



MATHEMATICS IN CAREERS

Investigation - Pet car alarm

Key career focus for this investigation: Software engineer, coding, information technology Related career areas: Animal science



THINKING ABOUT CAREERS

- Brainstorm information technology professions you can think of where maths is frequently used. Use <u>https://joboutlook.gov.au</u> 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 alerts a pet owner to an overheating car
- 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 alerts a pet owner to an overheating car.

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.





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INVESTIGATION BACKGROUND

Pets suffer when left unattended in a car with the windows rolled up on a hot sunny day. The temperature inside a car may reach greater than 40°C above the outside ambient temperature within an hour. By taking action to cool the interior and notifying the owner of impending pet harm, a car equipped with a pet-smart alarm could prevent harm to a pet left inside a hot car.

SOME PRE-INVESTIGATION TASKS

If you have a TI-Nspire calculator, use this for the investigation. If you do not have a TI-Nspire calculator then: 1. Download the TI-Nspire™CX II CAS student software from <u>https://education.ti.com/en-au/software/search</u>

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

YOUR INVESTIGATION

To understand the science behind the greenhouse effect and to use

- mathematics to analyse which characteristics to include in an ideal car
- coding and engineering to construct a model car with a pet-smart alarm system.

In your analysis you will need to include:

- An investigation into the temperature inside a closed car and if it increases by differing amounts depending on the colour of the car. If so how?
- An investigation into the temperature inside a closed car and if it changes by differing amounts as the size of the window changes. If so how?
- A graphical display showing the data collected to reach a decision on the colour and window size of the car.
- Does your analysis take into account the size of the pet? Discuss this.

If you have access to TI technology, use TI technology and Innovator Hub to build a model of the solution. Alternatively, another form of technology can be used to build a model of the solution.

To demonstrate the ideal model car with a pet smart alarm system you will:

- Construct a prototype car, including a support mechanism to hold the motor which opens the window.
- Write code to activate the alarm when the temperature reaches a critical level.

You will be required to demonstrate your working prototype through a short video created as the project is completed, which will document the process, and reveal the working prototype of the Pet Car Alarm.













REFERENCE MATERIAL

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 <u>https://education.ti.com/en-au/petalarm</u>

EXTENDED OR ADVANCED INVESTIGATION

Suggest ways of further refining the pet smart alarm and other applications of this investigation.









CAREERS RELATED TO THIS INVESTIGATION

ARTIFICIAL INTELLIGENCE SPECIALIST					
Canada description	Kow skills required	Mana information			
An artificial Intelligence Specialist develops computer systems that use big sets of <u>data</u> to perform 'intelligent' tasks: think visual perception, understanding natural language, reasoning and decision making. <u>Machine learning</u> is one way of building such systems based on providing the computer with examples of what it should do, and let it figure out (learn) how to do it. An artificial intelligence specialist may for example: • Work in medicine, improve medical diagnoses	 Scientific method Reasoning and problem solving Analytical thinking Creative thinking Coding and computer programming skills 	https://careerswithstem.com.au/ what-is-artificial-intelligence/			
SOFTWARE ENGINEER					
Career description	Key skills required	More information			
Software engineering is a branch of computer science that includes the development and building of computer systems software and applications software. Careers include: • IT Consultant • Game developer • Web designer	 Coding and computer programming skills Competent software development skills Good communication Precision and attention to detail 	<u>https://careerswithstem.com.au/sci-</u> ence-careers-list <u>/</u>			
CYBER SECURITY SPECIAL	ST				
Career description	Key skills required	More information			
 The job of a cyber security specialist includes: identify instances when a customer/client has been attacked but doesn't know it other cyber security measures. how industries (eg. Banks) can better prepare for the cyber security threats they'll be facing in future (eg. five years). 	 Analysis and representation of data Reasoning and problem solving Scientific method Software development Analytical thinking Creative thinking Technical skills 	https://careerswithstem.com.au/pro- files/cba-daniel-lekic/			













