

# FANCY PACKS FOR THE SWEETS PANTRY

## YEAR 4

In this activity, students will:

1. Develop a model for determining a sweets order based on a mysterious order received by the *Sweets Pantry*.
2. Explore the history of sweets manufacturing and packaging, the processes of sweets manufacturing and processing, materials used, and packaging designs
3. Learn about the role of engineers in package design and testing
4. Plan and conduct a fair test to test the properties of materials
5. Draw on their learning of material science, linear measurement, and informal concepts of area and volume, and engineering design processes in taking part in a **competition** held by the *Sweets Pantry* to design, construct, and test new packs to meet their customers' needs

### Prerequisite tool use

Students will be using a standard set of scales to weigh their packs. Familiarity with weighing scales as well as how to operate them is needed. If the children are unfamiliar with this, please see if they can be familiarised with it before the activity.

### Materials

- Student Workbooks:
  - Student Modelling Workbook (1 per student).
  - Student Design Workbook (1 per student).

- Strong tape/Masking tape/Glue stick to hold packs together.
- Staplers, punch.
- String, twine, strings of wool.
- Ribbons and other possible decorations.
- A range of materials, including cardboard, plastic, cellophane, coloured paper, wrapping tissue, vinyl, metallic tissue paper etc (see [https://en.wikipedia.org/wiki/Category:Packaging\\_materials](https://en.wikipedia.org/wiki/Category:Packaging_materials)).
- Weights (representing sweets).
- Weighing scales.

## Organisation of student work

Students will record their learning and results in the student workbooks provided by QUT. These will be collected by QUT at the end of the activity.

**Class Time:** To be determined.

## Additional Teacher Information on Packs

- [Paper Bag Facts](#)
- [Types of packaging materials](#)
- [Simple paper bag tutorial](#)
- [6 Ways To Re-Use/Recycle Empty Tissue Roll| Best Out of Waste](#)
- [Robots place sweets in plastic trays](#)
- [High Speed Candy Wrapping Machine](#)

Technologies	Science	Maths
<p><b>Design and Technologies Knowledge and Understanding (ACARA)</b></p> <ul style="list-style-type: none"> <li>Recognise the role of people in design and technologies occupations and explore factors, including sustainability that impact on the design of products, services and environments to meet community needs (<a href="#">ACTDEK010</a>)</li> <li>Investigate the sustainability of materials, systems, components, tools and equipment for a range of purposes (<a href="#">ACTDEK013</a>)</li> </ul> <p><b>Design and Technologies Processes and Production Skills (ACARA)</b></p> <ul style="list-style-type: none"> <li>Critique needs or opportunities for designing and explore and test a variety of materials, components, tools and equipment and the techniques needed to produce designed solutions (<a href="#">ACTDEP014</a>)</li> <li>Select and use materials, components, tools, equipment and techniques and use safe work practices to make designed solutions (<a href="#">ACTDEP016</a>)</li> <li>Evaluate design ideas, processes and solutions based on criteria for success developed with guidance and including care for the environment (<a href="#">ACTDEP017</a>)</li> </ul>	<p><b>Science Understanding (ACARA)</b></p> <p><i>Chemical Sciences</i></p> <ul style="list-style-type: none"> <li>Natural and processed materials have a range of physical properties that can influence their use (<a href="#">ACSSU074</a>)</li> </ul> <p><b>Science as a Human Endeavour (ACARA)</b></p> <p><i>Use and influence of science</i></p> <ul style="list-style-type: none"> <li>Science knowledge helps people to understand the effect of their actions (<a href="#">ACSHE062</a>)</li> </ul> <p><b>Science Inquiry Skills (ACARA)</b></p> <p><i>Planning and conducting</i></p> <ul style="list-style-type: none"> <li>With guidance, plan and conduct scientific investigations to find answers to questions, considering the safe use of appropriate materials and equipment (<a href="#">AC SIS065</a>)</li> <li>Consider the elements of fair tests and use formal measurements and digital technologies as appropriate, to make and record observations accurately (<a href="#">AC SIS066</a>)</li> </ul>	<p><b>Measurement and Geometry (ACARA)</b></p> <p><i>Using units of measurement</i></p> <ul style="list-style-type: none"> <li>Use scaled instruments to measure and compare lengths, masses, capacities and temperatures (<a href="#">ACMMG084</a>)</li> <li>Compare objects using familiar metric units of area and volume (<a href="#">ACMMG290</a>)</li> </ul> <p><i>Shape</i></p> <ul style="list-style-type: none"> <li>Compare the areas of regular and irregular shapes by informal means (<a href="#">ACMMG087</a>)</li> </ul> <p><i>Location and transformation</i></p> <ul style="list-style-type: none"> <li>Create symmetrical patterns, pictures and shapes with and without digital technology (<a href="#">ACMMG091</a>)</li> </ul> <p><b>Elaborations (C2C)</b></p> <ul style="list-style-type: none"> <li>Consolidate/extend understanding of combining and splitting 2D shapes</li> </ul>

