Software Requirements Specification

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"Space Fractions"

The Denominators (Team 10-2)

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1.0 Introduction

1.1 Purpose of this Document

This is the Software Requirements Specification (SRS) for the "Space Fractions" project. The purpose of the document is to describe the purpose and functionality of the software product requested by Ms. Andrea Brooks of Pecan Springs Elementary School. The SRS will include the details of the project's requirements, interface, design issues, and components.

1.2 Scope of the Development Project

The Space Fractions project is a learning tool created to help improve fraction-solving skills for sixth-grade students. The product will be a web-based, interactive game. At the end of the game, students will be given feedback based on their game scores. We are also providing an umbrella for the past games created. The umbrella will be a web-based menu system allowing the user to choose between the games.

1.3 Definitions, Acronyms, and Abbreviations

Term	*Definition*
HTML	Hypertext Markup Language: the formatting language used to describe web pages.
iMac	A type of computer made by Apple Computers.
KB	Kilobytes: a measure of the amount of space available on a computer.
Macromedia Flash	An application for creating dynamic graphics and sound, generally intended to produce artifacts for display over the World Wide Web.
MB	Megabytes: a measure of the amount of space available on a computer. One MB is equal to 1,024KB.
plug-in	A downloadable component for a web browser that provides additional functionality.
S2S	Student to Student: the designation representing the collective efforts of several hundred University of Texas Computer Science students taking Software Engineering

	with Dr. Vicki Almstrum.
SRS	Software Requirements Specification: this document.
umbrella	A software product that consists of several independent programs that are unified under a single interface.
web-based	Able to be run over the web, without any permanent files on the user's computer.

1.4 References

- Dr. Vicki L. Almstrum, professor at the University of Texas at Austin
- Ms. Andrea Brooks, client and teacher at Pecan Springs Elementary
- Class home page: http://www.cs.utexas.edu/users/almstrum/cs373/fa01/
- Mr. Keith Henning, team mentor
- Macromedia home page: http://www.macromedia.com
- S2S projects done in previous semesters: http://www.cs.utexas.edu/users/s2s/admin/s2s-by-semester.html
- Schach, Stephen R. *Object-Oriented and Classical Software Engineering*, Fifth Edition. McGraw-Hill, 2002

1.5 Overview of Document

This document is designed to provide information to both the client and the technical designers of the software. Section one is a brief overview of the product, including definitions and references. The definitions section is intended to assist the technical designers as well as the client in clarifying the terms used throughout the document. Section two is a general description of the product requirements from a user's perspective. This section includes information such as functional and data requirements, general constraints, and assumptions. Section three is a detailed requirements specification targeted toward technical designers. Specific requirements and expectations regarding the components of the product are given in this portion of the SRS document.

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2.0 General Description

2.1 User Personas and Characteristics

The target clients for our software are students in the sixth grade and their teacher. These students are in the process of learning how to solve arithmetic problems involving fractions. Moreover, these students (as well as the teacher) are assumed to have basic computer and Internet skills that will enable them to use this software. The personas we will use to model our intended users are:

- Alice, a sixth grade female student learning fractions who does not like to use computers;
- Bobby, a sixth grade male student learning fractions who is very competitive; and

- Claire, a sixth grade teacher with computer skills.

Detailed descriptions of these users follow.

User A (Alice)

Alice is a sixth grade female student learning fractions who does not like to use computers. Although she has used computers for email and games, she considers computers to be boring. She would rather read a story or talk with friends. However, she is really interested in learning fractions and enjoys working with other students.

User B (Bobby)

Bobby is a sixth grade male student learning fractions who is very competitive. He enjoys playing competitive sports and using computers, especially to play games. He has used computers since age five. He particularly likes to play games where he can excel. He is only somewhat interested in learning about fractions.

User C (Claire)

Claire is a sixth grade teacher who has computer skills. She enjoys teaching sixth graders and is interested in finding innovative ways to teach her students. She has been teaching the sixth grade for six years now. She finds that students have a particularly hard time learning about the concepts related to fractions.

2.2 Product Perspective

- This program requires a web browser capable of running Flash movies.
- This program will not be dependent on any other software and is not a component of another program.
- Since the product requires a Flash-supporting browser, the external interface will depend on the configuration of the browser. Therefore, various environments may yield different interfaces, but the behavior of the program will be the same.
- This program does not require any new hardware.

