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Scratch Programming
Lesson 3A : Decisions

Problem
Write code to calculate the bill for a customer who gets their car fixed. The car shop has to cover its costs - parts and labor - but also wants to make a profit. They usually make a profit of 25%, but if they believe the car is worth over $35000, they will increase their profit to 50%.

Variables
- RepairCost - cost to shop of parts and labor
- ProfitRate - 25 or 50%
- Profit - dollars of profit made
- Bill - what customer has to pay

Simplified Problem
- How would we calculate the bill if the shop always made 25% profit?

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  ProfitRate ← .25
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  ProfitRate ← .25
  
  Example:
  
  RepairCost ← $200

How much is Profit? ← $50

How much is Bill? ← $250
Simplified Problem

- What are the equations using variables?
  ProfitRate ← .25
  RepairCost ← $200
  Profit? ← $50
  Bill? ← $250

Equation for Profit?

ProfitRate * RepairCost

Simplified Problem

- What are the equations using variables?
  ProfitRate ← .25
  RepairCost ← $200
  Profit? ← $50
  Bill? ← $250

Equation for Bill?

RepairCost + Profit

Simplified Problem

- What are the equations using variables?
  ProfitRate ← .25
  RepairCost ← $200
  Profit? ← $50
  Bill? ← $250

Equation for Profit?

ProfitRate * RepairCost

ProfitRate

- However, ProfitRate is not necessarily 25%
ProfitRate

- However, ProfitRate is not necessarily 25%
- We cannot just assign it the value of .25
- It is based on the value of the car.
- New variable needed: CarValue
- ProfitRate gets set according to CarValue
- The code must decide what value to use
How can you make a decision?

• **IF**
  Used to perform or not to perform some segment of code:

  - The code is sometimes performed

  - When condition is true
How can you make a decision?

• **IF**
  Used to perform or not to perform some segment of code:
  - Sometimes nothing happens

Sometimes nothing happens

How can you make a decision?

• **IF/ELSE**
  Used to choose between two segments of code

- Exactly one of the two choices will happen

How can you make a decision?

• **IF/ELSE**
  Used to choose between two segments of code
  - Exactly one of the two choices will happen

Something will definitely happen

How can you make a decision?

• **IF/ELSE**
  Used to choose between two segments of code
  - Exactly one of the two choices will happen

A plain IF might do nothing but…
How can you make a decision?

- **IF/ELSE**
  - Used to choose between two segments of code
  - exactly one of the two choices will happen

*But an IF/ELSE will always do something...*

- **condition**
  - code - choice 1
  - code - choice 2

*Either Code Choice 1 will happen... or Code Choice 2 will happen... when condition is true*
How can you make a decision?

- **IF/ELSE**  
  Used to choose between two segments of code - exactly one of the two choices will happen

![IF/ELSE diagram]

- Conditions
  - The part of the IF or IF/ELSE that is used to make a decision
  - It is a code component that the computer can determine to be TRUE or FALSE

```
Example: Is CarValue > 35000
```

- Conditions are made of three components:
  - Part1
  - RelationalOperator
  - Part2
Conditions

- The part of the IF or If/ELSE that is used to make a decision
- It is a code component that the computer can determine to be TRUE or FALSE
- Example: Is CarValue > 35000
- Conditions are made of three components:
  Part1 RelationalOperator Part2

Examples

- These all can be placed in the condition part of an IF or IF/ELSE

Examples

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Examples

Examples

Examples

Examples

Examples

Examples
Examples

```
RelOP: equation = value
```

Examples

```
RelOP: equation
```

Back to our Car Shop

- Remember ProfitRate is usually 25% as long as CarValue is less than $35000, otherwise it is 50%
- We have to have the code `decide`

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Back to our Car Shop

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  IF
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Back to our Car Shop

• Remember ProfitRate is usually 25% as long as CarValue is less than $35000, otherwise it is 50%
• We have to have the code decide
• What two statements in Scratch can you use to make a decision?
  IF
  IF/ELSE
  Which should we use?

Back to our Car Shop

• Remember ProfitRate is usually 25% as long as CarValue is less than $35000, otherwise it is 50%
• We have to have the code decide
• What two statements in Scratch can you use to make a decision?
  IF
  IF/ELSE

Back to our Car Shop

• Remember ProfitRate is usually 25% as long as CarValue is less than $35000, otherwise it is 50%

What condition can we use to make our decision?

Remember ProfitRate is usually 25% as long as CarValue is less than $35000, otherwise it is 50%
Back to our Car Shop

Remember ProfitRate is usually 25% as long as CarValue is less than $35000, otherwise it is 50%

Car Shop: Complete Code: Input

Car Shop: Complete Code: Decide Which Profit Rate

Car Shop: Complete Code: Calculate Profit & Bill

Remember: Equations using variables?
ProfitRate ← .25
RepairCost ← $200
Profit? ← $50
Bill? ← $250
Equation for Profit? ProfitRate * RepairCost
Equation for Bill? RepairCost + Profit
Car Shop: Complete Code: Display Bill

```
say join Customer owes us $ BILL for 3 secs
stop script
```

Car Shop: Complete Code:

```plaintext
when I am clicked
set [Customer name] to [ask] 
end

when I am clicked
set [Cost of parts] to [ask]
end

when I am clicked
set [Cost of labor] to [ask]
end

when I am clicked
write [Customer name] then $ [Cost of parts] then $ [Cost of labor] and wait
end

```

Car Shop: Variation

Lets have them tell us the cost of parts and labor as two separate values. First ask for cost of parts.

```
ask How much did parts cost? and wait
set [Cost of parts] to [answer]
```

Car Shop: Variation

Lets have them tell us the cost of parts and labor as two separate values. First ask for cost of parts.
Car Shop: Variation

Let's have them tell us the cost of parts and labor as two separate values. Then ask for cost of labor.

