

<b>Title:</b> Scale Factor: Toy Cars v. Real Cars	<b>Grade(s):</b> 7th grade  <b>Author(s):</b> Arin Edge & Bethany Patrick	<b>BIG Idea:</b> Scale Factor
<p><b>Real-World Connection:</b>  The video clip shows how to design toy cars. Designers take actual cars that we drive around every day and measure their length, width, height, and many other items so that they can build a replica toy car that looks just like the real car. The difference in the new toy car is that it is a much smaller version of the cars we drive. The designers use scale factor to make the dimensions of the toy cars. Student will verify the scale of 1:64 between real cars and Hot Wheels.</p> <p><b>How Students will Experience the Connection:</b></p> <p>Video Clip                      Photo                      Podcast</p> <p>Print Media (article, ad, etc.)      Vodcast                      Other</p>		
<p><b>GPS Standards</b></p> <p><b>M7G3.</b> Students will use the properties of similarity and apply these concepts to geometric figures.</p> <p>a. Understand the meaning of similarity, visually compare geometric figures for similarity, and describe similarities by listing corresponding parts.</p> <p>b. Understand the relationships among scale factors, length ratios, and area ratios between similar figures. Use scale factors, length ratios, and area ratios to determine side lengths and areas of similar geometric figures</p> <p><b>M7P4.</b> Students will make connections among mathematical ideas and to other Disciplines</p> <p><b>M7P5.</b> Students will represent mathematics in multiple ways</p> <p><b>M7P1.</b> Students will solve problems (using appropriate technology).</p>	<p><b>Objectives:</b></p> <ul style="list-style-type: none"> <li>Given a toy Hot Wheels car, students will be able to accurately measure the dimensions of the car and convert the scale from 1/64 to the dimensions of the real version of that toy car .</li> <li>Students will be able to recreate a toy version of an actual real car that reflects a scaled down version using the 1/64 measurements.</li> <li>Students will be able to communicate their reasoning and methods to the class.</li> <li>Students will be able to explain how mathematics is used in the real world to create and build toy cars along with actual real cars.</li> </ul>	
<p><b>Materials:</b></p> <p>Computer &amp; Projector  Video: ( approx 3 min)  <a href="http://www.thefutureschannel.com/dockets/hands-on_math/designing_toy_cars/swf/video.swf">http://www.thefutureschannel.com/dockets/hands-on_math/designing_toy_cars/swf/video.swf</a></p> <p>Hot Wheels cars*  Real Cars to measure OR Dimensions from the internet*</p> <p>* If possible, choose toy cars with corresponding real cars to make it easier to verify calculations</p>	<p><b>Per Group:</b></p> <p>Measuring Tape  Markers  Rulers  Pencil  Hot Wheels Car  Calculator</p> <p><b>Per Student:</b></p> <p>Activity sheet</p>	

## Related Task:

Have students watch the DVD about creating toy cars. Ask a few questions that will see what they noticed about the video and what they already know about toy cars and real cars.

- **What did you learn about how toy cars are made?**
- **How do they make a smaller version of the real car?**
- **What does it mean for the toy car to be 1/64ths of the actual car?**

Give each group (2-3) a Hot Wheels car and the activity sheet to complete. Walk around and give assistance to those students who may need help. Student will measure all of the different dimensions of your toy Hot Wheels car and record that on the activity sheet. Then, convert those measurements into the corresponding measurements of the real car. Show students how to locate the dimensions as needed.



<http://en.wikipedia.org/wiki/Wheelbase>

- **Measure the dimensions on the Hot Wheels car and multiply it by 64 to get the 1/64 scale for the real car dimensions.**
- **If I wanted to make a real car using the toy car as a model, what would I do?**
- **If the length of your Hot Wheels car is 1 inch, how many lengths would you have to have to make your 1/64ths scale of the real car hold true? So, now you took the measurement of 1 inch, what multiplied by that 1 inch will give you 64?**

Once the class seems to have an understanding of the measurements and has completed the first using the toy car, move on to working with the real car. Students will use measuring tapes to go outside and measure the dimensions of a real car. If that is not possible, use the internet to find actual measurements. Remind students that they will use a similar process. Measure and record the dimensions of the real car then convert to find the corresponding measurements of the toy car. Students need to remember that they are doing this a little different this time because they are working from the real version to the toy version of the car this time instead of working from the toy version up. That will make a difference in how you solve for the dimensions of toy cars.

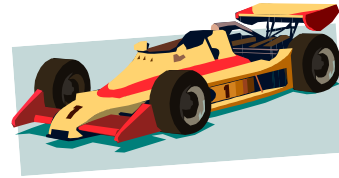
As groups finish, have them prepare presentations to share with the class about the relationships between the dimensions of the toy cars and real cars. Groups will listen to other groups share their methods and rationale.

- **What were your methods of solving this problem?** Students share their various methods.
- **What kind of measurement units did we use today?** Inches
- **How did you find the actual dimensions of the toy car from the real car?** Took the measurements we gathered from the real car in inches and divided by 64.
- **How could we know if our measurements were correct if we did have a toy version of the cars you measured?** We could line the toy car back to back and after 64 times it should equal the length of the real car. You could do the same thing with height and width.
- **How do toy car designers use scale models?** They create small scale cars that represent the dimensions of the actual car that is going to be build.

## Learn More:

*Mathematical Explorations: Hot Wheels (Winsor and Lesser); Mathematics Teaching in the Middle School , Nov 2009*

**Scale Factor:  
Toy Cars vs Real Cars**



1. In the video, the designer states that the toy cars have a scale of 1:64. Explain what that means in your own words.

2. Measure your toy car to complete the table below.

Feature of the Car	Toy Car Dimensions
Exterior Length	
Exterior Width	
Exterior Height	
Wheel base Length	
Other	

3. How can you use the scale and toy car dimensions to determine how large the real car would be? Explain how you plan to find the measurements of the real car .

4. Use your plan to find the measurements of the real car. Then complete the table below.

Feature of the Car	Real Car Dimensions
Exterior Length	
Exterior Width	
Exterior Height	
Wheel base Length	
Other	

5. Measure your real car to complete the table below.

<b>Feature of the Car</b>	<b>Real Car Dimensions</b>
<b>Exterior Length</b>	
<b>Exterior Width</b>	
<b>Exterior Height</b>	
<b>Wheel base Length</b>	
<b>Other</b>	

6. How can you use the scale and real car dimensions to determine how small the toy car would be? Explain how you plan to find the measurements of the toy car.

7. Use your plan to find the measurements of the toy car. Then complete the table below.

<b>Feature of the Car</b>	<b>Toy Car Dimensions</b>
<b>Exterior Length</b>	
<b>Exterior Width</b>	
<b>Exterior Height</b>	
<b>Wheel base Length</b>	
<b>Other</b>	