



Snowman Survival Challenge

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Target Grade: 3rd grade

Time Required: 3, 40-minute periods

Standards:

Science

- S3P1. Obtain, evaluate, and communicate information about the ways heat energy is transferred and measured.
 - b. Plan and carry out an investigation to gather data using thermometers to produce tables and charts that illustrate the effect of sunlight on various objects.
 - c. Use tools and every day materials to design and construct a device/structure that will increase or decrease the warming effects of sunlight on various materials.

Math

- MGSE3.NBT.2. Fluently add and subtract within 1000.
- MGSE.3.MD.1. Tell and write time to the nearest minute and measure elapsed time intervals in minutes.

Social Studies

- SS3E4. Explain the concept of opportunity cost as it relates to making a saving or spending choice.

ELA

- ELAGSE3SL1. Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 3 topics and texts, building on others' ideas and expressing their own clearly.
- ELAGSE3SL4. Report on a topic or text, tell a story, or recount an experience with appropriate facts and relevant, descriptive details, speaking clearly at an understandable pace.



Lesson Objectives:

Students will:

- Explore heat energy from the sun and understand how various materials used as insulators affect the rate of temperature change.
- Use a thermometer to measure temperature.
- Use charts to organize data.
- Experience the opportunity cost associated with selection of materials when choosing a design.
- Collaborate in small groups.
- Recount experiences verbally and in their science journals.

Central Focus:

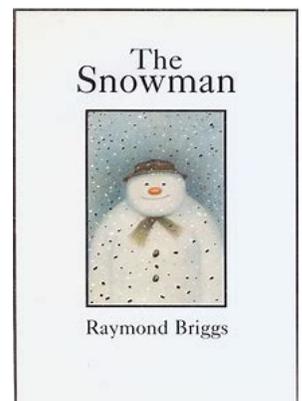
What makes a good insulator? Students will use the Engineering Design Process as they collaborate to design and test a home (insulator) to keep their snowman from melting.

Background Information:

Allow students to share what they know and any experiences they have had with snow and snowmen. Many students in this area may have had little experience. If this activity is used as an introduction activity, then you may want to let their discoveries be the background information. The following statement can be made to help the students focus on the science lesson objective. Various materials can be used as insulators, some more effective than others. During this activity, you will have the opportunity to find out which materials offer the best insulation. Insulators are materials or objects that do not allow heat to move through the quickly, or much at all. In this activity, using an insulator as the home for the snowman will cause the snowman to melt more slowly because the thermal energy from the sun will not be able to reach the snowman as easily. **Vocabulary:** Conductors, Insulators, Thermal Energy, Heat, Temperature, Thermometer, Elapsed time.

Materials

- Picture Book – *The Snowman* by Raymond Briggs
- YouTube: Video of deer discovering a snowman - <https://www.youtube.com/watch?v=OL1ULsxaOko>
- Teacher Tube: *The Snowman* Poem - https://app.schooltube.com/video/fc53eacda44c4228870f/The_Snowman
- Smart Board
- ELMO - Document Camera
- Snowman Building Guidelines Sheet – 1 per group (Edit the included one for specific class needs.)





- Ice Cubes (the ½ moon shaped) 6 per group (Can substitute with Whole Ice Cubes – 3 per group, real snow, or Snow Cone snow. If using snow, you will need 3 oz. Bathroom Cups – paper or plastic – 2 per group, and a scale with gram weights)
- Drinking Straw – 1 per group (*PREPARE IN ADVANCE unless your students are able to do this. Fold the bottom up ½ in. and put tape over it to keep water out of the straw. The straw will be used as a chimney in the house, for the digital thermometer to slide into for temperature measurements.*)
- Sandwich sized plastic zipper bag – 1 per group
- Stapler
- Rulers and/or measuring tapes – 1 per group
- Engineering Design Process Chart
- Snowman Picture (from student made snowmen)
- Model snowman setup with straw: This will be used by groups to test how the real snowman will fit into the structure they create. You could use a toilet paper roll stuffed with tissue. It should be inserted into the plastic bag with the straw sticking out. Zip the bag and staple the opening near the straw. Pictures included on last page of lesson.
- Home Building Guidelines Sheet – 1 per group (Edit the included one for specific class needs.)
- Materials Price List – 1 per group (Edit the included one for specific class needs.)
- Scissors – 1 pair per group
- Whole Punch
- Digital Thermometers – 1 per group
- Timer
- Data Chart – 1 per student

Instruction

Lesson 1 (Snowman Assembly, 40 minutes)

Introduction: Read aloud *The Snowman* by Raymond Briggs.

