UNIT

5

Photography

Discuss

Discuss these questions with a small group.

1. How many cameras do you own? Describe at least one camera you have now, and one that you used to have several years ago.
2. How often do you take photos? What do you usually take photos of?
3. What do you do with the photos you take?
4. What, to you, makes a "good" photograph of a group of people?

Reading 1: Mathematics

Pre-Reading Activities

Drawing Conclusions

When you are asked to read something in college, there is always a reason. Your instructor wants you to know, learn, or think about something.

Some writers will express their conclusions very directly. For example, in Reading 2 of Unit 1, *Why Buy Shade-Grown Coffee?* the conclusion is clearly stated—you should buy shade-grown coffee because it's better for the environment.

In textbooks, it can be harder to find the conclusions, especially when the information is mostly facts. However, there is always some reason that you are learning the information. In Reading 1 of Unit 4, *Rubies: Rare and Valuable*, you could conclude for example that gemstones are colored by different chemical impurities. This information could help a scientist create artificial gemstones. You learned that rubies are hard enough to be used in industry to cut other materials. In the future, you might choose industrial rubies as a tool for products that you design. Finally, you learned where rubies are commonly found. This information is valuable for someone involved in mining as well as the international gemstone market.

As you read any text, think about what you can do with the information and why it is important. Ask yourself what impact the information could have on your life.

Vocabulary

1. Read the definitions of words related to photography and mathematics. Then complete the sentences.

Photography:

blink: to open and close your eyes very quickly

shot: (informal) a photograph

shutter: the piece of a camera that opens and closes to expose film to light

Mathematics:

calculate: to determine the number of something mathematically

estimate: an approximation or guess

exponential: involving a variable in an exponent—10x is an exponential expression. Often used to show a very fast increase, such as *an exponential growth rate*.

formula: a mathematical explanation or rule shown in numbers and symbols

probability: how likely something is to happen; the chance that something will happen

round: to use a less exact but more convenient number when doing calculations

1. I got a great _____ of my friend while he was skiing!
2. I'm not sure how much money I'll need to save this year, but I _____ that it will be about 10 percent of my paycheck.
3. Food prices have seen a/an _____ increase this year!
4. Try not to _____ when I'm taking your picture.

5. The _____ for changing Celsius temperatures to Fahrenheit is T(°C) × 1.8 + 32 = T(°F).
6. The restaurant bill came to $59.73, so we can _____ it to $60 to figure out how much each person should pay.
7. The _____ on my camera broke, so I can't take any pictures.
8. What's the _____ that it will rain during my vacation?
9. I need to _____ exactly how much tax I will owe on that purchase.

2. **Match the mathematical symbols or equations on the left to the way they are read on the right.**

1. 12 + 3 ____
2. 12 – 3 ____
3. 12 × 3 ____
   (12)(3)
4. 12 ÷ 3____
5. 12/3 ____
6. = ____
7. % ____
8. 1.5 ____
9. –3 ____

a. equals
b. twelve **plus** three;
   add twelve **to** three
c. minus three; negative three
d. twelve **minus** three;
   subtract three **from** twelve
e. twelve **over** three
f. percent
g. twelve **times** three;
   twelve **multiplied by** three;
   multiply twelve **by** three
h. one point five
i. twelve **divided by** three;
   divide twelve **by** three

Predict

Work with a partner. Look at the title. To *blink* means "to close your eyes very quickly." How might blinking be related to photography? How might blinking be related to math?

Skim

Skim the reading quickly. Then circle your answers to the questions.

1. The reading will be *easy* / *medium* / *difficult* for me to understand.
2. I *do* / *do not* need to solve any math problems in this reading.
3. The reading *does* / *does not* have a clearly stated conclusion.

Scan

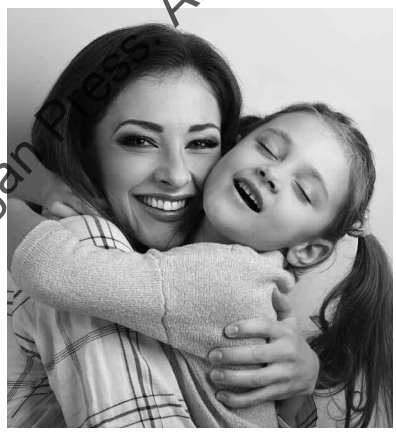
Find the answers to the questions in the reading as quickly as you can. Raise your hand to show your instructor when you have finished.
Find the answers to the questions in the reading as quickly as you can. Raise your hand to show your instructor when you have finished.

1. How many people are mentioned in the text? _____
2. How long does a camera shutter stay open for in good indoor light? _____
3. What prize is mentioned in the text? _____

Read

Read the textbook excerpt. For this reading, do not use a dictionary. Underline no more than five words you would like to look up in a dictionary later.

Mathematics for Everday Life: Who Blinked?



1 You've probably had the experience yourself, taking a photo of a group of people: You finally get everyone to stand still, and everyone to smile, and you take the photo—and when you check it, you find that someone blinked. *OK, everybody, line up again. . . .*

2 Australian scientist Nic Svenson, from the Commonwealth Scientific and Industrial Research Organization (CSIRO) had this experience so many times she began to wonder if there was a way to figure out how many pictures she would need to take to get one with no blinks. She started counting photos, but couldn't figure out a rule or guideline.

