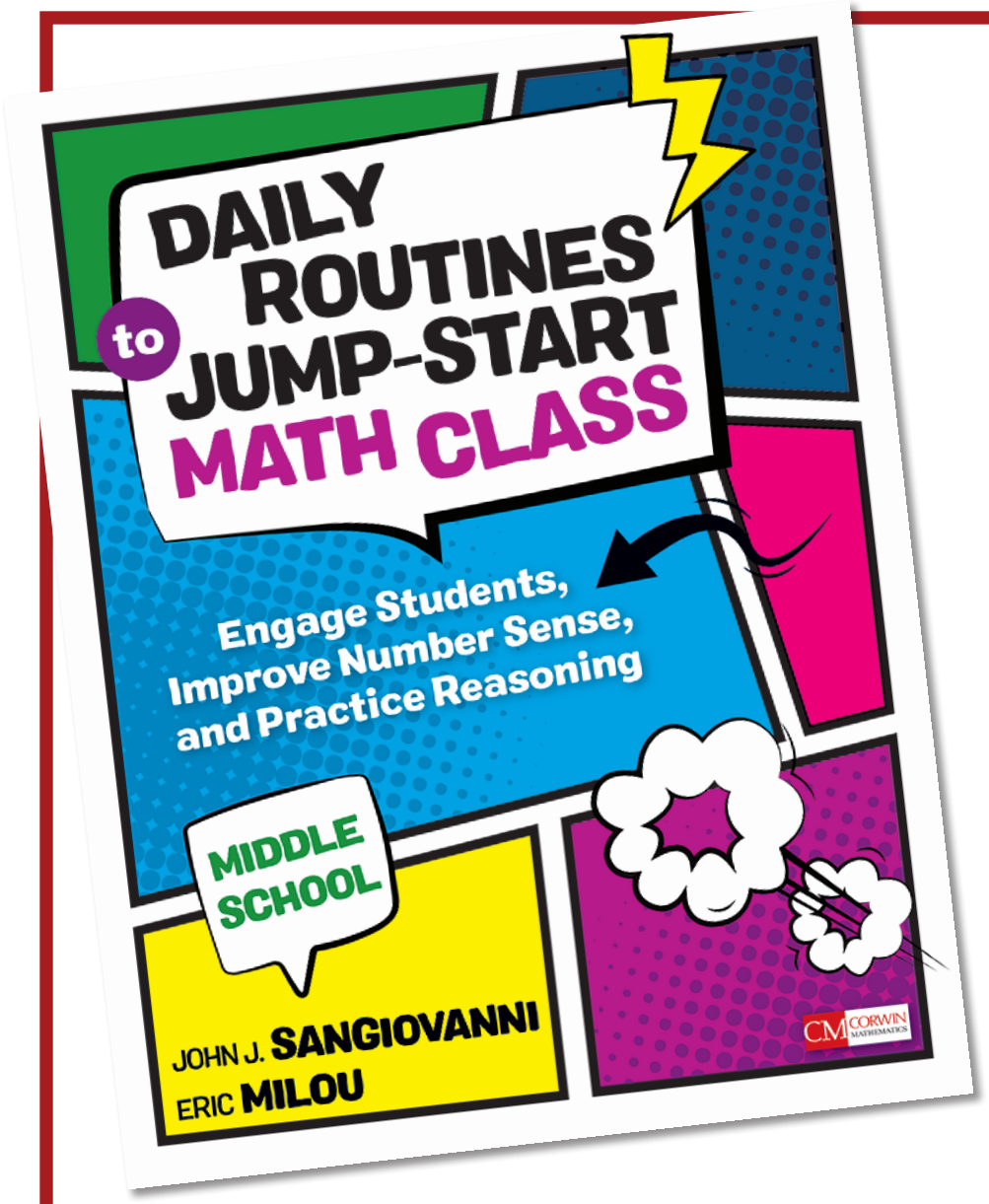


Thank you

FOR YOUR INTEREST IN CORWIN

Please enjoy this complimentary excerpt from *Daily Routines to Jump-Start Math Class, Middle School* by John J. SanGiovanni and Eric Milou. This lesson helps students learn to analyze mathematic scenarios based upon their environment. Students will learn to apply mathematics concepts to real world situations that lead to solutions and reasoning.