- Share YouTube Video: Live deer discovering a snowman
<https://www.youtube.com/watch?v=OL1ULsxaOko>
- Teacher Tube Video: *The Snowman* Poem – The poem could be shared at a later time if needed. https://app.schooltube.com/video/fc53eacda44c4228870f/The_Snowman

Whole Group

- Students share what they know about what happens to a snowman when the weather changes.



- The teacher will introduce the idea of finding a way to protect a snowman from melting. Allow students to brainstorm and offer suggestions.
- Introduce the task of designing a home to protect a snowman from the sun.
- Tell students that to make this fair, each group will need to have the same snowman and a way to measure the temperature inside their structure. Display the snowman guidelines sheet on the Smartboard using a document camera and go over the directions with the whole group. You could also display the prototype so that the students will see the finished snowman.
- Give each group a copy of the snowman guidelines sheet.

Snowman Guidelines: *(Student handout attached)*

- Each group will make one snowman using 6 half-moon ice cubes.
 - *(Note: Change the handout if using 3 whole ice cubes or snow.)*
- A regular sized drinking straw, folded over with tape on one end, should be sandwiched between the cubes and all of it should be inserted into a small sandwich sized plastic zippered bag. *(If using 3 full sized cubes, put the straw on one side. If making it from snow, the straw can be in the center of the snowman.)*
- The finished snowman should be no larger than 3 in. x 5 in, except for the straw sticking out.
- *Note: If using real or man-made snow add the following statement to the guidelines. - The finished snowman must weigh no more than ____ grams, including any accessories. (Calculate the acceptable mass in advance and add it to the handout to reflect the mass of the snow.)*

Small Group

- Each group will make a small snowman with no more than 6 half-moon ice cubes. *(Note: 3 whole ice cubes, or ____ grams of snow if that is what your class is using.)*
- Groups need to measure and record the measurements of their snowman on scratch paper, so they know the minimum size to make their house.
- Students should choose a name for their snowman and write it on the bag for identification.
- Take pictures of the snowmen students made, to be used tomorrow. (The snowmen will be stored in the freezer until their homes are ready.) The teacher should make a prototype with straw for size purposes only. Students will need this for Lesson 2.
- Students generate a list of ideas they might try to keep the snowman from melting.

Conclusion

- Hand out and review the Engineering Design Process Chart
- Students will share what they learned in small groups.

Lesson 2: Designing and Building Structure – 40 min.

Introduction: Display snowmen picture on the Smartboard and have groups introduce them by name.



Whole Group

- Display the house building guidelines on the Smart Board using the document camera and go over the directions with the whole group.
- Display the materials price list and order form on the Smart Board using the document camera and go over the directions with the whole group. Complete the form with a sample order.
- Hand out one copy of the house building guidelines, and materials price list with order form to each group.
- Introduce the available materials for students to evaluate and consider as they develop and finalize their plan.

Snowman Home Building Guidelines: *(Student handout attached)*

- *Each group will design and build a house for their snowman.*
- The snowman must fit completely inside the house.
- The house should have an entrance so that the snowman can go inside, and a hole so that the chimney (straw) can be easily inserted to the outside to measure the temperature.
- The group may choose up to four different materials from the materials list. These will be purchased to build the home.
- Budget \$1000

Small Group

- Using the ideas list generated yesterday along with the materials available, design and sketch a home for your group's snowman.
- Fill out the materials list and calculate the price of your snowman's home. Make sure to stay on budget.
- Adjust materials list if needed, then purchase materials.
- Begin construction.
- The teacher will make the hole for the straw in the top of each home.
- Use the prototype snowman to make sure yours will fit into the home.

