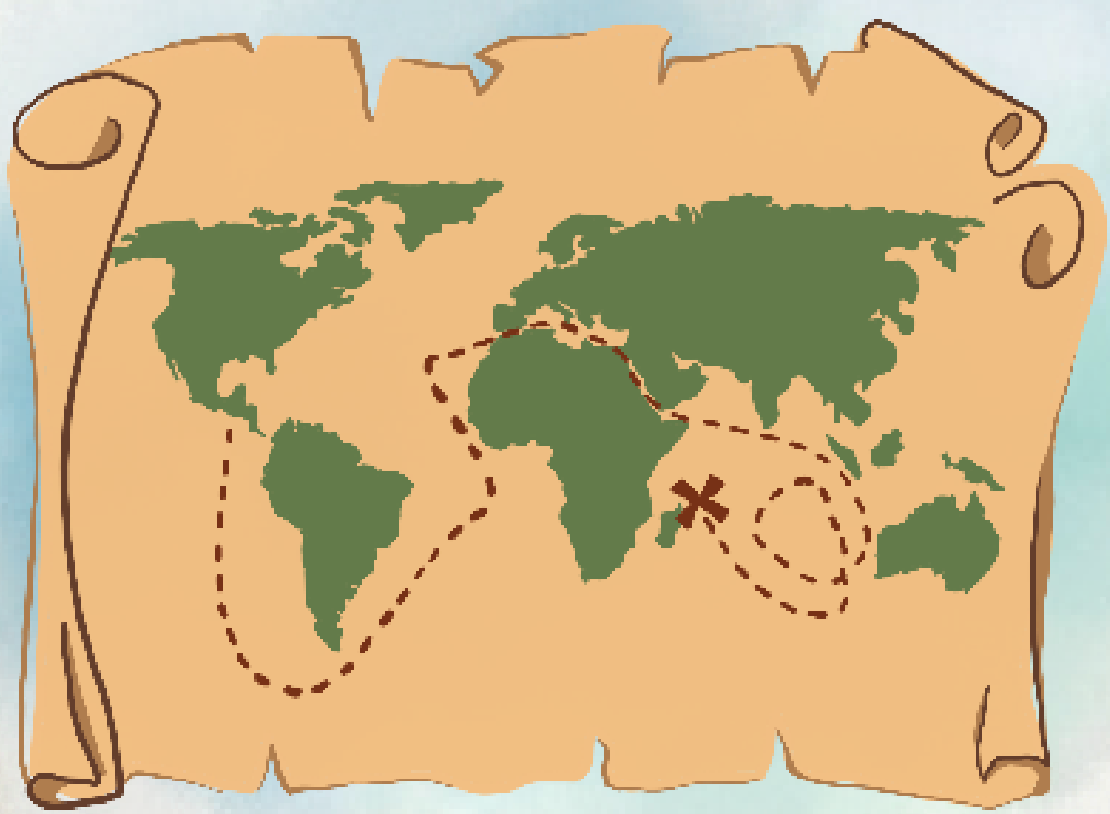
WonderHere

Mapping

Unit Study



Map Maker

MATH PROJECT

Primary (K-1st) Math Benchmarks Covered

- Examine and explore two and three dimensional shapes
- Compare, classify, and organize information through observations and measurements
- Accurate use of mathematical tools

Post-Primary (2nd-3rd) Math Benchmarks Covered

- Build, draw, examine, classify objects and figures
- Classify objects into cylinders, cones, etc.
- Recognize rectangular prisms, round cylinders, circular cones, and pyramids
- Classify plane figures into polygons and other figures
- Learn more about triangles/quadrangles
- Recognize a point, a segment of a line, a straight angle, and an angle
- Study symmetry in proportion to a line
- Accurate use of mathematical tools

Comprehensive (4th-6th) Math Benchmarks Covered

- Build, draw, examine, classify objects and figures
- Classify objects into cylinders, cones, etc.
- Recognize rectangular prisms, round cylinders, circular cones, and pyramids
- Classify plane figures into polygons/other figures and examining properties
- Triangles, quadrangles, and circles
- Concepts of a point, a segment of a line, a straight angle, and an angle
- Drawing, measuring, and classifying angles
- Symmetry in proportion to a line
- Rotational and translational symmetries in their surroundings
- 1st quarter of the system of coordinates and later to all quarters
- Concepts of scale, which are applied to enlargements and reductions
- Utilizing scales when working with maps
- Accurate use of mathematical tools

My Map Maker Name:

If I was a map maker,
this is what I would look like:

All Levels: TASK 1

An Introduction to Maps

A special name for a person who makes maps is called a cartographer. Using math, science, and observations, cartographers were able to make maps of their surroundings. During this project you will be learning about some of the math that cartographers put to use while map making. Later you will be doing the job of a cartographer! First, think about what you know about maps.

Brainstorm and draw what you know about maps:

Comprehensive: TASK 1 An Introduction to Maps

Continue the brainstorming process by writing down what you know about maps. This process will allow you to make connections about what you already know and help you with the upcoming tasks of this project.

Primary: TASK 2

Shapes on the Map

There are two different kinds of shapes: 2 dimensional (2-D) or 3 dimensional (3-D).

2-D shapes are flat, have no thickness, and can only be measured in two faces. Some examples of 2-D shapes are squares, triangles, and circles.

3-D shapes are not flat. They have thickness and three dimensions-length, width, and height. Some examples of 3-D shapes are cones, cubes, and cylinders.

Look at the map on the following page and follow these directions:

Draw a blue circle around each cone.

How many cones are there?_____

Draw a red star on each rectangular prism.

