

Real-World Takeaways

- The longer the text (or time distracted) and the faster a driver is going, the more road they miss while distracted.
- A car going 30 mph will travel more than 100 feet even in the time it takes to send a very short text.
- Each day approximately nine people in the United States die from distracted driving; 40% of those are pedestrians or passengers not engaged in the dangerous activity themselves.

Mathematical Objectives

- Use unit rates proportional reasoning to solve multi-step ratio problems

Lesson at a Glance

90 min.

		Lesson at a Glance	90 min.
Launch		Watch a PSA about the dangers of texting and driving. Discuss personal feelings about riding with someone who's texting and driving.	10 min.
Part One	1	Estimate how many seconds it would take to respond to two different text messages.	5 min.
	2	Use proportional reasoning to estimate how far a car going 30mph would travel in the time needed to type each text reply.	20 min.
	3	Determine how far the car would travel if it were going 60mph.	20 min.
Part Two	4	Calculate the distances traveled at different speeds during the time that's likely lost during common distractions like: unwrapping food, checking on a baby, gawking at a wreck.	20 min.
	5	Plan what you might say as a passenger if you were riding with someone who was distracted while driving.	15 min.

- L Students watch a PSA about the dangers of texting and driving. In the video, a teenager is driving down the road while using her cell phone. A moment later, you hear a crash. You then see the phone resting by the side of the road as emergency workers load the driver in the ambulance. (Note: the video is dramatic but is not graphic.)



Discussion Questions

1. *What happened in the video? What caused the accident?*
2. *How dangerous do you think texting and driving is? Do you think it's a big problem?*
3. *Have you ever been in the car when the driver was on their phone? How did it make you feel? Did you say anything?*

Key Takeaways

- It's common for drivers to use their cell phones while operating a car. It's also very dangerous.

- 1 If you received the text messages below, how many seconds do you expect it would take you to send a reply?1

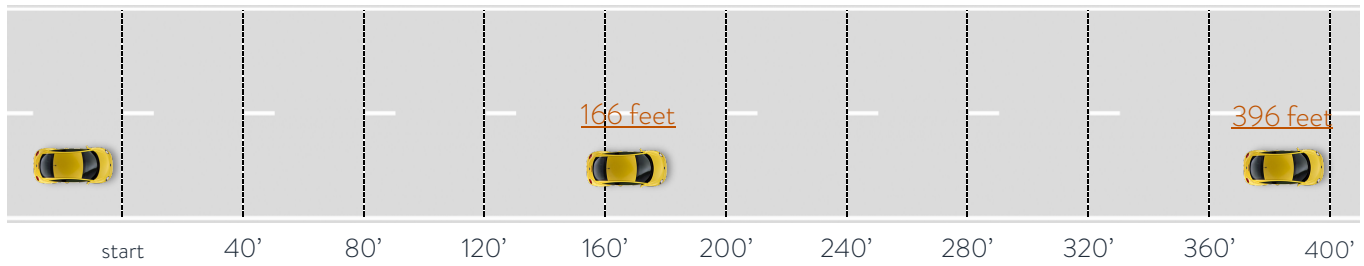
<p>What's your ETA?</p> <p>I'll be there in 20 minutes</p> <p></p> <p><u>4 seconds</u></p>	<p>Ordering food. What do you want?</p> <p>Will you order me a foot-long turkey sub with everything?</p> <p></p> <p><u>9 seconds</u></p>
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*Response times will vary by student.
The times above will be used as examples throughout this teacher guide.*

Teacher Tip

If students have cell phones, consider allowing them to type their messages and time how long it takes. Also, if students prefer to respond to different messages than the sample ones above, that's totally fine.

- 2 The car below is driving at 30 miles per hour. Use the diagram to show how far it would travel in the time it takes you to respond to the first text above. Then do the same for the second text. Are you surprised by these distances?