Conclusion: Students will share what they learned in small groups.

Lesson 3: Trial and Data Collection 40 min. - Note: This activity is meant to be conducted outside on a sunny day. If you must conduct it inside, the temperature will take longer to rise so you will want to begin early in the day and plan to take readings between other lessons being taught that day.

Introduction: Announce that today is the day for the snowmen to come live in their home will see which snowman had the best protection (insulation).

Whole Group

- Review guidelines for gathering data.
- Review how to use the thermometer and how to change the reading from Celsius to Fahrenheit.



- Display data chart on the Smart Board using the document camera and go over how to complete it, pay special attention to the Celsius and Fahrenheit scales. Complete one section as an example.

Snowman Temperature Recording Sheet

Reading #	1	2	3	4	5	6	7	8	9	10
Time										
Degrees Celsius										
Degrees Fahrenheit										
Temperature Change	+ OR – Degrees f									

Small Group

- Retrieve the snowmen from the freezer and have each group place theirs inside their structure. Secure the opening and finish any last-minute details.
- Take the homes with the snowman inside, and the thermometers, outside and place them on a picnic table in the sun. (They could also be put on the sidewalk, or if inclement weather, this could take place inside.)
- Insert the thermometer into the chimney and wait 5 minutes to allow the thermometer to acclimate before completing the initial temperature reading. Then write the beginning temperature on the chart. Measurements should be recorded in Celsius and Fahrenheit.
- Science Journaling – While waiting for the next temperature check, students will begin writing about building their snowman and constructing their home. They should include sketches of the snowman and the house.
- Complete a new temperature check and add it to the data chart every five minutes. (Adjust time to every 10 minutes if conducting activity inside.) Put a + or – and number of degrees change in Fahrenheit
- End when all but one of the snowmen has melted. *Note: A bonus could be given to any group for staying under the budget. Either subtract 2 degrees from the final reading or students could use their previous reading instead of the last, just for staying under the budget.*

Conclusion: Students will share what they learned in small groups.

Lesson Extensions

- ELA – Write a poem about your snowman experience.
- Students will be given the opportunity to redesign their snowman home at the end of the unit.

The journaled “wonderings” along with observations and data collected by all teams from the first project, will be used to guide students when they revise their design to build a new snowman house at the end of the unit.



Differentiation

Lesson 1:

Approaching Level: Students dictate or draw their list of ideas.

Beyond Level: Investigate the freezing temperature of water. Make a prediction for how long it will take the snowman to melt.

Lesson 2:

Approaching Level: Allow students to use a calculator for calculations.

Beyond Level: Students may want to set up a line graph to chart the change in temperature over time.

Lesson 3:

Approaching Level: Allow for a group chart to be copied later for the journal. Use only one scale for temperature, or highlight them in different colors, if using both causes confusion.

On Level: Each student completes their own data chart.

Beyond Level: Students should be encouraged to calculate the loss of temperature per minute and investigate the reason why the temperature may have gone down for some readings.

Assessment

Formative

Lesson 1

Teacher observation and finished snowman. Students will write a summary of this lesson in their science journal, make a prediction of what they think will happen and draw a picture of their snowman.

Lesson 2

Teacher observation and completed snowman home. Students will write a summary of the lesson and draw a picture of their snowman home. They should explain what they think will happen during the trial tomorrow.

Lesson 3

Students will write a summary of the activity in their science journal; science vocabulary will be used to explain the results. Each group should share their data aloud. After all students have shared, they will add a “wondering” comment to their journal which will include information about revisions they want to try next time around.



Summative

This would be taken from either the student “wonderings” (information acquired from completing this activity) or from the revised snowman home.

