SMARTron Software Requirements Specification

Version 0.7

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Mission Statement

Creating a headless bubble sheet analyzer that comes with a companion website which allows managing exams that have previously been scanned.

1 Introduction

1.1 Purpose

The purpose of this document is to give a detailed description of the requirements for the SMARTron software. It will illustrate the purpose and complete specifications for the development of the system. It will also explain the constraints, interfaces and interactions with other external applications. This document is primarily intended to be proposed to a stakeholder for its approval and a reference for developing the first version of the system for the development team.

1.2 Scope

SMARTron will be an automatic grading program maintaining compatibility with existing 200-answer bubble sheets used by SUNY Oswego. The program will allow the user to maintain a familiar workflow of scanning bubble sheets and receiving an email containing the results. This will be accomplished by a headless bubble sheet analysis program that receives emails containing an answer key and student bubble sheets from any scanner, and emails results to the user.

SMARTron will also include a web app providing benefits over the current automatic grading workflow. Scanned exams are associated with a user's LakerNet ID, and they can log in to the web app to view and edit scanned exams. The web app will provide functionality to make corrections to answer keys and rename exams. Users will also have the option to create an answer key in-app and generate a custom bubble sheet compatible with the analysis program.

1.3 Definitions, acronyms, and abbreviations

Term	**Definition**
User	An individual who utilizes the system
Bubble sheet	A paper form that contains fields for answering multiple choice

	questions with a fixed layout
PC	Personal Computer
SMARTron Engine	The headless application that receives and processes bubble sheets and emails results
SMARTron Web App	The online application that provides the user interface for viewing and correcting scanned exams
SMARTron Mail Client	An email address associated with the SMARTron application
LakerNet ID	The username/identification a user will provide, specific to SUNY Oswego
Credentials	The user's username/identification and password that they will use to log into the SMARTron Web App
Login	The action required from a user to be able to access the SMARTron Web App
SRS	Software Requirements Specification
QMR	Quality Management Report
CSV file	A comma-separated value text file used to store and format tabular data
Grade	The process done by the SMARTron Engine that calculates the points earned on an exam sheet
Statistics	Measurable numerical information pertaining to a student's calculated grades
Results	A student's grades and statistics from a selected exam
SMARTron Database	The collection of information stored by the SMARTron application

1.4 References

1.5 Overview

2 Overall Description

2.1 Product Perspective

2.1.1 User interfaces

The user will interact with a physical bubble sheet and a web-based client that allows for re-execution of the program with different inputs.

2.1.2 Hardware interfaces

The user will have access to and utilize a faculty scanner. There he will be able to scan all bubble sheets including the answer key without leaving his building. The user's PC is where he will interact with the email containing all data and statistics from the test results.

2.1.3 Software interfaces

The user will be able to utilize his existing Oswego email, which is a Google account, to initiate scanning the hard copy bubble sheets as well as receive the test results upon completion of the analysis by the program. The user will also be interacting with the SMARTron software in order to access results, create and edit answer keys. Microsoft Excel is the other software that the user wants to synchronize with SMARTron. Once the results have been emailed to the user, they should have the ability to upload/copy the results into a current Excel spreadsheet.

2.1.4 Communications interfaces

Computer
Email
Scanner

3 Specific Requirements

3.1 Functions

3.1.1 Automatic Scantron Analysis

FR-1: The SMARTron Engine shall load a PDF file of scanned bubble sheets received via email.

FR-2: The SMARTron Engine shall extract the images of bubble sheets from the received PDF

FR-3: The SMARTron Engine shall process each image.

FR-3.1: The SMARTron Engine shall convert the image to greyscale.

FR-3.2: The SMARTron Engine shall apply gaussian blur to the image.

FR-3.3: The SMARTron Engine shall create a copy of the image with the canny filter.

FR-3.4: The SMARTron Engine shall apply inverted threshold to original image.

FR-3.5: The SMARTron Engine shall find all edges on the canny image copy.

FR-3.6: The SMARTron Engine shall filter through all edges and detect circles.

FR-3.7: The SMARTron Engine shall sort the circles in rows and columns.

FR-3.8: The SMARTron Engine shall find question circle groups.

FR-3.9: The SMARTron Engine shall find name circle groups.

FR-3.10: The SMARTron Engine shall find date, ID, sex, and grade circle groups.

FR-3.11: The SMARTron Engine shall iterate through all groups recording the darkest circle.

FR-3.12: The SMARTron Engine shall store records of all detected fields.

3.1.2 Computing Statistics

FR-4: The SMARTron Engine shall compute the following statistics for a graded exam:

1. Mean score in both percentage and points
2. Median score in both percentage and points
3. Quartiles in points
4. Frequency of each response for each question
5. Lowest score
6. Highest score

7. Range of scores
8. Standard deviation of scores
9. Variation of scores
10. KR-20 reliability
11. KR-21 reliability
12. Coefficient (Cronbach) alpha reliability

FR-5: The SMARTron Engine shall request raw test data from the SMARTron Database when recomputing the statistics in FR-4.

3.1.3 Data Recording

FR-6: The SMARTron Engine shall create a blank CSV file.
FR-7: The SMARTron Engine shall produce columns in the CSV file for student name, ID, and score.
FR-8: The SMARTron Engine shall create rows in the CSV file for each student bubble sheet associated with the exam.
FR-9: The SMARTron Engine shall send an email to the address associated user containing the generated CSV file and the statistics computed in FR-4.
FR-10: The SMARTron Engine shall send the raw test data to the SMARTron Database.

3.2 Use Cases

Use Case UC-1	**Automatically Grade Exam**
Related Use Cases	UC-2, UC-3, UC-4, UC-5, UC-6, UC-7
Initiating Actor	User
Actor's Goal	Receive an email containing student grades and overall statistics for an exam.
Participating Actors	Scanner, SMARTron Engine, SMARTron Database, SMARTron Mail Client
Preconditions	The user has a set of filled-in bubble sheets with one filled in as an answer key. The user has access to a scanner that can send emails. The SMARTron Engine and Database are running.
Postconditions	The user has received an email with exam grades and statistics.

	Flow of Events for Main Success Scenario
1.	The user scans the filled-in bubble sheets with a scanner configured to send emails to the SMARTron system.
2.	The scanner emails the scanned bubble sheets to the SMARTron Mail Client.
3.	The SMARTron Mail Client extracts the attachment containing the scanned bubble sheets and passes them to the SMARTron Engine.
4.	The SMARTron Engine processes the bubble sheets to determine student grades.
5.	The SMARTron Engine records bubble sheet data in the SMARTron Database.
6.	The SMARTron Engine computes statistics for the exam.
7.	The SMARTron Engine creates a CSV file containing student grades.
8.	The SMARTron Mail Client sends an email containing the computed statistics and generated CSV file to the user.

Use Case UC-2	**Extract Emailed Bubble Sheets**
Related Use Cases	UC-1
Initiating Actor	SMARTron Mail Client
Actor's Goal	Extract a file containing scanned bubble sheets and send it to the SMARTron Engine
Participating Actors	Scanner, SMARTron Mail Client, SMARTron Engine, SMARTron Database
Preconditions	An email containing scanned bubble sheets has been sent to the SMARTron Mail Client's email address.
Postconditions	The SMARTron Mail Client has sent a file containing scanned bubble sheets to the SMARTron Engine.

	Flow of Events for Main Success Scenario
1.	The SMARTron Mail Client receives an email containing scanned bubble sheets as a PDF file or a set of supported image files.
2.	The SMARTron Mail Client extracts file attachments from the email.
3.	If every file is in a format supported by the SMARTron Engine, the files are sent to the SMARTron Engine.

Use Case UC-3	**Extract Answer Data**
Related Use Cases	UC-1, UC-2
Initiating Actor	SMARTron Engine
Actor's Goal	Extract all data contained on each bubble sheet.
Participating Actors	SMARTron Engine, SMARTron Database
Preconditions	The SMARTron Engine has a file or set of files containing images of bubble sheets.
Postconditions	The bubble sheet data has been extracted and stored in the SMARTron Database.

	Flow of Events for Main Success Scenario
1.	The SMARTron Engine applies filters to the image to remove irrelevant details and ease circle recognition.
2.	The SMARTron Engine determines the positions of filled circles on the bubble sheet.
3.	The SMARTron image translates circle positions into an array containing sets of filled circles for each field.
4.	The SMARTron Engine repeats steps 1 through 3 for each bubble sheet in the set.
5.	The SMARTron Engine marks one bubble sheet as the answer key.
6.	The SMARTron Engine sends the extracted bubble sheet data to the SMARTron Database.

Use Case UC-4	**Assign Student Grades**
Related Use Cases	UC-1, UC-2, UC-3
Initiating Actor	SMARTron Engine
Actor's Goal	Calculate a grade for each bubble sheet in a given exam.
Participating Actors	SMARTron Engine
Preconditions	The SMARTron Engine has bubble sheet data for an answer key and a set of student bubble sheets.
Postconditions	The SMARTron Engine has calculated a grade for each student bubble sheet.

	Flow of Events for Main Success Scenario
1.	The SMARTron Engine iterates through each answer on a student bubble sheet, assigning the appropriate points based on the answer key and the point value of the question.
2.	The SMARTron Engine stores the total points for the bubble sheet and associates the score with the name and Student ID read from the bubble sheet.
3.	The SMARTron Engine repeats steps 1 and 2 for each bubble sheet in the set.

Use Case UC-5	**Compute Statistics**
Related Use Cases	UC-1, UC-3, UC-4
Initiating Actor	SMARTron Engine
Actor's Goal	Compute the necessary statistics for an exam
Participating Actors	SMARTron Engine
Preconditions	The SMARTron Engine has a set of bubble sheet data and a set of student grades
Postconditions	The SMARTron Engine has computed all required statistics.

	Flow of Events for Main Success Scenario
1.	The SMARTron Engine computes necessary overall statistics (See **Appendix B**).
2.	The SMARTron Engine computes an item analysis for each exam item (See **Appendix B**).
3.	The SMARTron Engine computes item statistics for each exam item (See **Appendix B**).
4.	The SMARTron Engine stores the computed statistics.

Use Case UC-6	**Create CSV File**
Related Use Cases	UC-4
Initiating Actor	SMARTron Engine
Actor's Goal	Create a CSV file containing student grades for an exam.
Participating Actors	SMARTron Engine
Preconditions	The SMARTron Engine has a set of student grades.
Postconditions	The SMARTron Engine has generated a CSV spreadsheet of student grades.

	Flow of Events for Main Success Scenario
1.	The SMARTron Engine creates a blank CSV file.
2.	The SMARTron Engine creates columns for student name, student ID, and score.
3.	The SMARTron Engine fills each row with the corresponding data from an item in the set of student grades.
4.	The SMARTron Engine saves the generated CSV file.

Use Case UC-7	**Send Email to User**
Related Use Cases	UC-1, UC-5, UC-6
Initiating Actor	SMARTron Mail Client
Actor's Goal	Send an email containing student grades and overall statistics for an exam to the user.
Participating Actors	SMARTron Engine, SMARTron Mail Client, User
Preconditions	The SMARTron Engine has computed grades and statistics for an exam.
Postconditions	The SMARTron Mail Client has sent an email containing exam grades and statistics to the user.

	Flow of Events for Main Success Scenario
1.	The SMARTron Mail Client generates HTML displaying the computed statistics for the exam.
2.	The SMARTron Mail Client creates an email containing the statistics HTML.
3.	The SMARTron Mail Client adds the generated CSV file as an attachment to the email.
4.	The SMARTron Mail Client sends the generated email to the email address associated with the user.

Use Case UC-8	**Login to SMARTron Web App**
Related Use Cases	UC-9, UC-10
Initiating Actor	User
Actor's Goal	Access the SMARTron Web App
Participating Actors	SMARTron Web App
Preconditions	The user must have an existing LakerApps account.
Postconditions	The user has access to the features of the SMARTron Web App.

