

Photos & Angles

Grade: 4th

Materials Needed:

- Curriculum resources
- Protractors
- Blank paper
- Colored pencils or markers
- Computers with Scratch or the Scratch app
- Printed or projected images

Concepts:

- Geometry
- Angles and measurement of:
 - Acute
 - Right
 - Obtuse
- Lines:
 - Parallel
 - Perpendicular
 - Intersecting

Learning Objectives:

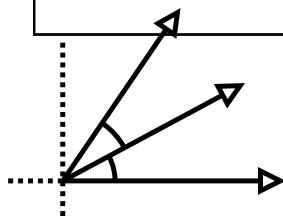
Students will be able to...

- Identify and draw angles as right, acute, or obtuse along with points, lines, line segments, and rays.
- Classify 2D images based on the presence or absence of parallel or perpendicular lines, or the type of angles the image has (right, acute, obtuse).
- Build knowledge of block coding through Scratch programming and how it connects to the word problem

What do students need to know prior to this lesson...

- Students should have had a formal introduction to geometry terminology such as lines (parallel, perpendicular, intersecting), rays, and angles (acute angles, obtuse angles, and right angles)
- Students should understand how to measure an angle by using a protractor

This lesson provides students with the opportunity to practice all of those skills while exploring how angles are an important part of photography.



Introduction:

The objective of the introduction is to make the learning in this lesson relevant to your students and it allows them familiarize themselves with some content in a low stakes activity. Some suggestions include:

- Show students the following image (download [here](#)):



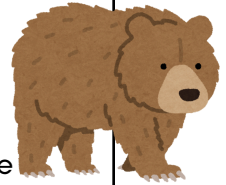
Image of San José State University. Photo by The 111th Group aerial photography.

- Engage students in a discussion. Some questions to consider are:
 - *What do you observe?*
 - *Where do you think this picture was taken?*
 - *Why do you think it was taken at _____?*
 - Provide students with the following terms:
 - Line
 - Parallel lines
 - Point
 - Angle
 - Ask students how they would describe the picture given the new vocabulary. Encourage them to see where they find those terms in the picture. Additional terms may be added.
- Discuss how photography relies heavily on angles in order to get the picture that is required. Ask students what they know about pictures and how angles might help with photography.
- In pairs or groups, have students read "[8 Types of Camera Angles and How to Use Them In Your Photography.](#)" Engage students by discussing the following:
 - *What did you learn?*
 - *What was surprising?*
 - *Can you share a time when you used one of the 8 angles when you were taking a picture?*
 - *What role do you think lines and angles play in each of these different types of pictures?*

Engagement Activity:

There are a variety of hands-on activities that you can engage your students to discuss angles and lines. Some of those activities might include:

- Angles & Words: Have students measure the different angles of a word
 - Write your school's mascot or your name on the board or a blank piece of paper.
 - Provide students with protractors and have them measure the different angles of the letters. They can compare their results with others.
 - The same process can be done for the different kind of lines they see (parallel, perpendicular, intersecting)



- Angles & Letters: Have students use a ruler to draw the first letter of their name (squared off).
 - Have students create random lines/geometric shapes inside the letter with a ruler.
 - Using a protractor, students can identify and measure the different angles they created along with the kind of lines present in their design.
 - Students can then customize / color each section.



- Angles & Photos: If you want to continue the photography theme, select a photo or provide the one below (download [here](#)).
 - Provide students with a protractor and have them identify the different angles and types of lines they see in the picture.
 - After about 5 minutes, ask students to share the different angles and lines they observed. As students are sharing, encourage them to share different sections of the image.



San José Mineta International Airport. Photo by The 111th Group aerial photography.

Relevant Background Activities:

Math

- Review relevant geometry content including points, rays, and different kinds of lines and angles.
- Review any relevant vocabulary

Computer Science

Explore CS First to acquaint students with Scratch. Try these lessons:

- [Welcome to CS First](#) (familiarize yourself with the platform)
- [Storytelling - Lesson 6: Interactive Storytelling](#) (conditionals)

Performance Task:

Your school is about to undergo construction and your principal says the current school design has “too many right angles.” You and your friend decide to take pictures and analyze the principal’s statement to determine if the current design indeed has “too many right angles.” You will be sharing your findings with the principal to make sure they make an informed decision about construction.

1. Go around the school and take pictures – make sure that you have different areas of the school!
2. Pick the best pictures (1 to 2 max)
 - a. Note to teacher: If you want students to continue thinking about photography you can include parameters of the kind of pictures you want students to take (e.g. eye-level, high angle shots, etc.)
3. Begin analyzing the pictures with your partner – identify and mark the following on the pictures you selected:
 - a. Rays
 - b. Lines
 - c. Parallel lines
 - d. Perpendicular lines
 - e. Intersecting lines
 - f. Right angles
 - g. Acute angles
 - h. Obtuse angles
4. Count how many of each term you have and compare that to the number of right angles to determine if your principal was correct in their assessment. Make sure you explain your reasoning.