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Car Shop: Variation - Complete

Demo CarRepair 2
Car Shop: Variation 2

- How about if we figure out labor costs based on how much we pay our mechanics each hour, how many hours they worked on the car, and how many workers were involved.
- Example: We pay mechanics $50 an hour each and 2 of them worked on the car for 3 hours each.

What is our labor cost? $300

Some variables
How about if we figure out labor costs based on how much we pay our mechanics each hour, how many hours they worked on the car, and how many workers were involved.

Example: We pay mechanics $50 an hour each and 2 of them worked on the car for 3 hours each.

What is our labor cost? $300

What is general equation? LaborCost = ?

Car Shop: Variation 2 Complete

1. Ask initial questions, decide ProfitRate
II. Ask rest of the questions

- Ask how much it would cost and wait
- Ask how many hours it took to fix the car and wait
- Ask how many workers did it take and wait
- Ask how many people were involved and wait

III. Calculate all the aspects of bill and display it

- Calculate the total bill
- Display the total bill

Car Shop: Variation 2 Complete

Demo: CarRepair

Car Shop: With Multimedia

Demo: CarRepair

What’s new?
What’s new?
Multiple Costumes
• each with own name
• statement to switch to new one:

What’s new?
Multiple Sounds

What’s new?
Multiple Stage Backgrounds
What’s new?
Multiple Stage Backgrounds

Statement to switch to any one.

For example this stage script is triggered at start to show first background.

What’s new?
More Motion & Control

Wait 1 secs

Glide 1 secs to x: 175 y: -150
What’s new?
More Motion & Control

Have sprite move at a steady pace to a new screen location over a specified time period

What’s new?
Having an item trigger an action to occur to another sprite or to the stage

Sends a “message” of your choice out to other items.

What’s new?
Having an item trigger an action to occur to another sprite or to the stage

Can make New message at any time
What's new?
Having an item trigger an action to occur to another sprite or to the stage

Scripts can be triggered by such messages

Car Shop: With Multimedia
Much of the multimedia action in the car shop is triggered by particular messages broadcast by the car sprite. Here are some scripts the stage has:

Car Shop: With Multimedia
Much of the multimedia action in the car shop is triggered by particular messages broadcast by the car sprite. Here are some scripts the stage has:

- Cheap service show

- Luxury service show

- Credit Card time
Let viewers enjoy starting background a while

Move sprite to starting position

Show sprite as starting question mark

Tell viewer the essence of the shop and calculation
**Car Shop: With Multimedia**

Complete Car Script (Part II)

- Ask for key values

```
ask how much does shop currently charge for each hour of labor and wait
set maintenance to unknown
ask how much do you think customer's car is worth and wait
set CarValue to unknown
say Here is the script to follow with the customer: For 2 nobex.
```

Explain why they are being shown the multimedia show

```
ask how much does shop currently charge for each hour of labor and wait
set maintenance to unknown
ask how much do you think customer's car is worth and wait
set CarValue to unknown
say Here is the script to follow with the customer: For 2 nobex.
```

**Car Shop: With Multimedia**

Complete Car Script (Part III)

- For inexpensive car, change costume to jalopy and play trouble starting sound, drive car to Joe, and show donut sequence. Time it well, use waits if useful.

```
if CarValue < $1000
    switch to costume: Jalopy
    play sound: trouble starting
    while 4000x to x: 175 y: 555
    set maintenance to 90
    broadcast: Conditional car
    set CarValue to donut sequence
    say Other customer time zones: For 4 seconds
    wait 4 seconds
    else
```

**Car Shop: With Multimedia**

Complete Car Script (Part III)

- Otherwise it is an expensive car. So change costume to sports car and play zoom sound, drive car into shop, and show luxury sequence. Time it well, use waits if useful.

```
if CarValue > $1000
    switch to costume: Sports car
    play sound: zoom
    goto 8000 to x: 175 y: 555
    set maintenance to 90
    broadcast: Conditional car
    set CarValue to luxury sequence
    say Other customer time zones: For 4 seconds
    wait 4 seconds
```

**Car Shop: With Multimedia**

Complete Car Script (Part IV)

- Most importantly, set ProfitRate so upcoming calculation uses 25%

```
set ProfitRate to 25%
```

**Car Shop: With Multimedia**

Complete Car Script (Part IV)

- Of course, prepare for calculations by setting ProfitRate for 50%

```
set ProfitRate to 50%
```
Complete Car Script (V)

Car Shop: With Multimedia

Ask for other necessary values, exactly as we did in previous versions of code:

- ask "How much did parts cost?" and wait
- set repairCost to answer
- ask "How many hours did it take to fix the car?" and wait
- set repairHours to answer
- ask "How many workers did it take?" and wait
- set numberOfWorkers to answer

Complete Car Script (Part VI)

Car Shop: With Multimedia

And do calculations like we have been doing:

- set repairCost to CostOfParts * LaborRate
- set totalRepairCost to repairCost + profit
- set totalBill to totalRepairCost + tax

Complete Car Script (Part VII)

Car Shop: With Multimedia

Finally signal stage to switch to credit card background and show how much customer owes:

- broadcast "PayUp!
- say join "Customer owes US $ Bill for 3 seconds"
- stop script

Remember this stage script?

Complete Script

Car Shop: With Multimedia

We are done, it was fun
Complete Script

We are done, it was fun

II. Ask type of car

III. Handle cheap car

IV. Or handle nice car

V. Ask for other values

VI. Calculate

VII. Display bill & end
Complete Script

We are done, it was fun

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