How many rectangular prisms are there?_____

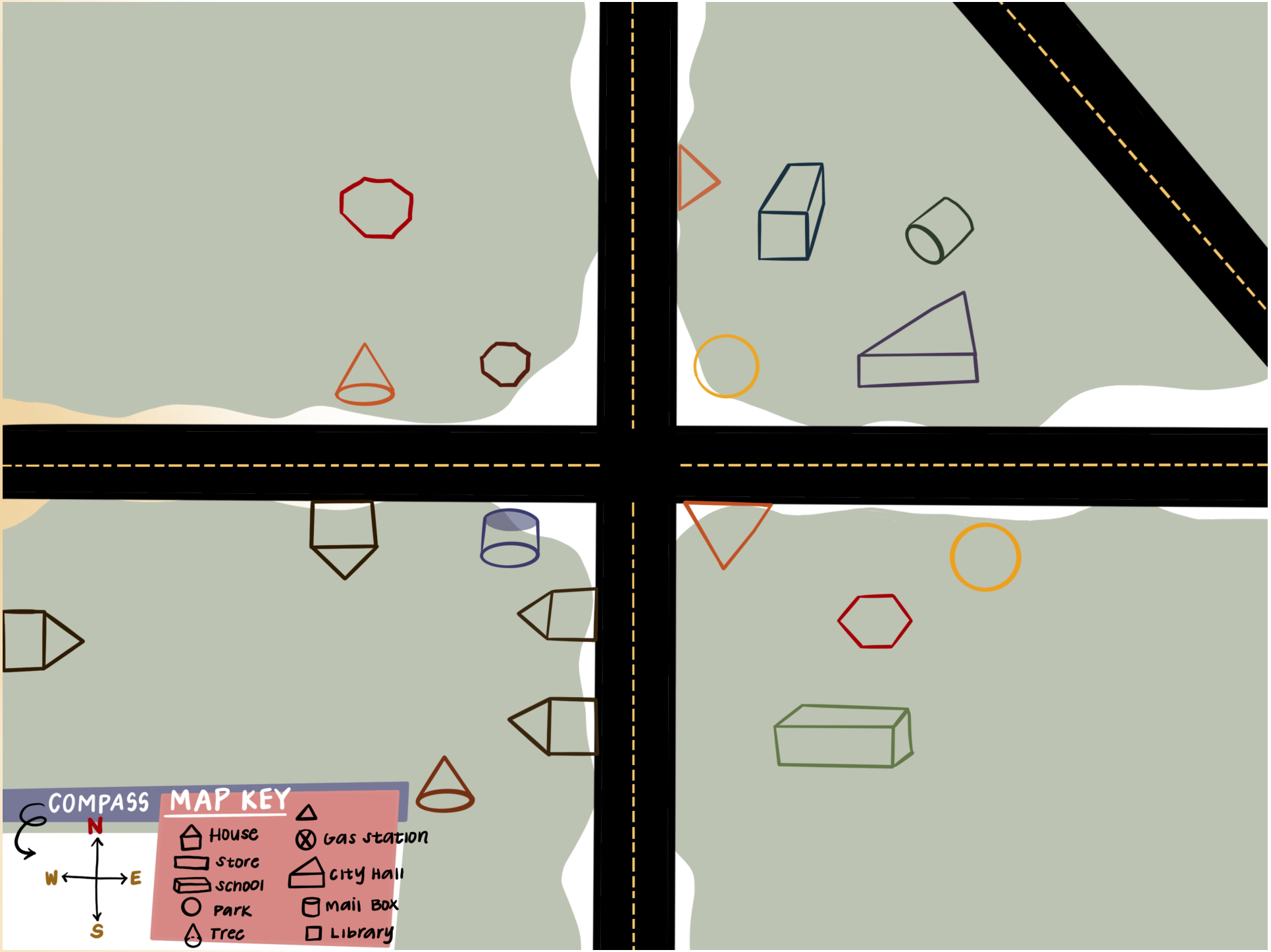
Draw a black box around each cylinder.

How many cylinders are there? _____

Draw a green dot on each pyramid.

How many pyramids are there?_____

In the box below draw and label other shapes that you find in the map.


COMPASS
N
W
E
S
MAP KEY
House
Store
School
Park
Tree
Gas station
City Hall
Mail Box
Library

Primary: TASK 3

Measuring the Map

A map key is an important part of a map that helps you find certain places on the map. Use the map key from the map on the previous page to help you complete the following activity.

Find the school and city hall. Draw a line between them. Using a ruler, measure how long your line is in inches.

The distance between the school and city hall is _____.

Next, find the two mail boxes on the map. Draw a line between them. Using a ruler, measure how long your line is in inches.

The distance between the two mail boxes is _____.

Now, find the two trees on the map. Draw a line between them. Using a ruler, measure how long your line is in inches.

The distance between the two trees is _____.

Finally, find the four houses on the map. Label the houses 1, 2, 3, 4. (Doesn't matter which is which). Draw a line from each house to the school. Using a ruler, measure how long your lines are in inches.

The distance between the school and house 1 is _____.

The distance between the school and house 2 is _____.

The distance between the school and house 3 is _____.

The distance between the school and house 4 is _____.

Color the house that is furthest from the school *green* on the map.

Primary: TASK 4

You're the Map Maker!

Now it is your turn to put your cartographer skills to use! Use the space below to brainstorm some important places you'd like to include in your town map.

Primary: TASK 4

You're the Map Maker!

Now that you know what you'd like to include. It is time to design your map. Be sure to include the following shapes on your map:

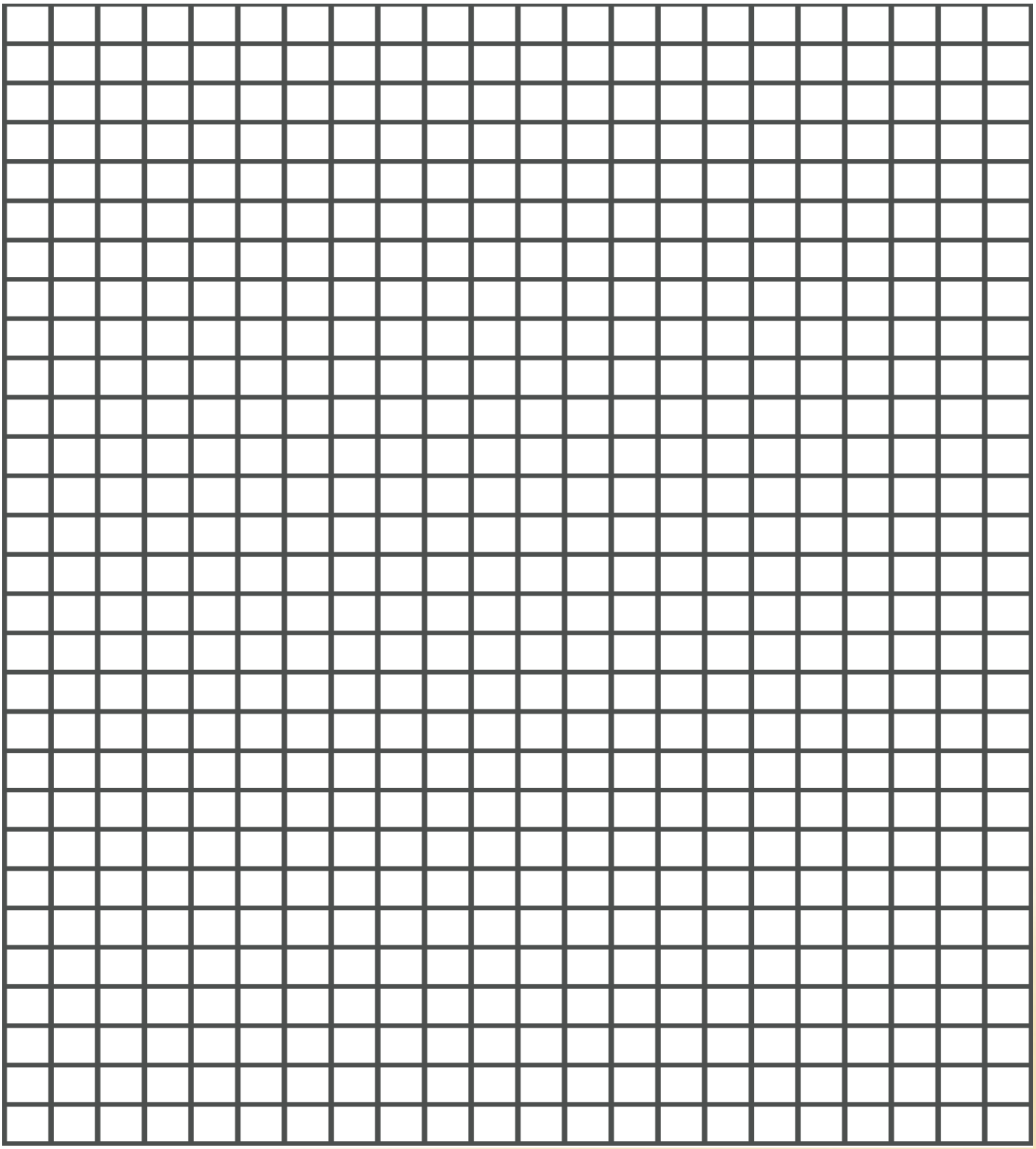
Triangles
Squares
Circles
Ovals
Rectangles
Line Segments
Point