	Flow of Events for Main Success Scenario
1.	The user opens the SMARTron Web app in their web browser
2.	The user is prompted to log into the SMARTron Web app
3.	The user enters their proper credentials (LakerNet ID and password)
4.	The user is redirected to the SMARTron Web app dashboard

Use Case UC-9	**Edit Answer Key**
Related Use Cases	UC-4, UC-5, UC-8
Initiating Actor	User
Actor's Goal	Edit an existing answer key
Participating Actors	SMARTron Web App
Preconditions	There must be an existing account on SMARTron, and there must be an existing answer key to edit
Postconditions	The exam is reanalyzed according to the new answer key

	Flow of Events for Main Success Scenario
1.	The user logs into the SMARTron Web app.
2.	The user navigates to the exam they wish to change.
3.	The user makes their desired changes to the answer key.
4.	The user saves the changes to the answer key.
5.	The associated exams are re-graded according to UC-4

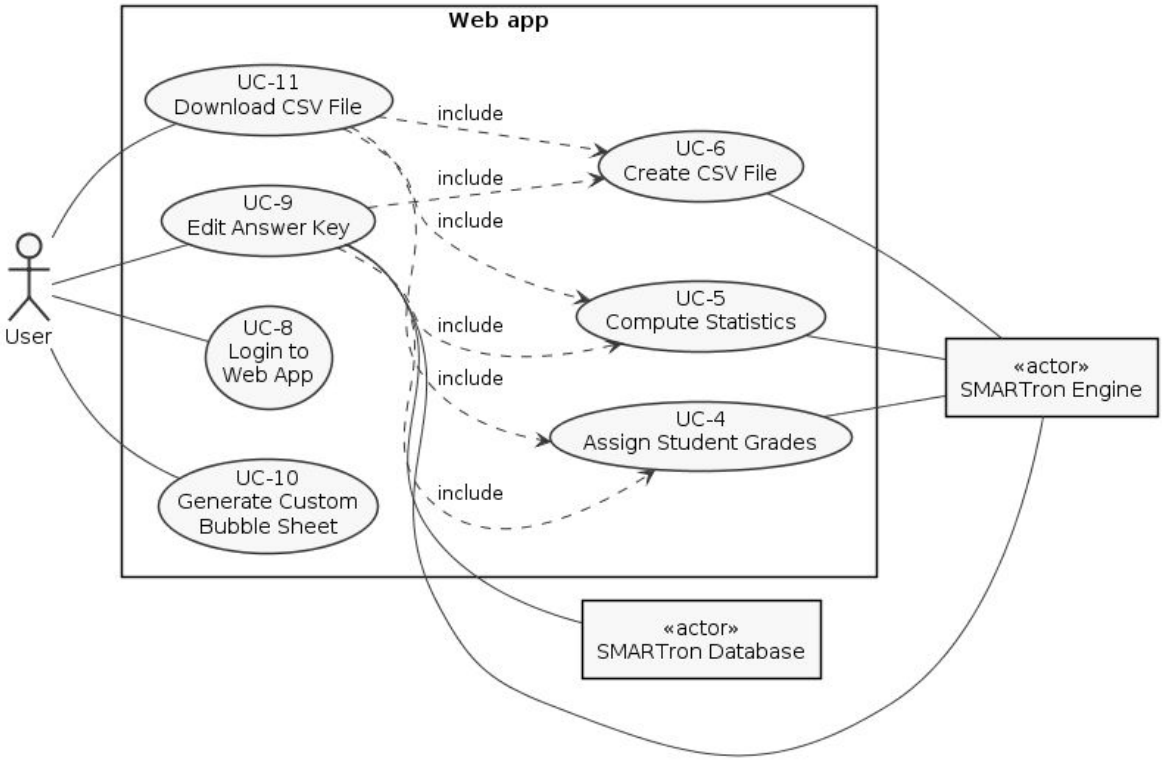
Use Case UC-10	**Generate Custom Bubble Sheet**
Related Use Cases	UC-8
Initiating Actor	User
Actor's Goal	Create a custom bubble sheet for a multiple-choice test.
Participating Actors	SMARTron Web App
Preconditions	The user must be logged into the SMARTron Web App.
Postconditions	A custom exam sheet is generated for future use.

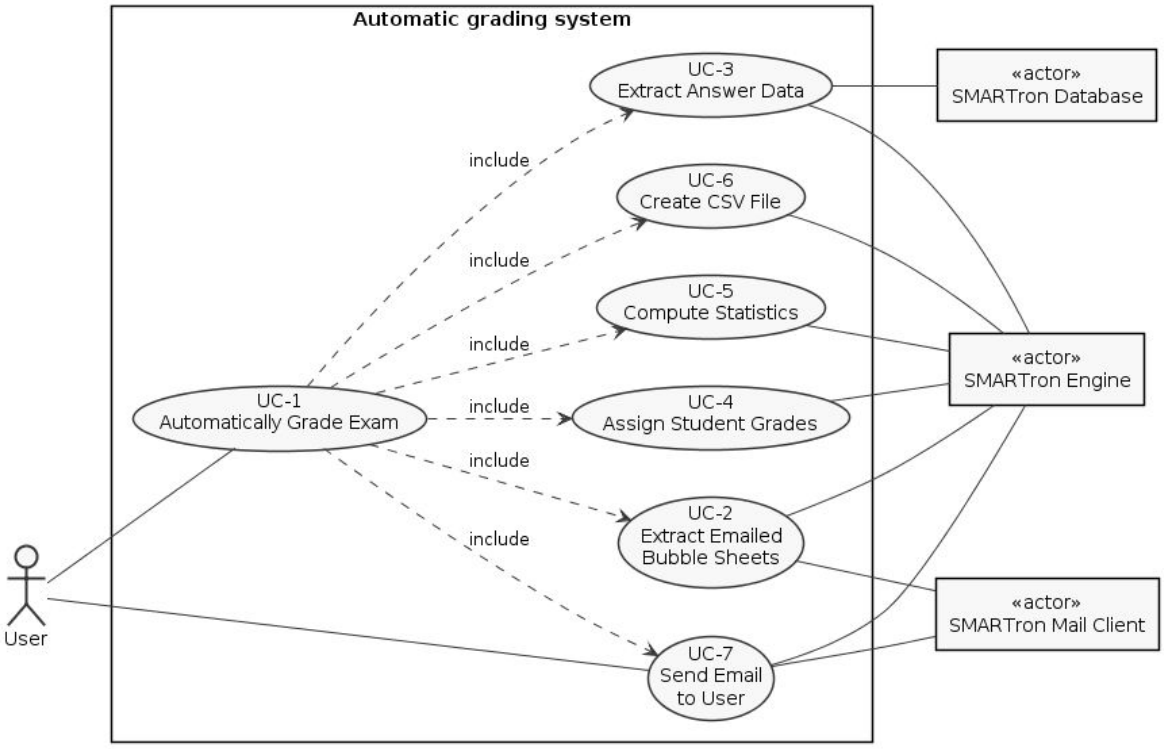
	Flow of Events for Main Success Scenario
1.	The user navigates to the “create exam sheet” page.
2.	The user customizes a bubble sheet.
3.	The user downloads a PDF of the custom bubble sheet.

Use Case UC-11	**Download CSV File**
Related Use Cases	UC-6, UC-8
Initiating Actor	User
Actor's Goal	Download from the SMARTron Web App a CSV file containing student grades for an exam.
Participating Actors	SMARTron Web App
Preconditions	The user must be logged into the SMARTron Web App. There must be an existing CSV file of student grades
Postconditions	The user has a downloaded copy of the CSV file available on their local device.

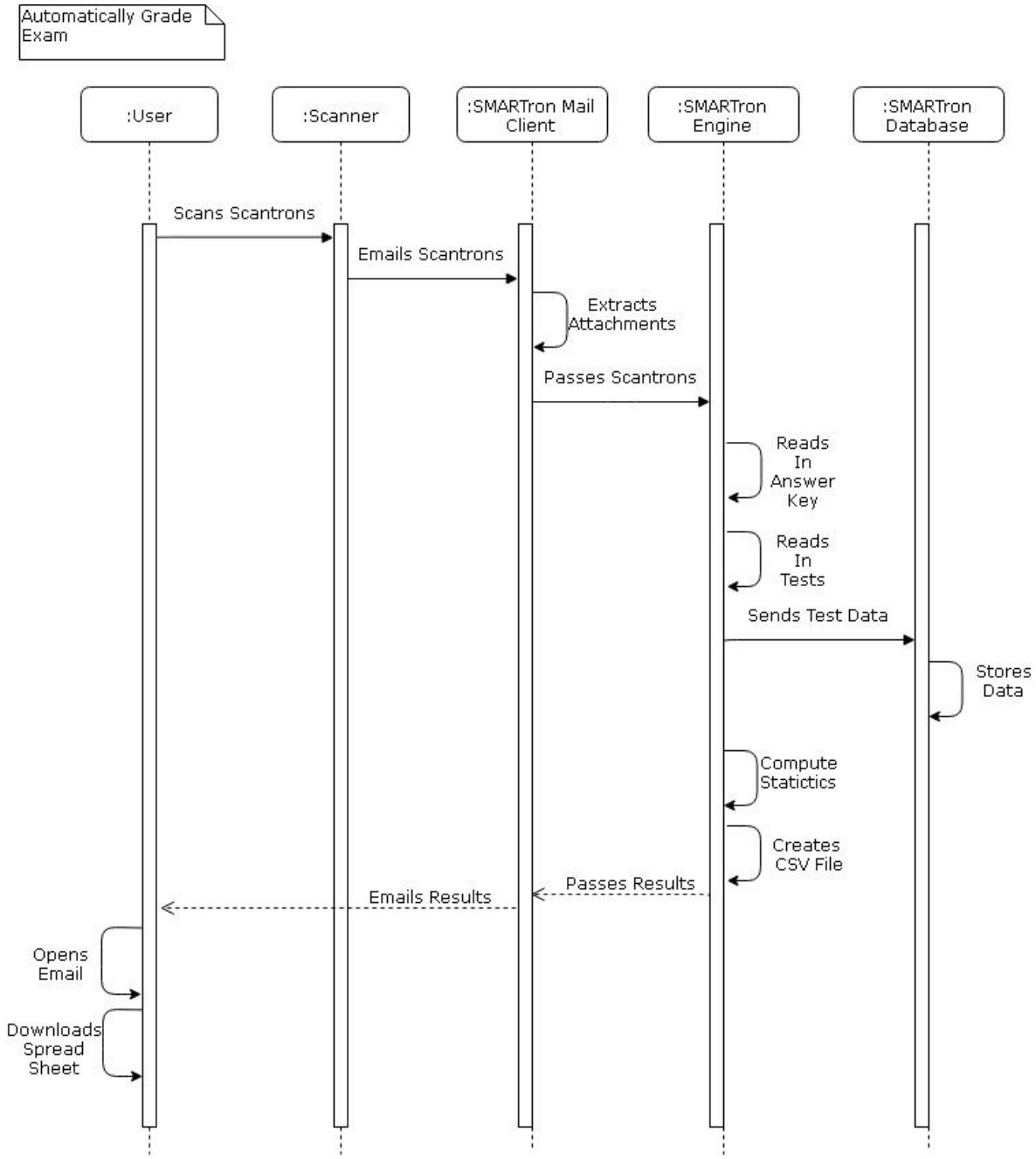
	Flow of Events for Main Success Scenario
1.	The user navigates to the exam for which they wish to download the CSV file
2.	The user selects the option to download the CSV file
3.	The user is prompted to save the CSV file
4.	Upon selection of “save file”, the CSV file is downloaded to the user’s device

