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Scratch Programming
Lesson 6: Counted Loops

Three Types of Loops
- Continue Forever without Stopping
- Continue until a condition becomes True
- Loop a given amount of times

This is called a "Counted Loop"
Situations For Counted Loops

- Figure out the grade of each person in a class of 100 students
- Display a separate dinner menu for each day during December - 31 days
- Find out who is the oldest person working in an office building with 325 workers
Situations For Counted Loops

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Baseball Scoring

- Let's write a script to keep track of the score during a baseball game
- 9 inning game
- In each inning, the “visiting” team is “up” first during the “top” half of the inning
Baseball Scoring

- Let's write a script to keep track of the score during a baseball game
- 9 inning game
- In each inning, the “visiting” team is “up” first during the “top” half of the inning
- Also, in each inning, the “home” team is up in the “bottom” half of the inning
- A whole inning consist of both teams being up in this order.

Baseball Scoring

- During their part of an inning, a team can earn zero or more “runs”
- Runs accumulate - so if you have 2 in the first inning, and later on 3 more in the fourth inning, your score will 5
- The team that has the most runs at any point in the game is “winning”
- If neither team has more, it is a “tie” game
Baseball Scoring

- After the last inning - the 9th - ends, the game is over and the team with the most runs wins the game

Baseball Scoring

- Our script will keep track of the score

Baseball Scoring

- After each half inning, it will announce which team is leading (has the most runs so far)
- Or, if neither then it will say it is a tie

Baseball Scoring

- Because this is one of the most well-known rivalries in all of sports, in our script we will make the visiting team be the “Boston Red Sox” and the home team be the “NY Yankees.”

- (Apologies to fans of other teams, the code can be modified to work with any two teams)
Baseball Scoring - Variables

- **HomeTeamRuns** - score of the home team, this starts at zero
- **VisitingTeamRuns** - score of the visiting team, this starts at zero
- **Inning** - the current inning of the game - this starts at 1 and goes up to 9

Handling an Inning

- As usual, it is wise to tackle a complicated problem by working on simpler parts first
Handling an Inning

- As usual, it is wise to tackle a complicated problem by working on simpler parts first
- So let's forget about 9 innings, and see if we can handle one inning

Handling an Inning

The Approach
- Find out how many runs the visiting team got
- Adjust visiting team’s score
- Say who is winning so far or announce a tie
Handling an Inning

The Approach

- Find out how many runs the visiting team got
- Adjust visiting team’s score
- Say who is winning so far or announce a tie
- Find out how many runs the home team got
- Adjust home team’s score

Handling an Inning

The Approach

- Find out how many runs the visiting team got
- Adjust visiting team’s score
- Say who is winning so far or announce a tie
- Find out how many runs the home team got
- Adjust home team’s score
- Say who is winning so far or announce a tie

Handling an Inning

The Approach

- Ask for # visiting runs
- Adjust VisitingTeamRuns
- State leader or tie
- Ask for # home runs
- Adjust HomeTeamRuns
- State leader or tie

Handling an Inning

The Approach

- Ask for # visiting runs
- Adjust VisitingTeamRuns
- State leader or tie
- Ask for # home runs
- Adjust HomeTeamRuns
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Handling an Inning

The Approach

• Ask for # visiting runs
• Adjust VisitingTeamRuns
• State leader or tie
• Ask for # home runs
• Adjust HomeTeamRuns

Announce Leader

• Have to decide who is leading

Announce Leader

• Have to decide who is leading
• How many choices?
Announce Leader

- Have to \textit{decide} who is leading
- How many choices?
  - Home team is winning
  - Visiting team is winning
  - It's a tie

- Three choices
- What do you use to make a three-way decision? \textit{A Nested IF}
Announce Leader

- Have to decide who is leading
- How many choices?
  - Home team is winning
  - Visiting team is winning
  - It's a tie
- Three choices
- What do you use to make a three-way decision? A Nested IF
Handle the Inning

**The Approach**
- Ask for # visiting runs
- Adjust VisitingTeamRuns
- State leader or tie
- Ask for # home runs
- Adjust HomeTeamRuns
- State leader or tie

Announce Leader

if HomeTeamRuns > VisitingTeamRuns
say The Yankees are Winning!
else
say The Red Sox are Winning!