Use the box below to draw a rough draft of your map:

Primary: TASK 4

You're the Map Maker!

Use the grid paper below to draw the final draft of your map. Be sure to draw neatly and include everything needed!



Post-Primary: TASK 2

Shapes on the Map

There are two different kinds of shapes: 2 dimensional (2-D) or 3 dimensional (3-D).

2-D shapes are flat, have no thickness, and can only be measured in two faces. Some examples of 2-D shapes are squares, triangles, and circles.

One group of 2-D shapes are called polygons. Polygons are flat, closed shapes that have at least 3 sides which don't intersect. Polygons are named based on the number of sides they have.

Example:

3 sided shape=triangle
4 sided shape=quadrangle
5 sided shape=pentagon
6 sided shape=hexagon
7 sided shape=heptagon
8 sided shape=octagon

On the map below, find all of the polygons and color them red.

3-D shapes are not flat. They have thickness and three dimensions-length, width, and height.

Some examples of 3-D shapes are cones, cubes, and cylinders.

Look at the map on the following page and follow these directions.

Draw a blue circle around each cone.

How many cones are there?_____

Draw a red star on each rectangular prism.

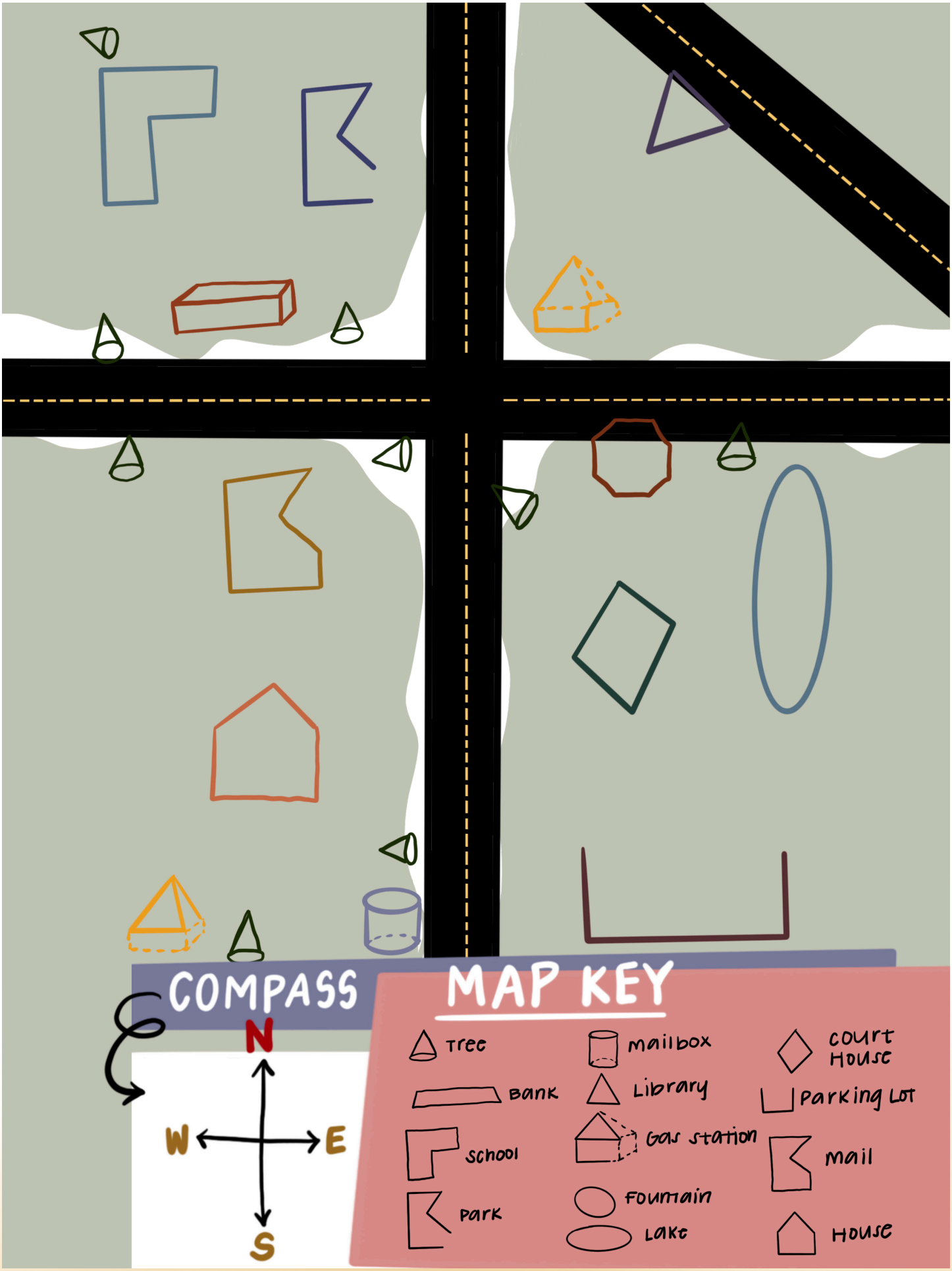
How many rectangular prisms are there?_____

Draw a black box around each cylinder.

How many cylinders are there? _____

Draw a green dot on each pyramid.

