Software Requirements Specification

for

Fraction Worksheet Creator

**Version 1.0 approved**

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**Revision History**

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| --- | --- | --- | --- |
| **Name** | **Date** | **Reason For Changes** | **Version** |
| Initial Draft | 02/09/2016 | Initial Draft | 0.0.1 |
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# Introduction

This section gives a scope description and overview of everything included in this SRS document. Also, the purpose for this document is described and a list of abbreviations and definitions is provided.

## Purpose

The purpose of this document is to give a detailed description of the requirements for the “Fraction Worksheet Creator” (FWC) software. It will illustrate the purpose and complete declaration for the development of system. It will also explain system constraints, interface and interactions with other external applications. This document is primarily intended to be proposed to a customer for its approval and a reference for developing the first version of the system for the development team.

## Product Scope

The “Fraction Worksheet Creator” (FWC) is an off-line worksheet generation tool designed by Elementary Engineers to help elementary school teachers to create a lot of exercises for students to study and practice fractions. The fractions worksheets are randomly created and never repeated so the teachers have an endless supply of quality fractions worksheets to use in the classroom or at home. The generated worksheets can contain fraction problems of various difficulty levels, from basic addition and subtraction problems with visuals and images suitable for small children, to quite advanced fraction equations. The worksheets created with “Fraction Worksheet Creator” are not pre-designed but are randomly generated based on a complex set of algorithms corresponding to the specific mathematical structure of each type of worksheet. This allows for virtually unlimited original worksheets. Furthermore, FWC will also generate an answer sheet. The worksheets will be created as PDF documents which are automatically opened on the computer once the generating process is done.

The “Fraction Worksheet Creator” worksheets are free to print, easy to use, and very flexible. This project is being produced by students at Framingham State University with help from Dr. Andrew Jung.

## Intended Audience and Reading Suggestions

This document is to be read by the customer, development team, the project managers, testers, documentation writers and end users. The SRS has been organized approximately in order of increasing specificity. The developers and project managers need to become intimately familiar with the SRS.

Others involved need to review the document as such:

*Overall Description* – The customer and end users have to become accustomed to the various product features in order to effectively advertise the product.

*System features* – Testers need an understanding of the system features to develop meaningful test cases and give useful feedback to the developers.

*External Interface Requirements* – The software developers need to know the requirements of the system they need to build.

*Nonfunctional and Functional Requirements* – The software developers.

## References

[1] IEEE Software Engineering Standards Committee, “IEEE Std 830-1998, IEEE Recommended Practice for Software Requirements Specifications”, October 20, 1998.

[2]

[3]

## 1.5 Overview

The remainder of this document includes three chapters and appendices.

The second one provides an overview of the system functionality and system interaction with other systems. Further, the chapter also mentions the system constraints and assumptions about the product.

The third chapter provides the requirements specification in detailed terms and a description of the different system interfaces. Different specification techniques are used in order to specify the requirements more precisely for different audiences.

The fourth chapter deals with the prioritization of the requirements. It includes a motivation for the chosen prioritization methods and discusses why other alternatives were not chosen. The fifth chapter describes other nonfunctional requirements.

The Appendices in the end of the document include all the results of the requirement prioritization and a release plan based on them.

# Overall Description

## Product Perspective

*<Describe the context and origin of the product being specified in this SRS. For example, state whether this product is a follow-on member of a product family, a replacement for certain existing systems, or a new, self-contained product. If the SRS defines a component of a larger system, relate the requirements of the larger system to the functionality of this software and identify interfaces between the two. A simple diagram that shows the major components of the overall system, subsystem interconnections, and external interfaces can be helpful.>*

## Product Functions

*<Summarize the major functions the product must perform or must let the user perform. Details will be provided in Section 3, so only a high level summary (such as a bullet list) is needed here. Organize the functions to make them understandable to any reader of the SRS. A picture of the major groups of related requirements and how they relate, such as a top level data flow diagram or object class diagram, is often effective.>*

## User Classes and Characteristics

*<Identify the various user classes that you anticipate will use this product. User classes may be differentiated based on frequency of use, subset of product functions used, technical expertise, security or privilege levels, educational level, or experience. Describe the pertinent characteristics of each user class. Certain requirements may pertain only to certain user classes. Distinguish the most important user classes for this product from those who are less important to satisfy.>*

## Operating Environment

*<Describe the environment in which the software will operate, including the hardware platform, operating system and versions, and any other software components or applications with which it must peacefully coexist.>*

## Design and Implementation Constraints

*<Describe any items or issues that will limit the options available to the developers. These might include: corporate or regulatory policies; hardware limitations (timing requirements, memory requirements); interfaces to other applications; specific technologies, tools, and databases to be used; parallel operations; language requirements; communications protocols; security considerations; design conventions or programming standards (for example, if the customer’s organization will be responsible for maintaining the delivered software).>*

## User Documentation

*<List the user documentation components (such as user manuals, on-line help, and tutorials) that will be delivered along with the software. Identify any known user documentation delivery formats or standards.>*