LEARN MORE about this title, including Features, Table of Contents and Reviews.

ROUTINE 1

PICTURE IT

About the Routine

Numbers are all around us. They are much more than the problems on a page. We use them to describe our world, to solve problems, and to ask questions about our world. Often, we make assumptions based on what we see and how we reason quantitatively. For example, we might choose a certain checkout line at a store because there are fewer people in it. In other cases, we might pick a line with more people because the line with fewer people has more items to be scanned. We might look at a gymnasium and consider it half full. We might select a certain cookie because it appears to have more chocolate chips. Mathematicians determine the number of people at an inauguration or the number of people at a parade by estimating and modeling with mathematics. This routine, *Picture It,* is designed to unlock students' interest and wonder about the mathematics around them. They are asked to analyze possibilities in a picture. In some cases, they are asked to reason about a total number or comparison of numbers. It can empower students to reason without concern for being "wrong." Students are

presented with a picture and asked to simply look for mathematics within the picture. We then pose a specific question for them to consider and discuss with a partner. The class then talks about possible solutions and, more importantly, the reasoning applied to those solutions. In the Ferris wheel picture, we might ask: "How many cars are on the wheel?" "How many people can ride the wheel at one time?" "How many people can ride the wheel in a day?"

Why It Matters

This routine helps students

- look for mathematics in their environment,
- apply mathematics concepts to real-world situations,
- pursue solutions with no clear solution path (MP1),
- reason about number and quantity in the real world (MP2),
- model with mathematical ideas to solve problems (MP4),
- refine strategies and ideas about estimation (MP2), and
- communicate their reasoning to others (MP3).

online resources All tasks can be downloaded for your use at **resources.corwin.com/jumpstartroutines/middleschool**

What They Should Understand First

Picture It always works regardless of your students' grade level or proficiency. Its complexity and rigor are tied directly to the questions that we ask about the pictures. It is a flexible routine that can be applied to any picture or any mathematics concept you are teaching or looking to reinforce. It may be best used simply to promote estimation, reasoning, and problem solving. Students do not need specific content skills to engage with *Picture It*. Instead, they need other less tangible skills. For many students, it may be one of the first opportunities to observe and think about open-ended applications of mathematics. They may be challenged to think about the mathematics in a picture. Your questions are an opportunity for problem solving. Students will need to be comfortable with situations that have no specific entry point or solution pathway. They should have some ideas about estimation, but no minimum level of proficiency is needed, as estimation will improve through work with the activity. They should also have a mindset of perseverance and various possibilities and approaches to solve a problem.

What to Do

1. Select a picture and a question to ask about the picture.
2. Display the picture and give students a few moments to examine it.
3. Pose the question to students. An example for the Ferris wheel picture is "How many people can ride the Ferris wheel at one time?"
4. Give students time to think about an answer to the question. Consider allowing them to capture some thoughts on paper or sticky notes or in their journals.
5. Have students share their solutions and reasoning with a partner.
6. Bring the class back together to share solutions and reasoning.
7. Highlight student ideas during discussion. Questions to ask (for the question above) might include these:
   - What did you need to consider to find your solution?
   - What assumptions did you have to make? Why?
   - How did you reason about the total number of cars on the Ferris wheel?
   - What is a reasonable number of cars?
   - What is a reasonable number of people for each car to hold?
   - What might be a range for the number of people the Ferris wheel can hold?
   - Are there any other unknowns that you can't answer from the picture?
   - What would be a completely unreasonable solution? Why?
8. Honor and explore all reasoning. Be sure to counter both logical and flawed reasoning with questions rather than confirmations of "right" or "wrong."
9. Consider asking students to think of other questions that they can ask about the picture. These questions could be used in subsequent classes.