How many pyramids are there?_____


COMPASS
N
W
E
S
MAP KEY
Tree
Mailbox
Court House
Bank
Library
Parking Lot
School
Gas station
Mail
Park
Fountain
Lake
House

Post-Primary: TASK 3 Lines and Angles on the Map

Cartographers use many different lines on a map to show information. One of the original tools cartographers used was called a sextant. This tool allowed the cartographer to look through it to use the angle between the sun and the horizon to determine latitude. Take a look at some types of lines that we use in maps that you also might use while making your map.

A line: a line in math is drawn with an arrow on each end because they go on forever and never end.

A ray: a part of a line that has only one fixed end point. The other end has no ending, like a line.

A segment: a portion of a line, drawn with a point on each end.

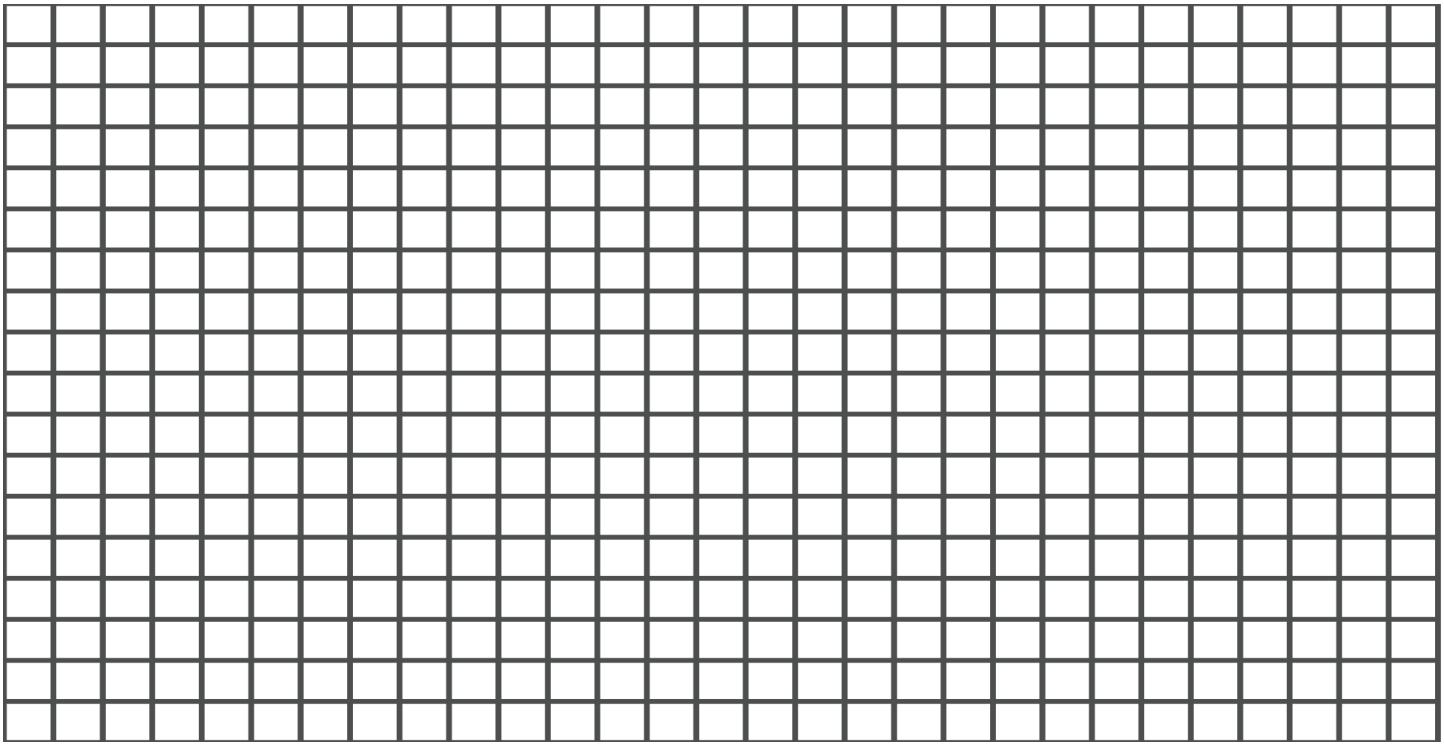
A point: a dot used to show location.

An angle: two rays joined by a common end point; angles are measured in degrees.

A straight angle: an angle that is formed and makes a straight line; a straight angle has a measurement of 180°.

Three other kinds of angles are: **acute**, **obtuse**, and **right**.

Your turn! On the grid paper below, practice drawing lines, rays, line segments, points, and angles. Label your drawings and don't forget to use a ruler to make your lines!

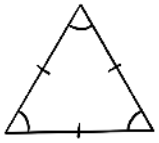


Post-Primary: **TASK 4**

Triangulation

Another way that math helps cartographers is a strategy called “triangulation”. Cartographers use their knowledge of triangles to determine long distances between geographical places. Let’s take a look at some different kinds of triangles!

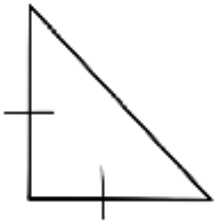
Equilateral Triangle: a triangle that has 3 equal length sides and three equal angle measurements



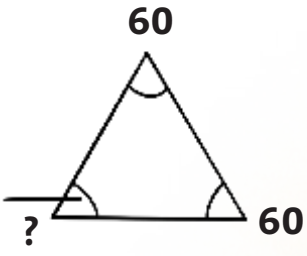
Isosceles Triangle: a triangle that has two equal sides and two equal angles

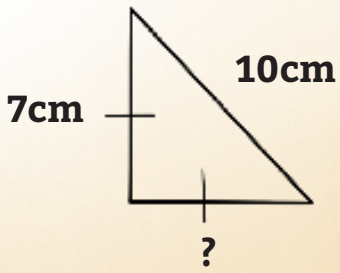
Scalene Triangle: a triangle with no equal sides and no equal angles

Label each of the following triangles as equilateral, isosceles, or scalene.



Using what you now know about triangles, fill in the missing information on the lines below.





Post-Primary: TASK 4 You're the Map Maker!