## ACTIVITY

1. Inform students that they will be doing an activity about sweets and the *Sweets Pantry*. Hand out the *Fancy Packs for the Sweets Pantry Modelling Workbook* (herein referred to as the *Modelling Workbook*) to the students.
  - a. Begin by getting the students to **individually brainstorm** various packs of sweets that they are aware of, and request them to list down four things about sweets packs they consider important. They should list the 4 factors in order of importance (see *Modelling Workbook*, page 2, numbers 1(a) – 1(d)).
 

*“As individuals, you will list four things you find important when choosing sweets from a display stand, or that you are aware of or have seen before”*
  - b. Follow this up with getting the students to **explain their decisions** (see *Modelling Workbook*, page 2, number 2).
  - c. Divide students into groups of 3 to 5. **Read out the modelling challenge** “*Help the Sweets Pantry*” to the groups (see *Modelling Workbook*, page 3).
  - d. Go through the “*Sweet Packs sold at the Sweets Pantry*” list with the groups (see *Modelling Workbook*, page 4).
  - e. In groups, get students to **work on the modelling activity** (see *Modelling Workbook*, page 5, number 3).

*“As a group, you will help the Sweets Pantry with a mysterious order they received from neighbourhood children. You will read the letter received by the Sweets Pantry on page 3 of your*

***Modelling Workbook, and create a model or method that the Sweets Pantry can use to fill the order. You will refer to the List of Sweets table on page 4 of your Modelling Workbook”***

- f. In groups, get students to **explain their model** to the *Sweets Pantry* (see *Modelling Workbook*, page 6, number 4).
- g. Collect the completed Modelling Workbooks from the students.

Prior to handing out the Design Workbooks, teachers to briefly cover point 2 below with students.

- 2. Prior knowledge of sweets package manufacturing and processing  
Students will briefly review the history of sweets manufacturing and processing, the process of sweets manufacturing and packaging, the engineers involved, the materials used, and packaging designs.
  - a. History of sweets packaging. Explain how Margaret Knight invented the flat-bottomed paper bag machine (Refer to *Appendix A*).
  - b. Discuss the term “*packaging*”. Ask students if they have heard of the word “*packaging*” before and if they know what it means (Teacher note: The word comes from the Dutch word ‘*pakkage*’)
  - c. Use a selection of YouTube videos below to introduce the following: sweets manufacturing, packaging and sustainability:
    - i. Sweets manufacturing and packaging
      - [Watch how Mars makes M&M’s](#) (1:37 minutes)

- [How are jelly sweets produced and packaged](#) (1:18 minutes)
- ii. Material and Sustainability
  - [Sustainability in packaging sweets](#) (first 3 minutes)
  - [Biodegradable Plastic for packaging Sweets](#) (2:18 minutes)

Teachers can now move on to point 3 below where students work on the Design Activity.

3. Inform students that they will be doing a **Design Activity** that involves materials testing, pack designs and fair tests.