else
say The game is tied!
Handling an Inning

- Handle Visitors
  - Say who is winning or "tie"
- Handle Home Team
  - Say who is winning or "tie"

Demo: Baseball Scoring 1

Handling The Whole Game

- Start when green flag clicked
- Announce game

Handling The Whole Game

- Start when green flag clicked
- Announce game
- Set score to 0 - 0

Handling The Whole Game

- Start when green flag clicked
- Announce game
- Set score to 0 - 0
- 9 Times:
Handling The Whole Game

- Start when green flag clicked
- Announce game
- Set score to 0 - 0
- 9 Times: Handle an Inning
- End

Finally, we use the counted loop!
Handling The Whole Game

- Start when green flag clicked
- Announce game
- Set score to 0-0
- 9 Times: Handle an inning
- End

9 times (9 innings)
The Counted Loop
[Repeat]

Before Game Starts
Above the Loop
Handling The Whole Game

- 9 times (9 innings)
- The Counted Loop
- [Repeat]
- Demo: Baseball Scoring 2

Multimedia Version

- Demo: Baseball Scoring

Multimedia Version

- Stage:

Multimedia Version

- Script Sounds:
  - When home team losing
  - When home team winning
  - When it's a tie game

Multimedia Version

- Costumes
  - When home team winning
  - When home team losing
  - When it's a tie game

Multimedia Version

- A second sprite
  - This is not necessary but it will allow us to change multiple objects on the screen at the same time - so makes a more interesting multimedia presentation
Multimedia Version

- A second sprite
- Two Costumes

Multimedia Version

- A second sprite
- Some scripts for this sprite

Multimedia Version

- A second sprite
- Some scripts for this sprite

At start, set inning variable to zero, put sound at low volume & be wearing CurrentInning costume

Multimedia Version

- A second sprite
- Some scripts for this sprite

Each new inning, increment inning variable, say the inning & increase volume (so crowd sounds noisier)

Multimedia Version

- A second sprite
- Some scripts for this sprite

When told that game is over, switch to that final costume

Multimedia Version

- A second sprite
- Some scripts for this sprite

Some changes to script for main sprite
• Some changes to script for main sprite

When game starts, show Tie Game costume

• Some changes to script for main sprite

In each nested-IF, instead of saying who is leading or that the game is tied, just switch to appropriate costume and play associated sound effect

• Some changes to script for main sprite

As each inning begins (start of each time around loop), send message to second sprite so it handles new Inning in manner previously discussed

• Some changes to script for main sprite

Right before game is over (script stops) send message to second sprite so it changes to GameOver costume (screen message) as previously discussed

• Final Issue

In baseball, if nine innings are over and no team has won the game (has more runs), the game goes into “extra innings.”

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That is, one whole inning at a time (top and bottom) is played until eventually (hopefully) at the end of the inning it is no longer tied - and some team has more runs. Then the game ends.
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- No longer do we repeat innings a set amount of times, but rather we do innings over and over until the game is over.
- What structure do we use in Scratch if we need to do something over and over until something special happens?
Final Issue

- After nine innings are over, have loop for extra innings, which might happen zero times

What condition means we should have extra innings? (That is we should loop?)

So, what condition means we should no longer have extra innings? (That is no longer should loop?)

The exact opposite condition

So, what condition means we should no longer have extra innings? (That is no longer should loop?)

When this is true, we should have no more innings - the loop should stop
After nine innings are over, have loop for extra innings, which might happen zero times. When this is true, we should have no more innings - the loop should stop. So its the condition we need here.

After nine innings are over, have loop for extra innings, which might happen zero times. Handle one inning.

A lot of code. Before game begins.

A lot of code. Handle regular nine innings (using repeat loop).

A lot of code. Handle extra innings if necessary (using Repeat Until loop).
A lot of code

Once past extra inning loop (which often happens zero times but sometime happens a while), the game is no longer tied and is thus over, so handle game ending.

A lot of code

Before game

Extra innings when necessary

Game ending

A lot of code

Although buried in different types of loops, these two blocks of code are exactly the same - “handle one inning”

A lot of code

Before game

Demo:
Baseball Scoring 3

Game ending

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