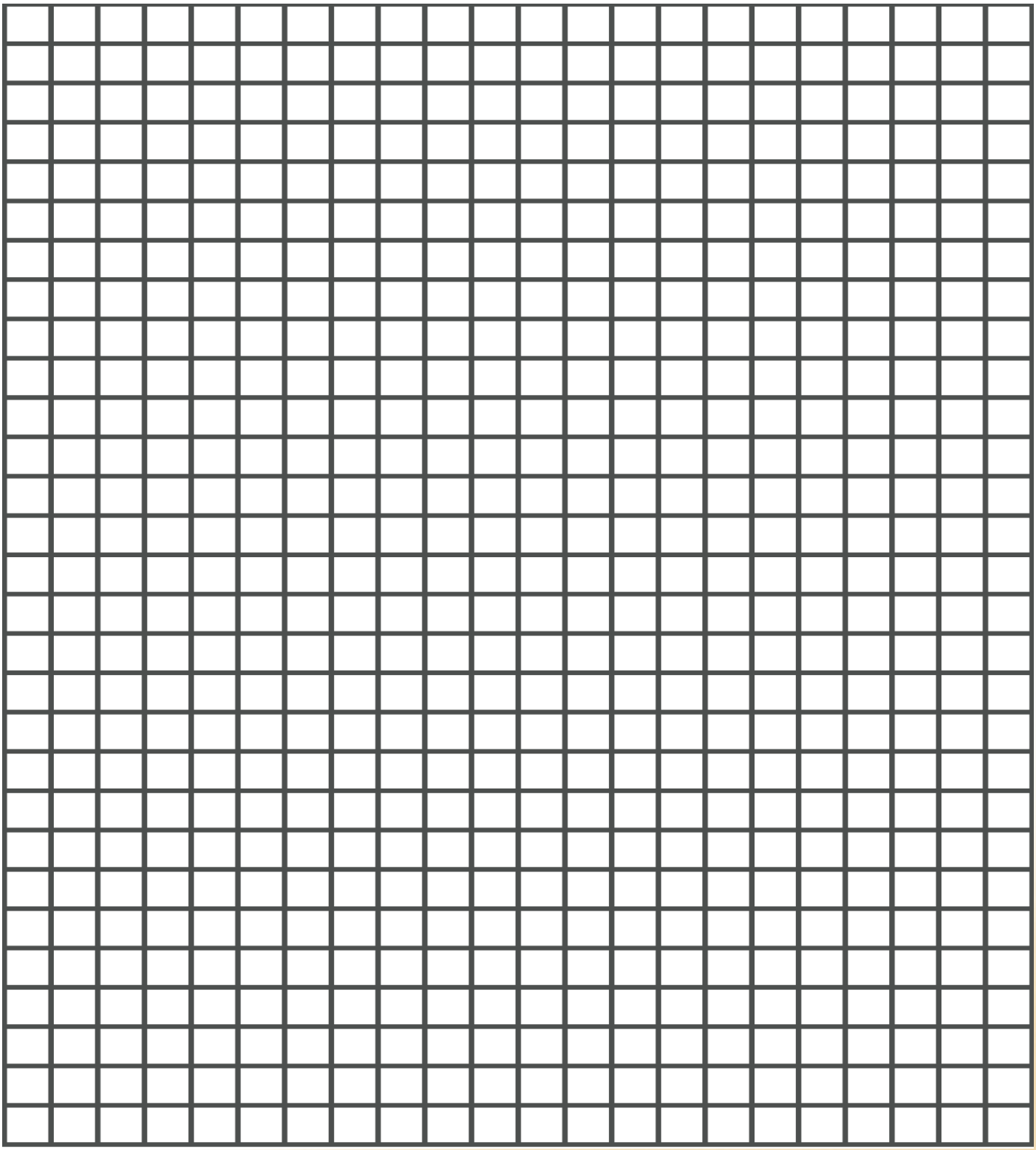
Now that you know what you'd like to include, it is time to design your map. Be sure to include the following shapes on your map:

Equilateral Triangle
Scalene Triangle
Isosceles Triangle
Quadrangle
Pentagon
Hexagon
Heptagon
Octagon
Cone
Cylinder
Pyramid
Rectangular Prism
Title
Map Key
Line Segment
Point
Right Angle
Compass
Scale
Ray
Acute Angle
Obtuse Angle

Use the box below to draw a rough draft of your map:

Post-Primary: TASK 4 You're the Map Maker!

Use the grid paper below to draw the final draft of your map. Be sure to draw neatly and include everything needed!



Comprehensive: TASK 2

Shapes on the Map

There are two different kinds of shapes: 2 dimensional (2-D) or 3 dimensional (3-D).

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One group of 2-D shapes are called polygons. Polygons are flat, closed shapes that have at least 3 sides which don't intersect. Polygons are named based on the number of sides they have. Shapes that are open (or whose lines do not meet) are *not* polygons.

Example:

3 sided shape=triangle
4 sided shape=quadrangle
5 sided shape=pentagon
6 sided shape=hexagon
7 sided shape=heptagon
8 sided shape=octagon

On the map below, find all of the polygons and color them red.

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Draw a blue circle around each cone.

How many cones are there?_____

Draw a red star on each rectangular prism.

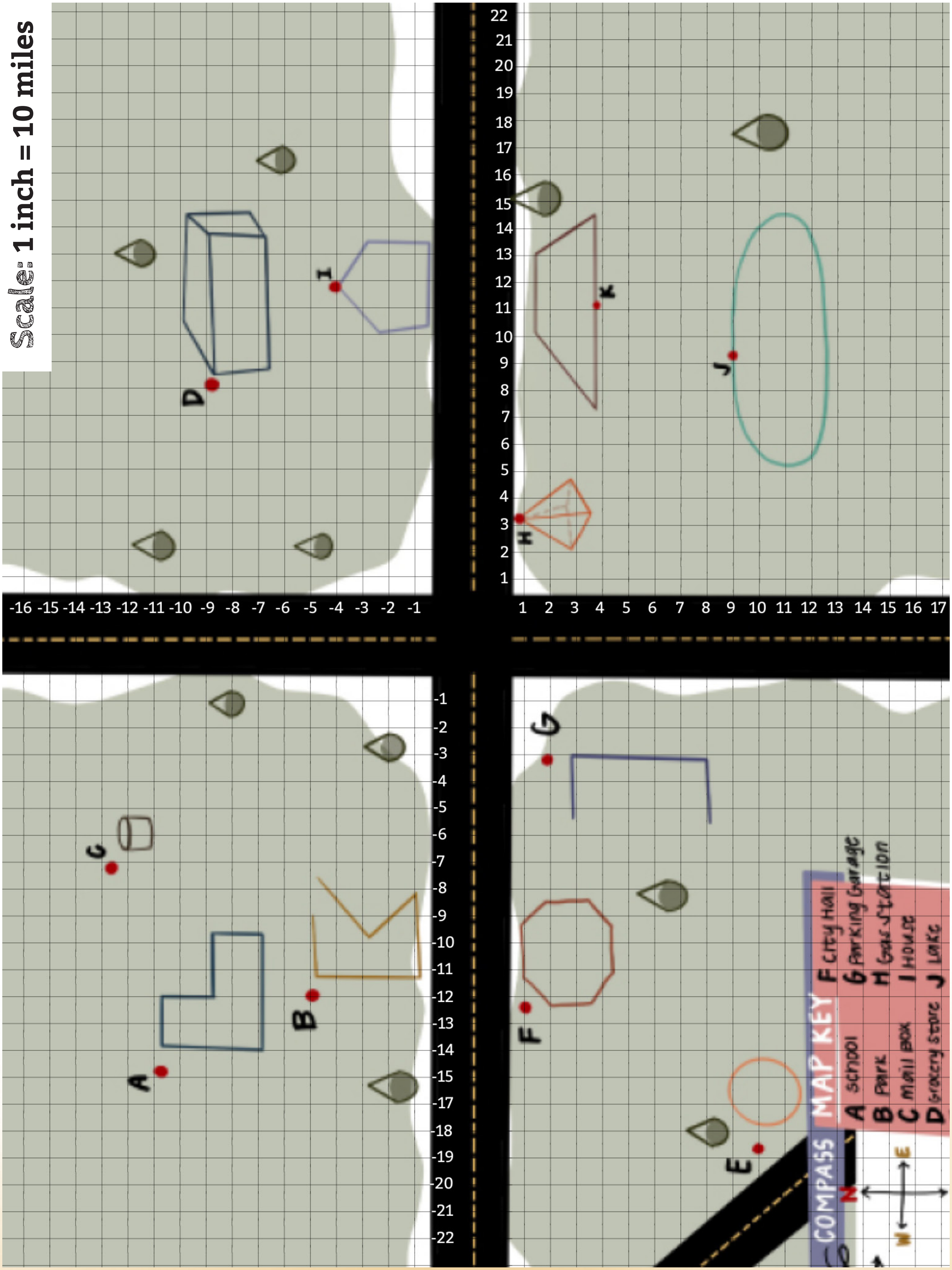
How many rectangular prisms are there?_____