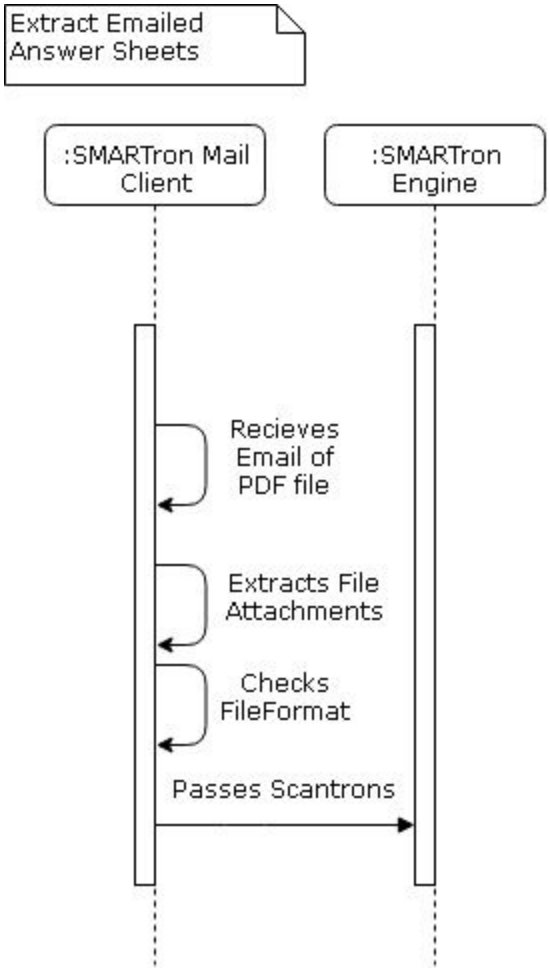
3.3 Use Case Diagrams

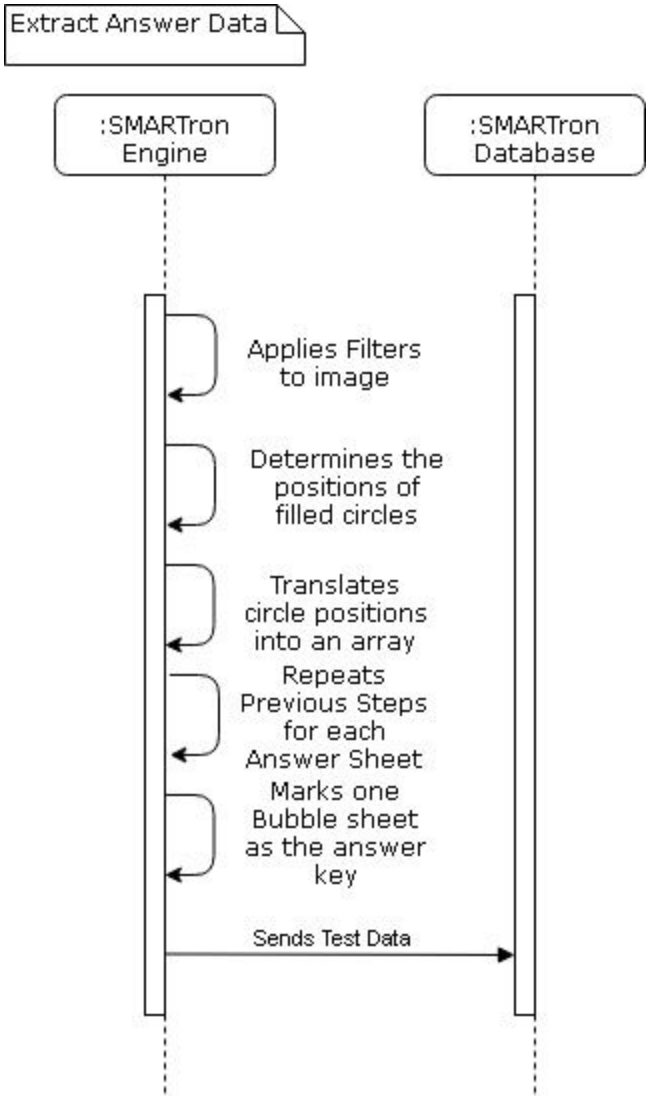


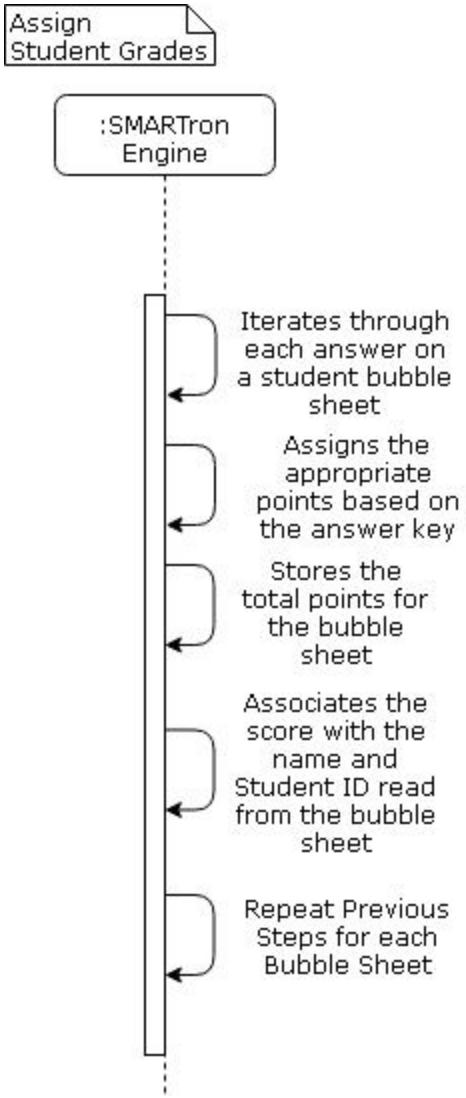

Automatic grading system
UC-3
Extract Answer Data
«actor»
SMARTron Database
include
UC-6
Create CSV File
include
UC-5
Compute Statistics
«actor»
SMARTron Engine
include
UC-1
Automatically Grade Exam
include
UC-4
Assign Student Grades
include
UC-2
Extract Emailed
Bubble Sheets
include
«actor»
SMARTron Mail Client
User
UC-7
Send Email
to User

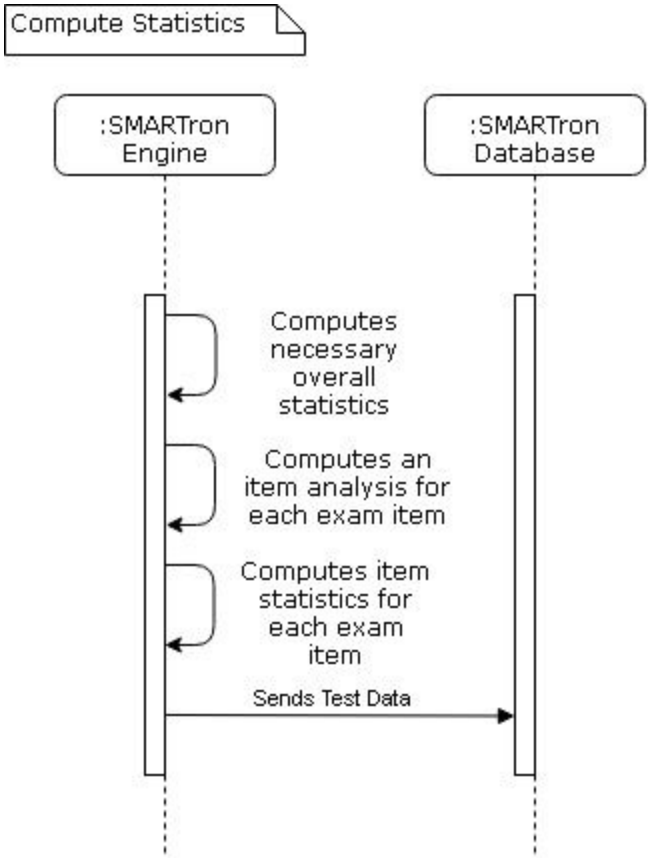
3.4 Sequence Diagrams

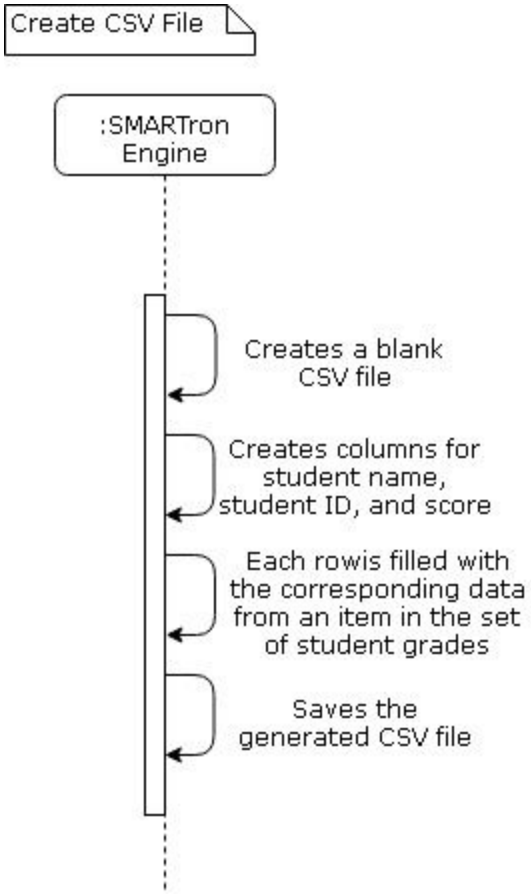


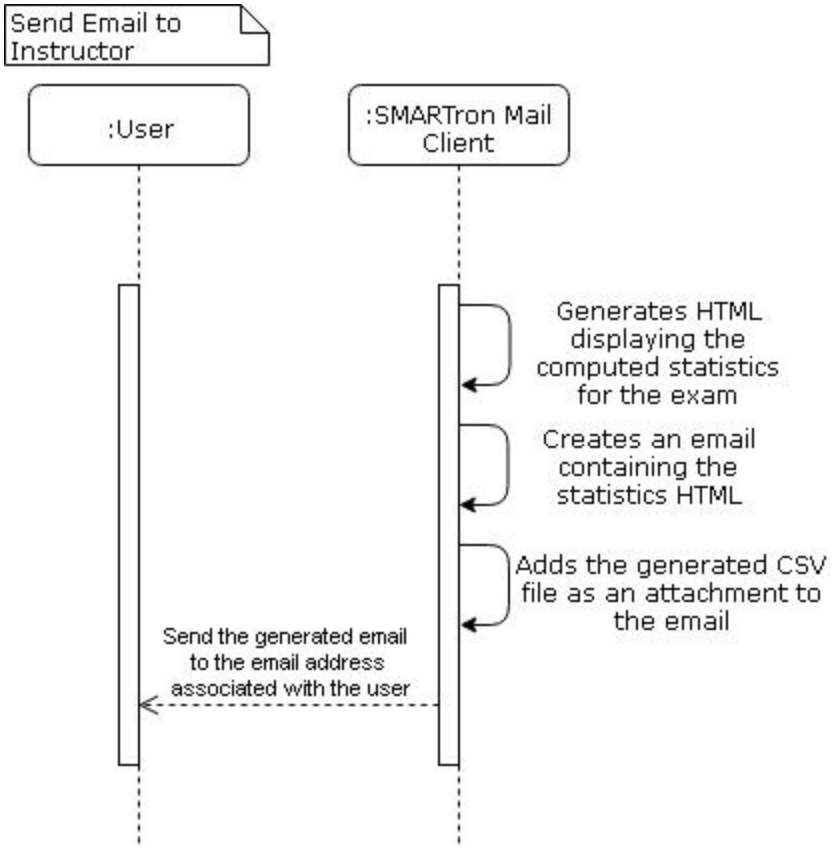

Extract Emailed Answer Sheets
:SMARTron Mail Client
:SMARTron Engine
Recieves Email of PDF file
Extracts File Attachments
Checks FileFormat
Passes Scantrons

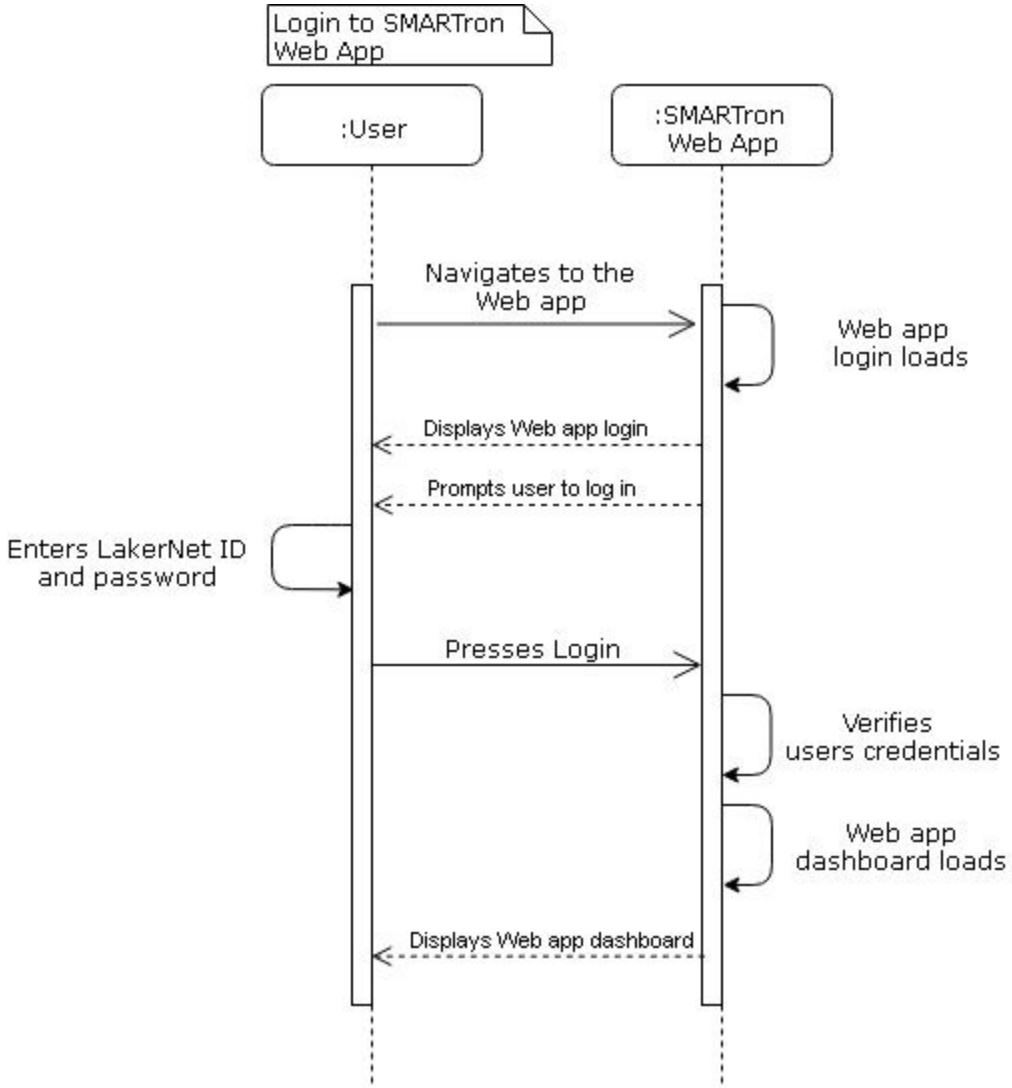

Extract Answer Data
:SMARTron Engine
:SMARTron Database
Applies Filters to image
Determines the positions of filled circles
Translates circle positions into an array
Repeats Previous Steps for each Answer Sheet
Marks one Bubble sheet as the answer key
Sends Test Data

