADDRESSED	6.G.4
STANDARDS FOR MATHEMATICAL PRACTICE	1. Make sense of problems and persevere in solving them. 3. Construct viable arguments and critique the thinking of others. 6. Attend to precision.

MATERIALS

For each pair of students: 1-inch graph paper, scissors and tape, square and cube

LAUNCH

Show students a square and a cube. (If possible, use a flat block such as a pattern block to represent the square and a building block in the shape of cube rather than pictures of these items.) Ask students to consider how these geometric shapes are the same and how they are different. Give students a few moments of independent think time and then have them share their thinking with their partners.

Listen for students to say that the square is two-dimensional and the cube is three-dimensional; also that the cube is composed of 6 sides (faces) that are squares. Reinforce vocabulary such as face, edge, vertex (vertices), and net.

Show students a net that forms a cube and one that does not. Ask them to predict which net will make a cube and to justify their reasoning with their partner.

TASK

Have students work with a partner to determine the number of different arrangements of squares that will make a cube. Tell them that each net of a cube they identify must be unique, not rotated or flipped.

Encourage students to draw each net on graph paper and then cut the net out so they can fold it into a cube. Caution students to remember that each edge must match another edge exactly. One edge cannot extend beyond another one.

After students have explored and found several different nets that will make a cube, tell them that there are 11 different nets that form a cube. Encourage the student pairs to persevere until they find them all. You may want to have students research nets of a cube after exploring nets independently. Students should then draw the nets on graph paper and cut them out to form cubes.

CLOSURE

Have students compare their nets and show how the nets fold to make a cube. Did the class find all 11 ways to make a cube? Ask students to determine the number of vertices, edges, and faces these cubes have.

