science generation

THE POWER OF PER

SCIENCE ACTIVITIES

SUPPLEMENTARY ACTIVITIES FOR OTHER CONTENT AREAS

FOCUS WORDS

Reader's Theater

Side Effects of Texting

Setting: Aymara just sent her friend Giselle a link to an article about texting. Giselle opened the article and she couldn't believe what she was reading.

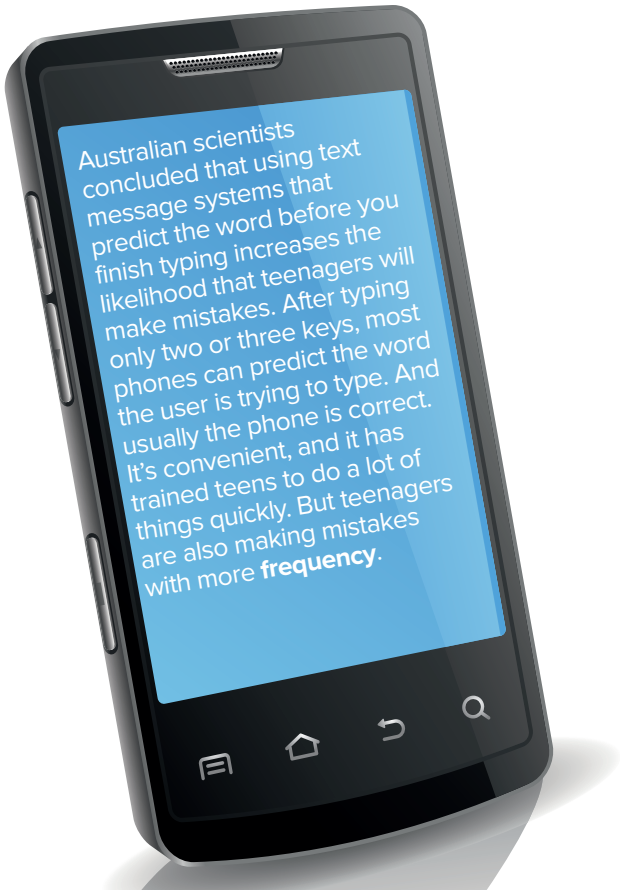
Giselle: This professor says we make more mistakes and say things without thinking because of *texting*.

Reggie: What are you talking about? No professor has been watching me text.

Giselle: *(rolling her eyes)* Uh, Reggie, when I said "we," I meant teenagers, not you and me. Anyway, the prof says the problem is that phones figure out what you're going to type after hitting two or three keys. Now we're getting too used to phones making decisions for us. That makes us do things with more **speed**, but also with lots more mistakes.

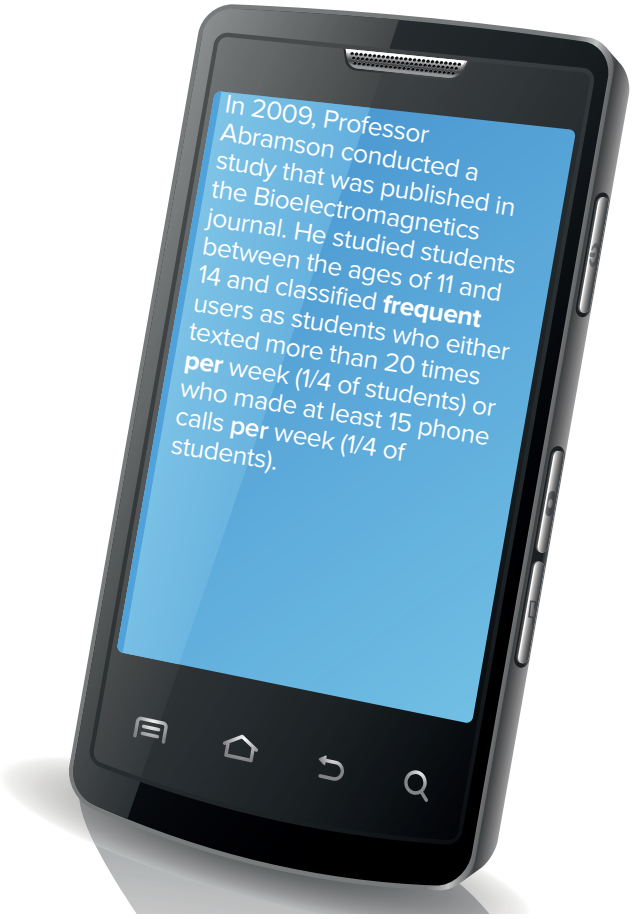
Reggie: Hmm, yesterday I did send Aymara a text that read, "Hope Valley Day," when it should have read, "Happy Valentine's Day." What's the article say?

Giselle: You want me to read it out loud? Okay, here goes:



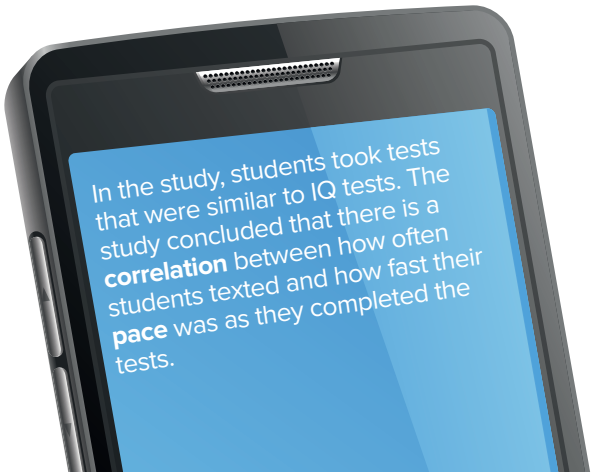
Reggie: Yeah, someone's always pointing out our mistakes. How about writing about how fast we are at typing?

Giselle: Reggie! Let me finish...



Reggie: In 2009! Did they even have cell phones back then? Twenty times **per** week is nothing! My BFFs text way more.

