

# Protect Your Melon



## **Grade Level Targeted: 5 – 8**

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## **Goals/Standards:**

### **NCOS Goals:**

- Grade 5 Goal 4: Learner will conduct investigations and use appropriate technologies to build an understanding of motion in technological design.
- Grade 6 Goal 1: Learner will design and conduct investigations to demonstrate an understanding of scientific inquiry.  
Goal 2: Learner will demonstrate an understanding of technological design.
- Grade 7 Goal 1: Learner will design and conduct investigations to demonstrate an understanding of scientific inquiry.  
Goal 2: Learner will demonstrate an understanding of technological design.  
Goal 4: Learner will conduct investigations, use models, simulations, and appropriate technologies and information systems to build an understanding of the complementary nature of the human body system.
- Grade 8 Goal 1: Learner will design and conduct investigations to demonstrate an understanding of scientific inquiry.  
Goal 2: Learner will demonstrate an understanding of technological design.

## **National Science Standards B, E, F & G**

## **Engineering Connection: Industrial Engineering and Mechanical Engineering**

### **Objective:**

Student will design and construct a helmet that will protect a melon from breaking when dropped from increasing higher levels at the lowest cost possible.

**Materials:** 1 cantaloupe or honeydew melon for each group, masking tape, scissors, and a variety of scrap materials such as foam, cardboard, material, plastic bags, straws, balloons, stir sticks Styrofoam, film containers, packing material, plastic bottles, etc.

### **Setting up the Activity (for the facilitator):**

**Provide the following materials for purchase: masking tape and a variety of scrap materials such as foam, cardboard, material, plastic bags, straws, balloons, stir sticks Styrofoam, film containers, packing material, plastic bottles, etc. If some materials are in short supply, groups may be limited as to how much they can have.**

**Divide students into groups of 3 or 4.**

**Give each group a pair of scissors and a cantaloupe or honeydew melon to use as a “head.”**

**Have each group draw a face on one side of the melon, including eyes, nose, and mouth. Explain that the face must be kept uncovered at all times so that the melon can see, breathe, and speak.**

**Explain to students that engineers are asked to take an idea and turn it into reality. They not only have to determine the best materials to use, but they also have to balance that with cost effectiveness. Since cost is always a major issue in the design of any product, the students are to create a helmet that will protect the melon from a fall from the highest level possible at the lowest cost. The melon must be freefalling and not attached to ropes or parachutes.**

**Have available materials sorted and priced. Materials such as tape and foam might be priced higher than materials like cardboard and straws.**

**Allow each group to look over the materials available. Explain to them that after their first purchase, materials may not be returned. They will be allowed to purchase additional materials. However, after their initial purchase, materials will double in price. Because of this, they should plan carefully before their first purchase.**

**Before acquiring materials, each group must complete a purchase order (see student sheet) that includes the group names, each material they want to purchase, the amount they are requesting, cost per unit, and total cost. Each time they purchase more materials, they must complete a new purchase order.**

**\*\*Teacher note: These purchase orders are collected and tallied while students are working.**

**After the allotted time (45 – 60 minutes), gather students around a block wall or something of similar height. One at a time, gently push the melons off the wall. The melons that survive (do not crack) will continue to compete at a greater height.**

**Continue dropping melons from increasingly greater heights (a roof or second-story window) until you have only a few survivors remaining. The design champions will be the team whose melon survived the highest fall *and* whose helmet cost the least amount of money to construct.**

### **Introduction (for youth):**

How many of you have ridden bikes? How many wear helmets when you ride? Has anyone ever been in an accident while riding your bike in which your helmet protected you from injury? (Allow students to share stories.)

Today your team is competing in a design contest to create the safest, most economical helmet on the market. Since you can't actually test your helmet on a real head, you will be using a melon for that purpose.

### **Finishing it up (for facilitator):**

**After testing is complete, lead a discussion about the activity using the questions below.**

### **Talking It Over:**

#### **a. Share What You Did:**

- 1. What materials did you start with? Why did you choose those? (Answers will vary)**

2. **Did you have to buy more materials after your first purchase? Why? Did you not use some that you purchased?** (Answers will vary)
3. **What material/s did you find most useful? Least useful? Why do you think that is?** (Answers will vary, but students might say that the materials that absorbed the shock, such as foam or packing material, did the best job of protecting the melon.)

**b. Process What's Important:**

4. **If you could start over, how would you alter your design?** (Answers will vary, but students will probably refer to the techniques that were successful for other groups.)
5. **What technique did you use in your design to protect the face even though it had to remain exposed?** (Answers will vary)
6. **What type of materials seemed to protect the melons best? Why do you think that is?** (Once again, students will probably answer that materials such as foam or packing materials protected the melons best. These materials absorbed the shock when landing, allowing less damage to the melon.)
7. **Why would it be impractical to simply surround the melon with more and more materials?** (Surrounding the melon with more materials will increase the cost of the helmet as well as decrease its comfort and appeal.)

**c. Generalize to Your Life:**

8. **How did having to watch your cost affect what you did?** (Answers will vary)
9. **Do you think that a melon worked well as a substitute for a head? Why and why not?** (Using the melon works well as a substitute because it is fragile and can be easily damaged. However, with the human head, the skull would probably survive a harder fall than the melon, but the brain might be damaged without a skull fracture.)
10. **Where do you think that the energy from the melon went when it hit the ground but didn't break? Where do you think it went when the melon burst?** (If the melon didn't break, then the materials surrounding it absorbed enough of the energy of impact to protect it. If not, the melon took the brunt of the energy.)

**d. Apply What You Learned:**

11. **How might the design of the helmet relate to the design of running shoes? How do the soles of the shoes make a difference?** (Running shoes are designed so that the sole absorbs the impact when the shoe hits the ground. This protects the runner's feet, legs, and hips from injury.)
12. **New cars come equipped with plastic bumpers designed to protect the body of the car. How do you think they do that?** (These bumpers serve the same purpose as the soles of running shoes. They are designed to give or collapse, absorbing most of the energy in a collision.)

**More Challenges:**

1. Have teams prepare a presentation that they will to a company executive board that is ready to choose a design of bicycle helmets to begin manufacturing. Using visuals and props, they are to try to convince the board to choose their team's design.
2. Ask that students research bicycle helmets on the market and compare their cost and effectiveness, based upon available statistics.

**Resources:**

<http://www.bhsi.org/>



# Purchase Order

Team Name \_\_\_\_\_

Item Requested	Quantity or Amount	Total Cost

Total Cost \$ \_\_\_\_\_

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Team Name \_\_\_\_\_

Item Requested	Quantity or Amount	Total Cost

Total Cost \$ \_\_\_\_\_

