




How much does a trip cost?

 Age group	13 and above
 Time	30 - 60 mins
 Subject	Computing



National Curriculum links

This activity would suit KS4 students or the top end of KS3.

The national curriculum for computing for key stages 3 and 4 aims to ensure that all pupils “can analyse problems in computational terms” and “are responsible, competent, confident and creative users of information and communication technology.”

England Key stage 3 subject content

Pupils should be taught to:

- design, use and evaluate computational abstractions that model the state and behaviour of real-world problems and physical systems
- use two or more programming languages, at least one of which is textual, to solve a variety of computational problems; make appropriate use of data structures [for example, lists, tables or arrays]; design and develop modular programs that use procedures or functions

England Key stage 4 subject content

Pupils should be taught to:

- develop their capability, creativity and knowledge in computer science, digital media and information technology
- develop and apply their analytic, problem-solving, design, and computational thinking skills

Learning outcomes

Pupils should be able to:

- Use Python to create a working program.
- Test a program and fix any bugs.

Skills developed

- **Programming:** Using Python to create a working program
- **Decomposition:** Breaking a bigger problem down into smaller more manageable sections.
- **Abstraction:** Removing unnecessary details to focus on the key parts.
- **Communication:** Sharing thoughts with others on how they arrived at their solution.

Prior Learning

Learners need to have an understanding of writing programs in Python.

Requirements

Students will need access to computers installed with Python or use an online Integrated Development Environment (IDE).

Overview of 'How much does a trip cost?'

In this task pupils are presented with a real-world context where they are presented with information to break down and use to create a working program which they then test and debug if needed.

The cost per mile is used to calculate the cost of a journey made by self-employed delivery drivers. Self-employed delivery drivers use their own vehicles to make deliveries. The model used in this activity reflects the current costing structure of logistics companies. The first 5 miles of a journey are costed at a higher rate of £0.80 per mile and then after 5 miles it is a lower rate of £0.40 per mile. The total cost covers petrol/diesel/electricity used for the delivery plus wear and tear to the driver's vehicle.

This type of task allows learners to use computational thinking, by looking at a problem and finding possible solutions. These skills, once learnt and applied to varying scenarios, can help learners approach any programming challenges.

Resource Overview

This resource includes these items:

- Teacher notes.
- Student activity sheet setting out the task and giving the information required for the students.
- Exemplar solution.
- Program example solutions in Python with string concatenation and Python with F-strings.
- Scaffolded programming task.
- Presentation slides to help explain the tasks.

The context

In this problem pupils are asked to create a program to work out the cost of the journeys of self-employed delivery drivers. There are specific rules that need to be taken into account when creating the program around what is input and output as well as the calculations that need to take place.

The learners can use a wide range of programming skills to create a program, and the program code provided is one possible solution.

The students need to create a program using Python that allows the user to:

- add the number of miles travelled as a decimal
- receive an output for the total cost for a journey as a sentence

The program needs to:

- calculate the cost of the journey at £0.80 per mile if the number of miles is under 5 miles
- if the journey is over 5 miles calculate the cost as £0.80 for the first 5 miles and £0.40 for the remaining miles
- round the output value to 2 decimal places
- consider the user experience to create a suitable visual output

Supporting notes

Students should be encouraged to plan their program before they start to code by following the guidance on the student activity sheet. This can be done by creating the algorithm either as a flowchart or pseudocode. The aim is to allow learners to plan what the program needs to do before starting to write the code.

Encourage learners to complete the test plan as this will allow them to identify any problems and debug any errors. This also gives pupils an opportunity to work together and compare each other's programs to see if they have created different solutions.

Learners who require a starting point for the task can use the scaffolded task. This program has the correct lines of code in the function and in the main program, all in the wrong order. The lines of code are commented out using the hash tag. To add to the program, learners will need to move it to the correct position and remove the hash tag.

Useful websites

- [Isaac Computer Science – Programming concepts](#)
- [IDE provider - trinket](#)

(Please note - to use the free Isaac Computer science website, users need to register:
<https://isaaccomputerscience.org>)

Generation Logistics Education Hub

This resource is one of the many engaging resources available from Generation Logistics on their Education Hub. For more details go to: www.educationhub.generationlogistics.org/