Scratch Programming

Lesson 5B : Sentinel Loops

Checkout Revisited

- Not worrying about tax and coupons, redo the checkout problem so it will calculate the total cost for buying a number of items until there are no more items. Then it allows the person to pay and gives them change.
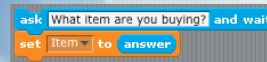

Handle one item

- Find out which item
- Find out cost
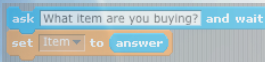- Tack this on to the bill
- Announce bill so far

Handle one item

`ask What item are you buying? and wait`
`set Item to answer`

- Find out cost?
- Tack this on to the bill
- Announce bill so far
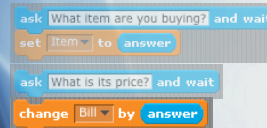
Handle one item

`ask What item are you buying? and wait`
`set Item to answer`
`ask What is its price? and wait`

- Tack this on to the bill
- Announce bill so far

Handle one item

`ask What item are you buying? and wait`
`set Item to answer`
`ask What is its price? and wait`
`change Bill by answer`

- Announce bill so far

Handle one item

Handle one item

Many Items

What do you use in programming to
make something happen many times?

Many Items

What do you use in programming to
make something happen many times? Loop

Many Items

What kind of loop?

Many Items

What kind of loop?
Should we stop asking for items eventually?

Many Items

What kind of loop?
Should we stop asking for items eventually?
Yes - so it cannot be a Forever loop

Many Items

What kind of loop?
Do we know exactly how many items there are?

Many Items

What kind of loop?
Do we know exactly how many items there are? No, so it cannot be a Repeat # loop

Many Items

What kind of loop?
So, it must be a Repeat Until loop

Many Items

repeat until

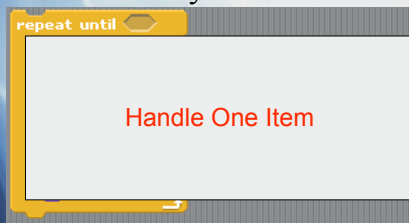Handle One Item

So, it must be a Repeat Until loop

Many Items

repeat until
ask What item are you buying? and wait
set Item to answer
ask What is its price? and wait
change Bill by answer
say join Your bill so far is $ Bill for 5 secs

So, it must be a Repeat Until loop

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Indicating We are Done

How should we have the cashier tell us there are no more items?

Indicating We are Done

How should we have the cashier tell us there are no more items? Lets have them type in DONE.

Indicating We are Done

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A special value used to stop some activity during programming is called a "flag" or "sentinel"

Sentinel

How should we have the cashier tell us there are no more items? Lets have them type in DONE.

Sentinel

How should we have the cashier tell us there are no more items? Lets have them type in DONE. In this code, DONE will be the sentinel value.

The variable that the sentinel value will end up in is called the "sentinel variable"

Sentinel

DONE is the sentinel value.

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Sentinel

The variable that the sentinel value will end up in is called the "sentinel variable"

```
repeat until ⬡
  ask What item are you buying (enter DONE when no more)? and wait
  set Item to answer
  ask What is its price? and wait
  change Bill by answer
  say join Your bill so far is $ Bill for 5 secs
```

DONE is the sentinel value.
In this code, Item is the sentinel variable.

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Ending Condition

```
repeat until ⬡
  ask What item are you buying (enter DONE when no more)? and wait
  set Item to answer
  ask What is its price? and wait
  change Bill by answer
  say join Your bill so far is $ Bill for 5 secs
```

So what should we use as the condition for the repeat until loop?

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Ending Condition

```
repeat until Item = DONE
  ask What item are you buying (enter DONE when no more)? and wait
  set Item to answer
  ask What is its price? and wait
  change Bill by answer
  say join Your bill so far is $ Bill for 5 secs
```

So what should we use as the condition for the repeat until loop?

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Rest of Code

```
repeat until Item = DONE
  ask What item are you buying (enter DONE when no more)? and wait
  set Item to answer
  ask What is its price? and wait
  change Bill by answer
  say join Your bill so far is $ Bill for 5 secs
```

Let us do a couple final things like start out with setting the Bill to 0 before we handle the items (prior to loop) and get the cash and announce the change after all the items have been handled (after the loop)

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Rest of Code

```
when 🚩 clicked
set Bill to 0
repeat until Item = DONE
  ask What item are you buying (enter DONE when no more)? and wait
  set Item to answer
  ask What is its price? and wait
  change Bill by answer
  say join Your bill so far is $ Bill for 5 secs
ask How much cash are you giving us? and wait
set Cash to answer
if Cash < Bill
  say You are a crook. for 6 secs
else
  say join Here is $ join Cash - Bill in change. Have a good day! for 5 secs
stop all ●
```

Set bill to 0

Get Cash,
Give Change

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Rest of Code

```
when 🚩 clicked
set Bill to 0
repeat until Item = DONE
  ask What item are you buying (enter DONE when no more)? and wait
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  change Bill by answer
  say join Your bill so far is $ Bill for 5 secs
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set Cash to answer
if Cash < Bill
  say You are a crook. for 6 secs
else
  say join Here is $ join Cash - Bill in change. Have a good day! for 5 secs
stop all ●
```

Set bill to 0

Sentinel loop
to handle all items
until DONE
entered

Get Cash,
Give Change

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Rest of Code

Set bill to 0

Sentinel loop to handle all items until DONE entered

Get Cash, Give Change

Demo: Checkout WithSentinel

Oddness

- When we entered DONE it still asked for the cost and did other stuff.

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- Remember, once in the body of any loop, all the code will be done. It will never stop in the middle.

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- Remember, once in the body of any loop, all the code will be done. It will never stop in the middle.
- In this case, it asked for the item in the loop and got DONE at the time - so it finished the rest of the code in the loop body

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Fix

- There is a clever and useful way to fix this that can and should be used in any sentinel loop

Fix

- You can ask for the first item before the loop, and ask for all the remaining items right before you loop around (bottom of body)

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Ask (item) used to be here

Fix

- You can ask for the first item before the loop, and ask for all the remaining items right before you loop around (bottom of body)

Now is here and here

Slide 43 — Fix

Fix
- You can ask for the first item before the loop, and ask for all the remaining items right before you loop around (bottom of body)

Before loop: first item
Bottom (in) loop: next item (rest)

Slide 44 — Better Version

Better Version
- Using correct sentinel loop

Set bill to 0
Better Sentinel Loop
handles all items until DONE entered
Get Cash, Give Change

Demo: Checkout WithSentinel

Slide 45 — General Sentinel Loop

General Sentinel Loop

Process the value in normal way for the problem

Anytime you want code to continue looping until a special value (sentinelVALUE) is entered and placed into a variable (SentinelVariable), you can structure your code as you see here.

Slide 46 — Example Sentintel Loop

Example Sentintel Loop

Process the value in normal way for the problem

Process the grades for students in a class until the name FAKE is entered as the student's name.

Slide 47 — Alternative Sentinel Loop

Alternative Sentinel Loop

Process the value in normal way for the problem

If you do not like repeating the same ASKs in two places, you can also use an IF statement, with a not condition in the body of the loop to get the same behavior.

Slide 48 — Availability of Slides

Availability of Slides

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to see the powerpoint slides and/or podcasts for this lecture