Giselle: I know, right? Get this:



Reader's Theater

Side Effects of Texting

Reggie: **Correlation**? That means something's connected, right?

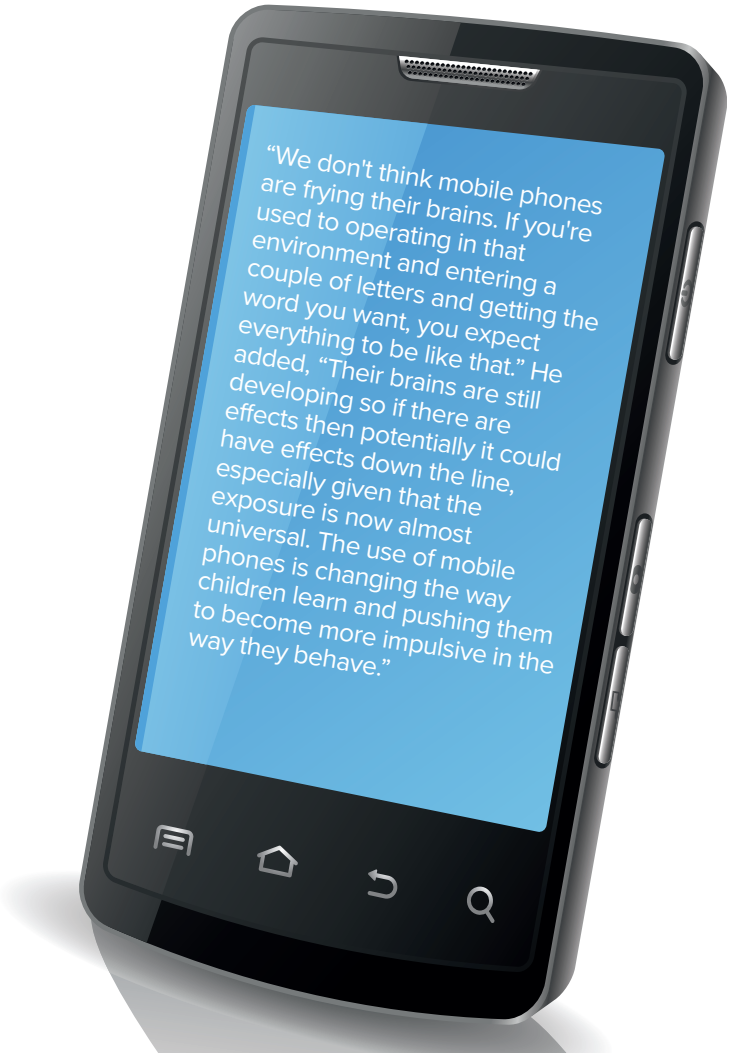
Giselle: Kind of, but not necessarily tied together like a cause and effect. They just happen at the same time. Kind of like: I grew taller this week, and my hair grew longer, but growing taller didn't cause my hair to grow longer. They both happen together, but some other reason causes both of them to happen. According to my mom, that reason is eating disgusting vegetables like broccoli. So this guy is saying that kids who text are likely to **speed** through the test. Let's see...where was I...

Reggie: Okay, this isn't cool. My dad better not see this. He already says I'm impulsive because my brain isn't connected to my body. Now he'll say that I'm impulsive because my cell phone is guessing what I'm typing. He's going to unplug me!

Giselle: Well, maybe both are true?

Reggie: Hey!

Giselle: Wait, listen to what else Professor Abramson said:



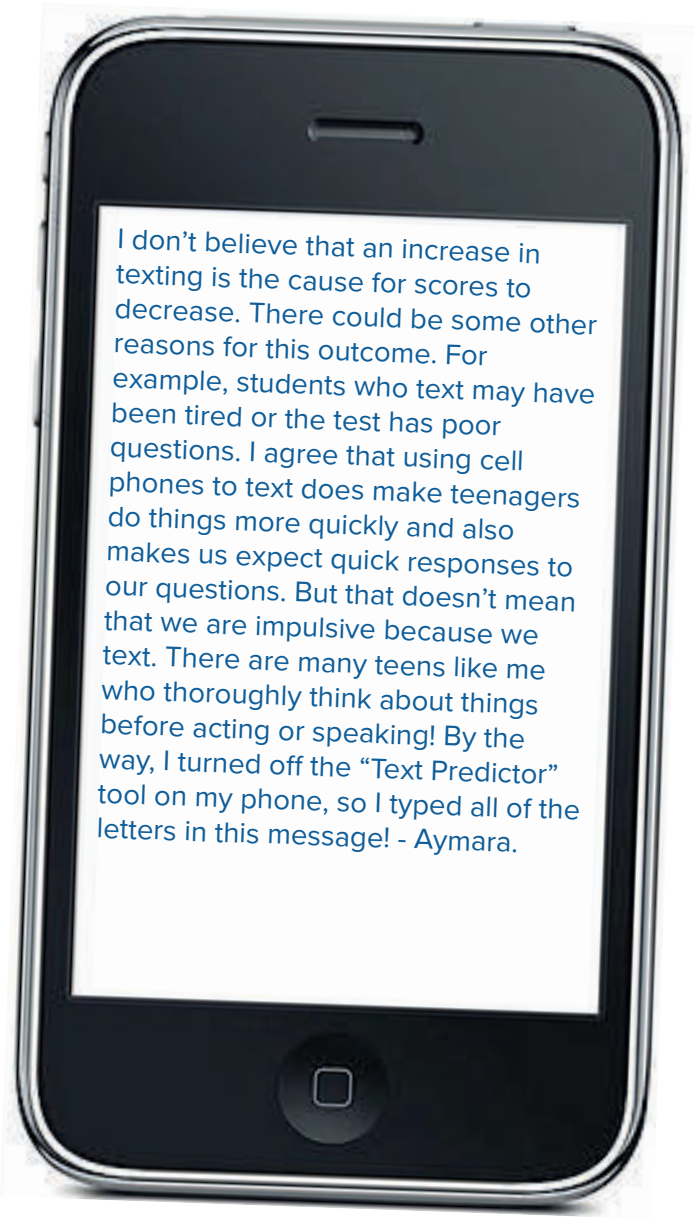
Reggie: *(sarcastically)* Nice of the professor to say that my phone isn't turning my brain into french fries. But I think it's too much to say that using phones makes teens impulsive.