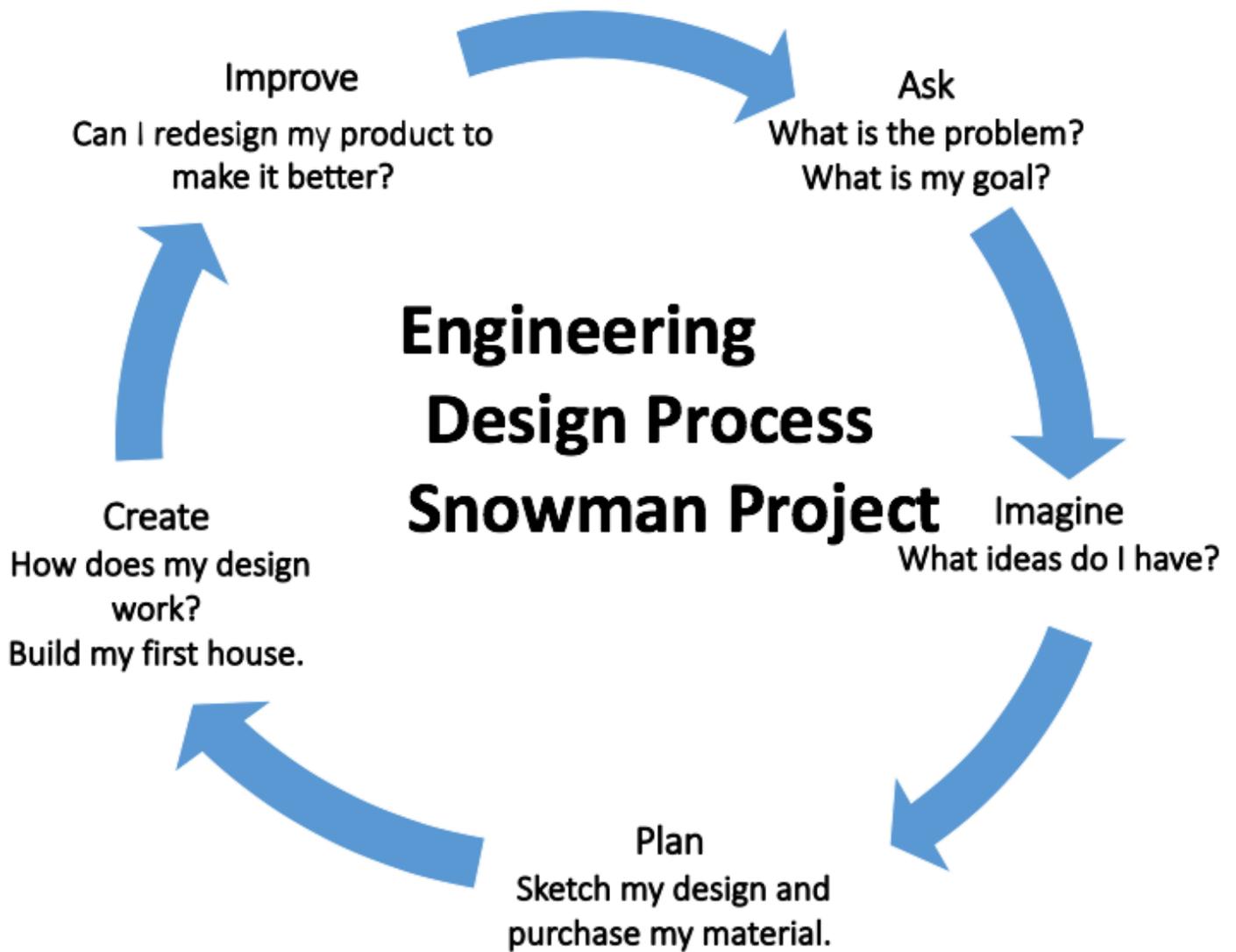
Social Studies: Students would be assessed through their reasoning of the opportunity cost for the different materials chosen for the home as opposed to what they might choose for the second home.

Snowman Sample

Prototype could be made using a shortened (3in.) toilet paper roll with no ice. Students will use it to make sure their snowman will fit into their home.