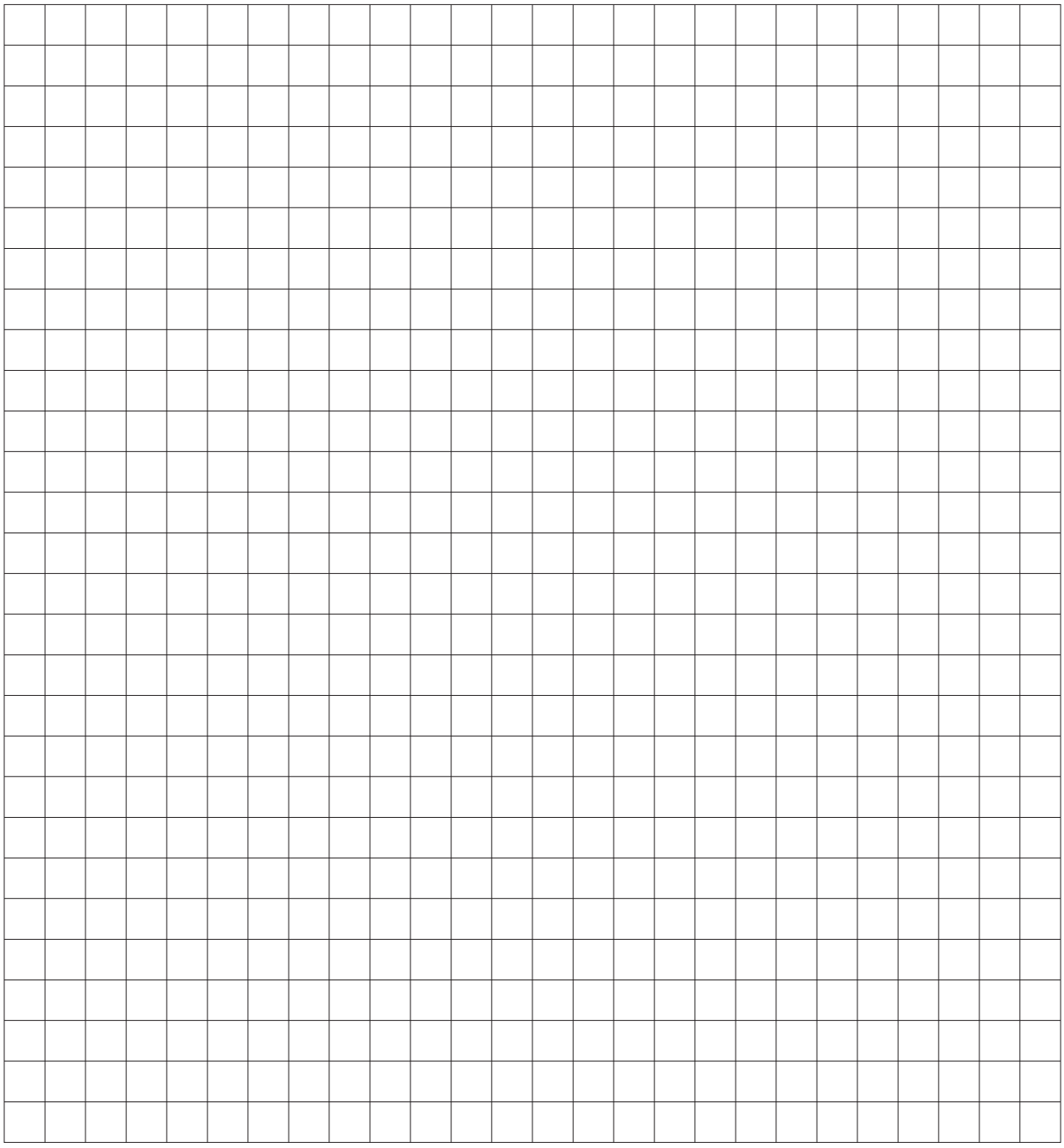
EXTENSION

Extend students' thinking by asking them to determine the surface area of one of these cubes. If we double the length of the edge, how will that effect the surface area?

CONSTRUCTING CUBES

NAME _____

How many different nets for a cube can you make? Sketch them on the grid below. (Find nets that are unique, not rotated or flipped.)



TEACHER'S PAGE

GRADE LEVEL	7
TASK	Varying Volumes
COMMON CORE STATE STANDARDS ADDRESSED	7.G.6
STANDARDS FOR MATHEMATICAL PRACTICE	1. Make sense of problems and persevere in solving them. 2. Reason abstractly and quantitatively. 6. Attend to precision.

MATERIALS

For each group:

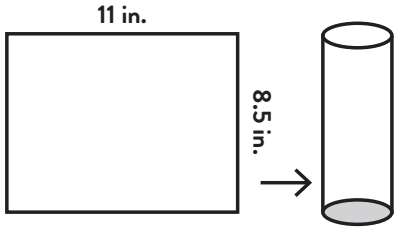
- 2 sheets of paper (8.5" x 11"), tape, cereal or rice, ruler, calculator

LAUNCH

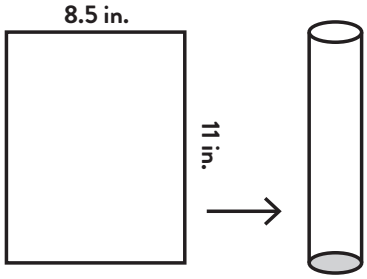
Tell students that they will be comparing the volumes of two cylinders. First, they will predict which cylinder has the greater volume and then they will fill both cylinders with rice (or cereal) to see if their prediction is correct. Finally, they will calculate the volume of each cylinder to reinforce that one cylinder does indeed holds more than the other.

TASK

Instruct the teams to make two cylinders as follows:



- Roll one sheet of paper lengthwise to create a tall, narrow cylinder. Tape the edges of the sheet of paper together, keeping the smallest amount of overlap possible.
- Roll the second sheet of paper widthwise to make a short, fat cylinder. Again, tape the edges of the sheet of paper so that they overlap as little as possible.



Ask students to predict which cylinder has the greater volume. After students share their thoughts with their partners, ask them to write down their prediction and to justify their thinking.

After each team has written down their prediction, do the following to demonstrate which cylinder has the greater volume:

- Place a piece of paper on a flat surface in front of the class.
- Place the short, fat cylinder on the paper and then take the tall, skinny cylinder and place it in the short fat one.
- Fill the tall, skinny cylinder with cereal or rice.
- Slowly, begin lifting the tall cylinder out of the short, fat one so that the cereal flows into the fat cylinder. (Students and many adults are often surprised that the cereal does not fill the short cylinder.) (Students and many adults are often surprised that the cereal does not fill the short cylinder.)

