Scratch Programming
Lesson 2: Solving a Problem

Availability of Slides
Go to
nbcs.rutgers.edu/~jt
to see the powerpoint slides and/or podcasts for this lecture

Problem
1. Figure out how many miles a car with a full tank of gas can travel if you know how big its gas tank is, and you know its gas mileage.

Problem
2. After asking for the length of a trip the car takes, calculate how much gas is used on the trip, and how much remains in the tank. Calculate how fill (percentage) the tank is.

Problem
3. Display a gas gauge on the screen and have the needle show how much gas is in the car. Add related to filling up a gas tank and sound effects to represent a car trip.

Part 1 : Variables
GallonsTankHolds

MPG
Part 1: Start

- Click here

Part 1: Input

- When clicked
- Ask: How many miles per gallon does your car get?
- Get: MPG
- Ask: How many gallons did you put into tank?
- Get: Gallons

Part 1: Calculate

- How far can car travel on full tank?

Part 1: Calculate

- How far can car travel on full tank?

Pick a variable: PossibleMiles

Example 1:
Part 1: Calculate

- How far can a car travel on a full tank?
  
  Pick a variable: PossibleMiles

Example 1:
  
  Gas Tank: 10 Gallons
  Gas Mileage: 20 mpg
  
  How many miles can the car travel? 200

Example 2:
  
  Gas Tank: 15 Gallons
  Gas Mileage: 30 mpg
  
  How many miles can the car travel? 450

General Situation:
  
  Gas Tank: GallonsTankHolds
  Gas Mileage: MPG
  
  How many miles can the car travel? (equation)
Part 1 : Calculate

- How far can car travel on full tank?

Pick a variable: PossibleMiles

$$\text{PossibleMiles} = \text{GallonsTankHolds} \times \text{MPG}$$

General Situation:

Gas Tank: GallonsTankHolds
Gas Mileage: MPG

How many miles can car travel? (equation)

Part 1 : Display Result

- Append calculation to code, say result, end script.

Part 2

2. After asking for the length of a trip the car takes, calculate how much gas is used on the trip, and how much remains in the tank. Calculate how fill (percentage) the tank is.

Part 2 : Variables

2. After asking for the length of a trip the car takes, calculate how much gas is used on the trip, and how much remains in the tank. Calculate how fill (percentage) the tank is.
Part 2 : Variables

2. After asking for the length of a trip the car takes, calculate how much gas is used on the trip, and how much remains in the tank. Calculate how fill (percentage) the tank is.

TripMiles
GallonsUsed
GallonsInCar
PercentFull

Part 2 : Input

Ask how many miles the car trip was.
Part 2: Calculate

How many gallons of gas used? (GallonsUsed)

Example 1: Car gets 20 miles per gallon, holds 15 gallons of gas, and took a trip of 60 miles?
How many gallons were used? 3

Example 2: Car gets 25 miles per gallon, holds 10 gallons of gas, and took a trip of 100 miles?
How many gallons were used? 4
Part 2: Calculate

How many gallons of gas used? (GallonsUsed)

Example 2: Car gets 25 miles per gallon, holds 10 gallons of gas, and took a trip of 100 miles?

What values are important to the calculation?

Do you remember the variable names?

So what is the general equation?
Part 2: Calculate

How many gallons of gas used? (GallonsUsed)

\[ \text{GallonsUsed} = \frac{\text{TripMiles}}{\text{MPG}} \]

Example 2: Car gets 25 miles per gallon, holds 10 gallons of gas, and took a trip of 100 miles. So what is the general equation?

Part 2: Calculate & Display

How many gallons of gas used? (GallonsUsed)

Example: Car gets 25 miles per gallon, holds 10 gallons of gas, and took a trip of 100 miles. So what is the general equation?

Part 2: Calculate

How many gallons left in tank? (GallonsInCar)

Example: Tank was full and held 15 gallons, and trip used up 3. How many left?

Part 2: Calculate

How many gallons left in tank? (GallonsInCar)

- Example: Tank was full and held 15 gallons, and trip used up 3. How many left?

Part 2: Calculate

How many gallons left in tank? (GallonsInCar)

Example: Tank was full and held 15 gallons, and trip used up 3. How many left? 12

Variable names?

- Example: Tank was full and held 15 gallons, and trip used up 3. How many left? 12
Part 2: Calculate

How many gallons left in tank? (GallonsInCar)

Variable names?

- Example: Tank was full and held 15 gallons, and trip used up 3. How many left? 12

GallonsTankHolds

GallonsUsed

Equation?

- Example: Tank was full and held 15 gallons, and trip used up 3. How many left? 12

GallonsTankHolds

GallonsUsed

Part 2: Calculate & Display

How many gallons left in tank? (GallonsInCar)

Equation?