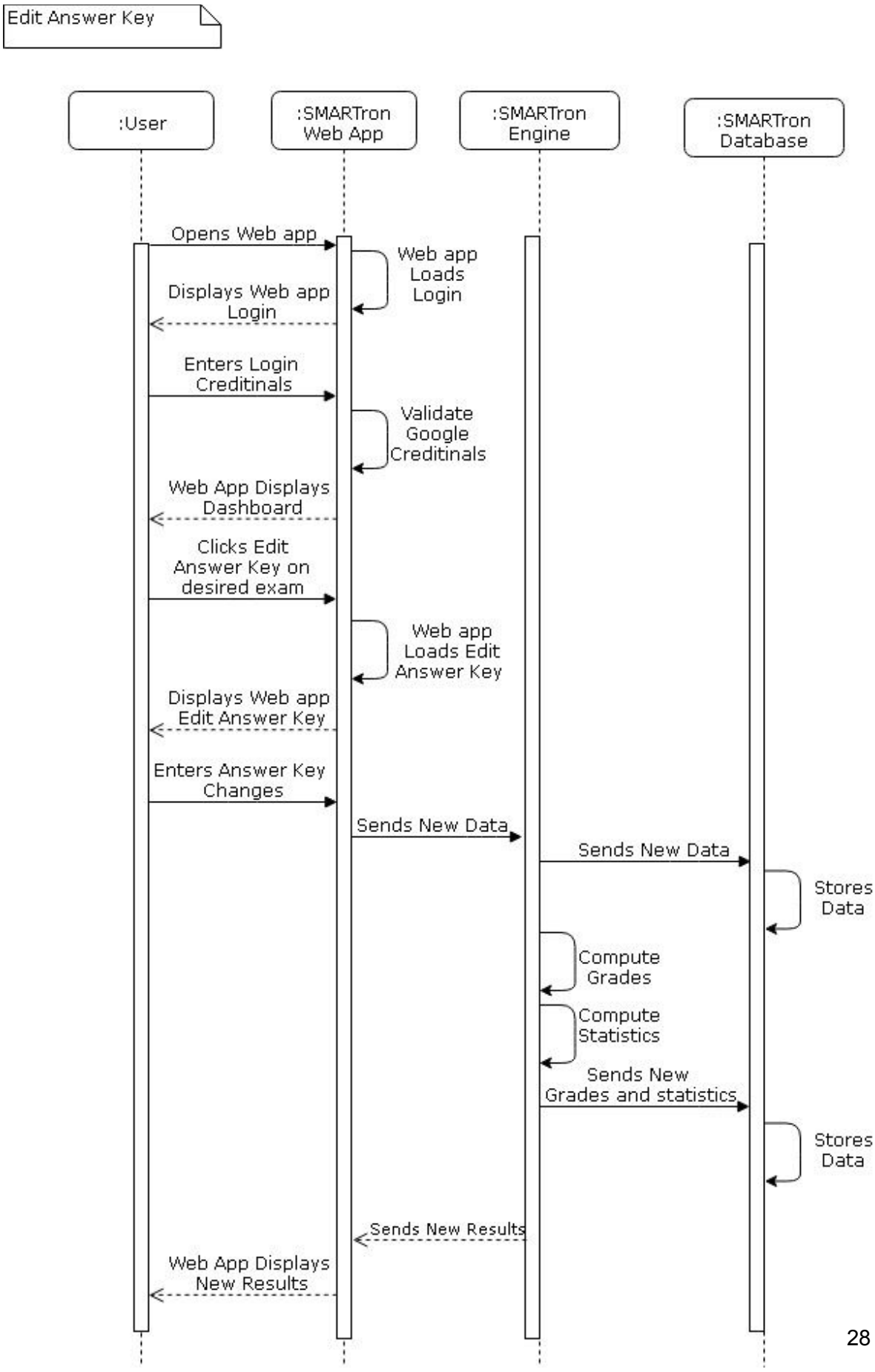

Assign Student Grades
:SMARTron Engine
Iterates through each answer on a student bubble sheet
Assigns the appropriate points based on the answer key
Stores the total points for the bubble sheet
Associates the score with the name and Student ID read from the bubble sheet
Repeat Previous Steps for each Bubble Sheet


Compute Statistics
:SMARTron Engine
:SMARTron Database
Computes necessary overall statistics
Computes an item analysis for each exam item
Computes item statistics for each exam item
Sends Test Data


Create CSV File
:SMARTron Engine
Creates a blank CSV file
Creates columns for student name, student ID, and score
Each rowis filled with the corresponding data from an item in the set of student grades
Saves the generated CSV file


Send Email to Instructor
:User
:SMARTron Mail Client
Generates HTML displaying the computed statistics for the exam
Creates an email containing the statistics HTML
Adds the generated CSV file as an attachment to the email
Send the generated email to the email address associated with the user


Login to SMARTron Web App
:User
:SMARTron Web App
Navigates to the Web app
Web app login loads
Displays Web app login
Prompts user to log in
Enters LakerNet ID and password
Presses Login
Verifies users credentials
Web app dashboard loads
Displays Web app dashboard