## Assumptions and Dependencies

*<List any assumed factors (as opposed to known facts) that could affect the requirements stated in the SRS. These could include third-party or commercial components that you plan to use, issues around the development or operating environment, or constraints. The project could be affected if these assumptions are incorrect, are not shared, or change. Also identify any dependencies the project has on external factors, such as software components that you intend to reuse from another project, unless they are already documented elsewhere (for example, in the vision and scope document or the project plan).>*

# User Requirements

## Functional Requirements

*These are the non-technical versions of the Functional Requirements for the Fraction Worksheet Creator.*

*Requirements for the Teacher System Features*

* The teacher shall be able to access the system using a username / password.
* The teacher shall be able to select various difficulty levels based on student skill.
* The teacher shall be able to select various problem types at each difficulty level.
* The teacher shall be able to select a range of values for numerator and denominator for each problem type when appropriate.
* The teacher shall be able to customize the header at the top of each worksheet.
* The teacher shall be able to review worksheets and answer sheets for worksheets printed by students.
* The teacher shall be able to delete worksheet / answer sheets when no longer needed.
* The teacher shall be able to create / modify / delete logins for students.
* The teacher shall be able to set difficulty levels for each student.

*Requirements for the Student System Features*

* The student shall be able to access the system using a username and password provided by the teacher.
* The student shall be able to select various problem types based on assigned difficulty level.
* The student shall be able to view tutorial content for each problem type.

*Requirements for the General System Features*

* The system shall provide a graphical user interface for all software interactions.
* The system shall generate random exercises for each worksheet.
* The system shall generate instructions on the worksheet for each problem type.
* The system shall allow previewing, printing and saving worksheets and answer sheets via PDF.
* The system shall provide context sensitive help.
* The system shall provide administrative privileges to an assigned user during installation.

## Non-Functional Requirements

*These are the non-technical versions of the Non-Functional Requirements for the Fraction Worksheet Creator*

* The system shall run on a Windows or MacOS device running Java 8 or higher.
* The system shall have access to a printer to print worksheets and answer sheets.

## Software Interfaces

* The software will interface with a MySQL database for the storage of user logins and worksheet generation seeds for answer sheet recall.
* The software will interface with an API for the creation of PDFs. The PDFs will be how worksheets and answer sheets are formatted, saved and printed.

# System Requirements

*<This template illustrates organizing the functional requirements for the product by system features, the major services provided by the product. You may prefer to organize this section by use case, mode of operation, user class, object class, functional hierarchy, or combinations of these, whatever makes the most logical sense for your product.>*

## Teacher System Features

*Features that will be utilized by the teacher user class.*

4.1.1 Difficulty Level Selection

The teacher shall be able to select various difficulty levels based on student skill. These options will be on the main menu. There will be three skill levels – Beginner, Intermediate and Advanced.

4.1.2 Problem Type Selection

The teacher shall be able to select various problem types at each difficulty level. These options will be available after the selection of difficulty level in 4.1.1. There will be at least three different problem types per skill level available.

Beginner 1 – TBD

Beginner 2 – TBD

Beginner 3 – TBD

Intermediate 1 – TBD

Intermediate 2 – TBD

Intermediate 3 – TBD

Advanced 1 – TBD

Advanced 2 – TBD

Advanced 3 – TBD

4.1.3 Parameter Selection

The teacher shall be able to select a range of values for numerator and denominator for each problem type when appropriate. These options will be available in the admin menu since these settings should be used also when the student prints worksheets.

4.1.4 Header Information

The teacher shall be able to customize the header at the top of each worksheet to include class name and teacher name. These options will be available in the admin menu since these settings should be used also when the student prints worksheets.

4.1.5 Print Number of Worksheets Option

The teacher shall be able to select a number of worksheets to print. This option will be available during the worksheet preview in the Adobe PDF Viewer.

4.1.6 Print Answer Sheet Option

The teacher shall be able to select the option to print an answer sheet for each worksheet. The answer sheet preview will be displayed after the worksheet preview in 4.1.5. During the answer sheet preview the teacher will be given the option to print.

4.1.7 Save Answer Sheet Option

The teacher shall be able to select the option to save an answer sheet for each worksheet. The answer sheet preview will be displayed after the worksheet preview in 4.1.5. During the answer sheet preview the teacher will be given the option to save to the hard drive.

4.1.8 Review Student Answer Sheet Option

The teacher shall be able to review all answers for worksheets printed by students. This option will be available in the admin menu. A student roster will be displayed and all worksheets printed by students will be listed. When clicked the answer sheet for that worksheet will be displayed in the Adobe PDF Viewer. Teachers will then be able to print or save the worksheet.

4.1.10 Delete Answer Sheet Option

The teacher shall be able to delete answer sheets for themselves or for students when no longer needed. This option will be available in the admin menu. A class roster will be displayed and all worksheets printed by the teacher and students will be listed. A delete option will be available for each answer sheet.