*“The Sweets Pantry has heard that Grade 4 students in the Brisbane area are learning about materials and thought we could help them with their problem. The pantry owners need some help improving their packaging of different sweets products. Customers have complained that the current packaging are boring, don’t have enough sweets in them, and break easily if customers are not careful with them”*

- a. Hand out the *Fancy Packs for the Sweets Pantry Design Workbook* (herein referred to as the *Design Workbook*) to the students.
- b. Begin by getting students to watch 2 videos about Packaging Engineers (see Design Activity, page 3, number 1). The videos are:
  - i. [8 Facts about Packaging Engineers](#) (3:58 minutes)
  - ii. [Packaging design makes a difference](#) (3:09 minutes)

- c. After the videos, get the students to individually detail the responsibilities of a Packaging Engineer (see *Design Workbook*, page 3, number 2).
- d. Proceed to get students to individually think of sweets packs they have seen or know about (see *Design Workbook*, page 5, number 3). Get them to detail in words and/or drawings.
- e. Introduce students to the *Sweets Pantry Competition*. The competition details are in *Appendix B* in this *Activity Guide* and in pages 6 – 10 of the *Design Workbook*.

***“The Sweets Pantry is having problems with its packaging of different sweets products, and would like you to come up with solutions to their problems. You will experiment with creating new sweets packs that appeal to customers”***

- f. Read out the *Sweets Pantry Competition* details to the students.
- g. Refer students to the *Sweets Pantry Competition* task for completing the *Sweets Pantry Competition* (see *Design Workbook*, page 11). Read out the tasks with the students, ensuring that they understand the *Sweets Pantry Competition* objectives.

***“Your packs must be attractive. They must hold between 250 grams and 450 grams of sweets. Your pack can be any shape and size. They can be bags, boxes, cylinders, or whatever you like. You must choose materials from those shown, but you cannot spend more than \$15.00 in buying your material. Be mindful of safety when handling material and equipment. Refer to the list of sweets sold at the Sweets Pantry detailed on page 7***

*of your Design Workbook, and the list of materials you can purchase to build your pack detailed on page 8 of your Design Workbook”*

4. **Science Experiment:** Students will be testing a range of materials for their properties. Refer students to the Assessment Task in the *Design Workbook* (see *Design Workbook*, page 12 - 18).
  
5. Students will carry out the **individual design** component of the *Sweets Pantry Competition* (see *Design Workbook*, page 19 - 22):
  - a. Get students to individually detail in their *Design Workbooks* the **type of pack** they wish to make (see *Design Workbook*, page 19, number 1).

*“As individuals, you will decide on the type of pack you wish to make”*

- b. Get students to individually list the **type of sweets** and the **number of each sweet type** they want their pack to hold (see *Design Workbook*, page 20, number 3). Refer them to the list of sweets sold by the Sweets Pantry as detailed in the Sweets Pantry Competition (see *Design Workbook*, page 7).

*“As individuals, you will decide on the type of sweets and the number of each sweet type (in units) you wish your pack to hold. Your pack may hold more than one type of sweets”*



- c. Get students to calculate the **quantity of sweets** (grams) that their designed pack will hold (see *Design Workbook*, page 20, number 2)
- d. Get students to individually list the **type of material(s)** and the **number of each material type** they want to use to make their pack (see *Design Workbook*, page 20, number 4). Refer them to the list of material detailed in the Sweets Pantry Competition (see *Design Workbook*, page 8). Remind students that there is a **\$15** limit on material use.

*“As individuals, you must decide on the type of material(s) and the number of each material type you wish to use to make your pack, being mindful of the \$15 limit. You may use multiple different materials”*

- e. Get students to individually detail the **reasons they have selected the material(s)** (see *Design Workbook*, page 20, number 5). Remind them to refer to results obtained from the science experiment they had carried out in step 4 above (see *Design Workbook*, page 12 - 18).
- f. Get students to individually detail **ideas of sustainability** that they have incorporated in the design of their pack (see *Design Workbook*, page 21, number 6).
- g. Get students to sketch their pack design, labelling all materials and measurements (see *Design Workbook*, page 22, number 7). Remind them that this step is important when the group reviews each individual design to decide which design is selected by the group.

