EMC Engineering Challenge Judging Cheat Sheet

How the February event will work:
Students are given the challenge (see EMC Design Challenge Feb 6 and Mar 15 2017.docx) and tasked with prototyping, testing, and coming up with a plan for a device that is within their budget and holds exactly 600 cm^3 of air, that will capture heat energy from the sun (or a grow lamp).

Teams will have thermometers, sample materials, and access to an area under a grow lamp (probably hung from the underside of tables).

Judges will hang out with 1-2 teams and observe the team's process. They can also circulate to notice how other teams are working on the challenge.

Judges can give feedback in the form of questions such as:

- What different designs are you considering?
- What do solar panels usually look like? Why do you think they look that way?
- What do you know about heating things up quickly?
- Have you experienced heat from the sun? What makes it feel warmer/cooler?
- How are you making sure your device holds 600 cm^3?
- How can you measure the volume?
- What trade-offs are you making to make sure your device isn't too expensive?
- Is there something you would do differently if the materials had different costs?
- Is there a way that you could test whether that idea will capture heat better than a different idea?

How the March event will work:
We are still designing this part, but here is the current plan:

- Students will have ~1 hour to build their box and fill out their final budget sheet
- Students will spend ~1 hour working on a Math Forum Problem of the Week and preparing an oral presentation of their thinking
- Teams will present their engineering designs and Math Forum PoW solutions to judges, science-fair style
- In the meantime, team members will be periodically taking the temperature of their devices, plotting the temperature change over time, and calculating average rates of speed and maximum temperatures attained to submit for final judging

How the actual scoring in March will work:
Judges will consider:

- The team's design process, rationale, and teamwork (see engineering_rubric.pdf): 60 points
- The accuracy of the volume and budget calculations:
    - Volume of the box is accurate: 10 points
    - Surface area of the base is accurate: 5 points
    - Surface area of the sides is accurate: 5 points
    - Total cost of the box is accurate: 20 points
- The rate (in degrees Celsius per minute) that the thermometer inside device heats up: 20 points for the highest rate, 15 for 2 next-highest, 10 for 3 next-highest, 5 for heating up at all
- The maximum temperature the thermometer of the box reaches: 20 points for the highest maximum, 15 for 2 next-highest, 10 for 3 next-highest, 5 for heating up at all