Tech Tools II

Outline

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- UNL

MOSS
- MOSS Visualizer
- Examples
  - Easy
  - Harder

iClicker

APIs
- The Canvas API
  - Outside Resources
  - Basics of Using the Canvas API
  - Request Course Information
  - Modify Course Information
- Other Useful Tools
- Drawbacks of the Canvas API
- Other Functions

Mobius Assessment
- CSCE 310
  - Test Questions
- CSCE 322
  - Test Questions
- General Goals
- Testing Platforms
  - Canvas Quizzes
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- Clickable Images

Ideas for Your Classes

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About Me

- Full-Time Lecturer in Computer Science & Engineering

  Teaching CSCE 322 and CSCE 310 (and CSCE 155N on Occasion)
- (Almost) Full-Time Ph.D. Student in Teaching, Learning and Teacher Education
- M.S. in Computer Science from the University of Central Florida (2013)

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About Me
UCF

- First GTA Assignment: Discrete Math, 218 Students (55 per Recitation Section)

  0 UTAs, 1 Other GTA

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UNL
CSCE 310

- Data Structures & Algorithms
- Required for All Computer Science and Computer Engineering Students

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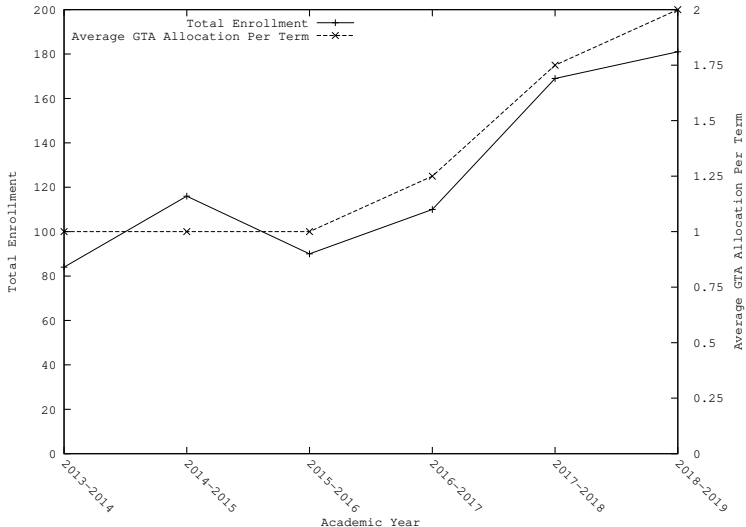

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- Programming Language Concepts
- Required for All Computer Science and Software Engineering Students

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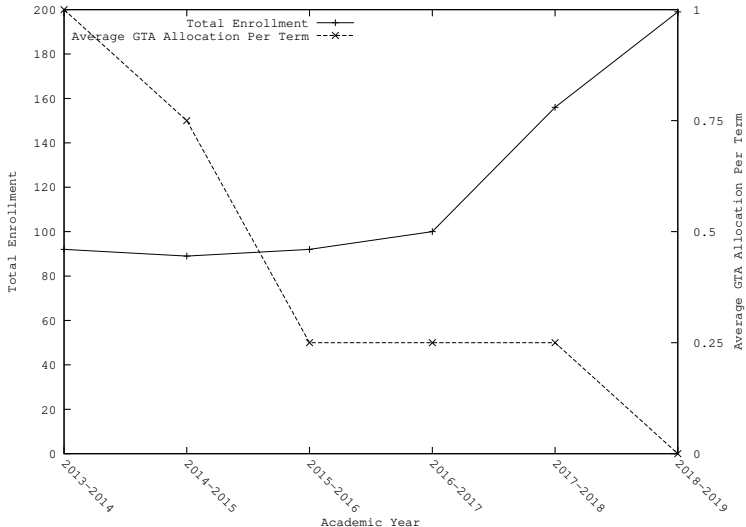

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MOSS

- **M**easure **O**f **S**oftware **S**imilarity
- Developed by Stanford University
- Compares code structure and returns percentage overlap between code in two **directories**
- Orders matches by **number** of overlapping lines (generally)

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65 Goals

- http://cse.unl.edu/~rpatrick/moss
- Tool to show MOSS results on a 2D plot
- Easier to find outliers to look at more closely

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Ideas for Your Classes

Examples

- Easy
- Harder
- Fun

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Examples
Easy

- Lots of code copied
- Minimal changes to variable names and whitespace
- Similar comments (or presence of comments in one submission and absence in the other)
- "Weird" similarities (asymmetric whitespace/indentation, methods of doing things, etc.)