Giselle: Yep, I agree. I don't think phones cause us to make other kinds of mistakes either. Say, I wonder what Aymara thinks about this article? She sent it to us. Why don't you send her a text and ask?

Reader's Theater

Side Effects of Texting

Reggie: *(a few minutes later)* Hey, Giselle, here is Aymara's answer:



Giselle: *(to Reggie)* This is classic Aymara—totally logical and totally opinionated! And she typed every word! Man, this is really long. She must text, like, at the **speed** of light!

Reggie: Hmm, okay, that's a good **pace**. But my thumbs hit the keys so fast, they burn the phone! I'm faster than Aymara.

Giselle: No way. Look, she filled my screen twice, no three times! Can you really beat that?

Reggie: But you don't even know how long it took her to do the texting! She could've taken five minutes! Here, time me for 30 seconds using the timer on your phone.

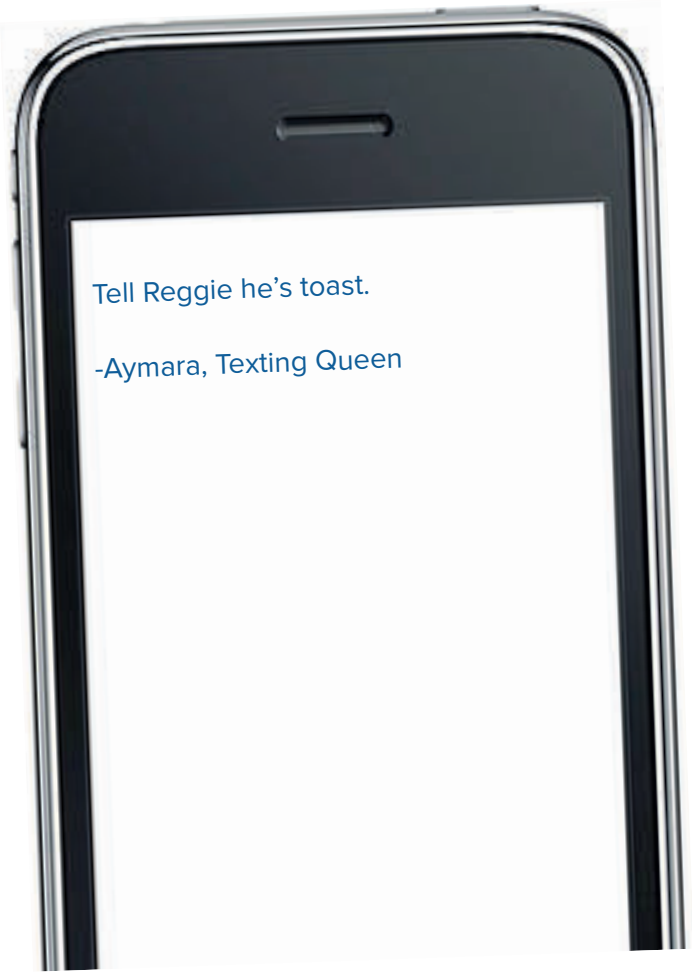
Thirty seconds elapse.

Giselle: ... and STOP! Let me check how you did. Nineteen words in 30 seconds. That's pretty fast! And I'm sorry but I'm counting LOL as one word. Not three. Okay, let's figure out your **speed**: 19 words **per** 30 seconds. And I can shift that to a **per** minute **rate** by doubling. That's 38 words **per** minute. For Aymara's text though, we know she typed a lot, but we don't know how long it took her. So I guess we don't know a **rate** for her.

Reggie: How about sending Aymara a text and tell her to time herself as she texts? Then we can compare our **rates**!

Giselle sends Aymara the message.

Giselle: Aymara is up for the challenge. *Look:*



Reader's Theater

Comprehension Questions

Respond in writing to the questions, then compare and discuss your answers with someone else.

Complete this sentence about the main idea of the article in the journal of *Bioelectromagnetics*.

Professor Abramson found in his study that

_____

_____

_____.

Reggie's dad says that Reggie is impulsive because his brain isn't connected to his body. What does the word *impulsive* mean in this use?

A) doing things quickly

B) doing things repetitively, or time after time

C) acting without thinking things through

D) doing physical things that don't require much thinking

Professor Abramson wanted to find out if students who used their phones a lot behaved impulsively, so he observed students who texted at least 20 times **per** week or called at least 15 times **per** week. When Reggie heard this, he said, "Twenty times **per** week is nothing! My BFFs text way more." Can you restate Reggie's point in more scientific language?

_____

_____

_____.

Reread this part of the Reader's Theater, when Giselle explained to Reggie what a **correlation** is:

> **Giselle**: Kind of, but not necessarily tied together like a cause and effect. They just happen at the same time. Kind of like: I grew taller this week, and my hair grew longer, but growing taller didn't cause my hair to grow longer. They both happen together, but some other reason causes both of them to happen. According to my mom, that reason is eating disgusting vegetables like broccoli.

Here are two more examples of **correlations:**

- People who eat yogurt every day weigh less than people who don't eat yogurt every day.
- People who are taller earn more money.

*Write some **correlations** you think may be true:*

1. _____

   _____

   _____.

2. _____

   _____

   _____ .

Discuss each question with a partner.

Aymara believes since her friends use cell phones, they've learned to do many things faster and expect other people to answer their questions quickly. Do you agree with Aymara? Can you provide examples to back up your opinion?