Edit Answer Key
:User
:SMARTron Web App
:SMARTron Engine
:SMARTron Database
Opens Web app
Web app Loads Login
Displays Web app Login
Enters Login Creditinals
Validate Google Creditinals
Web App Displays Dashboard
Clicks Edit Answer Key on desired exam
Web app Loads Edit Answer Key
Displays Web app Edit Answer Key
Enters Answer Key Changes
Sends New Data
Sends New Data
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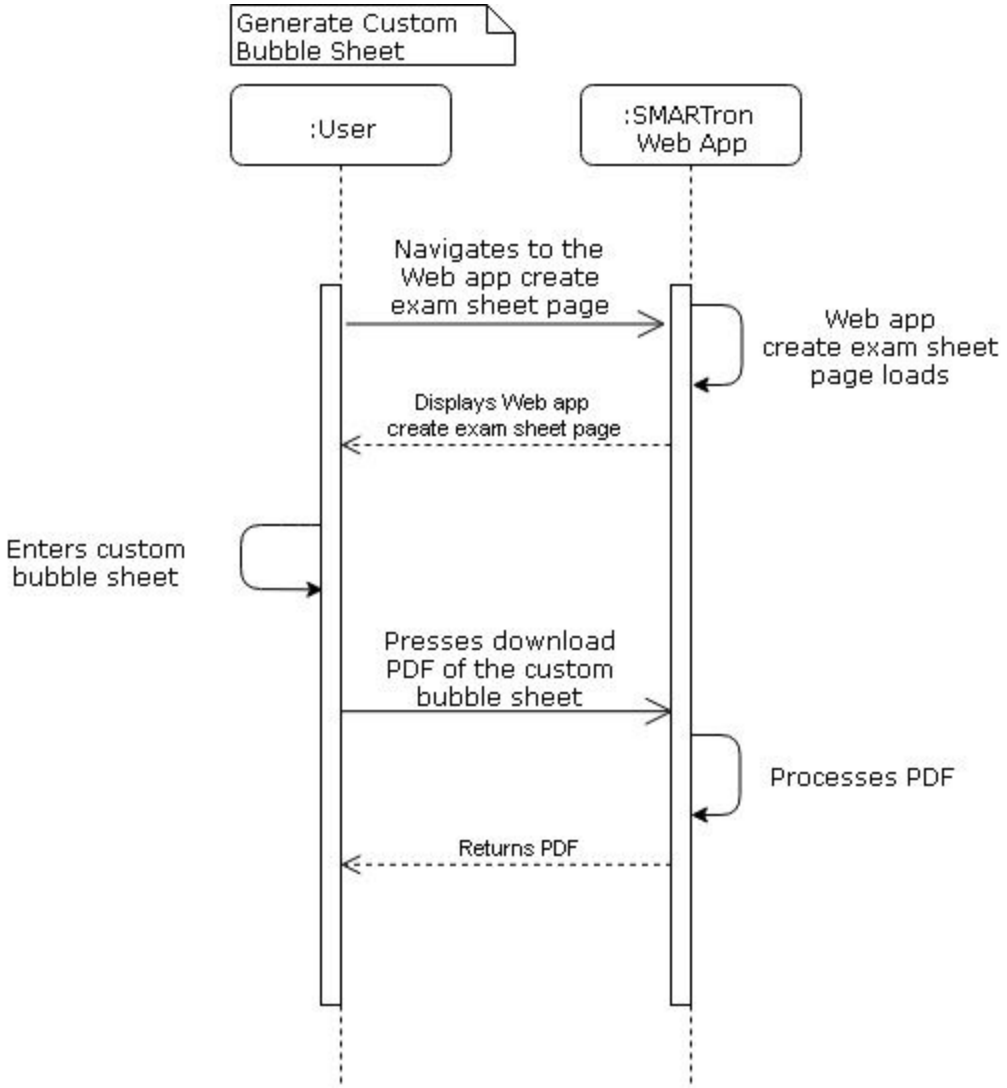
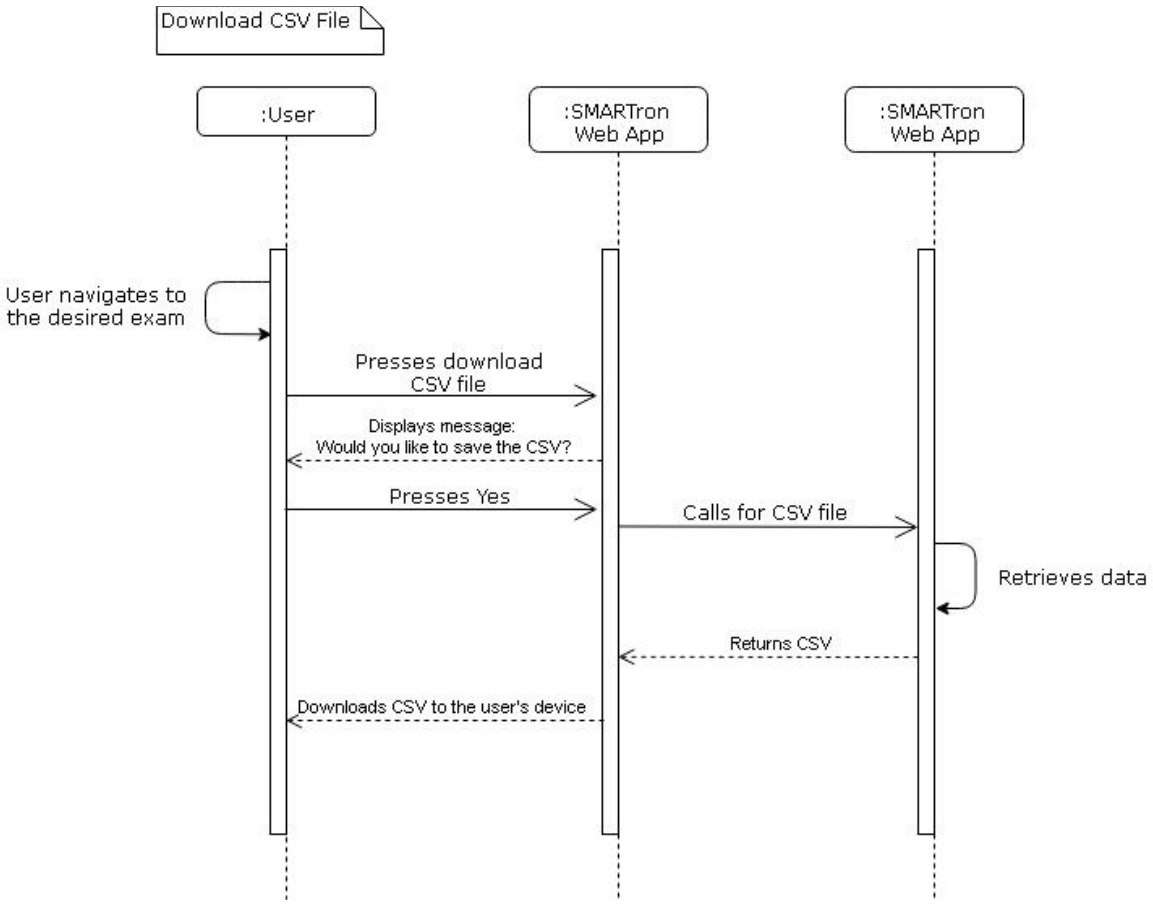
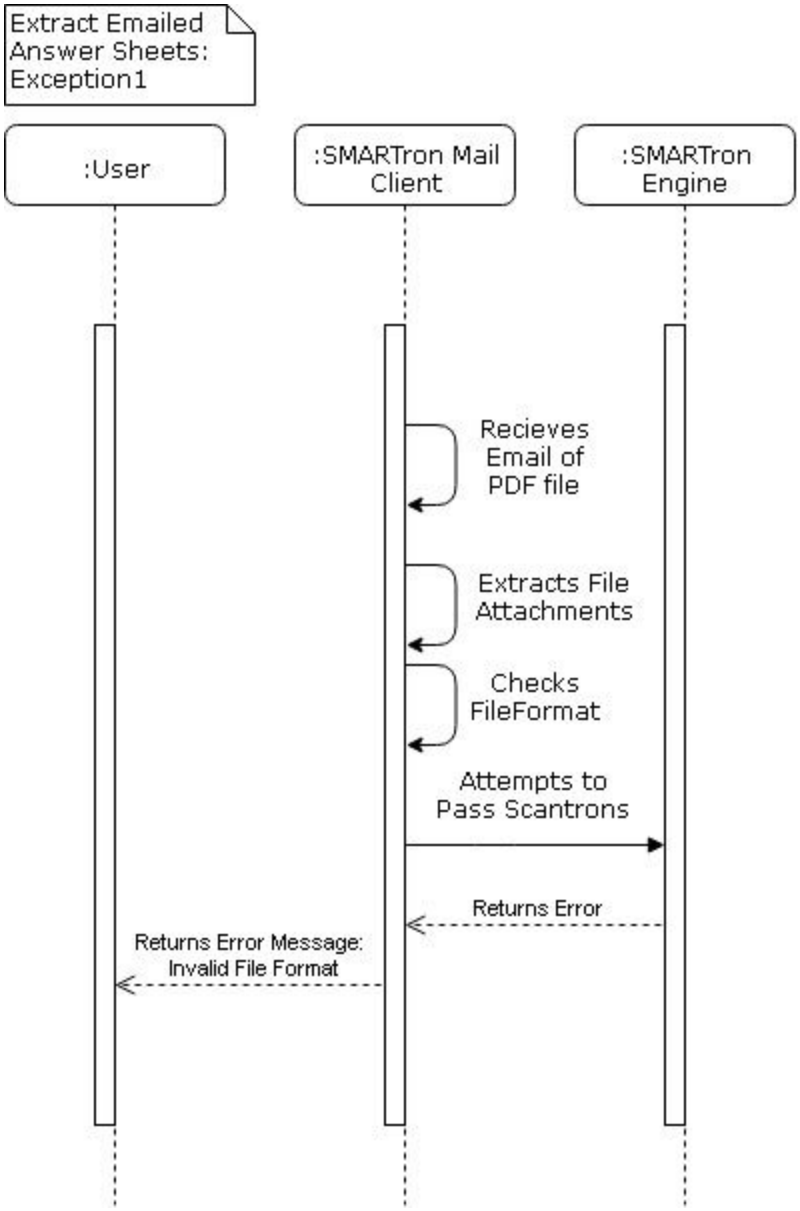
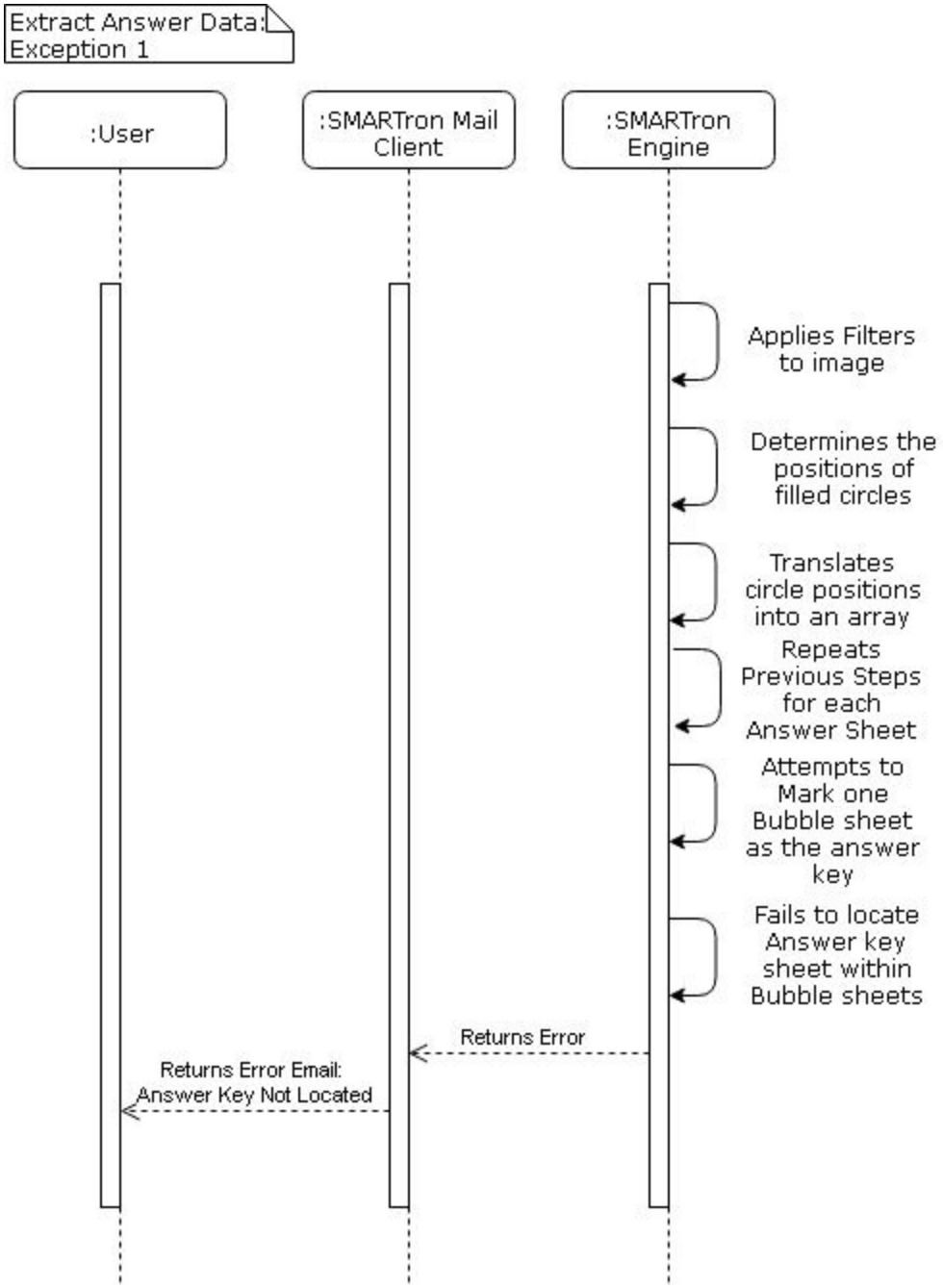
Stores Data
Sends New Results
Web App Displays New Results

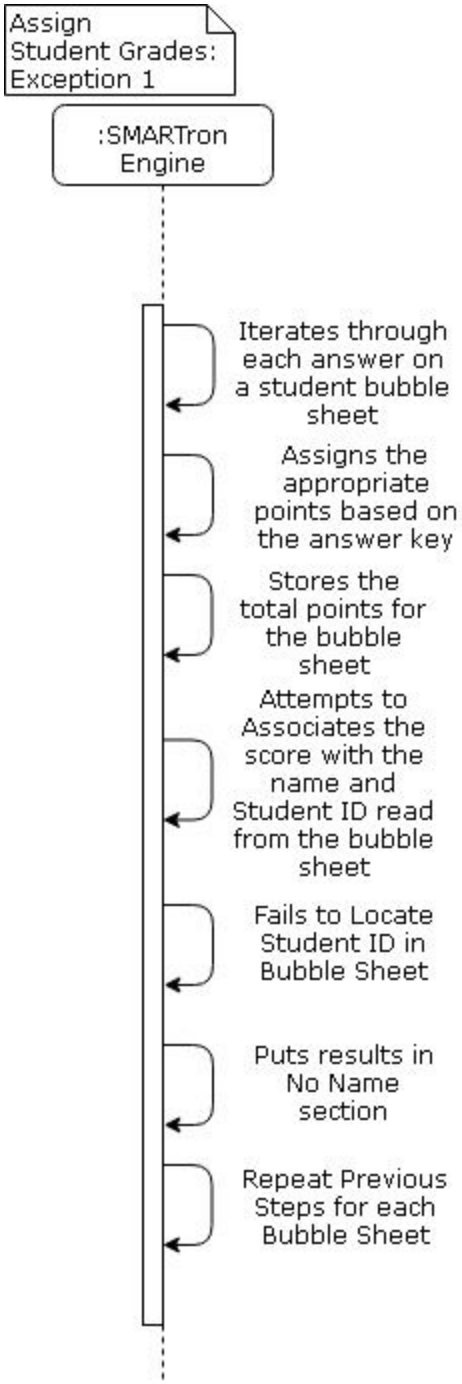

Generate Custom Bubble Sheet
:User
:SMARTron Web App
Navigates to the Web app create exam sheet page
Web app create exam sheet page loads
Displays Web app create exam sheet page
Enters custom bubble sheet
Presses download PDF of the custom bubble sheet
Processes PDF
Returns PDF

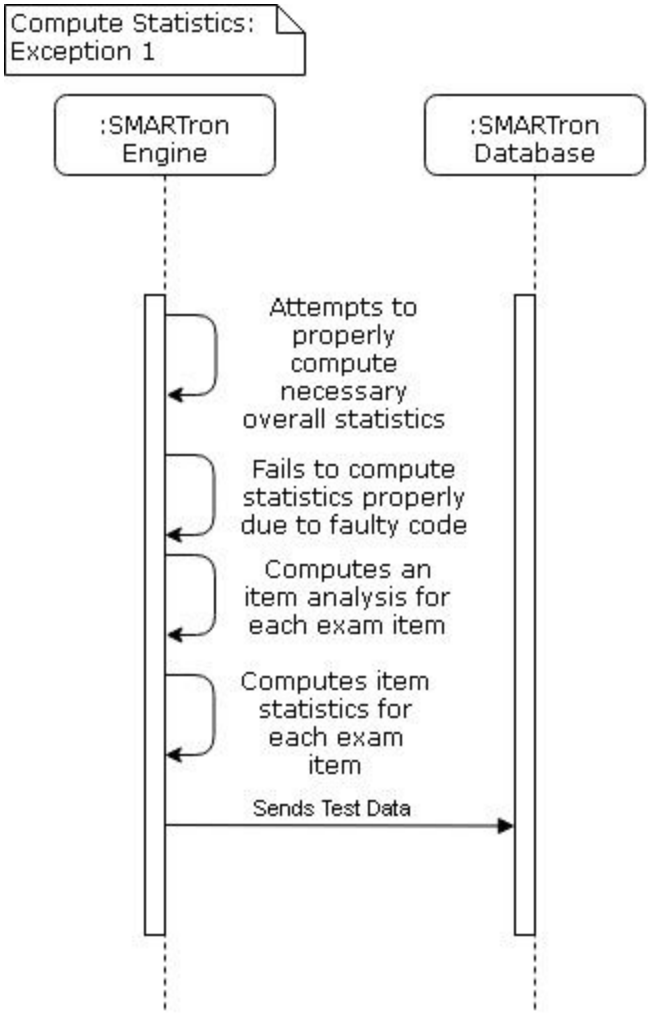

Download CSV File
:User
:SMARTron Web App
:SMARTron Web App
User navigates to the desired exam
Presses download CSV file
Displays message: Would you like to save the CSV?
Presses Yes
Calls for CSV file
Retrieves data
Returns CSV
Downloads CSV to the user's device