Scratch Activity:

- Complete a similar task with [this Scratch Program](#).
 - It's a marked up image of the Cesar Chavez Arch at San José State University where students identify different angles and lines.
- Alternatively, students can engage with [this Scratch program](#) where students try to identify the correct angle / line with everyday items such as a clock, bridges, house roofs, etc. Students also describe each angle.



Extensions:

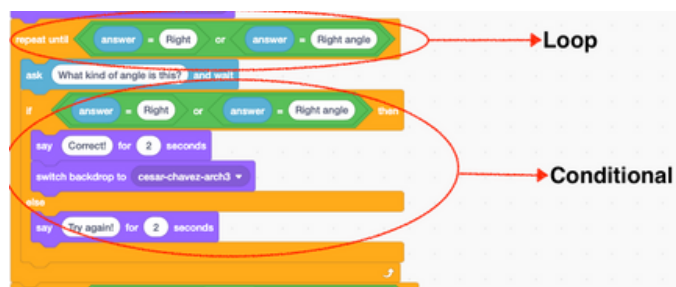
- Modify [Angles Scratch](#) program
 - Students can add their own picture(s) and find the angles / lines they want other students to identify and test.
 - Students who are testing the re-designed program can ask questions about the program and the mathematical concepts such as:
 - *How did you determine this was an acute angle and not an obtuse one?*
 - *Why did you ____?*
 - *How does your program do ____?*
- Explore [Dots & Angles Scratch program](#)
 - Have students move the different points and see what they notice.
 - Ask students how they can modify the program to enhance it.

Computer Science Concepts:

An explicit call out of a few select computer science concepts is important for students to realize that they are engaging in CS. In this lesson you can explicitly call out:

- Conditionals
- Loops

It's recommended that only 1-2 concepts are introduced at a time. This allows students to grasp the concepts in a manageable way.



Assessment:

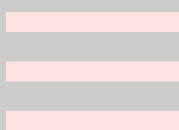
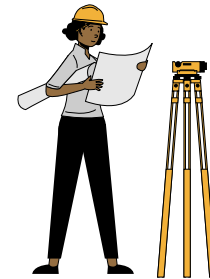
- Teacher observation of student work (formative assessment of conceptual understanding - got it/didn't get it)
- Depending on timing, you may want to extend the lesson to include a formal presentation on what they learned about angles from the pictures they took of their school.
- Formative assessment from your own curriculum

Career Connections:

Did you know...

That there are many careers that use **geometry** in their everyday workday? Let's take a look at some and how they use **angles and lines** in their work:

- **Civil engineers** - have you ever seen a picture or have been to the Golden Gate bridge? Civil engineers work with government entities to make sure structures are safe for the public and this includes anything with transportation like bridges. It's important to understand what angles are best to use when designing or repairing bridges to ensure everyone's safety.
- **Carpenters** - have you ever seen a wooden bookcase or table? Carpenters create or repair items using wood or other materials based on a blueprint or plan. These plans have lots of angles and lines that carpenters must follow to cut the material and create the design.
- **Athletes** must understand and use angles to play and improve their game. This could be for anything like soccer, basketball, gymnastics, etc.



Common Core Math Standards

4.G.1.

Draw points, lines, line segments, rays, angles (right, acute, obtuse), and perpendicular and parallel lines. Identify these in two-dimensional figures.

4.G.2.

Classify two-dimensional figures based on the presence or absence of parallel or perpendicular lines, or the presence or absence of angles of a specified size. Recognize right triangles as a category, and identify right triangles.

Computer Science Student Standards

CACS
3-5.AP.12.

Create programs that include events, loops, and conditionals.

CACS
3-5.AP.14.

Create programs by incorporating smaller portions of existing programs, to develop something new or add more advanced features.

CACS
3-5.AP.17.

Test and debug a program or algorithm to ensure it accomplishes the intended task.

CSTA
1B.AP.10.

Create programs that include sequences, events, loops, and conditionals.

CSTA
1B.AP.12.

Modify, remix, or incorporate portions of an existing program into one's own work, to develop something new or add more advanced features.

CSTA
1B.AP.15.

Test and debug (identify and fix errors) a program or algorithm to ensure it runs as intended.

All images represented in this lesson were obtained through Canva and/or are part of the fair use law.

CSTA Teacher Standards

1a.

Apply CS practices

2c.

Represent diverse perspectives

2e.

Use accessible instructional materials

4c.

Design inclusive learning experiences

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