Draw a black box around each cylinder.

How many cylinders are there? _____

Draw a green dot on each open shape.

How many open shapes are there?_____


Scale: 1 inch = 10 miles
MAP KEY
A School
B Park
C Mail Box
D Grocery Store
F City Hall
G Parking Garage
H Gas Station
I House
J Lake
COMPASS
N
E
W
A
B
C
D
E
F
G
H
I
J
K

Comprehensive: TASK 3 Measurements on the Map

Maps are small drawings used to represent a much larger geographical area. Cartographers use a scale to show the relationship to distance on a map to the distance in real life.

For example, a map scale might show that one inch is equal to one mile. On that map a distance of 5 inches on the map would be equal to 5 miles in real life.

Look at the map on the previous page and locate the scale.

Draw a line on your map from the school to city hall. Use a ruler to measure your line.

How many inches is it from the school to city hall? _____

How many miles? _____

Next, draw a line from the grocery store to the gas station. Use a ruler to measure your line.

How many inches is the grocery store to the gas station? _____

How many miles? _____

Finally, draw a line from the lake to the park. Use a ruler to measure your line.

How many inches is the lake from the park? _____

How many miles? _____

Find the point on the map that represents the house. Using your ruler draw a line going west from the house that represents 40 miles in real life according the map scale.

How many inches long is your line?_____

Comprehensive: TASK 4

Coordinate Plane

The map uses a horizontal and vertical grid that is used to help show information about an object's location. This grid is called a **coordinate plane**.

A coordinate plane has 2 axes. The x-axis is the horizontal line on the bottom. The y-axis in the vertical line on the right side of the grid. You can use the numbers along each of these axes to locate places and things on the map. When put together, the location along the x and y axis is called an **ordered pair**.

An ordered pair is written like this: (3,8). The three in the ordered pair represents the location along the x-axis and the eight represents the location along the y-axis.

Use the previous map to write the ordered pair for the following locations on the map.

School: **(-11, -15)**

Park:_____

Mail Box:_____

Grocery Store:_____

Fountain:_____

City Hall:_____

Parking Lot:_____

Gas Station:_____

House:_____

Lake:_____

Plot points on the map at the following ordered pairs to add these locations:

(12, 3) Pharmacy

(10, -10) Fire Station

(9, 2) Doctor's Office

(-15, -9) Bakery

(13, 20) Courthouse

(4, -20) Airport

Comprehensive: TASK 5 Lines and Angles on the Map

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A segment: a portion of a line, drawn with a point on each end.

A point: a dot used to show location.

An angle: two rays joined by a common end point; angles are measured in degrees.

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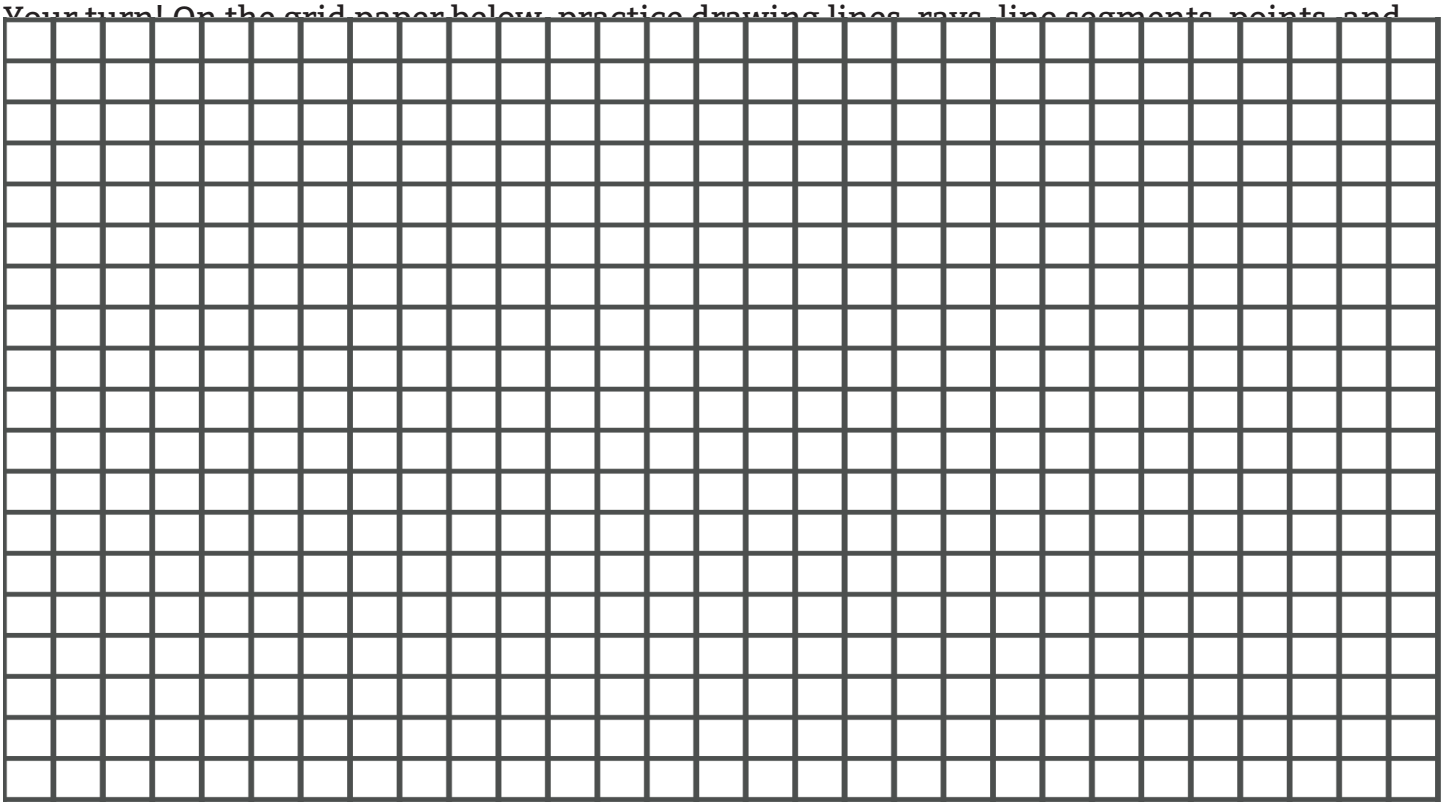
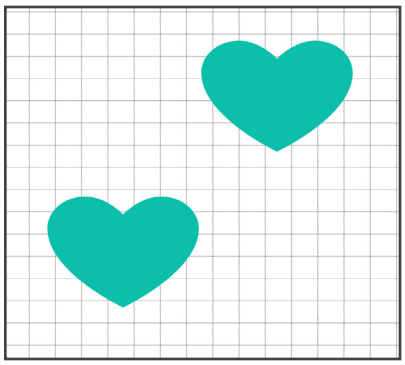
Your turn! On the grid paper below, practice drawing lines, rays, line segments, points, and