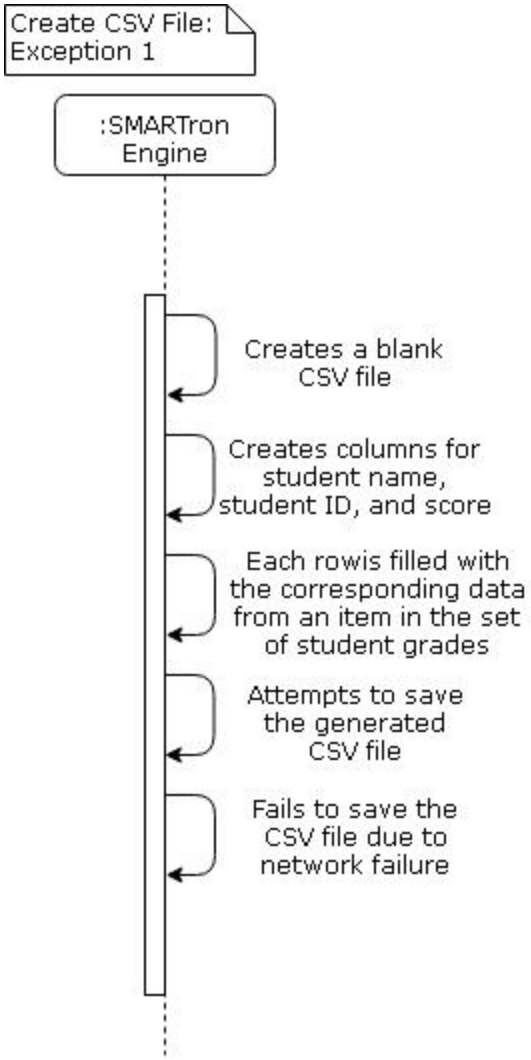
3.5 Exception Sequence Diagrams

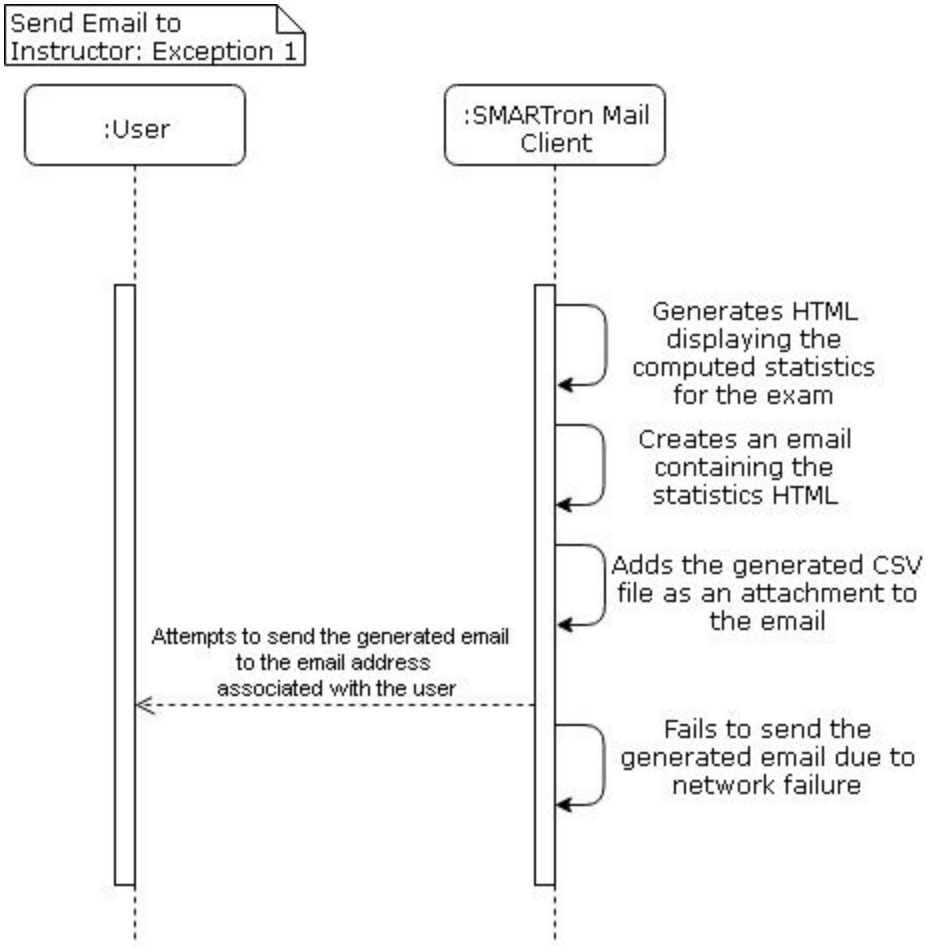


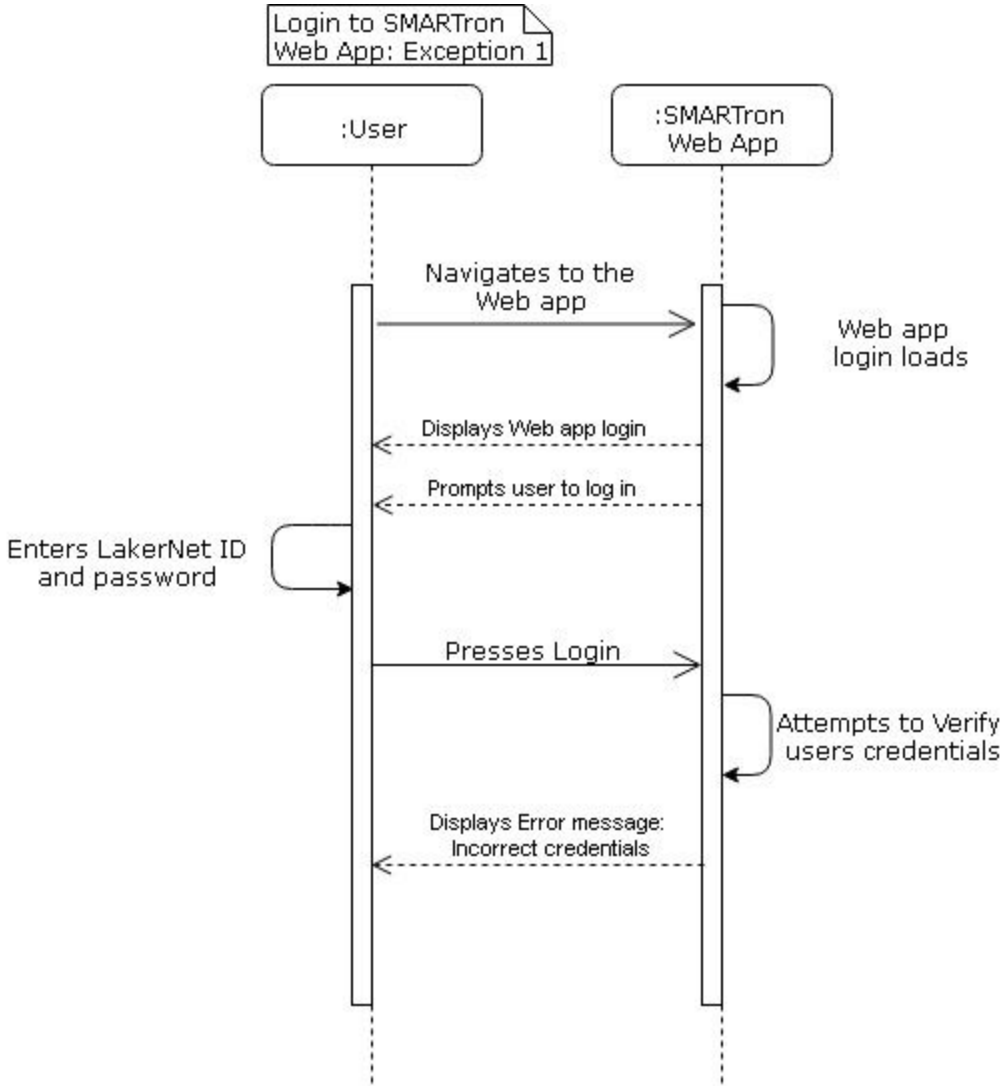

Extract Answer Data:
Exception 1
:User
:SMARTron Mail Client
:SMARTron Engine
Applies Filters to image
Determines the positions of filled circles
Translates circle positions into an array
Repeats Previous Steps for each Answer Sheet
Attempts to Mark one Bubble sheet as the answer key
Fails to locate Answer key sheet within Bubble sheets
Returns Error
Returns Error Email:
Answer Key Not Located

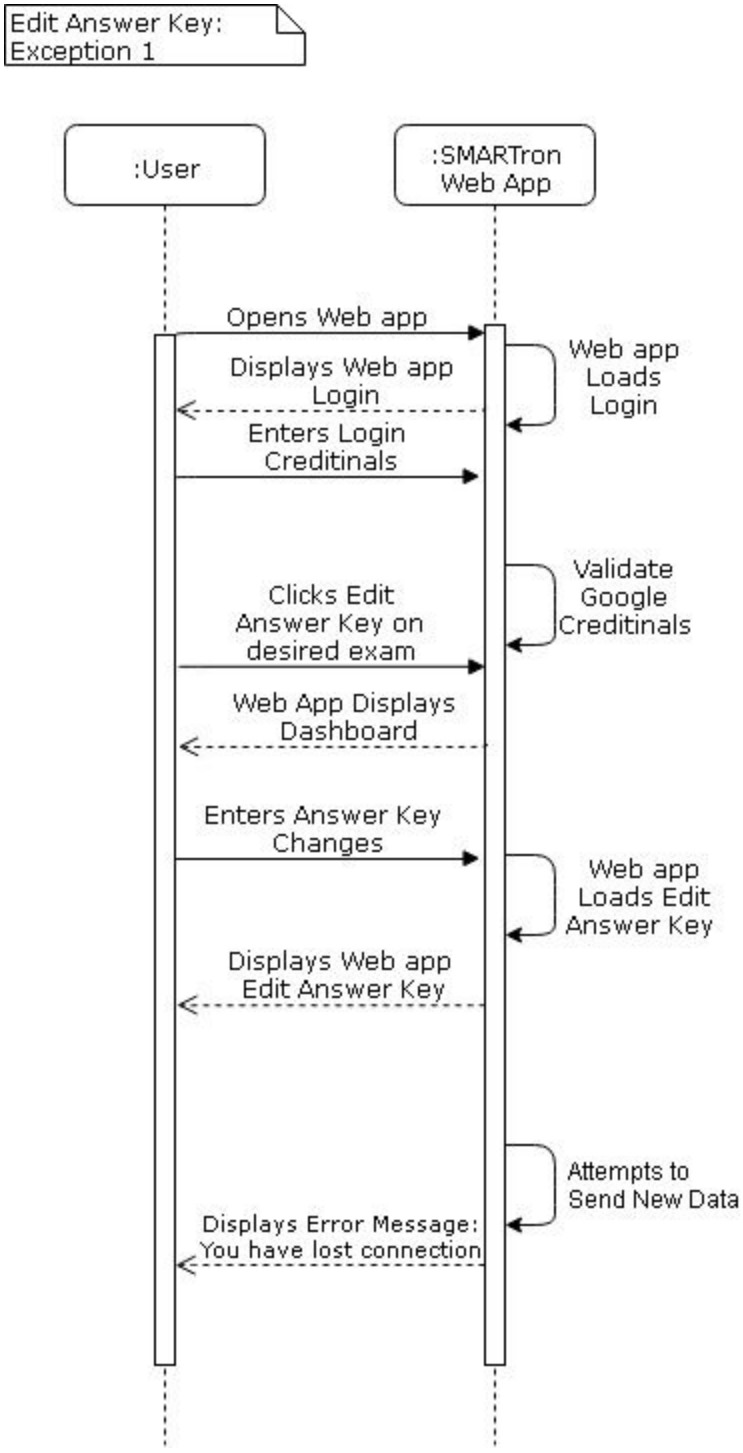

Assign Student Grades: Exception 1
:SMARTron Engine
Iterates through each answer on a student bubble sheet
Assigns the appropriate points based on the answer key
Stores the total points for the bubble sheet
Attempts to Associates the score with the name and Student ID read from the bubble sheet
Fails to Locate Student ID in Bubble Sheet
Puts results in No Name section
Repeat Previous Steps for each Bubble Sheet

