

FIRST LEGO LEAGUE - Ontario

Activity Sheet	
Gr 8 - Lesson #7	Switch – Efficient Line Following
Date:	Name(s):

<b>Check That I'm Done</b> <input checked="" type="checkbox"/>		
<input type="checkbox"/> Commented on my code	<input type="checkbox"/> Modify it task	<input type="checkbox"/> Coding Challenge

**Learn**

Percent efficiency is just a ratio of what you were able to use to what you had to start with. For example, if a light bulb needs 100KJ of electrical energy to produce 40KJ worth of light energy, you can calculate the efficiency mathematically:

**Efficiency = Useful Output / Necessary Input**

Efficiency (energy) = Useful energy out / Energy In

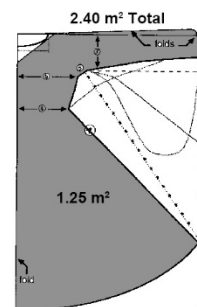
Efficiency (energy) = 40KJ/100KJ

Efficiency (energy) = 0.4

Percent Efficiency = 40% (we usually like to display it as a percent)

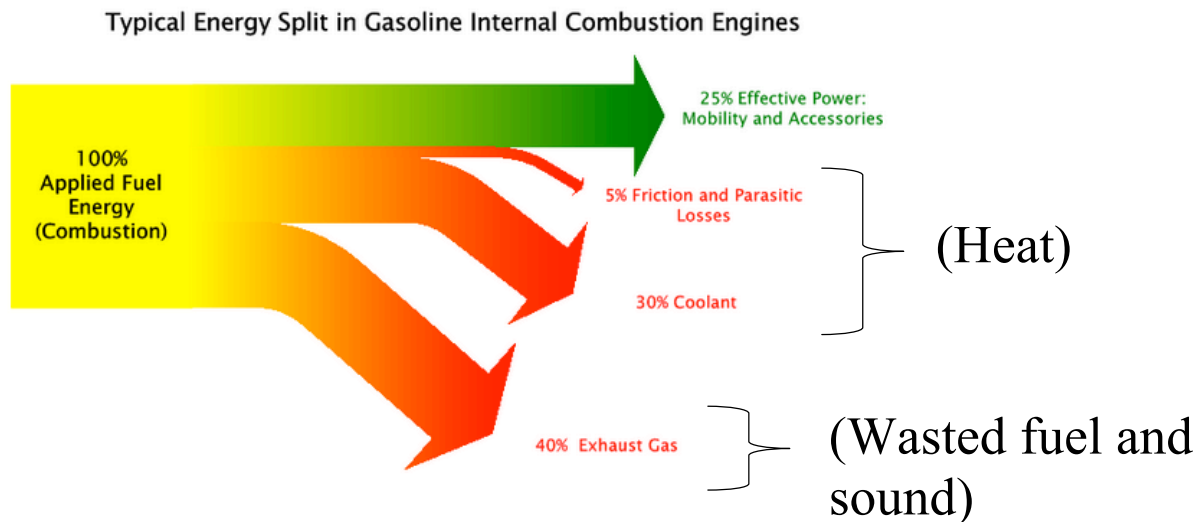
Another way of looking at efficiency, is it being measure of how little resources you wasted. This resource can be energy, time, money, materials, or any other important resource.

Using the same method above: Calculate the percent efficiently of this dress pattern.



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Here's an example of how the flow of energy in gasoline powered cars. Notice as energy is transformed, many losses occur.



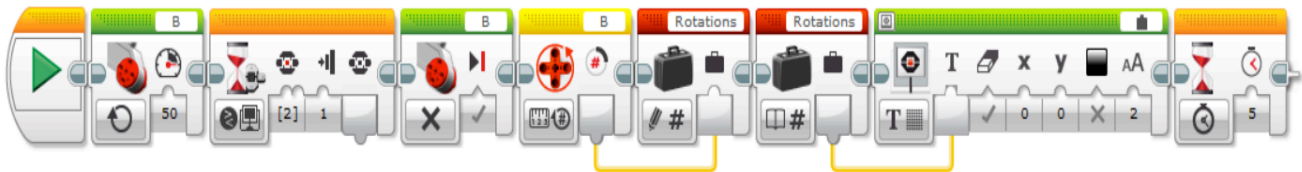
Heat, and sound are the most common forms of lost energy (when you're not talking about a speaker or a heater) because they are very often produced by accident when energy is getting transformed from one type to another. Almost all motors and lights make sound and heat by accident, as a side effect.

**Predict and Plan**

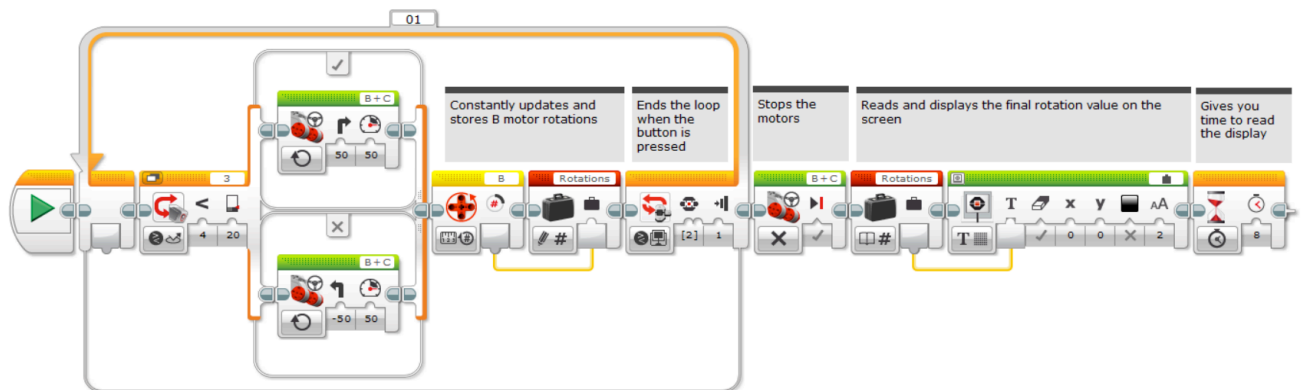
When following a line, your robot actually travels much farther than the distance of the line due to its 'zig-zag' motion.

Using your 1 meter of tape and the program below, measure (and display) how many rotations your robot needs to go perfectly straight along the tape. (We only need to track one wheel as they both go about the same distance). Simply hit the middle button to stop it at the end. Record this "ideal" rotations value in the record section.

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Now using the next program below, see how many rotations your line following program takes to follow the length of the tape. **Copy the code very carefully.** You will notice the rotations are larger now. Record this second distance in the record section.



### Demonstrate/Design/Discover

- ✓ Now that you have a method for testing the efficiency of your line following algorithm, change the threshold light values, the severity of the turn, and the power of the motors to make your line following program more efficient.
- ✓ Each time you change your program, record the rotations value in the record section.
- ✓ Calculate the *percent* efficiency of at least 3 trials. Remember the



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formula is Efficiency = Useful Output/ Necessary Input. In this case, our resource is distance.

Tips: Depending on the tape and floor you use, your program values may be slightly different for successful line following

**Record**

Test	Rotations	Percent Efficiency
Ideal rotations value		
Line following value #1		
Line following value #2		
Line following value #3		
Line following value #4		