*“As individuals you will now proceed to the design phase. You will design your pack by doing a labelled drawing that shows all the measurement, shapes and materials used in making your pack. Keep in mind the competition objectives we discussed before i.e. packs must be attractive, hold between 250 grams to 450 grams, any shape and size, and use material provided, being mindful of the \$15 limit on material(s)”*

6. Students will carry out the **group design** component of the *Sweets Pantry Competition* (see *Design Workbook*, page 23 - 31):

- a. Get groups to study the individual designs created by their group mates’ (see *Design Workbook*, page 23). The group will follow one of their group mates design details including materials and measurements. Each group will only make one.

*“As a group, look at each group member’s design and decide which design your group will follow”*

- b. Get students to detail why they selected that design (see *Design Workbook*, page 23, number 3).

*“Record in your Design Workbook why your group selected that design”*

- c. Get the groups to **start constructing** the selected pack (see design Workbook, page 25, number 4). They should collect the required material for the pack construction. Remind the groups that there is a **\$15** limit on materials. Refer groups to the list of material in page 8 of their *Design Workbook*. Remind them of **safety considerations** when handling material and equipment.

***“As a group, build your group’s pack from the chosen design, using the materials supplied. The pack your group builds should be strong enough to hold the quantity of sweets you have decided on. Remember: your group only has \$15 to spend on your materials. Be mindful of safety requirements when handling materials, and equipment”.***

- d. Get the groups to perform fair tests on their design packs (see *Design Workbook*, page 26, number 5). The testing process is open to how the groups wish to conduct them.
- i. Encourage the groups to discuss how they wish to perform the testing.

***“As a group, decide on a testing process to best suit your group pack”***

- ii. It is very important to ensure that the groups detail their testing process in page 26 – 28, numbers 5(a) – 5(e), of their *Design Workbook*, prior to carrying out the fair tests on their group pack.

***“As a group, detail your testing process in your Design Workbook”***

- iii. Get the groups to perform their fair tests on their constructed packs. They should record their results on page 28, number 5(f), of their *Design Workbook*.

***“As a group, go ahead and perform your tests. Record your observations, results etc in your Design Workbook”***

- e. Once the fair tests are over, get the groups to discuss and answer questions related to their group design and test results (see *Design Workbook*, page 29 – 31, numbers 6(a) – 6(g)).

***“As a group, discuss your observations and findings, and answer the questions in your Design Workbook”***

7. Fact Sheet: Get the groups to respond to the *Sweets Pantry*, detailing how they went with the *Sweets Pantry Competition*.

***“As a group, write to the Sweets Pantry, detailing how your group made the group pack attractive. Detail your group pack size, shape and materials used, sweets selected and how many grams the group pack was able to hold. Add these details into your Design Workbook”***

## Testing

- **Group Activity Testing:**
  - Each group tests their group pack’s capacity to hold weight.
  - The groups will conduct fair tests on their group packs.

## Appendix A

### History:

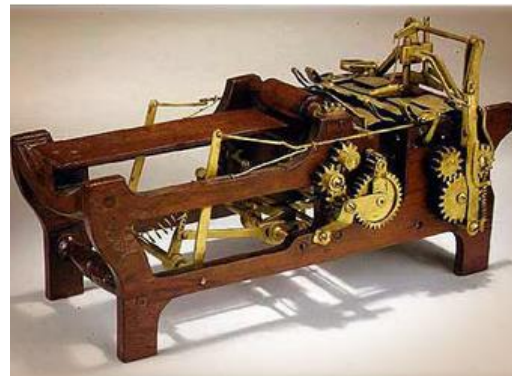
Candy has been packed in a variety of designs using many different materials including paper, plastic, and cardboard. The flat-bottomed paper bag machine

invented in the US (1838-1914). Margaret's first invention came about when she was 12 years old and witnessed an accident at a factory her brother worked at. The device she invented was then used in all cotton mill factories.



was invented by a woman named Margaret Knight (1838-1914). Margaret's first invention came about when she was 12 years old and witnessed an accident at a factory her brother worked at. The device she

Margaret designed and made the flat-bottomed paper bag machine because she found the manual method of making paper bags was too slow. She started with sketches of various machine types, and this led to a model of the equipment



being made from her drawings. When Margaret went to patent her design, she found that the patent was granted to a Charles Anan, who had come by and observed Margaret making the machine. But because Margaret had her design drawings to prove the idea and design was here, Margaret was given the patent rights.