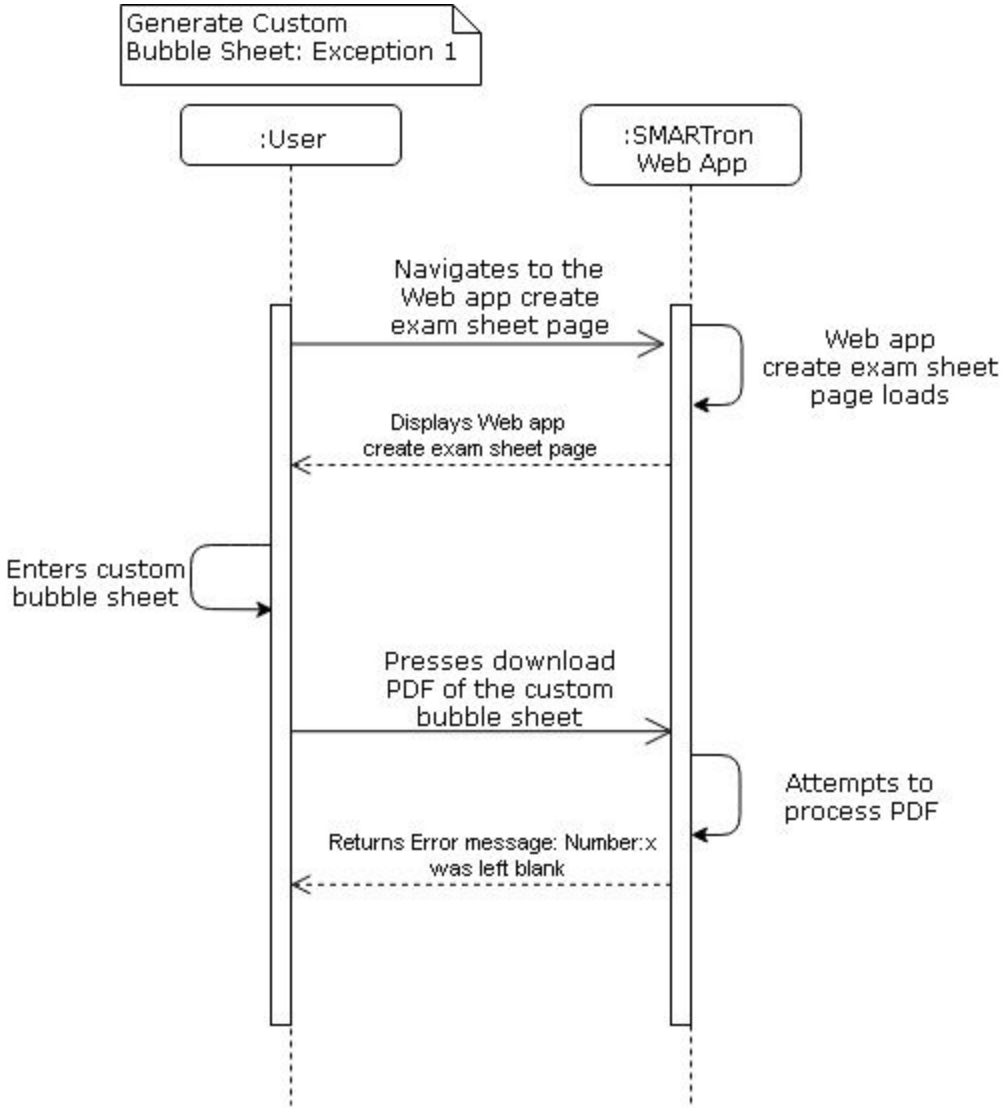

Compute Statistics:
Exception 1
:SMARTron
Engine
:SMARTron
Database
Attempts to
properly
compute
necessary
overall statistics
Fails to compute
statistics properly
due to faulty code
Computes an
item analysis for
each exam item
Computes item
statistics for
each exam
item
Sends Test Data

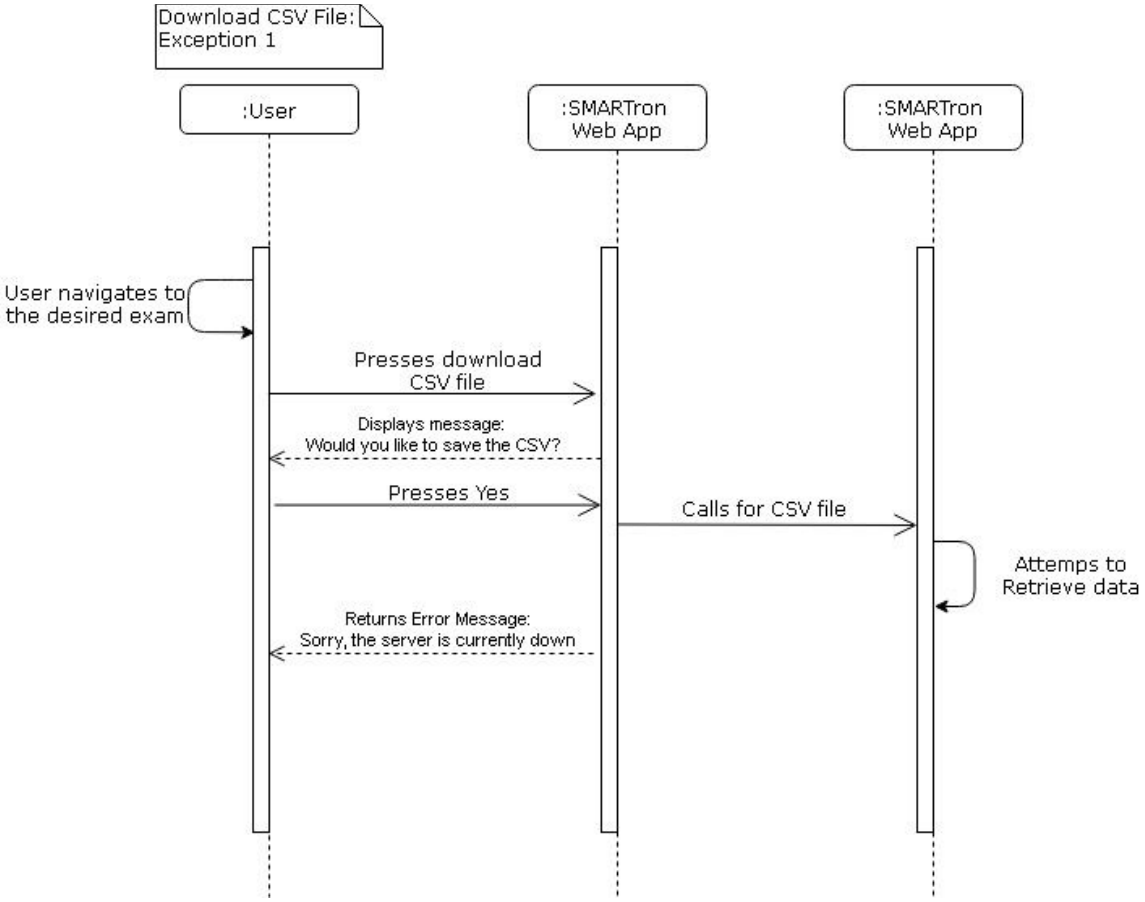

Create CSV File:
Exception 1
:SMARTron
Engine
Creates a blank
CSV file
Creates columns for
student name,
student ID, and score
Each rowis filled with
the corresponding data
from an item in the set
of student grades
Attempts to save
the generated
CSV file
Fails to save the
CSV file due to
network failure


Send Email to Instructor: Exception 1
:User
:SMARTron Mail Client
Generates HTML displaying the computed statistics for the exam
Creates an email containing the statistics HTML
Adds the generated CSV file as an attachment to the email
Attempts to send the generated email to the email address associated with the user
Fails to send the generated email due to network failure

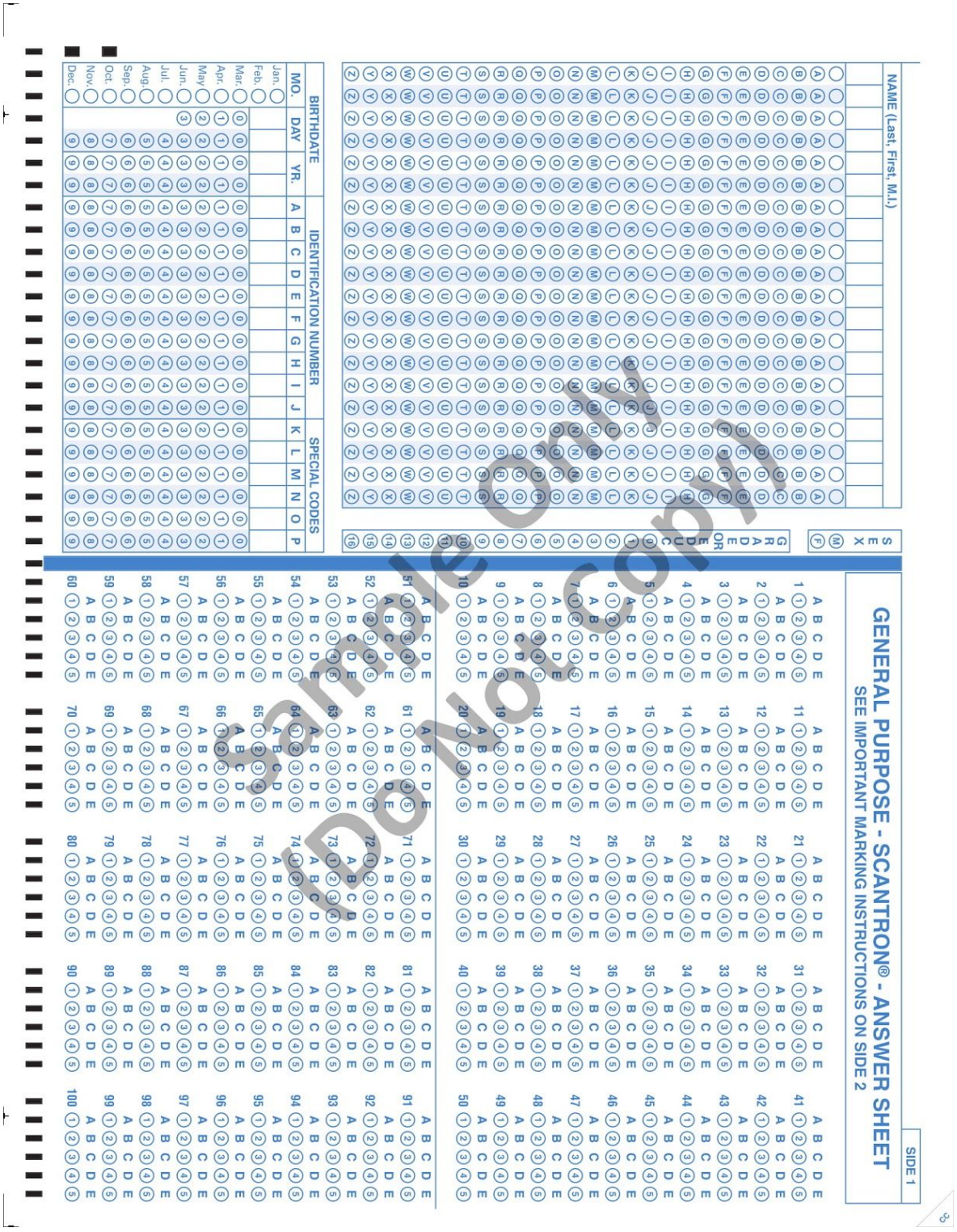

Login to SMARTron Web App: Exception 1
:User
:SMARTron Web App
Navigates to the Web app
Web app login loads
Displays Web app login
Prompts user to log in
Enters LakerNet ID and password
Presses Login
Attempts to Verify users credentials
Displays Error message: Incorrect credentials