Have students complete the activity sheet.

CLOSURE

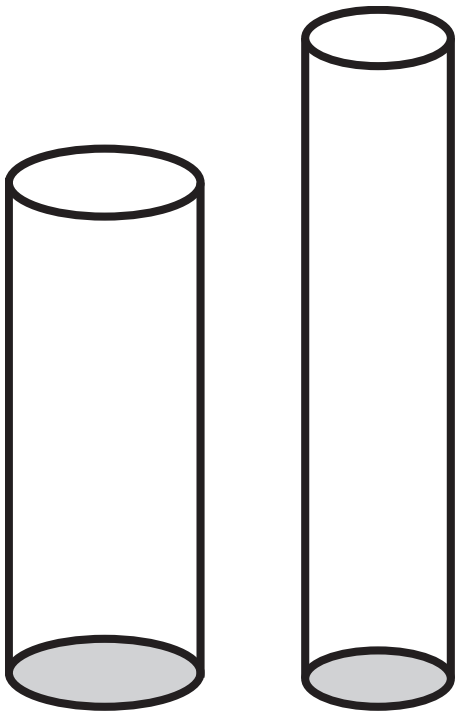
Ask the teams to compare their calculations with other teams and then reflect on the volumes of the two cylinders. Ask: *Which shape created the larger volume? Why?*

EXTENSION

Ask students to consider similar situations involving area. Pose the question: *Which shape has the greater area: a circle with a radius of 4 inches or a square whose side measures 4 inches?*

VARYING VOLUMES

NAME _____



Record the dimensions of each cylinder and then calculate its volume.

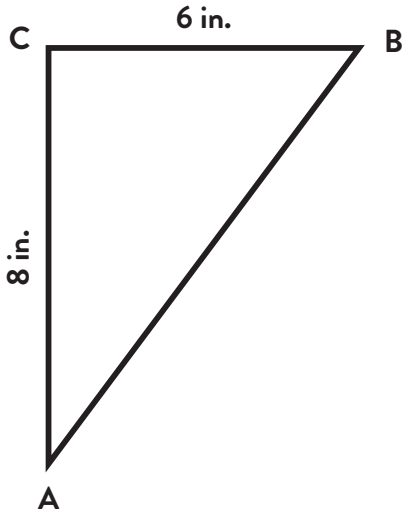
	Taller Cylinder	Shorter Cylinder
Radius		
Radius squared		
Height		
Volume		

TEACHER'S PAGE

GRADE LEVEL	8
TASK	Pythagorean Plaza
COMMON CORE STATE STANDARDS ADDRESSED	8.G.8
STANDARDS FOR MATHEMATICAL PRACTICE	1. Make sense of problems and persevere in solving them. 2. Reason abstractly and quantitatively. 6. Attend to precision. 7. Look for and make use of structure.

LAUNCH

Review with students finding the lengths of the sides of a right triangle. Ask students to find the length of *AB*.



Have students compare their answers and share their strategies for finding *AB*. After establishing the definition of the Pythagorean theorem, ask students if the theorem can be applied to any triangle.

Tell students that they will continue this work by finding the distances between locations as identified on a map (student page).

TASK

Students work to determine the lengths between the locations on the map. They are not instructed to use the Pythagorean theorem at first. The launch is intended to trigger that connection as the students begin working on the map. If students try to measure the distance by counting units or by using a ruler, instruct them to think about creating right triangles to find the distances instead.

You can assign distances for different student groups to find, or simply ask students to find the distance to each location from a specific starting point.

Some of the distances, such as $\sqrt{41}$, can be estimated, or students can use a calculator and round the distance appropriately.

CLOSURE

Ask students to explain their strategies. Ask: *Why is the Pythagorean theorem helpful for finding the distances between the locations? Might the theorem also be used if we needed to know the "distance" of the leg of a right triangle, given that we knew the length of the hypotenuse and the other leg?*

EXTENSION

Have students research Pythagorean Triples and be prepared to share their findings with the rest of the class.

PYTHAGOREAN PLAZA

NAME _____