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Examples
Easy

Moss Results

Fri Jan 25 05:58:57 PST 2019

Options -l cc -d -m 10

[How to Read the Results | Tips | FAQ | Contact | Submission Scripts | Credits]

File 1	File 2	Lines Matched
1188csce310homework02/csce310homeWork02part01/1171/ntacbxnuvj/ (71%)	1188csce310homework02/csce310homeWork02part01/1188/onljrmpsso/ (73%)	54
1188csce310homework02/csce310homeWork02part01/1151/dhbexcnzpd/ (36%)	1188csce310homework02/csce310homeWork02part01/1151/owxcdklzzi/ (82%)	25
1188csce310homework02/csce310homeWork02part01/1151/owxcdklzzi/ (80%)	1188csce310homework02/csce310homeWork02part01/1158/cbyqbgtifd/ (82%)	25
1188csce310homework02/csce310homeWork02part01/1148/wwomsqnmsz/ (53%)	1188csce310homework02/csce310homeWork02part01/1151/dhbexcnzpd/ (36%)	46
1188csce310homework02/csce310homeWork02part01/1151/dhbexcnzpd/ (35%)	1188csce310homework02/csce310homeWork02part01/1158/cbyqbgtifd/ (80%)	24
1188csce310homework02/csce310homeWork02part01/1151/tubnhjcfr/ (96%)	1188csce310homework02/csce310homeWork02part01/1158/iojwexfhqy/ (96%)	25
1188csce310homework02/csce310homeWork02part01/1151/szhgsyxfmt/ (96%)	1188csce310homework02/csce310homeWork02part01/1158/iojwexfhqy/ (96%)	25
1188csce310homework02/csce310homeWork02part01/1151/szhgsyxfmt/ (96%)	1188csce310homework02/csce310homeWork02part01/1151/tubnhjcfr/ (96%)	21
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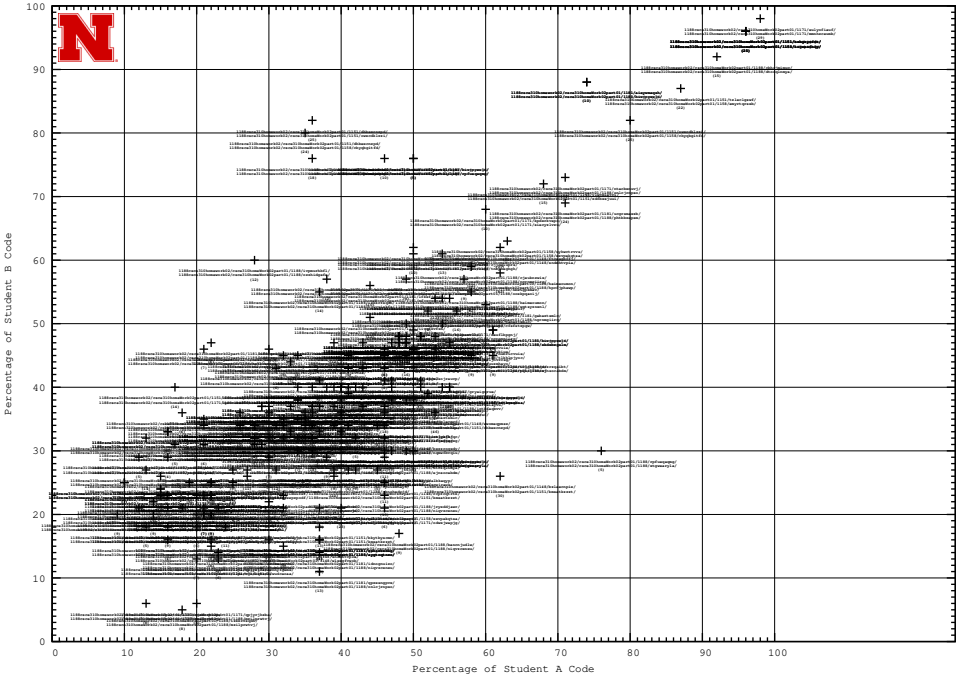
1188csce310homework02/csce310homeWork02part01/1181/huvjcyzwjt/ (96%)	1188csce310homework02/csce310homeWork02part01/1188/bivrpowold/ (96%)	10