Anticipated Strategies for This Example

For the Ferris wheel picture/example, the question posed was "How many people can ride the Ferris wheel at one time?" The solution can only be estimated because there are many variables that influence an answer, such as rider height or weight. The answer will change as the variables change. Students will also be challenged because they don't know the number of cars the wheel holds. They can estimate the number of cars to be 40 because we can see 20 cars that make about one-half of the total wheel. Others may reason that it has 40 cars because they make out one-fourth of the wheel and count 10 cars within it. With this in mind, students might determine that each car can hold four to six people. Some may think that a car can hold only two people. It is almost impossible to know for sure. Students should offer that an exact number isn't needed but that a specific number can be argued. Students are then likely to multiply the number of people in a car by the number of cars. We should also keep in mind that students might adjust their ideas about the number of cars or the number of people in those cars because they are looking to simplify the computation.

PICTURE IT—ADDITIONAL EXAMPLES

A. *Picture It* is a ripe opportunity for critical thinking, reasoning, and estimating. It is limited only by the creativity of the questions asked or images found. It is important to remember that questions don't need exact answers. In example A, you see a shelf of canned vegetables. You might tell students that there are 12 ounces in a can, wondering how many ounces are on the shelf. You might ask how many full cases of six cans each are on the shelf. You might ask about the ratio of one color to another or the ratio of one type of vegetable to another in the picture. Unit rates are also a possible topic for this picture as you could give a price per can and ask about the total on the shelf.

A

B. Example B shows a portion of a parking lot. You might ask students how many people work in the building based on the cars in the parking lot. This opens the door to conversations about reasonableness and range. As you know, each of the cars has at least one driver, but the number of passengers is based on the size and type of the car. Students might also consider that some spots are empty and some workers may not drive to work. Another option is to give students an estimate and ask them if the estimate is reasonable based on the picture.

B

C. *Picture It* may be best used with real-world examples and open questions. But it can also be used to reinforce skills and concepts the class has learned or is learning. Example C's collection of colorful balloons might be a good opportunity to investigate students' understanding of fractions, percentages, measurements, or ratios. You might ask students what the combined lengths of string might be. You might ask them to estimate the sum in inches as well as centimeters. You could ask them to describe the picture with fractions or percentages. For example, about half (21/40) are right of center in the picture. You can slot or frame ideas for students to find the solution to. For example, you might say, "About 1/10 of the balloons are ____." Students could then complete the statement and justify their thinking. You might ask about the ratio of red balloons to all balloons or the ratio of red and orange to blue and green balloons. You can ask students to find an example of equivalent ratios.

C

D. How many cereal boxes are on the shelf? You might consider the depth of the shelf. You might get a sense of how many boxes can fit in a section and then apply that number to the number of same-sized sections on the shelf. Finding pictures and asking questions doesn't have to be left up to you. You can work with colleagues to find and exchange pictures and questions. You might also charge your students with finding and submitting pictures for use during the routine. You can ask them to submit questions with their pictures or modify the routine to generate questions. To do this, pose the picture and ask students to take a few moments to examine it. Then ask students to share ideas with a partner about the questions they have about the picture. Then bring the class together to share questions. You may choose to have the class select the most interesting question they would like to explore in subsequent classes. Or you may pass the picture and student-generated questions to another class or teacher.

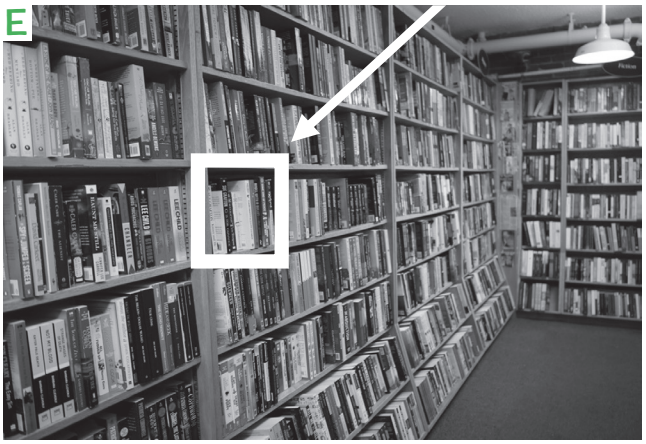
D

PICTURE IT VARIATION—USING A KNOWN AMOUNT

Often when we estimate, we use a benchmark to reason about the total. Mathematicians do this when they estimate the number of people in a crowd. It's done in a wide range of mathematical modeling situations. It is similar to the idea of capturing a person in a picture to show how long, wide, or tall an object is by comparison. We might also think of it as a reference or measuring stick. However, your students' understanding of this concept or experience applying it can differ considerably.