2.3 Overview of Functional Requirements

The umbrella will be a singular component, providing links to projects relating to fractions, decimals, and percents in a format accessible over the World Wide Web.

The "Space Fractions" game will have the following functional components:

1. An introductory movie to set up the storyline.
2. A main menu, including a brief help section.
3. A series of fraction questions (testing arithmetic, equivalence, graphical interpretation, and improper versus proper fraction skills) that sequentially form a storyline related to the introduction.
4. An ending scene where the user's score is calculated and ranked, with an option to quit the game or try again.

In addition, a component accessible over the World Wide Web will allow the series of fraction questions to be updated by an administrator of the game.

2.4 Overview of Data Requirements

The administrator of the program may wish to design a custom game complete with custom fraction questions. This information must be saved in a file on the web server where the game is hosted and will be easily edited through simplified administrative screens. The user's score must be kept as local data within the game so that the results may be given at the end of the game. Input will consist entirely of mouse clicks for the user to choose answer options and to set preferences. Output will be sounds and animations through Flash movies to acknowledge success or failure in answering the fraction questions.

2.5 General Constraints, Assumptions, Dependencies, and Guidelines

This program will run on any Internet-accessible computer with a web browser that supports JavaScript and Macromedia Flash 5.

2.6 User View of Product Use

Upon starting the program, the user is taken through a brief introductory movie to provide background story and information that will help them complete the fraction questions. There is an option to skip the introduction, if desired. Otherwise, they will watch the movie to its completion and be taken to the main screen.

At the main title screen, the user will be able to view a general help screen to reveal basic instructions on game play. Also, a short summary of our team and a link to our website will be provided. To start the game, the user will click on the corresponding button. The information and interface will be effective so that Bobby will easily recognize what to do to start the game immediately and Alice will have no problems navigating through the help section to understand the rules and gameplay. Claire will be assured that the students will know what to do from this main screen.

Next, the user progresses through a series of questions in the form of cartoon images that comprise the main story. These questions will test the user's knowledge of basic fraction operations and will be presented as a multiple-choice questionnaire. The user will be given a problem and then must click the correct solution. A friendly robotic sidekick will assist with general usability issues and give hints towards the correct response. Bobby will be captivated by the storyline and will wish to progress as fast as possible. The gameplay will be dynamic and adaptive to provide different storylines based on the user's progress.

After the last question, the main character's adventure will come to an end. The last scene will be determined by the user's response on certain critical questions that impact the story's plot, and an option to try again will be presented. In addition, the player's exact score will be given with a customized message. This gives Bobby the competition he requires and allows Alice to have a unique experience the next time through the program. Either way, the user will be encouraged to try again and further better their fraction skills.

As the game administrator, Claire can use the question updater to change any of the questions

in the game. She navigates to the updater page, which asks for a password. Upon correct submission of her password, she uses an intuitive web forms interface to update the game to her desiring.

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3.0 Specific Requirements

3.1 External Interface Requirements

The following table summarizes the external interface requirements for the "Space Fractions" game. The characteristics of the user interface are presented, as are the interactions between the product and existing hardware and software on the host platform.

User Interface	The interface for this program will be relatively simple. As the target users are in the sixth grade, this product will be as graphically oriented and appealing as possible. No portion of the interface will require the keyboard; all input will be accomplished via mouse clicks.
Hardware Interaction	This software will be developed in Macromedia Flash and HTML. These technologies require a minimum hardware configuration, but no other hardware requirements are needed. There is no explicit interaction with the client's hardware.
Software Interaction	This product requires a web browser capable of running the Flash plug-in, which has the system requirements specified here under the section "Playback." Otherwise, this product has no software interaction.

3.2 Detailed Description of Functional Requirements

3.2.1 Template for Describing Functional Requirements

This section describes the template that is used to describe each of the functional components of the "Space Fractions" game specified in section 2.3. Those components are described in subsections 3.2.2 through 3.2.7.

Purpose	A description of the functional requirement and its reason(s).
Inputs	Which inputs; in what form/format will inputs arrive; from what sources input will be derived, legal domains of each input element.
Processing	Describes the *outcome* rather than the *implementation*; includes any validity checks on the data, exact timing of each operation (if needed), how to handle unexpected or abnormal situations.
Outputs	The form, shape, destination, and volume of the output; output timing; range of parameters in the output; unit measure of the output; process by which the output is stored or destroyed; process for handling error messages produced as output.