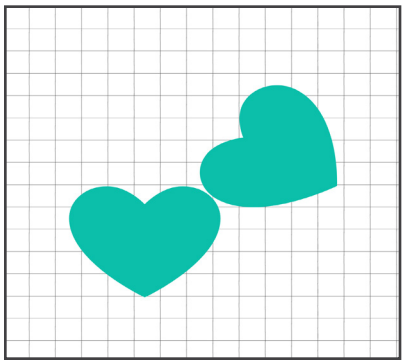
Comprehensive: TASK 6 Rotational and Translational Symmetry

Before moving on to create your map, let's experiment with three different kinds of **symmetry**, or how shapes can move across a plane.

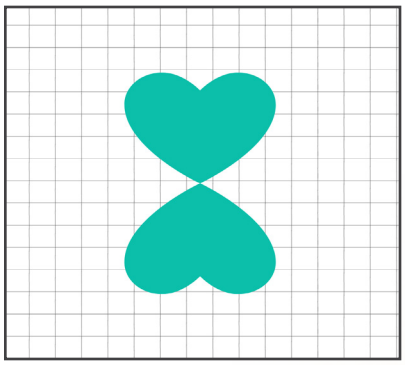
Translation: the shape slides across the plane.



Rotation: one point of the shape stays in the same place and rotates through some angle about that point.



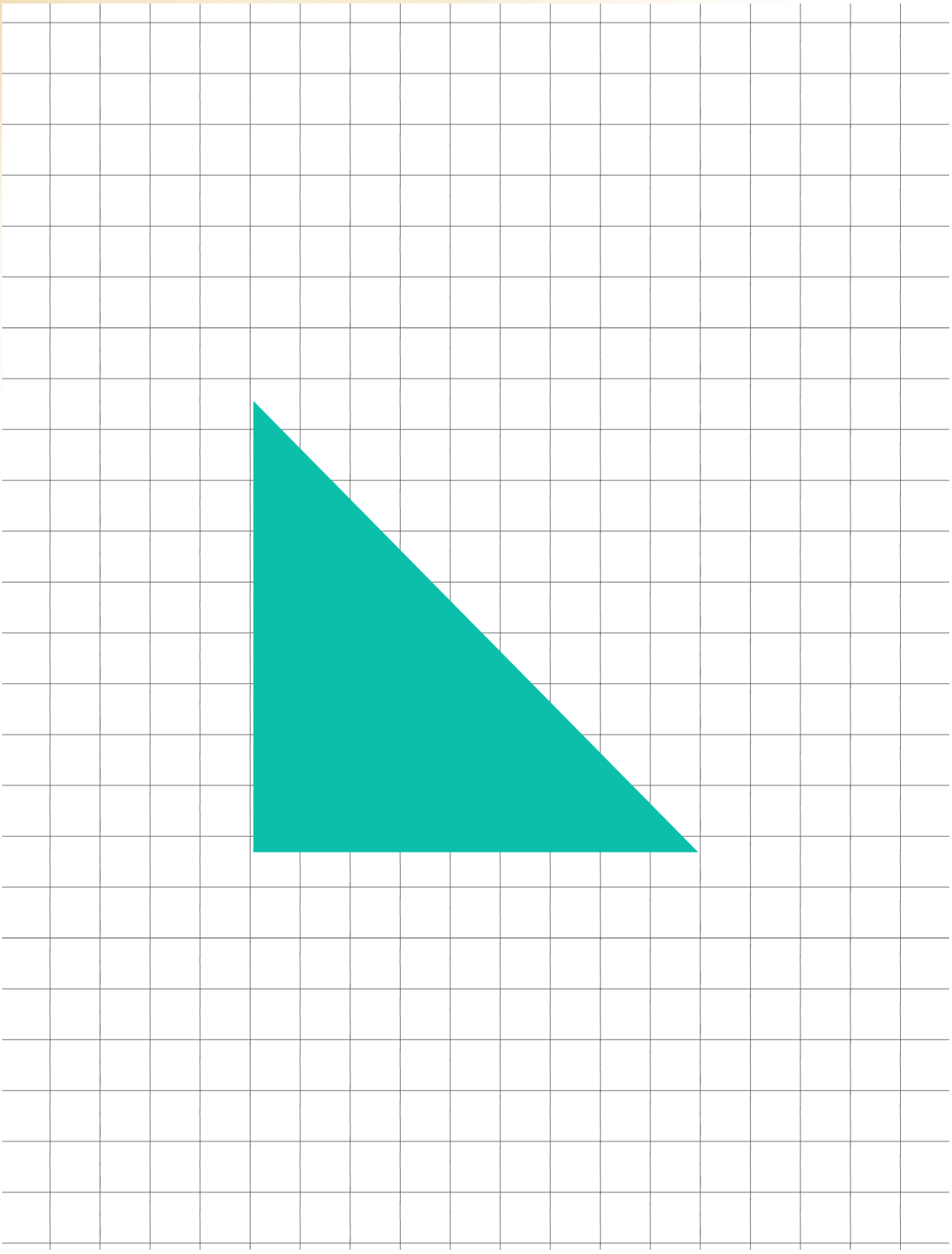
Reflection: the shape flips over. A reflection leaves some line in the same place. Everything on the other side of that line is reflected through the line to the opposite side, like a mirror.



