THE MATHEMATICAL ASSOCIATION OF VICTORIA

TEXAS INSTRUMENTS

TEACHER NOTES

MATHEMATICS IN CAREERS

Investigation - Food industry and coding

Key career focus for this investigation: Software engineer, coding, information technology
Related career areas: Food industry

THINKING ABOUT CAREERS

- Brainstorm information technology professions you can think of where maths is frequently used. Use https://joboutlook.gov.au to explore information technology related career pathways that include use of mathematics. *How is maths used in these scenarios? What maths is used in these scenarios?*
- This task focuses on how maths is used in designing a product that automates or optimises a process or product related to food.
- Explore careers such as software engineer, robotics engineer, to discover how maths is used in these. For a more extensive list of careers related to this task, with a maths / science focus, refer to the table at the end of the task and explore the maths used in these jobs.

MATHEMATICS IN EVERYDAY LIFE AND CAREERS

Mathematical focus for this investigation

- Using formulas to solve problems
- Using authentic situations to apply knowledge to solve real world problems
- Implement algorithms

Scientists including information technology professionals use various formulae and algorithms. They apply their mathematical thinking and problem-solving skills in various situations. In this case specifically designing a product that automates or optimises a process or product related to food. Many people use various formulae and algorithms every day. For example, cooking recipes, long division and using a computer search engine all utilise algorithms. An algorithm is a well-defined set of instructions designed to perform a particular task or solve a type of problem. Anything that follows a set of specified instructions is an algorithm.

Brainstorm and share scenarios where this mathematics may be used in information technology professions to solve problems.

MATHEMATICAL INVESTIGATION
FOOD INDUSTRY AND CODING

TEACHER INFORMATION

LINKS TO VICTORIAN CURRICULUM

Mathematics links to Victorian Curriculum Level 10	Application to work and life
Patterns and algebra Implement algorithms using data structures in a general-purpose programming language (VCMNA334)	Many people use various formulae and algorithms every day. For example, cooking recipes, long division and using a computer search engine all utilize algorithms. An algorithm is a well-defined set of instructions designed to perform a particular task or solve a type of problem. Anything that follows a set of specified instructions is an algorithm.
Further example of other maths used Level 9 Apply set structures to solve real-world problems (VCMNA307)	For example: Using a sort algorithm to find a median from a set of numbers.

PROFICIENCY FOCUS: VICTORIAN CURRICULUM

This investigation focuses on: Reasoning, Understanding, Problem Solving

Reasoning refers to students developing an increasingly sophisticated capacity for logical, statistical and probabilistic thinking and actions, such as conjecturing, hypothesising, analysing, proving, evaluating, explaining, inferring, justifying, refuting, abstracting and generalising.

This investigation focuses on:
- Students explaining their thinking
- Deduce and justify strategies used and conclusions reached
- Adapt the know to the unknown
- Transfer learning from one context to another.

Understanding refers to students building a robust knowledge of adaptable and transferable mathematical concepts and structures.

This investigation focuses on:
- Describe their mathematical thinking.

Problem Solving is the ability of students to make choices, interpret, formulate, model and investigate situation, select and use technological functions and communicate solutions effectively.

This investigation focuses on:
- Students designing investigations and planning their approaches
- Verifying their answers are reasonable.

Information and communication technology
Information Communication Technologies (ICT) are powerful tools that can support student learning. Students can develop and demonstrate their understanding of concepts and content in Mathematics using a range of ICT tools. It is also important that students know how to use these ICT efficiently and responsibly, as well as learning how to protect themselves and secure their data.

MATHEMATICAL INVESTIGATION
FOOD INDUSTRY AND CODING

STUDENT INVESTIGATION WITH TEACHER GUIDE

INVESTIGATION BACKGROUND

Like most other process industries, food companies are finding ways to improve productivity throughout the plant with the use of factory automation. Whether it be in the actual processing of the food or the packaging of the food, automation is everywhere in today's modern food plants.

PRE-INVESTIGATION TASKS

Start by having students watch some of the YouTube clips listed below, as a sample. You may choose other similar clips.

1. Download the TI-Nspire™ CX II CAS Student software from https://education.ti.com/en-au/software/search

2. Complete the 10 minutes of code for TI-Nspire™ CX II CAS technology, the link is https://education.ti.com/en-au/activities/ti-codes/nspire/10-minutes

YOUR INVESTIGATION

Design a product that automates or optimises a process or product related to food, then use coding to demonstrate how the product works.

Prompts

- Watch the clips below for some ideas.
- Explain what your product does, how it works who it will benefit and how.
- If you have access to TI technology, use TI technology to build a model of the solution. Alternatively, another form of technology to build a model of the solution.

Glossary

- Code is a system of words, letters, figures, or other symbols substituted for other words, letters, etc., especially for the purposes of secrecy.
- In communications and information processing, code is a system of rules to convert information — such as a letter, word, sound, image, or gesture — into another form or representation, sometimes shortened or secret, for communication through a channel or storage in a medium. (Wikipedia)
- Coding is what makes it possible to create computer software, apps and websites. Your browser, your OS, the apps on your phone, Facebook – they're all made with code.
- Coding - a process by which algorithms are represented and implemented (VCAA)

Further prompts for teachers

Class discussion of *What is coding?* To start this discussion you may choose to view the following YouTube clip as a class *Granny was a hacker*: https://youtu.be/fYAZNUisrek

Brainstorm with students some ideas they may explore. Example: one group of students designed a hands-free water refill system sensored to stop and start. The idea came from the fact that due to COVID-19 drinking fountains could not be used at schools as they posed a COVID-19 health risk. If you have access to technology, (example TI or any other) use the technology for students to build a model of their solution.