4.1.11 Student Login Creation

The teacher shall be able to create logins for students. This option will be available in the admin menu. Teachers will be able to assign usernames for each student and assign them to a specific class.

4.1.12 Student Difficulty Setting

The teacher shall be able to set difficulty levels for each student. This option will be available in the admin menu. Teachers will be able to assign and modify difficulty levels for each student. This setting will determine the worksheets to which the student has access.

## Student System Features

*Features that will be utilized by the student user class.*

4.2.1 Problem Selection

The student shall be able to selection various problem types based on assigned difficulty level. After login the student will only be able to print worksheets for the difficulties set by the teacher in the admin menu.

4.2.2 Tutorial Viewer

The student shall be able to view tutorial content for each problem type. This option will be available in the Tutorial Menu.

## General System Features

*Features that will be utilized by all user classes.*

4.3.1 Randomized Problem Generation

The system shall generate random exercises for each worksheet. The worksheets will be created using a seed value that will create sensible random values for all problems in the worksheet. The seed value will be saved so that the worksheet can be recreated later if desired.

4.3.2 Worksheet Instructions

The system shall generate instructions on the worksheet for each problem type. After the header a standardized set of instructions will be displayed showing a fully solved example problem.

4.3.3 PDF Options

The system shall offer standard options for reviewing, saving and printing worksheets and answer sheets in PDF format. This will work as part of the PDF API that will be used to create the worksheets. These functions will be offered as part of the default Adobe PDF Viewer.

4.3.4 Help System

The system shall provide context sensitive help. A help button will be provided on every screen and window within the software. Clicking this button will provide help and instructions for that particular screen or window.

4.3.5 Admin Setup

The system shall provide administrative privileges to an assigned user during installation. As part of the installation process the first user account will be created that will act as the administrator. This special teacher account will be able to create additional teacher accounts as well as student accounts.

# Other Nonfunctional Requirements

((Eric - Not included in this version of the SRS – Please keep these as a placeholder for future SRS development. This file should be saved prior to submission and have this section edited out.))

## Performance Requirements

* **Number of Users:** The number of registered users shall not be limited, since the software shall be designed to be used by only one user at any given time.

## Safety Requirements

No safety requirements have been identified.

## Security Requirements

* The system shall only allow unauthorized users to access the login and registration pages and the help utility.
* The system shall require a username and password to gain access to the FWC.
* The system shall store user passwords securely in a database.

## Software Quality Attributes

* **Correctness:** The system shall create a correct answer sheet for each generated worksheet.
* **Interoperability:** The system shall work seamlessly with the MySQL database to store login, teacher-student, worksheet, and answer sheet information and retrieve such information for use in the software.
* **Usability:** The system shall be easy to use and have an internal help utility to show users how to perform functions offered by the software.

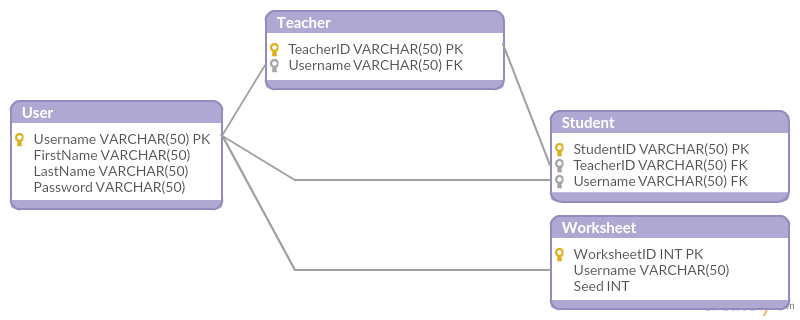
## Business Rules

* The system shall not allow students to register for a user account. Teachers must register their students using a teacher account.
* The system shall allow students to generate worksheets and view previous worksheets, but not to view answer sheets.
* The system shall allow teachers to view answer sheets for worksheets created by their students.
* The system shall allow both teachers and students to access and delete existing worksheets from their previously created worksheets.

# Other Requirements

* 1. **Database Schema**

The database schema that is used in the FWC MySQL database is given below.



**Appendix A: Glossary**

*<Define all the terms necessary to properly interpret the SRS, including acronyms and abbreviations. You may wish to build a separate glossary that spans multiple projects or the entire organization, and just include terms specific to a single project in each SRS.>*

**Appendix B: Analysis Models**

*<Optionally, include any pertinent analysis models, such as data flow diagrams, class diagrams, state-transition diagrams, or entity-relationship diagrams*.>

**Appendix C: To Be Determined List**

*<Collect a numbered list of the TBD (to be determined) references that remain in the SRS so they can be tracked to closure.>*

1. Three levels of difficulty for worksheets:
2. Beginner (addition and subtraction problems with visuals and images)
3. Intermediate (addition and subtraction without visuals, maybe introductory multiplication)
4. Advanced (multiplication and division, word questions and problems, mixed numbers, least common multiple, greatest common factor)

*! This could go to our requirements (Olga)*