	<u>Message A (ex. 4 sec.)</u>	<u>Message B (ex. 9 sec.)</u>
Method 1: solve proportion	$\frac{30 \text{ miles}}{1 \text{ hour}} = \frac{d \text{ feet}}{4 \text{ seconds}}$ <p>1 mile = 5,280 feet 30 miles = 5,280 · 30 = 158,400 feet 1 hour = 60 minutes · 60 sec./min. = 3,600 sec.</p> $\frac{158,400 \text{ feet}}{3,600 \text{ seconds}} = \frac{d \text{ feet}}{4 \text{ seconds}}$ $3,600d = 158,400 \cdot 4$ $3,600d = 633,600$ <p><u>d = 176 feet</u></p>	$\frac{30 \text{ miles}}{1 \text{ hour}} = \frac{d \text{ feet}}{9 \text{ seconds}}$ <p>1 mile = 5,280 feet 30 miles = 5,280 · 30 = 158,400 feet 1 hour = 60 minutes · 60 sec./min. = 3,600 sec.</p> $\frac{158,400 \text{ feet}}{3,600 \text{ seconds}} = \frac{d \text{ feet}}{9 \text{ seconds}}$ $3,600d = 158,400 \cdot 9$ $3,600d = 1,425,600$ <p><u>d = 396 feet</u></p>
Method 2: convert mph to feet per minute, then apply unit rate	$\frac{30 \text{ miles}}{1 \text{ hour}} = \frac{158,400 \text{ feet}}{1 \text{ hour}} = \frac{158,400 \text{ feet}}{3,600 \text{ seconds}} = \frac{44 \text{ feet}}{1 \text{ second}}$ <p>The car travels 44 feet in 1 second. The text message takes 4 seconds to write.</p> $44 \text{ feet/second} \cdot 4 \text{ seconds} = \underline{176 \text{ feet}}$	$\frac{30 \text{ miles}}{1 \text{ hour}} = \frac{158,400 \text{ feet}}{1 \text{ hour}} = \frac{158,400 \text{ feet}}{3,600 \text{ seconds}} = \frac{44 \text{ feet}}{1 \text{ second}}$ <p>The car travels 44 feet in 1 second. The text message takes 9 seconds to write.</p> $44 \text{ feet/second} \cdot 9 \text{ seconds} = \underline{396 \text{ feet}}$

Teacher Tip

When students write their calculations, it's best that they include the units. However, writing out the units can be cumbersome, especially with an expression such as 3,600 seconds · d feet = 158,400 feet · 4 seconds. If students don't write their units when doing their calculations, make sure they at least include their units with the answer.

- 3 If the car were driving at 75 miles per hour, calculate how far it would travel in the time it takes to send each text message. Based on this, which do you think is more dangerous – texting on a highway or in a residential area – and why?

Students can use the same methods from before, replacing 30 miles (and 30 mph) with 75 miles (and 75 mph).
Alternatively, they can use their previous answers as a starting point for finding the new distances.

	<u>Message A (ex. 4 seconds)</u>	<u>Message B (ex. 9 seconds)</u>
Method 1: solve proportion	$\frac{30 \text{ mph}}{176 \text{ feet}} = \frac{75 \text{ mph}}{d \text{ feet}}$ $30d = 176 \cdot 75$ $30d = 13,200$ $d = \underline{440 \text{ feet}}$	$\frac{30 \text{ mph}}{396 \text{ feet}} = \frac{75 \text{ mph}}{d \text{ feet}}$ $30d = 396 \cdot 75$ $30d = 29,700$ $d = \underline{990 \text{ feet}}$
Method 2: reason proportionally	<p>When the car is driving at 30 mph, it will go 176 feet in 4 seconds.</p> <p>Compared to a car driving at 30 mph, a car driving at 75 mph is traveling $75 \div 30 = 2.5$ times as fast. If the car drives 2.5x as fast, it will travel 2.5x as far (in the same amount of time).</p> $176 \text{ feet} \cdot 2.5 = \underline{440 \text{ feet}}$	<p>When the car is driving at 30 mph, it will go 396 feet in 9 seconds.</p> <p>Compared to a car driving at 30 mph, a car driving at 75 mph is traveling $75 \div 30 = 2.5$ times as fast. If the car drives 2.5x as fast, it will travel 2.5x as far (in the same amount of time).</p> $396 \text{ feet} \cdot 2.5 = \underline{990 \text{ feet}}$

