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Scratch Programming

Lesson 2: Solving a Problem

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 as is in the car. Add related to filling up a gas tank and sound effects to represent a car trip.

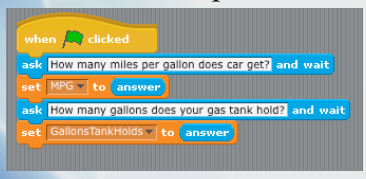
Part 1 : Variables

GallonsTankHolds

MPG

Part 1 : Start

Part 1 : Input



Part 1 : Calculate

- How far can car travel on full tank?

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  Pick a variable:

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- How far can car travel on full tank?

  Pick a variable: PossibleMiles

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  Example 1:

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- How far can car travel on full tank?

Pick a variable: PossibleMiles

Example 1:

Gas Tank: 10 Gallons

Gas Mileage: 20 mpg

Part 1 : Calculate

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Pick a variable: PossibleMiles

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Gas Tank: 10 Gallons

Gas Mileage: 20 mpg

How many miles can car travel?

Part 1 : Calculate

- How far can car travel on full tank?

Pick a variable: PossibleMiles

Example 1:

Gas Tank: 10 Gallons

Gas Mileage: 20 mpg

How many miles can car travel? 200

Part 1 : Calculate

- How far can car travel on full tank?

Pick a variable: PossibleMiles

Example 2:

Gas Tank: 15 Gallons

Gas Mileage: 30 mpg

How many miles can car travel?

Part 1 : Calculate

- How far can car travel on full tank?

Pick a variable: PossibleMiles

Example 2:

Gas Tank: 15 Gallons

Gas Mileage: 30 mpg

How many miles can car travel? 450

Part 1 : Calculate

- How far can car travel on full tank?

Pick a variable: PossibleMiles

General Situation:

Gas Tank: GallonsTankHolds

Gas Mileage: MPG

How many miles can car travel? (equation)

Part 1 : Calculate

- How far can car travel on full tank?

  Pick a variable: PossibleMiles

  PossibleMiles = GallonsTankHolds * MPG

  General Situation:

  Gas Tank: GallonsTankHolds

  Gas Mileage: MPG

  How many miles can car travel? (equation)

Part 1 : Calculate

- How far can car travel on full tank?

  Pick a variable: PossibleMiles

  General Situation:

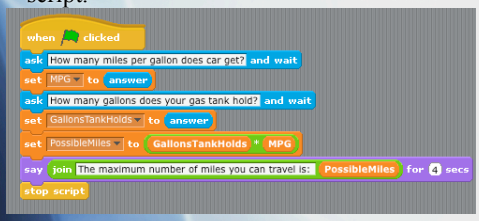
  Gas Tank: GallonsTankHolds

  Gas Mileage: MPG

  How many miles can car travel? (equation)

Part 1 : Display Result

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



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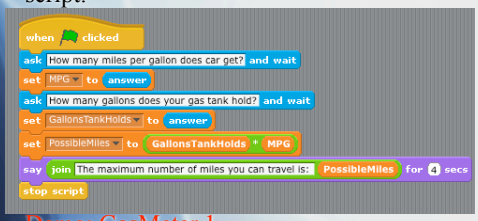

- Demo: GasMeter 1

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.

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TripMiles
GallonsUsed

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TripMiles
GallonsUsed
GallonsInCar

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.

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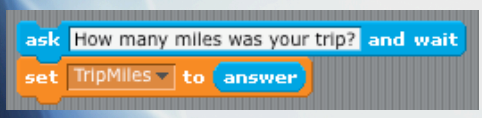

Part 2 : Calculate

How many gallons of gas used? (GallonsUsed)

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

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How many gallons were used?

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

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?
How many gallons were used?

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?
How many gallons were used? 4

Part 2 : Calculate

How many gallons of gas used? (GallonsUsed)

4

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?

Part 2 : Calculate

How many gallons of gas used? (GallonsUsed)

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What values are important to the calculation?

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How many gallons of gas used? (GallonsUsed)

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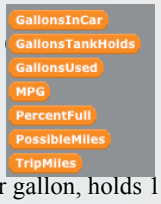
Example 2:Car gets 25 miles per gallon, holds 10 gallons of gas, and took a trip of 100 miles?