Professor Abramson thinks that if teens use tools to complete words when is texting, they will do many other things before thinking them through. Giselle, Reggie, and Aymara all disagree with the professor. What is your opinion?

For the previous question, did you really think about it, or did you decide on your opinion instantly?

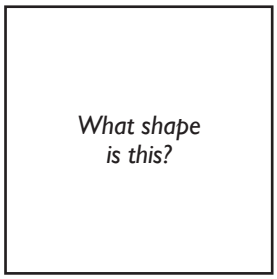
Giselle timed how fast Reggie texted. His **rate** was 19 words in 30 seconds. Then Giselle calculated his **rate** of words **per** minute. Why do you think Giselle wanted to know how many words Reggie could text in one minute instead of 30 seconds?

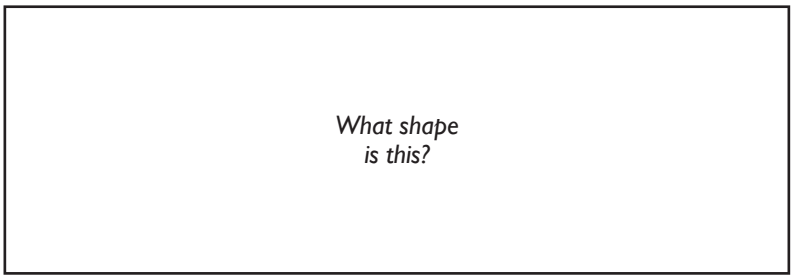
Aymara texted Giselle a long message. But Giselle couldn't use it to compare Aymara's texting **speed** to Reggie's. Why not?

Speaking Scientifically

Ratio and rate: What's the diff?

You probably know this old trick:





If you said one is a square and one is a rectangle, you're right. And if you said they are both rectangles, you're also right! That's true even though the shape on the left is also a square. A square is a special kind of rectangle—one with equal side lengths.

Similarly, a **rate** is a special kind of **ratio**.

A **ratio** is just a comparison of amounts.

For example: In Ms. Litton's class, there are 15 girls to 16 boys.

You can also write this in other ways:

15 girls:16 boys

$\frac{15 \text{ girls}}{16 \text{ boys}}$

→ What is the gender **ratio** in your class?

By the way, it is also correct to use a total in the comparison instead of the way it's done above. For example: In Ms. Litton's class there are 15 girls to 31 total students. It's more like a simple fraction this way, but it's still correct.

15 girls:31 students

A **rate** is a special type of **ratio** that uses two different kinds of units together to give information. In Ms. Litton's class, we compared the number of girls to boys—all the same unit (students). But consider a different situation: You just got a job that pays $75,000 a year. In this case, you are putting together an amount of money and an amount of time. Two totally different units. This is a **rate**.

$75,000/year

You also use **rates** when you talk about **speed**. **Speed** is *always* a **rate**:

25 miles **per** hour (mph)

$\frac{0.75 \text{ meters}}{5 \text{ seconds}}$

Speaking Scientifically

Ratio and rate: Can you tell the difference?

In the table below, mark whether each statement refers to a rate or just a ratio.

Tortoises walk about 100 feet every 5 minutes.	☑ rate	☐ just a ratio
Only three of the sodas were sugar free, and nine were regular.	☐ rate	☑ just a ratio
My internet connection can download two full-length movies in about 10 minutes.	☐ rate	☐ just a ratio
The Berkeley Yellow Jackets won 22 out of 25 games this season.	☐ rate	☐ just a ratio
Famous supermodels often make $250 **per** hour.	☐ rate	☐ just a ratio
At the 2008 Olympics, Usain Bolt ran 100 meters in 9.69 seconds.	☐ rate	☐ just a ratio

Two different kinds of units used: length and time.

This is a **RATE**.

Both of the numbers are referring to soda.

This is just a **RATIO**.

Unit Rates: They communicate better and are easier too.

A *unit* ***rate*** has a value of 1 for the second number. For example, 65 miles **per** 1 hour is a unit **rate**. So is this price for strawberries: $2.49 for 1 dry pint.

Two more examples of unit **rates:**

Dominic scores about 16 points per game.

Maggy types 45 words per minute.

These two examples are not unit ***rates****—yet. Work with a partner to calculate the unit* ***rate****. Show your work.*

The hose leaks 4 gallons of water every 5 hours.

$13.50/6 rides on the subway.

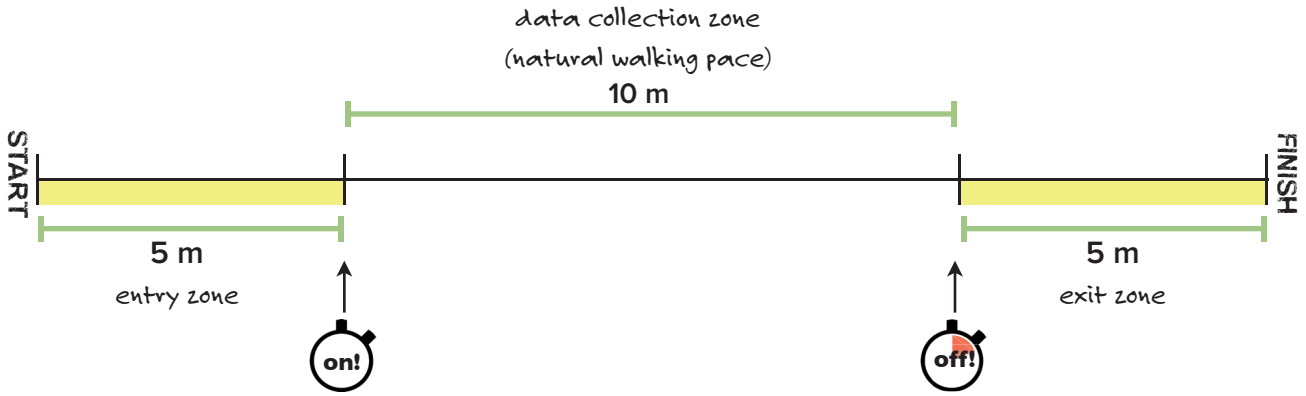
Speaking Scientifically

What is your natural walking pace?