Teacher Tip

The distances may start to feel abstract. To help students better visualize just how far the car is traveling, encourage them to relate the distances to something familiar. For instance, a football field is 100 yards long, or 300 feet (not including the endzones). This means that in the 9 seconds it takes to send the second text message, a car driving at 75 mph would travel *farther than three football fields*. That's nuts.

4 Distracted driving is one of the leading causes of car accidents. Of course, phones aren't the only type of distraction. For each activity below, estimate how many seconds it takes and how fast the car may be driving. Which type of distraction would you say is the most dangerous and why?



Activity	Texting	Unwrapping Food	Checking on Baby	Rubbernecking
Time	4 seconds	<u>6 seconds</u>	<u>4 seconds</u>	<u>8 seconds</u>
Speed	60 mph	<u>20 mph</u>	<u>35 mph</u>	<u>10 mph</u>

Times and speeds will vary based on students' estimates. Students may also disagree that the activity that causes the car to travel the farthest is necessarily the most dangerous. Students might also consider how likely it is that other cars and pedestrians will be present. For instance, the car travels the least far during rubbernecking, but there's also a good chance other cars will be doing the same.

Method 1: calculate distances traveled	<p>60 mph = 88 feet per second</p> <p>$88 \text{ fps} \cdot 4 \text{ sec.} = \underline{352 \text{ feet}}$</p> <p>1st most dangerous</p>	<p>25 mph = 29.3 feet per second</p> <p>$29.3 \text{ fps} \cdot 6 \text{ sec.} = \underline{175.8 \text{ feet}}$</p> <p>3rd most dangerous</p>	<p>35 mph = 51.3 feet per second</p> <p>$51.3 \text{ fps} \cdot 4 \text{ sec.} = \underline{205.2 \text{ feet}}$</p> <p>2nd most dangerous</p>	<p>10 mph = 14.7 feet per second</p> <p>$14.7 \text{ fps} \cdot 8 \text{ seconds} = \underline{117.6 \text{ feet}}$</p> <p>4th most dangerous</p>
Method 2: reason proportionally to compare pairs	<p>Texting vs. Baby</p> <p>Texting and checking on baby take the same amount of time but the texting car is going faster.</p> <p>Texting is more dangerous than checking on the baby.</p>	<p>Texting vs. Food</p> <p>Unwrapping food takes 1.5x as long as texting, but texting car is traveling 3x as fast.</p> <p>Texting is more dangerous than unwrapping food.</p>	<p>Food vs. Baby</p> <p>Unwrapping food takes 1.5x as long as checking on the baby, but the baby car is traveling 3.5x as fast.</p> <p>Checking on the baby is more dangerous than unwrapping food.</p>	<p>Baby vs. Gawking</p> <p>Rubbernecking takes 2x as long as checking on the baby, but the baby car is driving 3.5x as fast.</p> <p>Checking on the baby is more dangerous than rubbernecking.</p>
Texting > Unwrapping Food > Checking on Baby > Rubbernecking				

- 5 Most drivers agree that driving distracted is dangerous...but many do it anyway. Each day, approximately 9 people in the United States die from distracted driving. 60% are drivers, 25% are passengers, and 15% are pedestrians.

Imagine you're riding in a car with someone you know, and suddenly they get distracted (e.g. by a text, baby, etc.). Come up with one thing you say in this situation to help them re-focus on driving. Would you actually say it??

Responses will vary.

Teacher Tip

Traffic accidents are the leading cause of the death for teenagers. Even if your students don't drive yet themselves, they might often ride with an older sibling or family member. In situations like this, they might be reluctant to speak up or be criticized as a "back seat driver." As hokey or preachy as it may sound, you might challenge your students to consider what's worse: being annoying or being in an accident.