Do you remember the variable names?

Part 2 : Calculate

How many gallons of gas used?



4

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

Do you remember the variable names?

Part 2 : Calculate

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MPG

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TripMiles

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Part 2 : Calculate

How many gallons of gas used? (GallonsUsed)

4

MPG

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

TripMiles

So what is the general equation?

Part 2 : Calculate

How many gallons of gas used? (GallonsUsed)

GallonsUsed = TripMiles / MPG

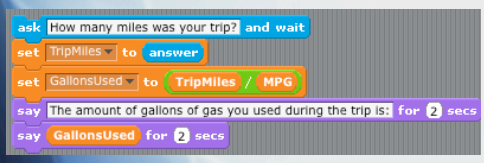
4 MPG

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

So what is the general equation?

Part 2 : Calculate & Display

How many gallons of gas used? (GallonsUsed)



Part 2 : Calculate

How many gallons left in tank? (GallonsInCar)

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

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Variable names?

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How many gallons left in tank? (GallonsInCar)

Variable names?

GallonsTankHolds

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

GallonsUsed

Part 2 : Calculate

How many gallons left in tank? (GallonsInCar)

Equation?

GallonsTankHolds

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

GallonsUsed

Part 2 : Calculate & Display

How many gallons left in tank? (GallonsInCar)

Equation?

GallonsTankHolds

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

GallonsUsed

Part 2 : Calculate

How full is the tank? (PercentFull)

Part 2 : Calculate & Display

How full is the tank? (PercentFull)

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

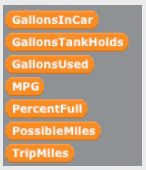
Part 2 : Calculate

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%

Part 2 : Calculate

How full is the tank? (PercentFull)

Variables? GallonsTankHolds GallonsInCar

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

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How full is the tank? (PercentFull)

Equation? GallonsTankHolds GallonsInCar

- 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)

PercentFull = GallonsLeft / GallonsInTank

Equation? GallonsTankHolds GallonsInCar

- 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)

PercentFull = GallonsLeft / GallonsInTank

Try It GallonsTankHolds GallonsInCar

- 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)

PercentFull = GallonsLeft / GallonsInTank

4 / 10 =

Try It GallonsTankHolds GallonsInCar

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

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4 / 10 = .4

Try It

GallonsTankHolds GallonsInCar

- 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)

PercentFull = GallonsLeft / GallonsInTank

4 / 10 = .4 Not 40!

Try It

GallonsTankHolds GallonsInCar

- 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)

PercentFull =(GallonsLeft / GallonsInTank)

So multiply result by 100

GallonsTankHolds GallonsInCar

- 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)

PercentFull =(GallonsLeft / GallonsInTank) *100

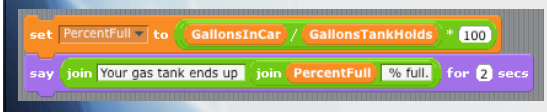
So multiply result by 100

GallonsTankHolds GallonsInCar

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

Part 2 : Calculate & Display

How full is the tank? (PercentFull)



Part 2 : Complete Code

All three values calculated and displayed.

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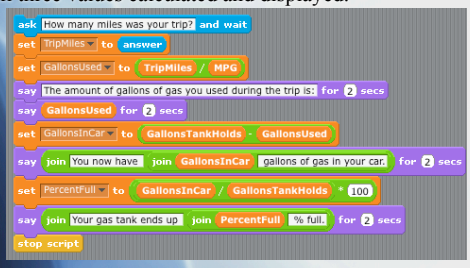
All three values calculated and displayed.



Demo: GasMeter 2

Rounding

The percent sometimes has a lot of messy decimal places.

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There is an operator to fix this.

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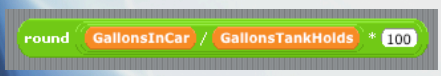
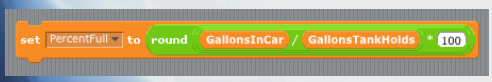


Rounding Percent

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

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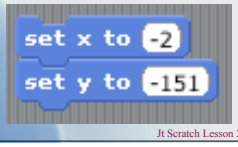

Part 3: Add Multimedia

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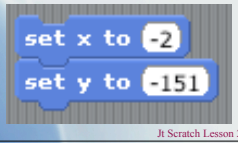
How did I know the point was -2, -151?



