Design

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1:36 AM

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15110 Principles of Computing Term Project Proposal

Project Title
Potions and Proportions
Project Description
Main Purpose:

Overall, U.S. students have a poor understanding of rational numbers. Teachers too, find that rational numbers, specifically fractions, are a difficult subject to teach. Not understanding fractions and proportions inhibits a student's further progress in mathematics and their decision making ability in real-world situations.
The purpose of this project is to create a game that will introduce elementary school students to fraction concepts in an engaging and effective way. The game will develop students' conceptual understanding of fractions through in a virtual potion-making game.
Functionalities:
The player will use virtual measuring tools to portion ingredients and make a recipe. Using different measuring tools, the player will explore the idea of equivalent fractions. The plot of the game will be that the player is trying to transform their cursed friend from a frog back into a human. The player will get measuring tools to make the potion out of a "magic cabinet" —an unreliable cabinet. It will not always have the exact measuring tools that the player needs —the recipe might call for ½ of a teaspoon while the cabinet only has a 1/10 teaspoon measure, so to make the potion, the player will have to understand that 5/10 = ½. The game will also introduce the concept of fraction addition by displaying the sum of all the ingredient fractions next to the cauldron. If the player succeeds, he or she will turn their friend back into a human. If the potion is incorrect, the frog will transform into something else and the player will have to try again.
External Resources:
Though I would like to develop the code to run the game on my own, using only Tkinter, if the game mechanics prove to be complicated enough, I might use Pygame and focus more on the structural challenges of the game.
Expected timeline:
By Friday, 11/19
Have completed a paper prototype of the game and a storyboard/flowchart of the possible paths through game play, including what happens when the player gets a problem wrong and must repeat the recipe.
By Friday, 11/26
Have completed a digital prototype of the game without sophisticated graphics and more complicated forms of user input.
Final Deadline: Wednesday, 12/1
Have a completed, playable game with more polished graphics and interaction.

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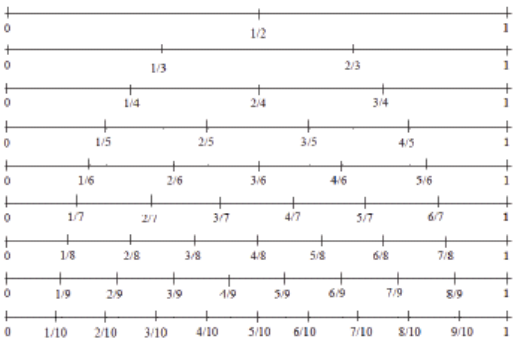
Figure 4. Finding equivalent fractions on a number line
Use of number lines to teach equivalence of fractions in a Japanese curriculum



Source: Adapted from Shoseki (2010).

Design from 2 perspectives
User -- what it looks like
Programmer -- how to accomplish it, intentions

Examples online at kosbie.net

Pixel vs. rectilinear

Now for reasonableness

This will start out as a simple game. Simple liquids. Simple graphics. Simple gameplay.

Here are the ways that it can be built upon, but that I shouldn't worry about as part of the foundation of the game:

-multiple levels
-introducing all the various interpretations of fractions
- Intitally, just deal with equivalence, how they add up, build a sense of what's what
- Not drilling, building intuition

-making it a cooking game (even a wizard cooking game)
-having solid potion ingredients that you slice up and add
- Having more story-- having you be starting a business instead of saving a friend
- My own art
- **Changing the proportions of the recipe, doubling, halving**
- Multiple screens for cabinet, etc

Things I'm not sure about:
-placing on a number line?
- Get instructions and help from "good witch"

Things that really need to be in it initially (also bolded things above)
- Various accurately proportioned measures for fractions in potion recipe
- Decent mouse click and drag interaction with ingredients bottles
- Good responses to user input-- if you do something wrong, potion boils, etc.
- Sequential steps for recipe -- yes

What the user will see

A brief picture and text explanation of the plot-- friend steps on a toadstool, is transformed into a toad. Don't know what to do, but good witch comes out of the forest, says she'll help, come back to her house. Go there. She says she'll help cure your friend, but she needs you to help her make the antidote because she's old and has lost her touch/because it needs to be someone who knows the person who transforms them from a toad back into a person.

Story setup complete. In the witch's "lab"
You have a bunch of fun weirdly shaped bottles full of potions with parchment labels (both text and picture) (along the bottom of the screen, all around?). On the left side of the screen is the recipe for the antidote.
You have to make the antidote, but the witch doesn't have all the tools she needs anymore and the recipe has to be exact-- measured correctly.
The user has to add the ingredients step by step, measuring out amounts like 1 goblet using 10 thimbles
-- have conversion table as a "pull out" from somewhere on the screen to read
The user adds the ingredients to the cauldron. If they add the incorrect amount,
What should happen?
Get a warning
Get a certain number of undos
Get help from witch-- fix it using something else
Shouldn't be one shot thing pass/fail
Assuming they add them correctly to the cauldron, it's color will change to become more like the color of the potion illustrated on the potions book
Next to the cauldron will be a "progress bar" type number line, marked with given measurements/fill marks and how much you've added

Conversion table brainstorm:

Measurement instruments:
Goblet
Mug
Cup
Vial
Beaker
Thimble
Glass
Urn

1 cauldron = 4 goblets

Goblet is main unit of measure?

http://www.botanical.com/botanical/cvcookix.html