When walking with friends, do you tend to struggle to keep up? Or do you have to slow down to let them catch up with you? In this activity, you and a partner will work together to measure your natural walking **pace**. When you are finished, you will be able to compare your unit **rate** (meters **per** second) with those of other students to see if you are faster or slower than others.

STEP 1: Establish the course

You and your partner will need to measure and mark off a 20-meter walking course in the way shown in the diagram below. This might be in a hallway or an area outside.



STEP 2: Collect data

Have your partner walk the 20-meter course. At the moment he or she moves past the 5-meter entry zone and into the 10-meter data collection zone, **start** your stopwatch. At the moment he or she finishes walking through the data collection zone and crosses into the 5-meter exit zone, **stop** your stopwatch.

Write down the number of seconds (round to the nearest hundredth) it took for your partner to walk through the 10-meter data collection zone.

Repeat this procedure and average the two times. Then trade jobs so your partner can collect data about you.

Natural Walking Pace Data				
Name	**Trial 1 time**	**Trial 2 time**	**Average time**	**Per second rate (unit rate)**

STEP 3: Share your findings during a class discussion.

Lab 1

Breathing rate and heart rate: Do they correlate?

Today you will be exploring whether there is a relationship between your breathing and your pulse.

You will need to work in groups of four for this lab. You will all get turns doing four different jobs:

1. Timekeeper
2. Breath counter
3. Pulse taker
4. Subject (the person being measured)

Materials:

- Jump rope
- Stopwatch
- Pencil and paper for taking notes

Preparation:

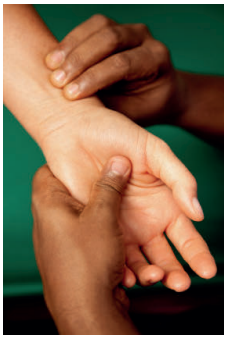
Decide who will take which job first.

STEP 1: Collect baseline data

Tell the subject to sit quietly for a few moments.

*Measure resting heart **rate**:*

Using the method shown in the photograph, the pulse taker locates where he or she can feel the subject's pulse. When the timekeeper signals, the pulse taker counts the number of heartbeats in exactly 30 seconds.



*Measure resting breathing **rate**:*

During the same 30 seconds, the breath counter observes the subject and counts the number of breaths he or she takes. Record your data in the table on the next page.

Repeat this procedure so you can find an average for **accuracy**. Remember to convert your data to a unit **rate** (**per** minute) by multiplying by 2.

When you have finished collecting baseline data for the first subject, continue Step 1 by rotating jobs until everyone in your group has had their resting heart **rate** and resting breathing **rate** measured.

STEP 2: Measuring the effects of exercise

Now you are going to measure the effects of exercise at two intensity levels.

The procedure is exactly the same as Step 1, but this time the subjects will be exercising prior to data collection.

Low-intensity test:

Have the subject jump rope (or a similar exercise) at a slow **pace** for one minute. Immediately after he or she completes this task, measure his or her pulse and breathing for 30 seconds. (Don't forgot to convert to a unit **rate**.) Record the data on the next page.

High-intensity test:

Have the subject jump rope (or similar) at a fast **pace** for two minutes. Immediately after he or she completes this task, measure his or her pulse and breathing for 30 seconds. (Don't forgot to convert to a unit **rate**.) Record data on the next page.

When you have finished the low- and high-intensity exercise tests for the first subject, continue Step 2 by rotating jobs so that everyone in your group is measured.

Lab 1

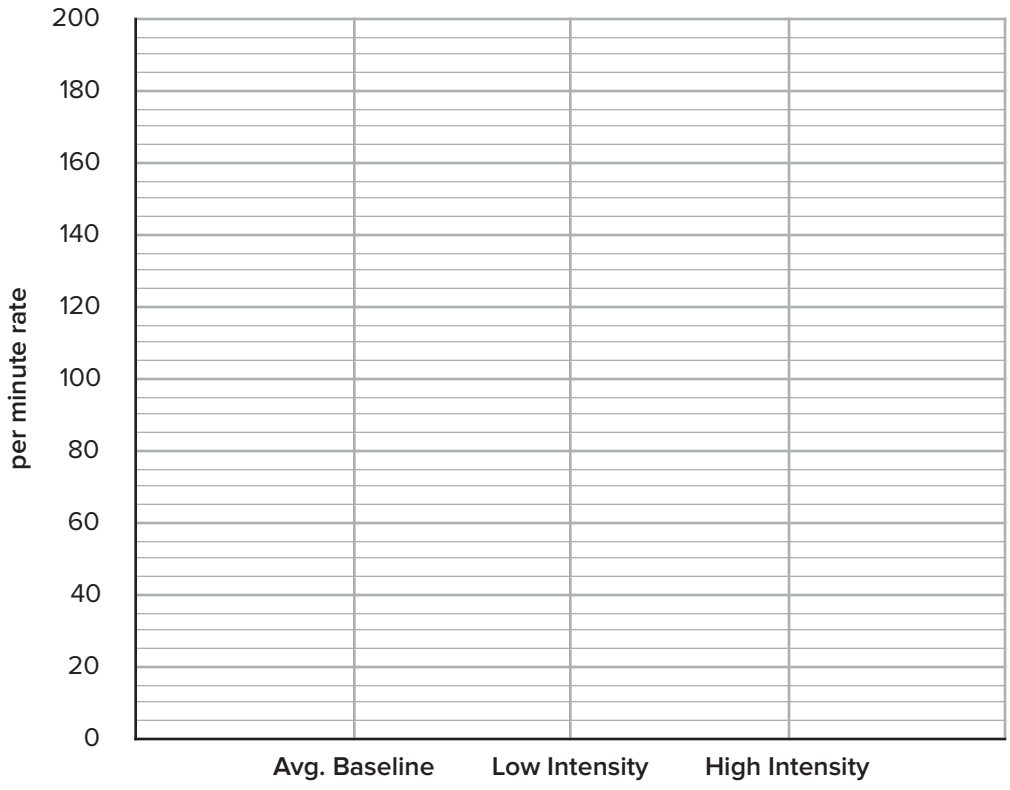
Breathing rate and heart rate: Do they correlate?

