Name: _____ **Date:** _____

Meeting Energy Needs — Optimization Worksheet **Answers**

Instructions

Please fill in the chart below with what you think is the best *source* of energy for each energy *need*. Different needs can be met with different sources, so think carefully about the best option for each need. For each type of need, you may use the same source or a combination of different sources — the decision is up to you.

Need: Cooking **Options:** coal, biomass, LPG, biodigester, solar power **Choice:** ____**answers will vary**_____ **Emissions:** _____ **Cost:** _____	**Need:** Cooking **Options:** coal, biomass, LPG, biodigester, solar power **Choice:** ____**answers will vary**_____ **Emissions:** _____ **Cost:** _____
Need: Cooking **Options:** coal, biomass, LPG, biodigester, solar power **Choice:** ____**answers will vary**_____ **Emissions:** _____ **Cost:** _____	**Need:** Heating **Options:** coal, biomass, LPG, geothermal **Choice:** ____**answers will vary**_____ **Emissions:** _____ **Cost:** _____
Need: Heating **Options:** coal, biomass, LPG, geothermal **Choice:** ____**answers will vary**_____ **Emissions:** _____ **Cost:** _____	**Need:** Heating **Options:** coal, biomass, LPG, geothermal **Choice:** ____**answers will vary**_____ **Emissions:** _____ **Cost:** _____
Need: Lights and other electricity **Options:** coal, hydropower, solar power, wind, biodigester **Choice:** ____**answers will vary**_____ **Emissions:** _____ **Cost:** _____	**Need:** Lights and other electricity **Options:** coal, hydropower, solar power, wind, biodigester **Choice:** ____**answers will vary**_____ **Emissions:** _____ **Cost:** _____
Need: Hot water **Options:** coal, biomass, LPG, solar hot water, biodigester **Choice:** ____**answers will vary**_____ **Emissions:** _____ **Cost:** _____	**Need:** Hot water **Options:** coal, biomass, LPG, solar hot water, biodigester **Choice:** ____**answers will vary**_____ **Emissions:** _____ **Cost:** _____

Energy Source	Cost ($)	Emissions
coal 	100	500
biomass 	0	300
LPG 	200	200
biodigester 	100	50
geothermal 	500	0
hydropower 	50	100
solar power 	400	0
wind 	100	0
solar hot water 	50	0

Questions

1. Look at the 10 blocks on the first page, each with an energy need.
   How many of these blocks are for cooking needs? __3__ blocks.
2. What *percentage* of this family's energy needs are for cooking? __30__ %
3. How many blocks are for lighting? __2__ blocks.
4. What percentage of this family's energy needs are for lighting? __20__ %
5. Write your total cost and emissions for each category below:

	COST	EMISSIONS
COOKING	**Answers will vary based on students' choices**	
HEATING		
LIGHTS & ELECTRICTY		
HOT WATER		

6. What is your TOTAL cost altogether? ___**answers will vary**____ dollars

7. What is your TOTAL emissions level altogether? ___**answers will vary**____

8. If you chose every energy source to have ZERO emissions, what would your total cost be?
   ___**answers will vary**____ dollars

9. Write down your definition of optimization.
   Answers will vary, but basically: Optimization is considering and weighing all the factors involved in solving a problem or making a decision, and picking the best solution for the situation.

10. Write down the problem that engineers are trying to optimize to help people in rural China and other developing areas:
    Engineers are trying to provide cleaner energy to people without much money, so they must optimize between emissions levels and energy costs.