- Example: Tank was full and held 15 gallons, and trip used up 3. How many left? 12

GallonsTankHolds

GallonsUsed

Part 2: Calculate

How full is the tank? (PercentFull)

- Example: Tank holds 10 gallons, and has 4 gallons left. How full (percent) is tank? 40%
Part 2: Calculate

How full is the tank? (PercentFull)

Variables?
- Example: Tank holds 10 gallons, and has 4 gallons left. How full (percent) is tank? 40%

Equation?
- Example: Tank holds 10 gallons, and has 4 gallons left. How full (percent) is tank? 40%

PercentFull = GallonsLeft / GallonsInTank

Try It
- Example: Tank holds 10 gallons, and has 4 gallons left. How full (percent) is tank? 40%
Part 2: Calculate

How full is the tank? (PercentFull)

\[
\text{PercentFull} = \frac{\text{GallonsLeft}}{\text{GallonsInTank}}
\]

Try It

Example: Tank holds 10 gallons, and has 4 gallons left. How full (percent) is tank? 40%

Part 2: Calculate

How full is the tank? (PercentFull)

\[
\text{PercentFull} = \frac{\text{GallonsLeft}}{\text{GallonsInTank}} \times 100
\]

So multiply result by 100

Try It

Example: Tank holds 10 gallons, and has 4 gallons left. How full (percent) is tank? 40%

Part 2: Complete Code

All three values calculated and displayed.
Part 2: Complete Code

All three values calculated and displayed.

```
ask "How many miles did you travel?" and wait
ask "How much did you pay?" and wait
ask "How much gas did you buy?" and wait
set gallons * 100 / to totalGallons
set gasCost / to gasPrice
output "You traveled " totalMiles " miles.
output "You paid with " totalCost " dollars.
output "You bought " totalGallons " gallons of gas.
```

Rounding

The percent sometimes has a lot of messy decimal places.

There is an operator to fix this.

Rounding Percent

The percent sometimes has a lot of messy decimal places.

There is an operator to fix this. Round

```
Round (GallonsInCar / GallonsTankHolds) * 100
```
Rounding Percent

The percent sometimes has a lot of messy decimal places. There is an operator to fix this. Round

Complete Code

- Lets look at the complete code with the animated needle and sound effects. (Then we will come back and see how it works.)

- Demo: GasMeter

Part 3: Add Multimedia

- Make the sprite a needle
- Make the stage a car gas gauge (with E for empty and F for full)

Part 3: Add Multimedia

- Make the sprite a needle
- Make the stage a car gas gauge (with E for empty and F for full)
- Place sprite needle below guage in right spot.
Part 3: Add Multimedia

- Make the sprite a needle
- Make the stage a car gas gauge (with E for empty and F for full)
- Place sprite needle below gauge in right spot.

How did I know the point was -2, -151?

I experimented….

Point end of needle towards E (again experiment)

Indicate no gas in car
Part 3: Add Multimedia

- Make the sprite a needle
- Make the stage a car gas gauge
- Place sprite needle below gauge in right spot.
- Point end of needle towards E
- Indicate no gas in car
- Now say you are filling up tank and point needle sprite towards F.

Part 3: Add Multimedia

- Make the sprite a needle
- Make the stage a car gas gauge
- Place sprite needle below gauge in right spot.
- Point end of needle towards E
- Indicate no gas in car
- Now say you are filling up tank and point needle sprite towards F
- And remember to move needle as gas is used

Part 3: Math for pointing needle

- Experiment showed you needed to point the needle at 40 degrees to point to E
- And you needed to point needle at 140 degrees to point to F
- This is exactly 100 apart

WHAT LUCK !!!!!

Part 3: Math for pointing needle

- Experiment showed you needed to point the needle at 40 degrees to point to E
- And you needed to point needle at 140 degrees to point to F
- This is exactly 100 apart
- For every 1 more percent of gas the tank is full, we can move needle 1 degree past 40 degrees.
Part 3: Math for pointing needle

- Experiment showed you needed to point the needle at 40 degrees to point to E
- And you needed to point needle at 140 degrees to point to F
- This is exactly 100 apart
- For every 1 more percent of gas the tank is full, we can move needle 1 degree past 40 degrees. Remember PercentFull is the variable.

Part 3: Sound Effects

- For any sprite, you can have one or more sounds. You can import them if you want.

Part 3: Sound Effects

- There is a collection of statements for sounds:

   - So right before we ask how long the trip was, play the traffic sound and say we are taking the trip.
The Whole Code
• Start on green, show and say tank is empty

The Whole Code
• Ask MPG & size of tank, fill it up, move needle, say how far you can go on full tank

The Whole Code
• Play traffic sound, drive to trip, ask how long it was and tell how much gas used

The Whole Code
• Calculate and say how much gas left and how fill tank now is and point needle properly to indicate gas has been used

Availability of Slides
Go to
nbc.s.rutgers.edu/~jt
to see the powerpoint slides and/or podcasts for this lecture