Enter your data from all tests into this table.

	Heart Rate		Breathing Rate	
	30-second sample	***per** minute **rate***	*30-second sample*	***per** minute **rate***
Baseline Test 1				
Baseline Test 2				
Average of Baseline Tests				
Low-Intensity Exercise Test				
High-Intensity Exercise Test				

STEP 3: Graphing your data

After you complete your table, plot your data points on the graph. Use one color to represent heart **rate** and a different color to represent breathing **rate**. If this is not a familiar task to you, ask your teacher to show you a sample graph.



Lab 1

Breathing rate and heart rate: Do they correlate?

STEP 4: Consider your data...What might it mean?

1. What effect does exercise have on your breathing **rate**? On your pulse **rate**?

2. Is there a **correlation** between your breathing and pulse **rates**? If so, why do you think this relationship exists?

3. Why did you repeat your measurements when collecting baseline data? Would you have better data if you repeated the other tests too? Why or why not?

4. You have collected quantitative data about what happened when you exercised. Can you add some qualitative data about what happened during the tests? For example, did your face feel hot?

5. On a scale from 1 to 4, **rate** your group's **precision** when collecting data:

☐ disorganized and imprecise (1) ☐ okay, but not great (2) ☐ good with minor exceptions (3) ☐ flawless (4)

Can your group make a claim about something you think is true based on the evidence in your lab work? If so, **MAKE IT**!

MAKE CLAIM HERE!

Lab 2

Unit Rates and Percentage: Concept Cousins

Shooting free throws

Competitive basketball players always try to improve the number of free throws that they make. As most of you know, when you are fouled, you can shoot a free throw. That means you stand alone on the free throw line, and no one blocks you. When you make it, the team scores a point. Sound easy? Actually, even professional basketball players miss a lot!

Michelle is a starting point guard for Patterson High. In the last 10 games, she made 27 out of 42 free throws. That's 27 made **per** 42 attempts.

To find the unit **rate** of Michelle's **accuracy** with free throws, this is what you do:

$$\frac{27 \text{ made}}{42 \text{ attempts}}$$

THINK:
What do I need to do to change the **ratio's** second number to 1?

$$\frac{27 \text{ made}}{42 \text{ attempts}} \begin{matrix} \div 42 \\ \div 42 \end{matrix} = \frac{.64 \text{ made}}{1 \text{ attempt}}$$

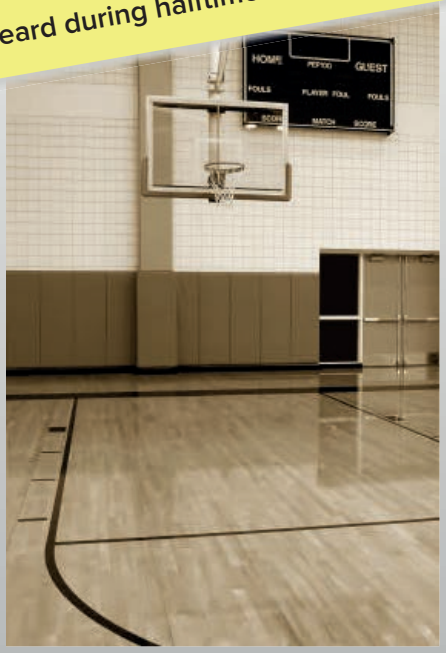
That unit **rate** is totally valid, but it's kind of strange to think of Michelle making .64 of a basket. One way that can help everyone understand how good (or bad) Michelle is at shooting free throws is to convert the unit **rate** into a percentage **rate**.

It's very easy:

.64 made per attempt = 64% accuracy

Percentage is a lot like unit **rate**. The difference is that unit **rate** is **per** one, and percentage **rate** is **per** 100. So in this case, we can think of Michelle making about 64 out of 100 of her free throws. Not bad!

Overheard during halftime at a recent game:



Coach: Michelle, so far in tonight's game, you've made 3 out of the 12 free throws you took. That is a **rate** of .25 baskets **per** 1 shot. Or just 25 percent.

Michelle: Geez coach, that's not too good. My free throw success **rate** is usually much higher. What should I do?

Coach: Well, you always shoot as soon as you get the ball from the official. Try to slow down to give yourself a few seconds before you shoot.

Michelle: Okay, sure! Lots of times if I slow down, I am more **accurate**!

Lab 2

Can studying rate lead to a better strategy?

When Michelle and Jordan have the same free time, they enjoy competing in a friendly game of wastebasket-ball. The way they usually play is by crumpling up lots of paper from the recycling bin and shooting as many times as they can in one minute. Whoever gets more "baskets" wins.

But Michelle was thinking about what her coach told her the other day. On her real basketball team, she's trying to balance the **frequency** and **accuracy** of her shooting.

She asked Jordan to design an experiment with her using the same materials they use when they play their game.

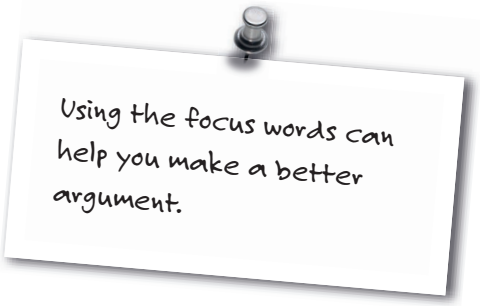
Michelle wants to explore whether she would have a greater success **rate** making baskets if she attempts as many shots as possible or if she prepares more carefully for each shot.

If you were Jordan, how would you recommend Michelle set up her experiment?