3.2.2 Introductory Movie

Purpose	A short movie to set up the storyline of the game and provide information to help the user complete the fraction questions.
Inputs	If the user clicks a mouse button while in this component, they will skip the movie and proceed to the main menu. No other input is recognized.
Processing	Upon entrance to the movie component, the introductory movie will begin playing. If a mouse click is received, this component will terminate the movie and forward the user to the main menu component. Otherwise, the movie will continue to its completion and the user will be moved to the main menu.
Outputs	A movie is displayed on the screen.

3.2.3 Main Menu

Purpose	A menu that displays a brief section offering help on playing the game, and provides a link to the main game component and the Denominators' web page.
Inputs	The user can click on the corresponding button to begin the game or follow the link to the Denominators' web page.
Processing	This component will wait until the user selects a button. At that time, the user will be forwarded to the game sequence component or the Denominators' web page, depending on the button selected.
Outputs	This component will output either the game sequence or the Denominators' web page.

3.2.4 Game Sequence

Purpose	A series of multiple-choice fraction questions, which sequentially form a storyline related to the introduction.
Inputs	The user will respond to questions by clicking on the desired answer from a set of choices.
Processing	This component will display a question, and then wait until the user chooses an answer. • If the user selects the correct answer, a message to this effect will be displayed and the component will move to the next question. • If the incorrect answer is selected, this component will inform the user of this and give them another chance to answer the question. However, their score will not count this question as being answered correctly. • At certain "critical points," this component will choose different directions in the plot based on whether the question at the critical point was answered correctly. • After the user has proceeded through a set number of questions, they will be directed to the ending scene component.
	This component will output plot-based questions with fractional numbers that

Outputs	are customizable by the game administrator, and offer feedback to the user based on their performance on individual questions.

3.2.5 Ending Scene

Purpose	A screen offering a conclusion to the game's plot based on performance at certain critical points in the game sequence, where the user's score is displayed and the user is given a chance to exit or return to the main menu.
Inputs	The user can select either to end the game or return to the main menu via mouse clicks.
Processing	This component will wait until the user selects either to return to the main menu or to exit the game. After receiving the user's input, the component will act accordingly.
Outputs	The user's overall score is displayed, as well as a plot conclusion that is obviously related to the story in certain key questions.

3.2.6 Question Updater

Purpose	A web-accessible tool to allow questions in the game sequence to be updated by a game administrator.
Inputs	The user will input new data via pulldown menus and text fields. Each question will be updated on a separate page, and the user will click a button to progress between these pages.
Processing	The component will wait for the user to click a submission button for each question. After the button is clicked, the component will check that the inputted data is complete and makes sense in the context of the updated question.
Outputs	The component will generate a text file on the game server, which is used by the game sequence to dynamically load question data.

3.2.7 Math Umbrella

Purpose	This component will provide links to mature S2S projects dealing with mathematics for sixth graders, organized by topic (for example, all fractions-related projects will be grouped together).
Inputs	The user will follow a number of links to World Wide Web documents.
Processing	This component will wait for a user to click a link, and then follow that link.
Outputs	The component opens the specified S2S product in a separate window.

3.3 Performance Requirements

Only one person can use a single instance of the product. However, the product will reside on the Internet so more than one user can access the product and download its content for use on their computer. The product will consist of Flash movies linked together to form a web-based

game: there will be a small introductory movie (~200KB), a main menu movie (~100KB), and a main game movie (1-2MB). Due to the relatively small size of the introductory and main menu movies, they can be downloaded in approximately one minute with a modem connection. Because Flash movies do not have to be fully downloaded to play, the main game can be played within a few minutes with a regular modem connection to the Internet.

3.4 Quality Attributes

- The product will be as secure as the web browser that will run the product.
- The product will be available over the Internet via the S2S website.
- Reliability will be ensured by extensive testing by the team members and mentors, if available.
- Maintainability is a primary goal for this project. For example, using appropriate sub-scenes in the main Flash game to split up the code will allow for easy alteration at a later date.

3.5 Other Requirements

There are no additional requirements at this time.

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Change Log

- Version 2.0 (12-15-2001): Document updated to reflect changes in requirements.
- Version 1.1 (10-31-2001): Incorporated suggested changes.
- Version 1.0 (10-10-2001): Document created.