Gathering the Data

3 She turned to her colleague, Dr. Piers Barnes, who suggested they develop a formula.

4 First, they needed some data. The average number of times someone blinks while getting their photo taken is ten per minute. The average blink lasts about 250 milliseconds, and a camera shutter stays open for about 8 milliseconds, in good indoor light.

5 Then they considered factors that could influence their data. They concluded that if one person blinks, that doesn't cause another person to blink. In other words, blinking is independent. Furthermore, blinking in one person also doesn't follow a regular pattern.

Creating the Formula

6 Using the information about frequency of blinking, Barnes created a graph to show the probability of a person blinking in a photograph. And from that, he was able to devise a formula.

7 According to Svenson and Barnes, the probability of a single person blinking when a photo is taken can be expressed like this:

8 The number of blinks (x) multiplied by the period of time (t) during which the photo could be ruined.

9 The formula, then, looks like this:

- For one person: $1 - xt$
- For two people: $(1 - xt)(1 - xt)$
- For more than two people: $(1 - xt)n$, where n = the number of people in the group.

10 While the formula isn't difficult, it's still more work that most people want to do when gathering their friends together for a group shot. For a quick estimate, use this handy calculation: If there are fewer than 20 people in your group, divide the number of people by three if you have good light and by two if you have low light. (In bad light, the camera shutter stays open longer, so people have more time to blink.)

11 You might have to do a little rounding, but you can see how it works: For a group of ten friends in good light, you'll probably have to take three pictures ($10 \div 3 = 3.334$, so if we round down, that gives us 3). If you have eight friends in poor light, plan on taking four pictures to get a good one.

12 In groups of more than 20, the number of pictures you need to take increases exponentially, and by the time your group is 50 or larger, it's practically impossible to get a photo with no one blinking.

13 For their efforts, Svenson and Barnes were awarded the Ig Nobel prize for mathematics in 2006, beating out around 6,000 nominees and impressing 100 judges. The Ig Nobel prizes, awarded annually at Harvard University, honor unconventional but theoretically sound research that accomplishes two things: (1) make people laugh and then (2) make them think.

Post-Reading Activities

Main Ideas

Circle the answer that best expresses the main ideas of the reading.

1. The purpose of the formula is to
   a. explain to people why group photos usually look bad
   b. help people understand how many shots they will take to get a group photo that looks good
   c. tell people how many seconds to keep their eyes open when they are having their picture taken

2. The Ig Nobel prize is awarded to research that is
   a. untrue
   b. popular
   c. humorous

3. The main purpose of the reading is to
   a. show readers how mathematics can help them in daily life
   b. discourage people from taking large group photos
   c. help photographers take more successful pictures

Vocabulary

Write answers to the questions. Then discuss them with a partner.

1. Did you underline any words to look up? If so, look them up now. Write the words and their definitions.

   a. _____

   b. _____

   c. _____

   d. _____

   e. _____

2. Now read the text again. Were the words you chose to look up important to understanding the reading? Do you wish you had chosen any different words?

3. Cross out the word that does NOT have a similar meaning to the word in bold.

   1. **photograph**
      a. shot
      b. shutter
      c. image
   2. **equation**
      a. factor
      b. calculation
      c. formula
   3. **guess**
      a. estimate
      b. approximate
      c. wonder
   4. **formula**
      a. guideline
      b. rule
      c. period

Details

Circle the best answer.

1. Dr. Piers Barnes is
   a. someone who works with Nic Svenson
   b. someone Nic Svenson hired

2. Which event takes more time?
   a. a person blinking
   b. a camera shutter opening and closing

3. In which situation will you need to take more photos to get one where nobody is blinking?
   a. lots of light
   b. a little light

4. What is true if you want to take a photo of a group of 50 people?
   a. In good light, you will need to take about 17 photos to get one with no one blinking.
   b. You will probably never be able to get a photo with no one blinking.

Reading Skills: Drawing Conclusions

Discuss these questions with a partner or small group.

1. Re-read Paragraph 1. What conclusion can you draw about what people think about a photo in which someone is blinking? What helps you draw that conclusion?

2. Had other researchers considered the problem of blinking in photographs before Svenson and Barnes? How do you know?

3. Why did the text give the estimation method of dividing the number of people in a group by two or three (depending on light), instead of giving more precise formulas?

4. What opinion does the writer of the text have about the Ig Nobel prizes? Why do you think so?

Understanding the Text

Discuss these questions with a partner.

1. Do you think the next reading in this unit will continue to discuss photography or will it discuss a different topic? Why?

2. What kind of exercises might follow this reading?

Extension

Discuss these questions with a small group, or write a paragraph of response for each.

1. Now that Svenson and Barnes have developed this formula, do you think they apply it every time they take a group photo? Why or why not? Will you apply it the next time you take a group photo? Why or why not?

2. Think of some other common occurrences in life that you wish there were a mathematical formula for (for example, *What is the probability that the phone will ring while you are in the shower?*).

3. Share your answers to Question 2 with another group or the whole class. Imagine scientists have found a formula to explain all the questions. Vote on which formula should win the next Ig Nobel prize for math.