Edit Answer Key:
Exception 1
:User
:SMARTron
Web App
Opens Web app
Displays Web app
Login
Web app
Loads
Login
Enters Login
Creditinals
Validate
Google
Creditinals
Clicks Edit
Answer Key on
desired exam
Web App Displays
Dashboard
Enters Answer Key
Changes
Web app
Loads Edit
Answer Key
Displays Web app
Edit Answer Key
Attempts to
Send New Data
Displays Error Message:
You have lost connection


Generate Custom Bubble Sheet: Exception 1
:User
:SMARTron Web App
Navigates to the Web app create exam sheet page
Web app create exam sheet page loads
Displays Web app create exam sheet page
Enters custom bubble sheet
Presses download PDF of the custom bubble sheet
Attempts to process PDF
Returns Error message: Number:x was left blank


Download CSV File:
Exception 1
:User
:SMARTron
Web App
:SMARTron
Web App
User navigates to
the desired exam
Presses download
CSV file
Displays message:
Would you like to save the CSV?
Presses Yes
Calls for CSV file
Attemps to
Retrieve data
Returns Error Message:
Sorry, the server is currently down

Appendix A: 200 Question Scantron Sheet



SCANTRON®
GENERAL PURPOSE
ANSWER SHEET
form no. 4521
IMPORTANT DIRECTIONS
FOR MARKING ANSWERS
• Use #2 pencil only.
• Do NOT use ink or ballpoint pens.
• Make heavy black marks that fill the circle completely.
• Erase cleanly any answer you wish to change.
• Make no stray marks on the answer sheet.
EXAMPLES
WRONG
WRONG
WRONG
RIGHT
DO NOT WRITE
IN THIS SPACE
SCANTRON®
Reorder Form No. 4521
www.ScantronStore.com
800-722-6876
SIDE 2
SCANTRON® Trans-Optic® EM-4521-5654321
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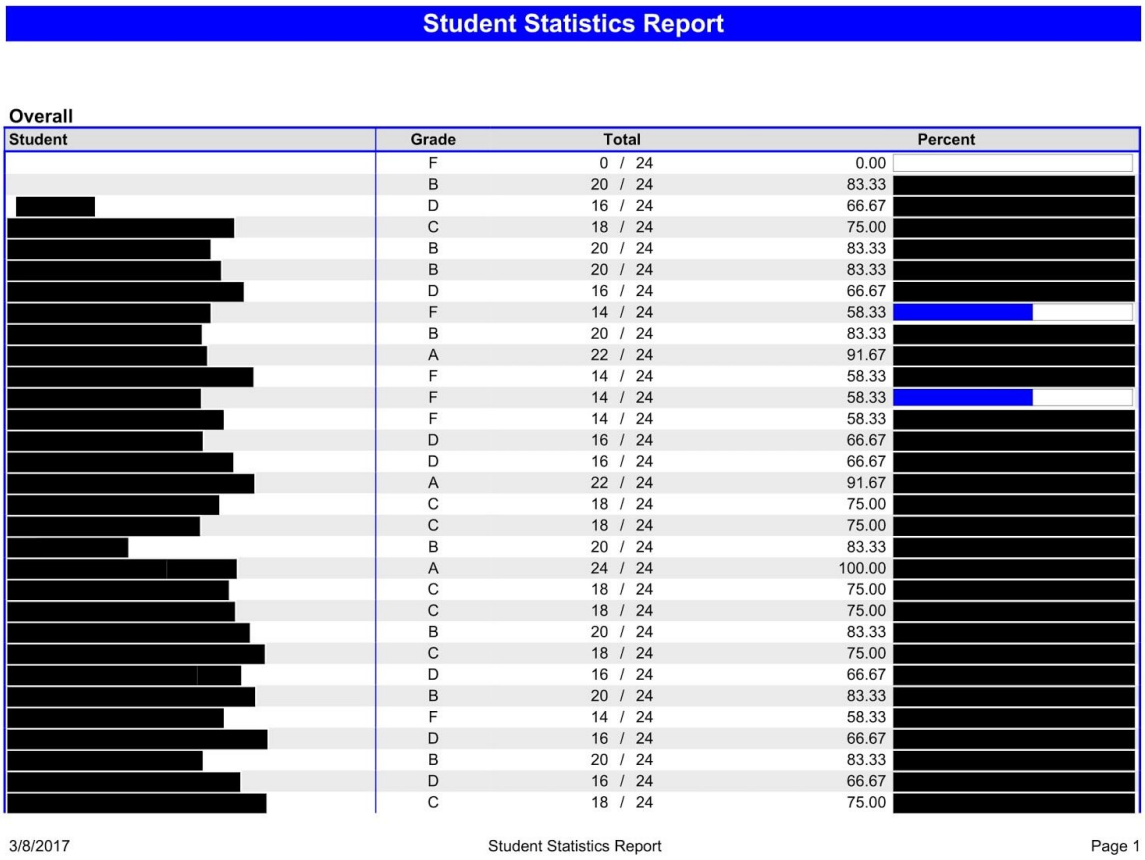
Sample
(Do Not Copy)

Appendix B: Sample Results



Student Statistics Report

Overall

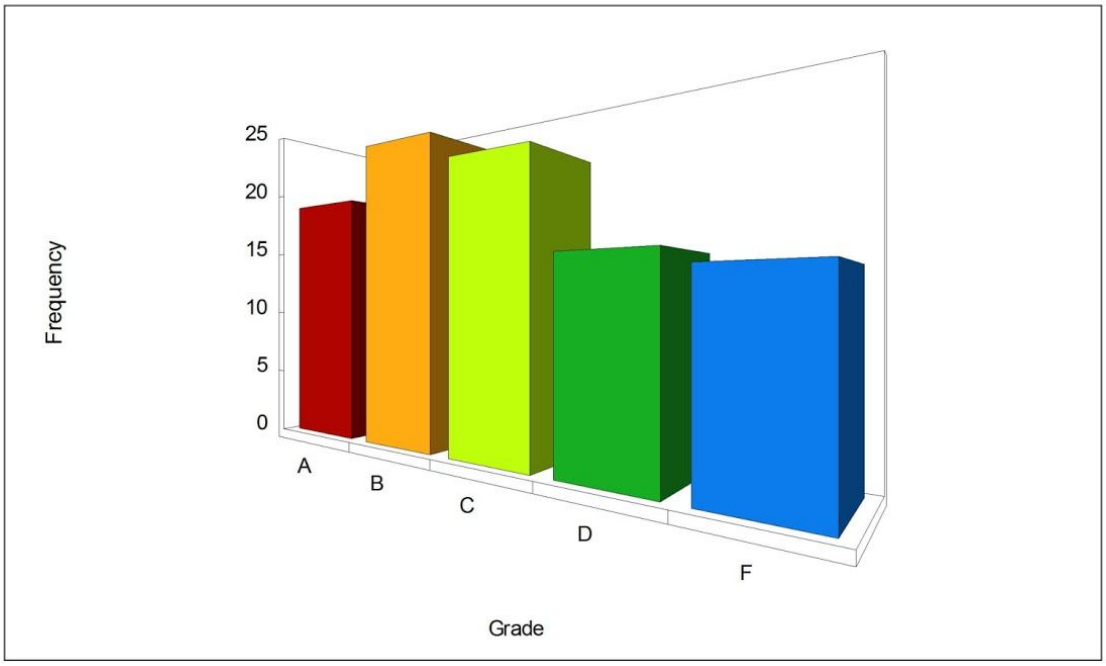
Student	Grade	Total	Percent
	F	0 / 24	0.00
	B	20 / 24	83.33
	D	16 / 24	66.67
	C	18 / 24	75.00
	B	20 / 24	83.33
	B	20 / 24	83.33
	D	16 / 24	66.67
	F	14 / 24	58.33
	B	20 / 24	83.33
	A	22 / 24	91.67
	F	14 / 24	58.33
	F	14 / 24	58.33
	F	14 / 24	58.33
	D	16 / 24	66.67
	D	16 / 24	66.67
	A	22 / 24	91.67
	C	18 / 24	75.00
	C	18 / 24	75.00
	B	20 / 24	83.33
	A	24 / 24	100.00
	C	18 / 24	75.00
	C	18 / 24	75.00
	B	20 / 24	83.33
	C	18 / 24	75.00
	D	16 / 24	66.67
	B	20 / 24	83.33
	F	14 / 24	58.33
	D	16 / 24	66.67
	B	20 / 24	83.33
	D	16 / 24	66.67
	C	18 / 24	75.00

3/8/2017 Student Statistics Report Page 1

Class Frequency Distribution Report

Overall Mean Score: 76.02%

Grade	Percent Score	Raw Score	Frequency	Percent
A	90.00 - 100.00	21.60 - 24.00	19	21.11
B	80.00 - 89.99	19.20 - 21.59	23	25.56
C	70.00 - 79.99	16.80 - 19.19	21	23.33
D	60.00 - 69.99	14.40 - 16.79	14	15.56
F	0.00 - 59.99	0.00 - 14.39	13	14.44



Note: No 3D bar graphs!

Test Statistics Report

	Overall
Score Data	
Number of Graded Items	12
Total Points Possible	24
Maximum Score	24
Minimum Score	0
Statistics	
Mean Score	18.24
Mean Percent Score	76.02
Benchmark Score	-
Range of Scores	24.00
Standard Deviation	3.71
Variance	13.76
Percentiles	
Percentile (25)	16.00
Median Score	18.00
Percentile (75)	20.00
Inter Quartile Range	4.00
Confidence Intervals	
1%	17.22
5%	17.47
95%	19.02
99%	19.27
Test Reliability	
Kuder-Richardson Formula 20	0.57
Kuder-Richardson Formula 21	1.84
Coefficient (Cronbach) Alpha	0.57

Condensed Item Analysis Report

Legend: Correct: Incorrect: Distractors Chosen More than Correct Answer:

Question1

Response	Frequency	Percent
***A**	83	92.22
B	4	4.44
C	0	0.00
D	2	2.22
E	0	0.00
Missing	1	1.11

Question2

Response	Frequency	Percent
A	1	1.11
B	1	1.11
***C**	87	96.67
D	0	0.00
E	0	0.00
Missing	1	1.11

Question3

Response	Frequency	Percent
A	4	4.44
***B**	82	91.11
C	3	3.33
D	0	0.00
E	0	0.00
Missing	1	1.11

Question4

Response	Frequency	Percent
A	6	6.67
B	34	37.78
***C**	49	54.44
D	0	0.00
E	0	0.00
Missing	1	1.11

Question5

Response	Frequency	Percent
A	5	5.56
B	16	17.78
C	3	3.33
***D**	65	72.22
E	0	0.00
Missing	1	1.11

Question6

Response	Frequency	Percent
***A**	78	86.67
B	6	6.67
C	0	0.00
D	4	4.44
E	0	0.00
Missing	2	2.22

Question7

Response	Frequency	Percent
A	0	0.00
***B**	79	87.78
C	1	1.11
D	8	8.89
E	0	0.00
Missing	2	2.22

Question8

Response	Frequency	Percent
A	2	2.22
***B**	76	84.44
C	11	12.22
D	0	0.00
E	0	0.00
Missing	1	1.11

Question9

Response	Frequency	Percent
A	43	47.78
***B**	21	23.33
C	20	22.22
D	5	5.56
E	0	0.00
Missing	1	1.11

Question10

Response	Frequency	Percent
A	21	23.33
***B**	43	47.78
C	11	12.22
D	14	15.56
E	0	0.00
Missing	1	1.11

Question11

Response	Frequency	Percent
A	1	1.11
B	6	6.67
C	1	1.11
***D**	81	90.00
E	0	0.00
Missing	1	1.11

Question12

Response	Frequency	Percent
A	2	2.22
B	6	6.67
C	4	4.44
***D**	77	85.56
E	0	0.00
Missing	1	1.11

Test Item Statistics Report

Question		Summary Statistics				Reliability	
Question	Points	Graded	Correct	Incorrect	No Response	Point Biserial	Percent Correct
Question1	2	90	83	6	1	0.35	92.22
Question2	2	90	87	2	1	0.55	96.67
Question3	2	90	82	7	1	0.40	91.11
Question4	2	90	49	40	1	0.48	54.44
Question5	2	90	65	24	1	0.58	72.22
Question6	2	90	78	10	2	0.41	86.67
Question7	2	90	79	9	2	0.35	87.78
Question8	2	90	76	13	1	0.49	84.44
Question9	2	90	21	68	1	0.37	23.33
Question10	2	90	43	46	1	0.45	47.78
Question11	2	90	81	8	1	0.36	90.00
Question12	2	90	77	12	1	0.35	85.56