Surface Area Investigation Worksheet

Does tread surface area affect friction?

Objective: Create three different tread designs to determine the effect of surface area on friction.

Prepare your models

1. Using the shoe print template provided, make three shoe prints on cardboard or card stock.
2. Cut out shapes from cardboard in varying sizes. These pieces will be used to create tread.
3. Create three soles with distinctly different tread patterns. One sole should have a tread pattern with a small surface area, one with a large surface area, and one in the middle. Glue the shapes to the bottom of the shoe print cutout. Be sure the shapes do not extend past the edges of the cutout.

Collaborate: Compare your designs with a friend's. Are there any similarities? How did they decide on their designs?

Reflect: How did you ensure that your designs represent three different surface areas?

Test your models

1. Attach a weight to the top of the model.
2. Let the model slide down the ramp, and time how long it takes to reach the bottom. Record the time in the table below.
   Extension
   Calculate the speed of each model using the formula Speed = Distance/Time, and record the speed.

Model	Surface Area (cm^2)	Time (s)	Speed (m/s)	Notes
Design #1				
Design #2				
Design #3				

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Determine the surface area of your treads

1. Using paint, coat the bottom of the model. Press the paint-coated side to a sheet of 1-cm graph paper.
2. Count the squares that are filled with paint to estimate the surface area of the model's tread.
3. Record the surface area in the table above.

Reflect: What conclusions can you draw from your data? Remember, a slower speed indicates an increase in friction.

Create a line graph of your data.

Speed Compared to Surface Area of Treads