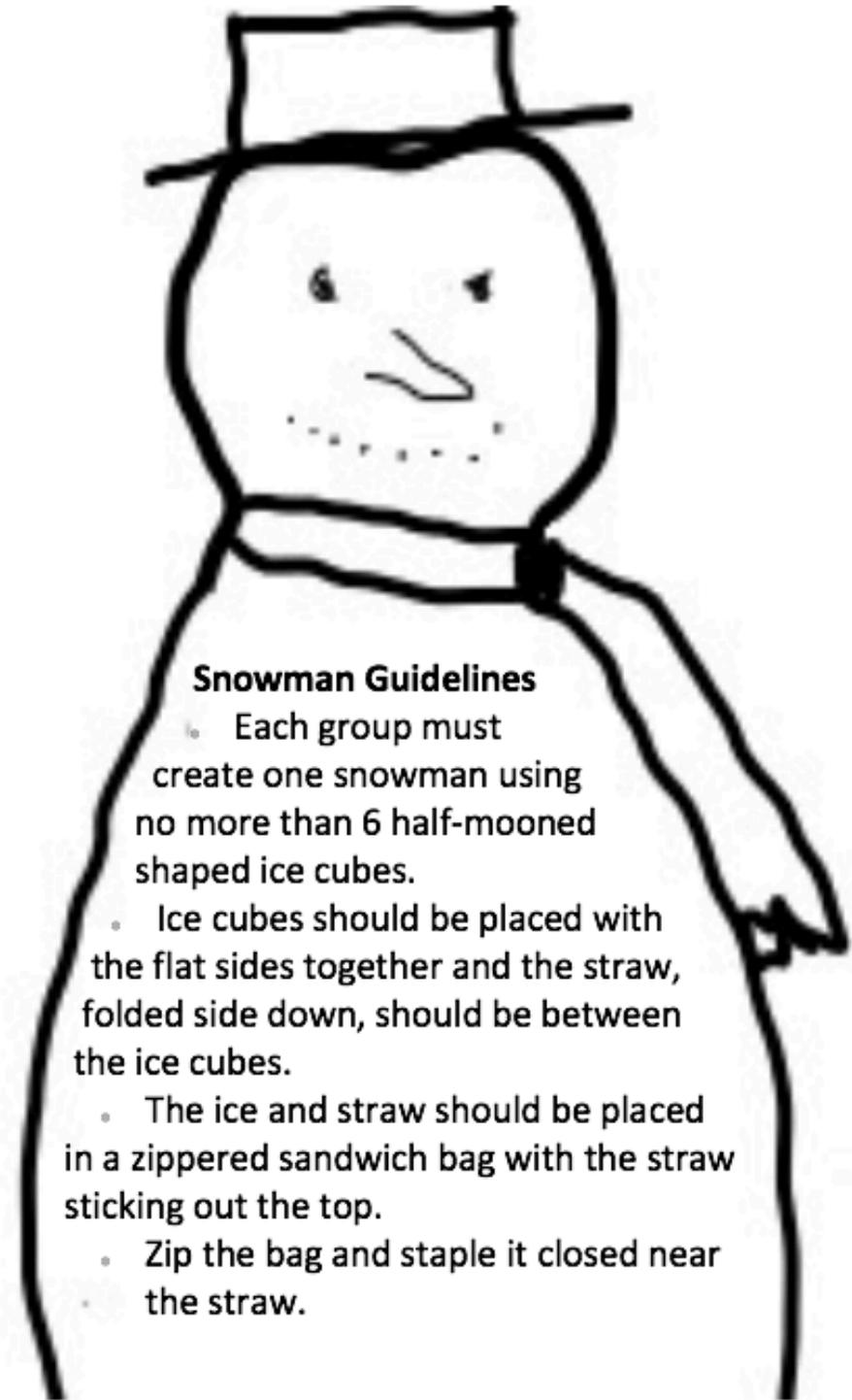
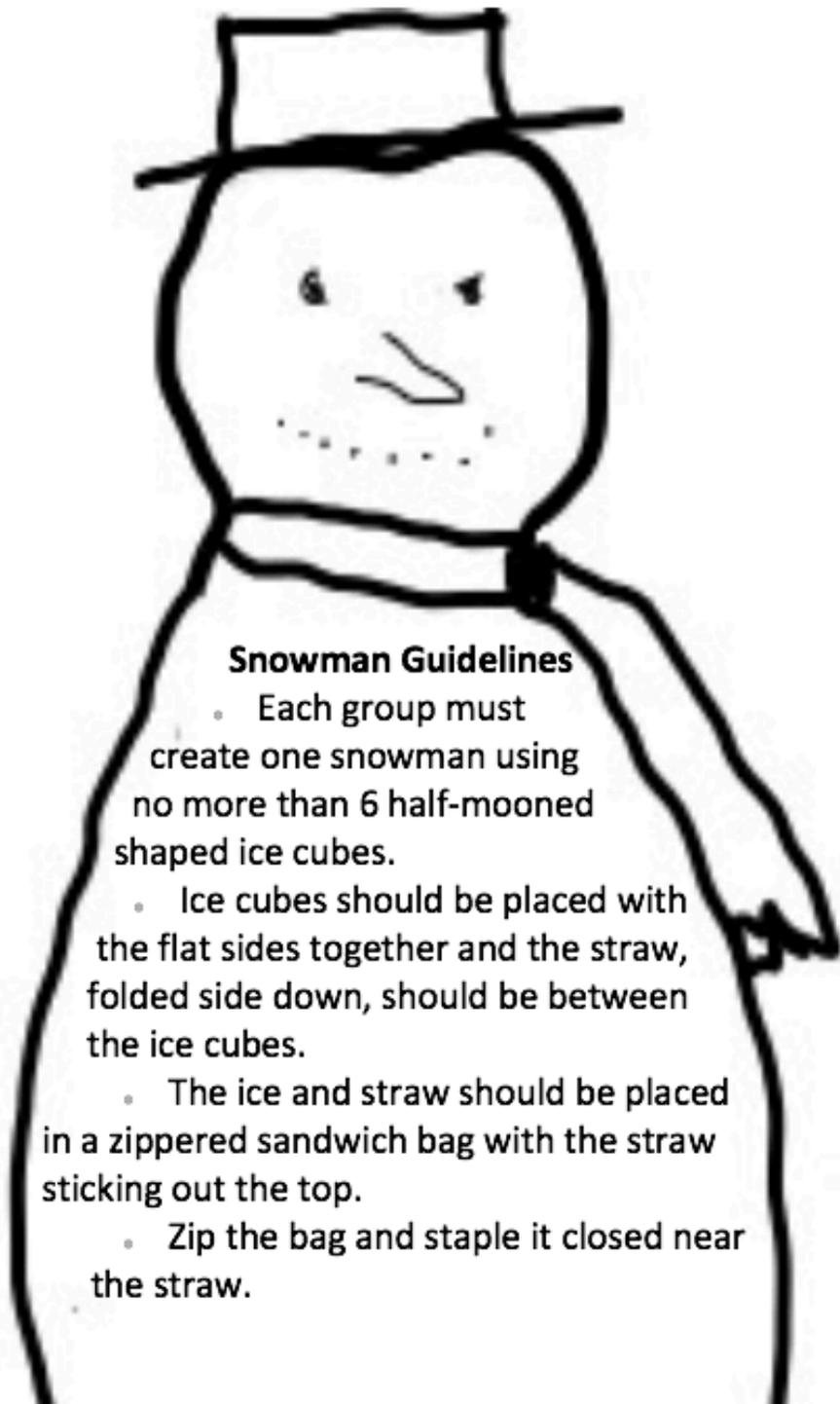
Engineering Design Process Snowman Project