(Source: <https://www.asme.org/engineering-topics/articles/diversity/margaret-knight>)

## Appendix B

### The Sweets Pantry Competition

The *Sweets Pantry* wishes to improve the packaging of its different sweets products. Some customers have complained that the packs are boring, don't have enough sweets in them, and often break if they are not careful with them.



The owners of the *Sweets Pantry* have therefore decided to have a competition to see who can create a new sweets pack that customers will like. These are the rules for the competition:

- The packs must be attractive.
- They must hold between 250 grams and 450 grams.
- The packs can be any shape and size. They can be bags, boxes, cylinders, or whatever you like.
- You must choose materials from those shown but you cannot spend more than **\$15.00** in buying your materials.



Imagine you are entering the *Sweets Pantry* competition. Here is the range of sweets the Pantry sells.

*Range of sweets sold at the Sweets Pantry*

<b>Sweets</b>	<b>Weight (grams) per unit (item)</b>
Chocolate Drops	30 grams per item
Chocolate Twists	25 grams per item
M&Ms	20 grams per item
Marshmallow Twists	10 grams per item
Rock Candy	50 grams per item
Rocky Road Fudge	15 grams per item
Candy Cane	40 grams per item
Lollipops	45 grams per item

## *List of Materials*

<i>Material</i>	<i>Cost per sheet (\$)</i>
<b>Paper</b>	<b>\$1.00</b>
<b>Plastic Sheet</b>	<b>\$4.00</b>
<b>Vinyl</b>	<b>\$6.00</b>
<b>Cellophane</b>	<b>\$3.00</b>
<b>Cardboard</b>	<b>\$4.00</b>
<b>Baking Paper</b>	<b>\$2.00</b>
<b>Aluminium foil</b>	<b>\$4.00</b>
<b>Foam</b>	<b>\$6.00</b>
<b>Bubble Plastic</b>	<b>\$5.00</b>
<b>Wrapping Paper</b>	<b>\$5.00</b>
<b>Fabric</b>	<b>\$8.00</b>



# Investigation

Here is what you have to do in entering the competition:

## First, make some decisions:

- Decide what **type of pack** you will design and make.
- Decide what **types of sweets** your pack will hold. It can hold more than one type of sweet. Decide on the **number of each sweet type**.
- Based on your selection of types of sweets and number of each sweet type, **calculate the weight (in grams)** your pack will hold.
- Decide what **types of materials** your pack will hold. It can hold more than one type of material. Decide on the **number of each material type**.
- Record your decisions in your workbook.

## Second, design your pack:

- **Design** your own pack by doing a **labelled drawing** that shows all the measurements and shapes needed in making the pack, and the materials you plan to use. Do your own design in your workbook. Keep a record of all of the materials you will be using.

## Third, make some more decisions:

- Look at each group member's design.
- As a group, decide which design your group will follow.
- Why did you choose that design? Record your answers in your workbook.
- Follow your chosen design and build your group pack using the materials supplied. Remember! You only have **\$15.00** to spend on your materials.
- The packs need to be strong enough to hold the quantity of sweets you have decided on. You will be able to check this by using the scales *after* you have made your pack.

**Next, answer the questions in your workbook.**

- How much did your pack hold? How close were you to your prediction?
- Was your pack strong enough to hold your sweets?
- How would you rate your design? Place a mark *anywhere* on the line below:

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Poor

Fair

Excellent

- Why did you rate your design this way?
- What *changes* would you make to improve your sweets pack?
- How were you using maths and science in designing and creating your pack?

**Note: For this competition, you will be provided with objects that represent sweets.**