Notice how the size of the heart remains the same.

On the grid on the next page, move the shape to show the three different types of symmetry.

Draw the triangle below three more times to show translation, reflection, and rotation. Make sure the size of the triangle remains the same.

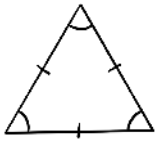


Comprehensive: **TASK 7**

Triangulation

Another way that math helps cartographers is a strategy called “triangulation”. Cartographers used their knowledge of triangles to determine long distances between geographical places. Let’s take a look at some different kinds of triangles!

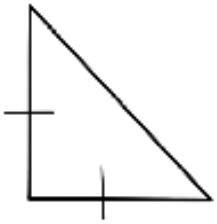
Equilateral Triangle: a triangle that has 3 equal length sides and three equal angle measurements



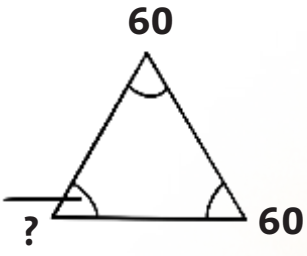
Isosceles Triangle: a triangle that has two equal sides and two equal angles

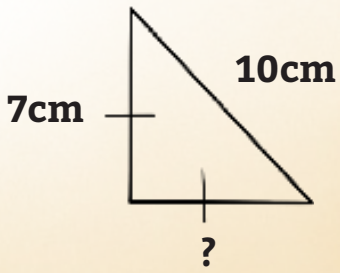
Scalene Triangle: a triangle with no equal sides and no equal angles

Label each of the following triangles as equilateral, isosceles, or scalene.



Using what you now know about triangles fill in the missing information on the lines below.





Comprehensive: **TASK 8**

You're the Map Maker!

Now that you know what you'd like to include. It is time to design your map. Be sure to include the following shapes on your map:

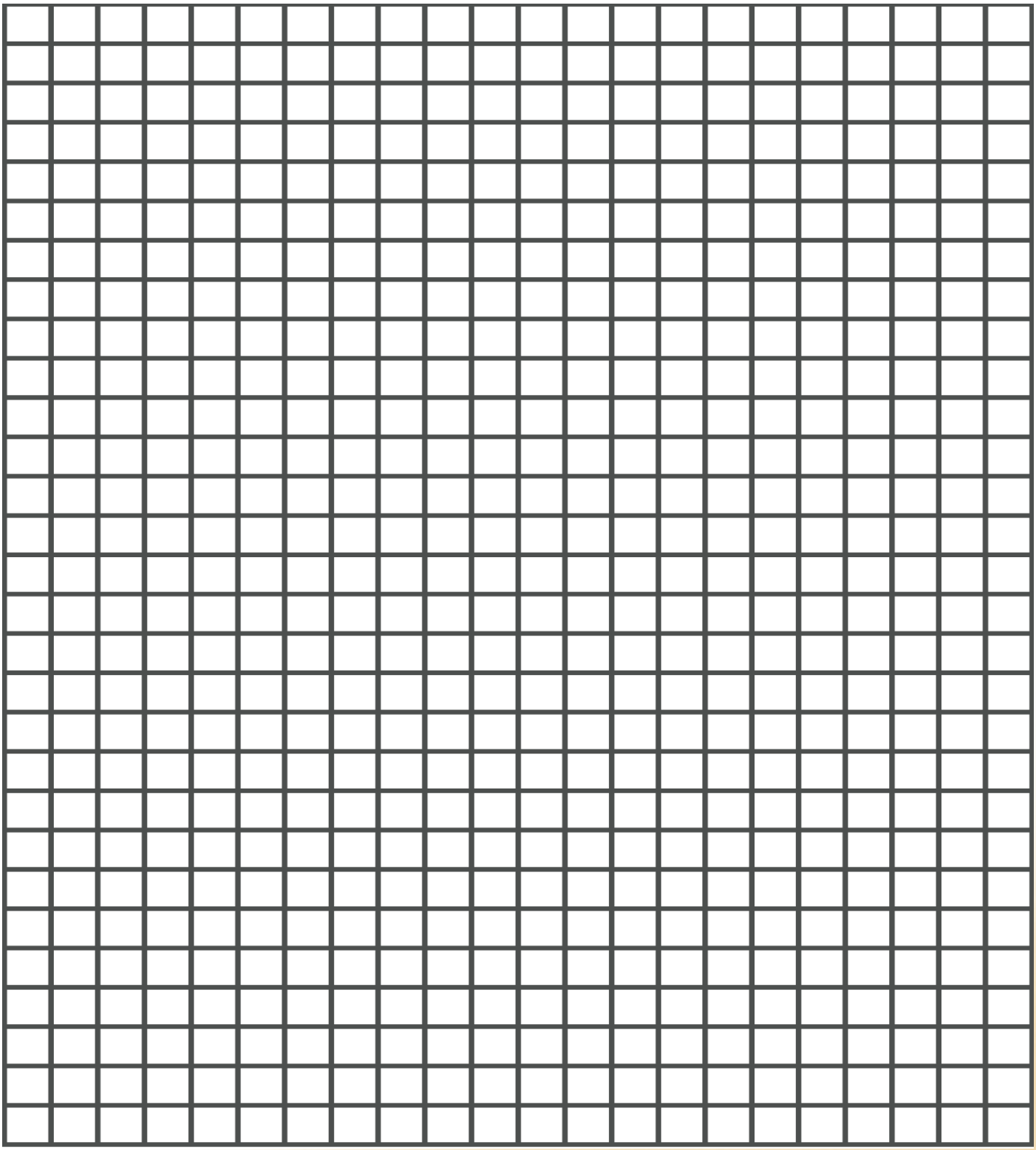
Equilateral triangle
Scalene Triangle
Isosceles Triangle
Quadrangle
Pentagon
Hexagon
Heptagon
Octagon
Cone
Cylinder
Pyramid
Rectangular Prism
Title
Map Key
Line Segment
Point
Right Angle
Compass
Scale
Ray
Acute Angle
Obtuse Angle

Use the box below to draw a rough draft of your map:

Comprehensive: **TASK 8**

You're the Map Maker!

Use the grid paper below to draw the final draft of your map. Be sure to draw neatly and include everything needed!



All Levels

Reflection

Now that you are finished with your project, take some time to reflect by answering the following questions. You may answer verbally (with a parent dictating) or by writing your responses below.

When I worked on this math project, I thought that the work was ...

Something interesting that I discovered, was...

Something I thought was hard was...

I am still wondering...

Overall, I think that the work I did was...