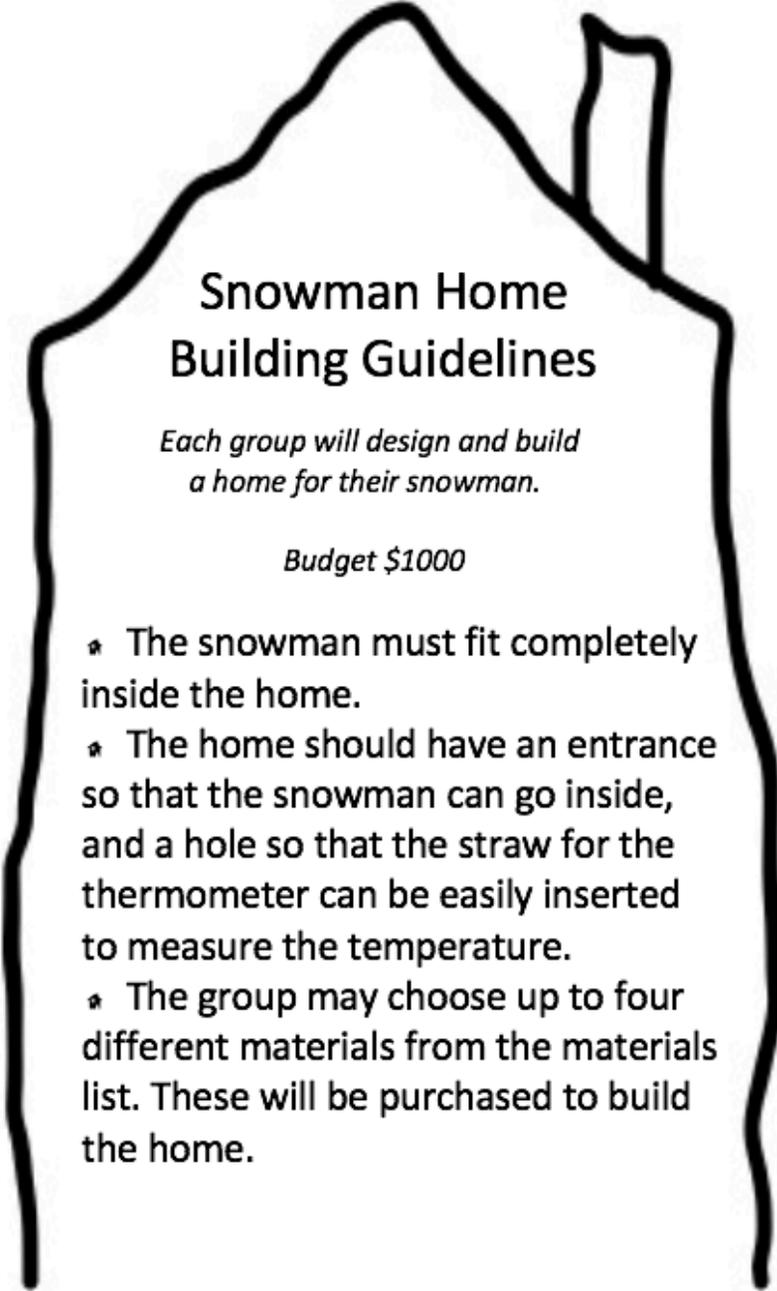


Material Description	Cost Each
Duct Tape – Standard 2in. width x 12 in. piece. (36 in. max per group)	\$75
Newspaper – 6 x 11 sheet (2 max per group)	\$100
Felt - 6 x 11 sheet (2 max per group)	\$150
Plastic Bubble Wrap – 6 x 11 sheet (2 max per group)	\$300
Paper Towels – 6 X 11 sheet (2 max per group)	\$50
Flat Wrapping Foam - 8 x 12 sheet (2 max per group)	\$300
Cardboard pieces - 8 x 12 sheet (2 max per group)	\$150
Packing Peanuts – 4 peanuts per order (2 max orders per group)	\$100
Toilet Paper Rolls (2 max per group)	\$25

Homebuilding Supply Order Form

Material	Price	Quantity	Cost
Duct Tape – Standard 2 in. width x 12 in. piece (36 in. max per group)			
Newspaper – 6 x 11 sheet (2 max per group)			
Felt - 6 x 11 sheet (2 max per group)			
Plastic Bubble Wrap – 6 x 11 sheet (2 max per group)			
Paper Towels – 6 X 11 sheet (2 max per group)			
Flat Wrapping Foam - 8 x 12 sheet (2 max per group)			
Cardboard pieces - 8 x 12 sheet (2 max per group)			
Packing Peanuts – 4 peanuts per order (2 max orders per group)			
Toilet Paper Rolls (2 max per group)			
Budget \$1000		Total Cost	