Check with your teacher to see if you have time to try your experiment.

Writing

There is an old saying: "Quality over quantity." It's nice and poetic, but is it always true? Write about aspects of your life when you feel your success is measured by **speed** or **frequency** more than how carefully you do things. In addition, write about times when you feel most successful by striving for **accuracy** or **precision**. Do you believe one is more important than the other? Do you think one is not emphasized enough in your life right now? Is your **pace** too fast? Too slow? Just right?



Writing

Sentence Surgery

The verb **correlate** is one of our focus words for the week. If two things **correlate**, it means there is a connection or relationship between them. So you are **correlated** to your brother? Not exactly.

Let's see if we can figure out what this word means by looking closely at how it was used in the Reader's Theater this week. Sometimes, we have to ask ourselves a lot of questions when we read in order to understand the meaning.

What two actions are being **correlated** here?

_____

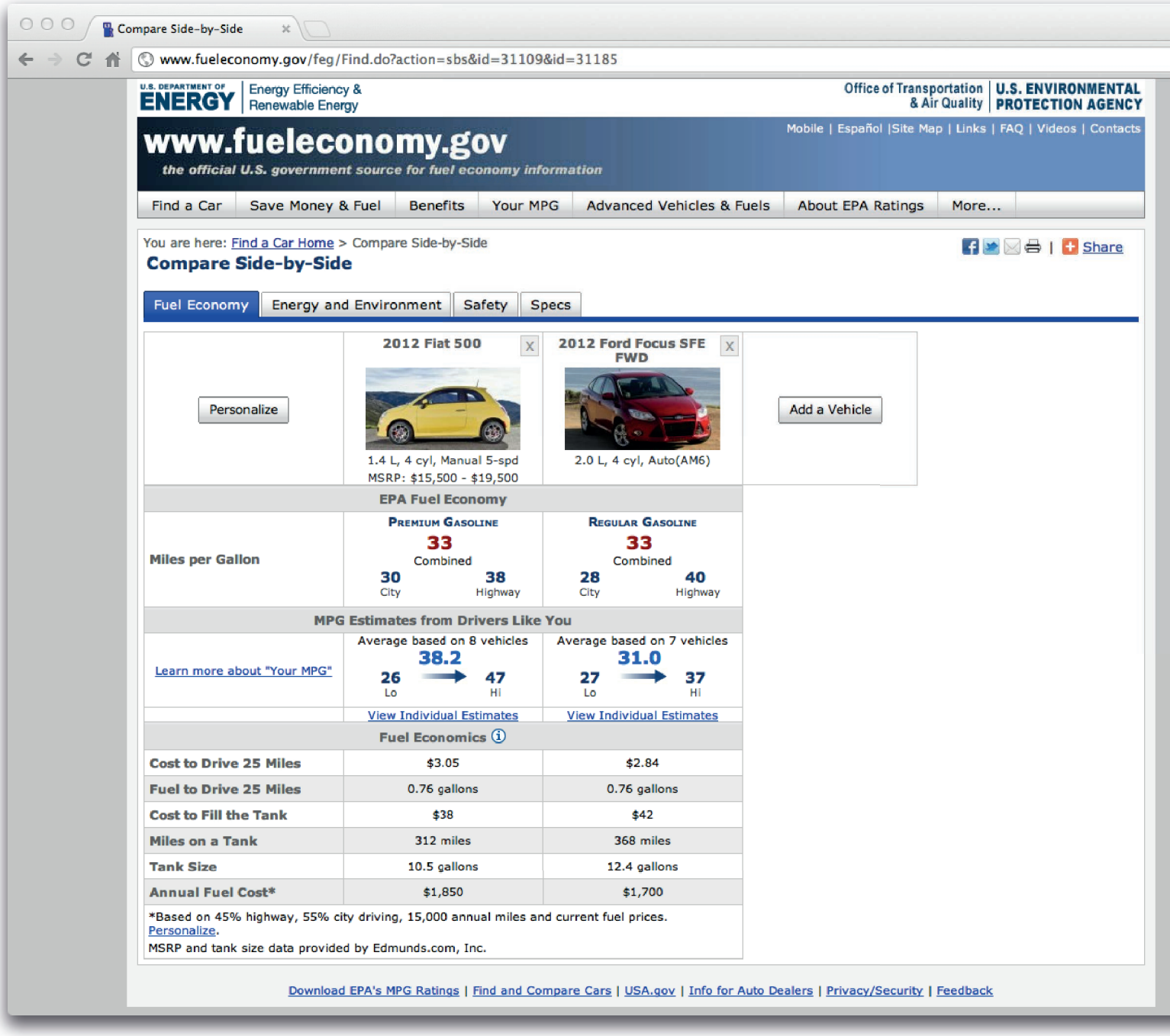
_____

What do you think is the reason for this **correlation**?

_____

_____

Talking Cars in Math Class



Compare Side-by-Side

www.fueleconomy.gov/feg/Find.do?action=sbs&id=31109&id=31185

U.S. DEPARTMENT OF ENERGY | Energy Efficiency & Renewable Energy

Office of Transportation & Air Quality | U.S. ENVIRONMENTAL PROTECTION AGENCY

www.fueleconomy.gov

the official U.S. government source for fuel economy information

Mobile | Español | Site Map | Links | FAQ | Videos | Contacts

Find a Car | Save Money & Fuel | Benefits | Your MPG | Advanced Vehicles & Fuels | About EPA Ratings | More...