Part 3: Add Multimedia

- Make the sprite a needle
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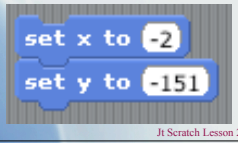
I experimented….



Part 3: Add Multimedia

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- Make the stage a car gas gauge (with E for empty and F for full)
- Place sprite needle below guage in right spot.
- Point end of needle towards E (again experiment)

Part 3: Add Multimedia

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- Point end of needle towards E
- Indicate no gas in car

Part 3: Add Multimedia

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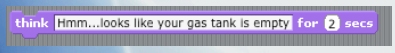
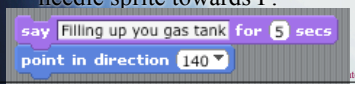


Part 3: Add Multimedia

- Make the sprite a needle
- Make the stage a car gas gauge
- Place sprite needle below guage 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 guage 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

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- This is exactly 100 apart

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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.

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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. So:

Part 3: Sound Effects

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

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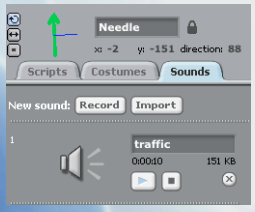
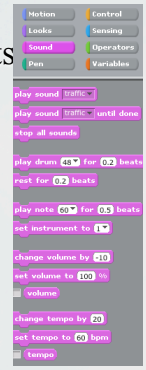


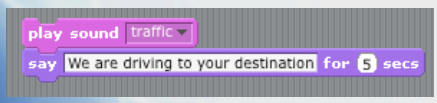
Part 3: Sound Effects

- There is a collection of statements for sounds:



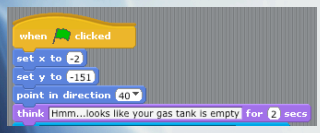
Part 3: Sound Effects

- So right before we ask how long the trip was, play the traffic sound and say we are taking the trip.



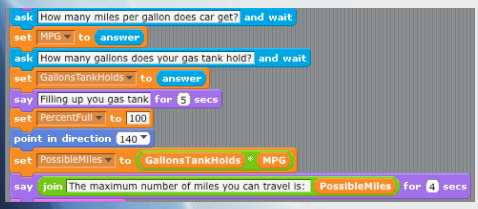
The Whole Code

- Start on green, show and say tank is empty



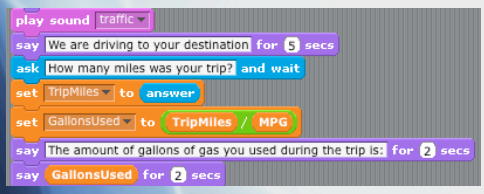
The Whole Code

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



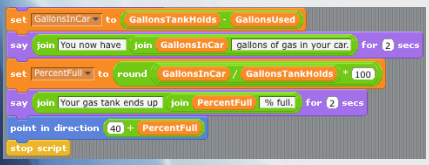
The Whole Code

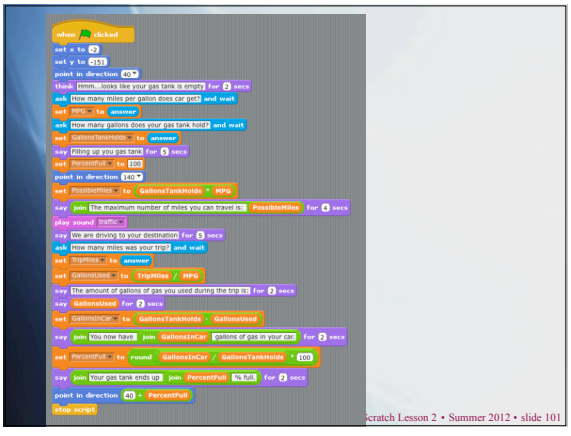
- Play traffic sound, drive to trip, ask how long it was and tell how much gas used



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





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