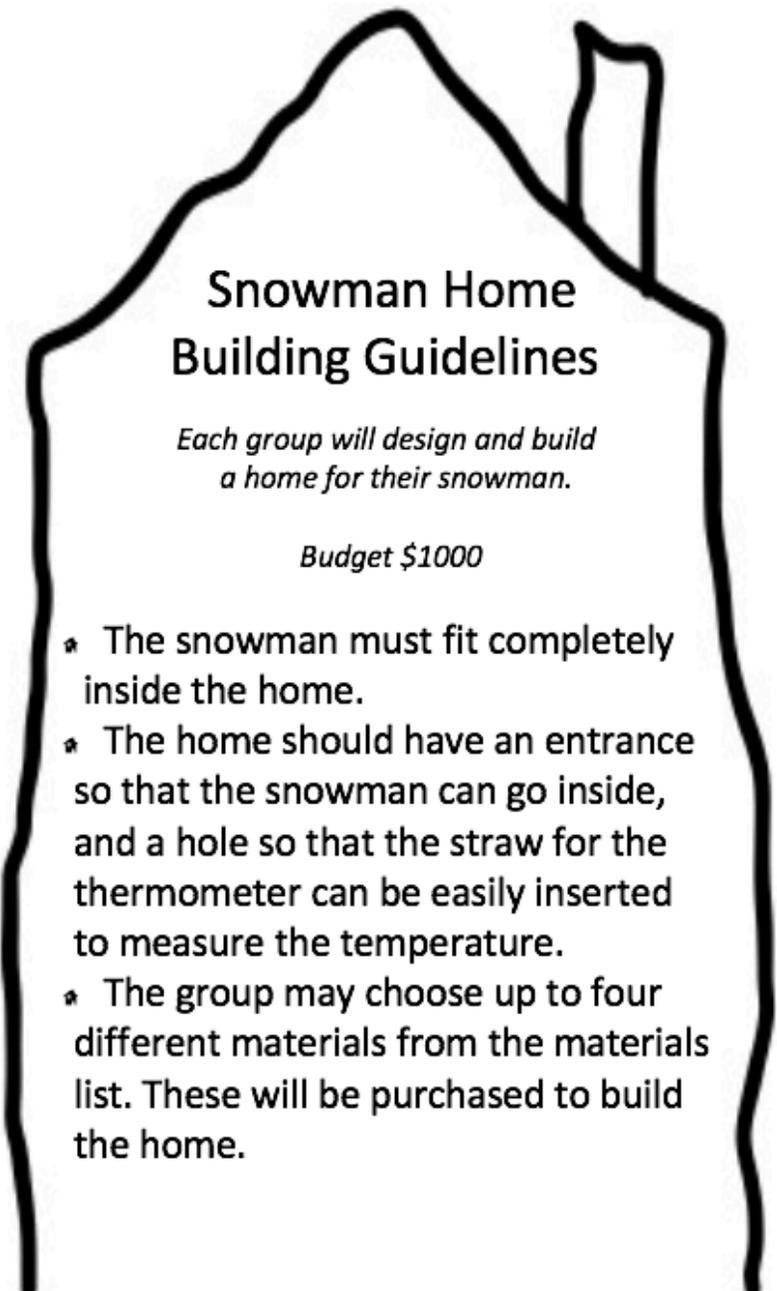


Snowman Home Building Guidelines

Each group will design and build a home for their snowman.

Budget \$1000

- ✦ The snowman must fit completely inside the home.
- ✦ The home should have an entrance so that the snowman can go inside, and a hole so that the straw for the thermometer can be easily inserted to measure the temperature.
- ✦ The group may choose up to four different materials from the materials list. These will be purchased to build the home.



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