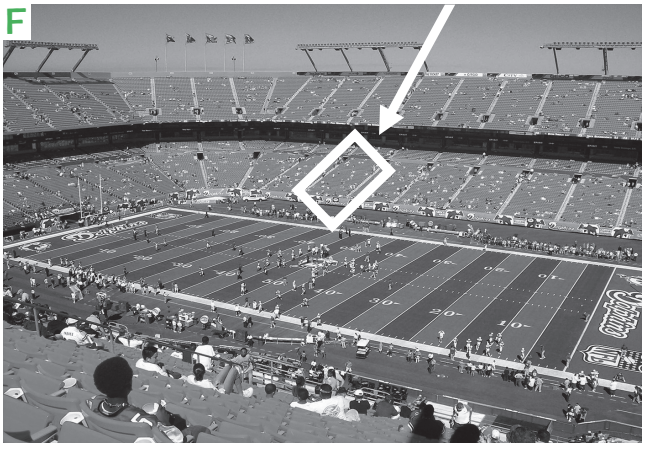
E. Example E is an opportunity to enhance students' estimation skills. Here, students are given a sense of the size of 15 books on the shelf. They are then asked to think about how many books are on that shelf (running diagonally from out of frame to the next shelf and from floor to ceiling). You can ask them about what is reasonable. They might consider a low-end and high-end estimate. You should be thoughtful about the numbers you use in the reference. Here, 15 is a fairly friendly number. Even so, some students might change that number to 20 to make it even more friendly. Others might think about that section of the shelf as three sets of 15 and determine that 50 is a better number to work with. Any of these approaches are reasonable. Yet many of your students may not have considered the possibilities. Still others may not perceive that they are "allowed" to approach situations with this sort of logic.

E



F. Of course, references can be used in alternate directions as well. In some situations, the total amount is known but we are interested to know the size of one or more parts of the whole. Take a look at example F. Here, it is known that the stadium holds 65,000 people. So how many might one section hold? Are all of the sections the same size? How many sections are there in one level of the stadium? How many sections are there in the whole stadium? These questions can begin to help students think about how many people one section could hold.

F



Again, this routine, and these problems in general, are not designed to have students find exact answers. This may be quite challenging for students to accept at first. The ideas inherent in the routine are valuable but challenging even for adults. The routine can be exciting, but patience may be needed at first.

PICTURE IT VARIATION—COMPARING PICTURES

The first variation of *Picture It* featured the idea of references or benchmarks to support estimation and conclusions about pictures. But you can also use a picture and other known data to draw conclusions about other pictures or situations.

G. If you have ever flown, you know that there is a big difference between 2-by-1, 3-by-3, and 3-by-3-by-3 seating. Example G shows the inside of a 737 on the top and the inside of a 777 underneath. You might ask students to first examine the pictures and share what they notice about them. You might ask them to discuss why the seating would be different and what the number of seats might do to the overall size of the airplane.

You can tell students that a 737 holds 143 or so people. With this information, how many people do they think the 777 holds? After they share possibilities and reasoning with a partner, you can facilitate a group discussion. Then you can add new information. For example, you might then share the lengths of the two planes and ask students to consider how that would impact their solutions.

G

H. Doughnuts are delicious! This text could go no further until that fact was acknowledged. Fortunately, there is a vast number of pictures of doughnuts available for your students to work with in this routine. Example H shows how two or more pictures might be used for discussion in this routine.

You can ask students to compare or contrast two or more pictures. You might provide specific questions. For example, you could ask them to find a ratio that could be used to describe each of the pictures (1:3 sprinkles to all in two of the pictures). Or you might ask them to find ratios that describe the differences between the pictures. But the best way to use this variation may be simply to provide two or more pictures and ask students to come up with numbers and concepts to describe them.

H