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REFERENCE MATERIAL

- Teachers can teach students some basic coding using the TI or other CAS or a coding program.

- A few YouTube clips:

Industry Certified Robotic Automation for the Food Industry
www.youtube.com/watch?v=OSNpvficmug

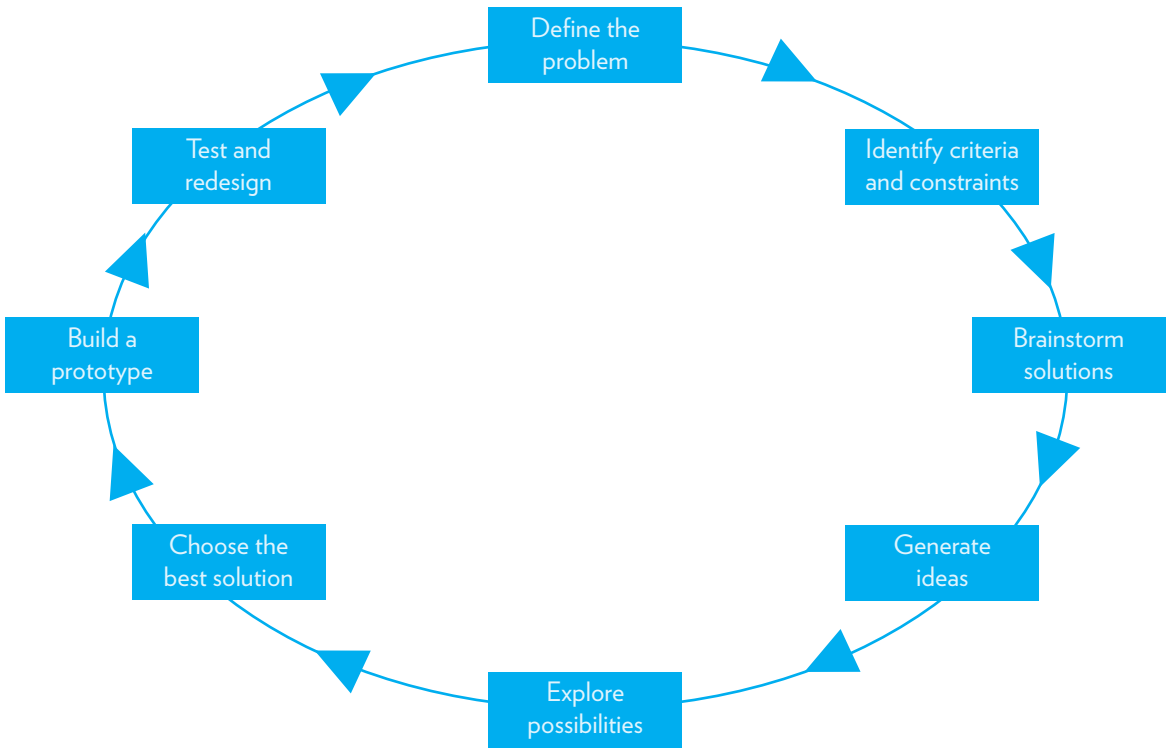
Latest Automation Technology for the Food Industry
www.youtube.com/watch?v=oUjCeLeKYSs

Extreme Fast Automatic Food Processing Machines Modern Food Processing Technology
www.youtube.com/watch?v=FN4pBXEkyy8

- What to avoid:

I Love Lucy: A Colorized Celebration - 'Job Switching' clip
www.youtube.com/watch?v=K3axU2b0dDk

The Engineering Design Process (diagram below) may be a helpful tool in developing your teams' ideas and helping you think through your solution.



The following TI link will be of assistance in writing the code and creating the model:
https://education.ti.com/en/activity/detail%3Fid%3D218AEDB86CBB4305B2120FAEF4E09812

MATHEMATICAL INVESTIGATION
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CAREERS RELATED TO THIS INVESTIGATION

Refer to the student investigation, it provides:

- An extensive table of careers related to this investigation
- Further career references

CAREERS ACTIVITIES

Refer to the student investigation, it provides:

- A table of the top 10 rated jobs of 2021. This data comes from careercast.com. Have students investigate the jobs specific to this investigation.

MATHEMATICAL INVESTIGATION
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INDUSTRY PARTNER

This project was produced collaboratively between The Mathematical Association of Victoria (MAV) and Texas Instruments

TI has for decades, operated with a passion to create a better world by making electronics more affordable through semiconductors.

We have operated with a passion to create a better world by making electronics more affordable through semiconductors. We were pioneers in the transition of the world from vacuum tubes to transistors and then to integrated circuits (ICs) – and we've been advancing IC technology and the ability to reliably produce ICs in high volumes for decades. Each generation of innovation builds upon the last to make technology smaller, more efficient, more reliable and more affordable – making it possible for semiconductors to go into electronics everywhere. We think of this as Engineering Progress. It's what we do and have been doing for decades:

- The object-detection capability used in a $20 million military radar system from the 1980s is now possible using a $20 radar chip in automobiles everywhere to increase vehicle safety and reduce collisions.
- Home automation systems that cost tens of thousands of dollars 20 years ago are now only hundreds of dollars. Today, these systems are more accessible to homeowners and are making homes safer, more convenient and more energy efficient.
- Technology that previously was only used in expensive factory robotic systems is affordable enough to be integrated into home appliances, making common household tasks, like vacuuming, easier and more convenient.

Our passion to create a better world by making electronics more affordable through semiconductors is alive today as we help our customers develop new applications, particularly in the industrial and automotive markets.
www.ti.com/about-ti/company/what-we-do.html