You are here: Find a Car Home > Compare Side-by-Side

Share

Compare Side-by-Side

Fuel Economy | Energy and Environment | Safety | Specs

	2012 Fiat 500	2012 Ford Focus SFE FWD	
Personalize	1.4 L, 4 cyl, Manual 5-spd MSRP: $15,500 - $19,500	2.0 L, 4 cyl, Auto(AM6)	Add a Vehicle

EPA Fuel Economy		
	Premium Gasoline	Regular Gasoline
Miles per Gallon	33 Combined 30 City, 38 Highway	33 Combined 28 City, 40 Highway

MPG Estimates from Drivers Like You		
	Average based on 8 vehicles 38.2 26 Lo → 47 Hi	Average based on 7 vehicles 31.0 27 Lo → 37 Hi
Learn more about "Your MPG"	View Individual Estimates	View Individual Estimates

Fuel Economics		
Cost to Drive 25 Miles	$3.05	$2.84
Fuel to Drive 25 Miles	0.76 gallons	0.76 gallons
Cost to Fill the Tank	$38	$42
Miles on a Tank	312 miles	368 miles
Tank Size	10.5 gallons	12.4 gallons
Annual Fuel Cost*	$1,850	$1,700

*Based on 45% highway, 55% city driving, 15,000 annual miles and current fuel prices. Personalize.

MSRP and tank size data provided by Edmunds.com, Inc.

Download EPA's MPG Ratings | Find and Compare Cars | USA.gov | Info for Auto Dealers | Privacy/Security | Feedback

Your math teacher will project a page from the website above (or you can use this printout). Look at all the data available about the fuel economy of cars available in the United States. Your goal is to make a comment or ask a question during class discussion that relates to the webpage and also uses one of the focus words correctly. Your teacher will check off the word when he or she hears it used by a student in a mathematically **accurate** way.

Good luck!

Touch Type

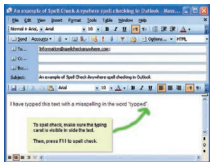
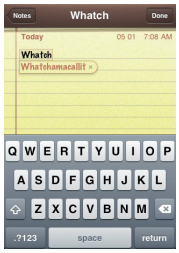
Throughout most of the 20th century, most American students took a typing class during middle or high school. Most people used typewriters to make their essays, letters, or other important documents appear more formal. It was common for people to compose drafts of documents in *long hand* (handwriting) first and then type on a typewriter. Making a mistake when typing meant starting over, so **accuracy** and **precision** were essential. But this took a long time. People had to look at their draft, remember a few words or sentences, find the keys on the typewriter, and hope that they didn't make a mistake!

Thus, touch type was invented to increase the **speed** at which a person could type a document. The touch type system allowed typists to keep their eyes on the long hand version of their documents without having to glance at the keyboard. The system required typists to learn where the keys were and to practice striking the keys accurately while increasing their **pace**. You may have noticed that on most keyboards, there is a little bump on the *F* and the *J* keys. These tiny bumps guide touch typists to the important home keys. Once their index fingers are on these two keys, a person who has learned to touch type uses muscle memory to strike the other keys. After a few months of practicing, most typists can reach the **rate** of 60 words **per** minute without looking at the keyboard!

Computers allow people to easily correct errors and revise their thoughts while typing. As a result, most people compose letters, essays, and other documents while typing on the computer. As the **frequency** of computer use in schools and work increased, schools stopped teaching touch type. Most kids develop their own system for typing by the time they reach middle school.

Some people think that students should still learn how to touch type because it frees their brain to be more creative and reflective when writing. They say that a person who has to hunt for keys while typing loses concentration and will produce less thoughtful work. Other people say there is no **correlation** between producing thoughtful essays or reports and the use of touch typing. What do you think? Do you think you would produce better essays if you didn't have to look at the keyboard?

A brief history of keyboard error correction:

1900–1950	1950s	1970s	1980s	1990s	2000s
Until around 1950, a person had to start all over after making a mistake while typing!	Correction fluid was invented. Mistakes could be covered up and typed over.	Early computers allowed for deletion and backspacing to correct errors	Spell check was introduced in word processing software.	Autocorrect was introduced in word processing software to automatically correct mistakes.	Predictive texting and typing became common on cell phones and computers.
					

For Discussion:

Improvements in error correction technology allow people to work faster and worry less about **accuracy** and **precision**. What do you think will be the next innovation in error correction technology? Why might some people say that this technology is harming society as much as it is helping it?

Examining the Focus Words Closely

SciGen Unit 7.3

→ Scientific or * Everyday Use	Definition	Try using the word...
→ **per** *preposition*	for each	*How many hours of TV do you watch **per** week?*
→ **speed** *noun*	the rate at which something moves	*Which is faster: the **speed** of light or the **speed** of sound?*
* **speed** *noun*	the rate at which something occurs	*I cleaned my room at a remarkable **speed**.*
→ **rate** *noun*	a comparison of two different units to give information	*Distance traveled compared to time tells the **rate** of speed. Do you know what* mph *stands for? Hint: The speed limit of many highways is 65 mph.*
* **rate** *verb*	to give something a value or rank	*How would you **rate** last year's Super Bowl?*
→ **ratio** *noun*	a comparison of two amounts	*What is the **ratio** of boys to girls in your classroom?*
→ **frequency** *noun*	the number of times that something happens within a particular period	*What is the **frequency** at which you send text messages?*
* **frequent** *adjective*	happening often	*Why are student absences more **frequent** during the month of June?*
→ **accuracy** *noun*	correctness in every detail	*In which sports is **accuracy** crucial?*
* **accurate** *adjective*	correct in all details	*Have you ever seen a news report that was not entirely **accurate**?*
→ **precision** *noun*	the state of being very exact	*Why is **precision** important when conducting a scientific investigation?*
* **precise** *adjective*	exact	*What are the **precise** words that Martin Luther King, Jr., said during the march on Washington, D.C.?*
→ **pace** *noun*	the speed or rate at which something is done	*At what **pace** can you run continuously for 30 minutes?*
* **pace** *verb*	to walk in one direction and then switch to the other again and again	*Why might a student **pace** in front of the principal's office?*
→ **correlate** *verb*	to have a relationship where two or more things happen or change together	*Why do you think obesity **correlates** with increased risk of a heart attack?*
* **correlation** *noun*	a relationship between two or more things that happen or change together	*Do you think there is a **correlation** between time spent on after-school activities and test performance in class?*