CAREERS RELATED TO THIS INVESTIGATION

Career description	Key skills required	More information			
Creates, designs and develops computer games.	Scientific methodCommunication	https://careerswithstem.com.au/pro- files/niamh-fitzgerald/			
	Creative thinkingGraphics, art				
	Coding and computer programming skills				
	 Problem solving 				
ROBOTICS ENGINEER					
Career description	Key skills required	More information			
 A robotics engineer will design and develop robotic equipment. They construct, configure, test, and debug robots and robotic systems. Careers include: Robotics technician Robotics software engineer Toy designer 	 Scientific method Collaboration and communication Thorough understanding of electrical wiring and computer software engineering. Proficient with computer-aided drafting (CAD) software to create accurate drawings and schematics. 	https://careerswithstem.com.au/pro- files/mahonri-owen/			
SITE RELIABILITY ENGINEER					
Career description	Key skills required	More information			
Companies such as google employ site reliability engineers. A site reliability	Scientific methodCoding	https://careerswithstem.com.au/pro- files/anna-emmerson/			
engineer, is responsible for the	 Reasoning and problem solving Applytical thinking 				
for example, Google Photos.	Creative thinking				
OTHER RELATED CAREERS	S TO EXPLORE				
https://careerswithstem.com.au/future-tech-jobs-in-australia/					
Data scientist	Automation consultant				
 Data engineer 	 Machine learning engineer 				
Cloud engineer					
For an overview of digital technologies being a priority industry and sector, visit: https://djpr.vic.gov.au/priority-industries-sectors/digital-technologies					









CAREERS ACTIVITIES

THE 10 BEST RATED JOBS OF 2021			
Rank	Career	Median salary	Projected growth
1	Data Scientist	\$98 230	33%
2	Genetic Counsellor	\$85 700	21%
3	Statistician	\$92 270	35%
4	Medical Services Manager	\$104 280	32%
5	Mathematician	\$110 860	33%
6	University Professor	\$80 790	9%
7	Operations Research Analyst	\$86 200	25%
8	Information Security Analyst	\$99 730	31%
9	Actuary	\$111 030	18%
10	Software Engineer	\$110 140	22%

Data from <u>Careercast.com</u>.

Select one of the careers, from either of the tables above, that interests you and find out:

- What are the tasks involved in this career? What may a typical day look like?
- What level of education or qualifications do you need to do this career?
- What are some other similar or related careers?
- What mathematics skills would be used in this career?
- Where does the career you have selected, to investigate, rank according to careercast.com?
- How many people in Australia are currently employed in this career (or field)?











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











FURTHER CAREER REFERENCES

Australian Jobs Report 2021

www.nationalskillscommission.gov.au/australian-jobs-report

An overview of trends in the Australian labour market to support job seekers and employment service providers, career advisers, those considering future training and people interested in labour market issues.

Business Victoria Future Industries

https://business.vic.gov.au/grants-and-programs/future-industries

Future Industries is about supporting investment in high-growth industries through industry excellence and development projects, including establishing collaborative networks and building supply chain readiness capabilities.

Career Education

<u>www.education.vic.gov.au/school/teachers/teachingresources/careers/Pages/default.aspx</u> Career Education teaching resources to help teach students to make informed career decisions and equip themselves for the world of work.

CEAV Online Learning Resources

<u>https://ceav.vic.edu.au/media/250615/careers-in-the-construction-technology-industries-student-resource.pdf</u> Designed to enable students to attend a virtual Industry Immersion Experience, these online resources will help students discover more about Victoria's priority growth industries and give them the opportunity to reflect on their skills, interests and undertake career planning and exploration.

Jobs Victoria

www.jobs.vic.gov.au

JobOutlook

<u>www.joboutlook.gov.au</u> Relevant and current labour market trends and career information.

MyFuture

<u>www.myfuture.edu.au</u> A database of over 600 careers.

National Careers Institute

www.dese.gov.au/nci

The National Careers Institute (NCI) ensures Australians have access to reliable and accurate careers information, resources, and support.