Percentage of Student B Code
Percentage of Student A Code
0
10
20
30
40
50
60
70
80
90
100

Examples
Easy

1188csce310homework02/csce310homeWork02part01/1181/ucgrsmaxzb/ (71%)		1188csce310homework02/csce310homeWork02part01/1188/ph (69%)
10-33		10-33

1188csce310homework02/csce310homeWork02part01/1181/ucgrsmaxzb/

```
>>>> file: csce310Homework02Part03.cpp
#include "csce310Homework02Part03.h"

#include <vector>

using namespace std;

vector<int> placeNumbers( vector<int> nums , vector<char> signs ){
  int i,j=0,k,temp,max=0,min=100,index;


  for (i=0;i<nums.size();i++){
              if(signs[j]=='>'){
                    for (k=i;k<nums.size();k++){
                          if (nums[k]>max){
                                max=nums[k];
                                index=k;
                          }
                    }//find the max
                    max=0;
                    temp=nums[i];
                    nums[i]=nums[index];
                    nums[index]=temp; //swap
              }
              if (signs[j]=='<'){
                    for (k=i;k<nums.size();k++){
                          if (nums[k]<min){
                                min=nums[k];
                                index=k;
                          }
                    }
                    min=100;
                    temp=nums[i];
                    nums[i]=nums[index];
                    nums[index]=temp;
              }
              j=j+1;
  }
  return nums;
}
```

1188csce310homework02/csce310homeWork02part01/1188/phtbbzepsm/

```
>>>> file: csce310homeWork02part01.cpp
#include "csce310homeWork02part01.h"

#include <vector>

using namespace std;

vector<int> placeNumbers( vector<int> nums , vector<char> signs ){
  int i=0,j=0,k=0,maxNums=0,minNums=100,index=0,temp=0;


  for (i=0;i<nums.size();i++){
              if(signs[j]=='>'){
                    for (k=i;k<nums.size();k++){
                          if (nums[k]>maxNums){
                                maxNums=nums[k];
                                index=k;
                          }
                    }
                    maxNums=0;
                    temp=nums[i];
                    nums[i]=nums[index];
                    nums[index]=temp;
              }
              if(signs[j]=='<'){
                    for (k=i;k<nums.size();k++){
                          if (nums[k]<minNums){
                                minNums=nums[k];
                                index=k;
                          }
                    }
                    minNums=100;
                    temp=nums[i];
                    nums[i]=nums[index];
                    nums[index]=temp;
              }
              j++;
  }
  return nums;
}
```

Examples
Harder

- Minimal code copied
- Significant changes to variable names
- "Weird" similarities (asymmetric whitespace/indentation, methods of doing things, etc.)

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Moss Results

Fri Jan 25 06:00:18 PST 2019

Options -l haskell -d -m 10

[How to Read the Results | Tips | FAQ | Contact | Submission Scripts | Credits] Not a majority of the code, but certainly more than most other matches

File 1	File 2	Lines Matched
1178csce322homework03/csce322homeWork03part01/1178/eibdqnuqfy/ (28%)	1178csce322homework03/csce322homeWork03part01/1178/rygsuqbaco/ (26%)	53
1178csce322homework03/csce322homeWork03part01/1171/ayoyuzalnc/ (26%)	1178csce322homework03/csce322homeWork03part01/1171/qcmqdxrqrm/ (26%)	59
1178csce322homework03/csce322homeWork03part01/1171/llnkqyknzv/ (11%)	1178csce322homework03/csce322homeWork03part01/1171/vszstnpqsi/ (18%)	40
1178csce322homework03/csce322homeWork03part01/1178/aiutztxbcs/ (6%)	1178csce322homework03/csce322homeWork03part01/1178/uiuduyhqsd/ (7%)	24
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1178csce322homework03/csce322homeWork03part01/1178/tsxwomicbg/ (4%)	1178csce322homework03/csce322homeWork03part01/1178/uiuduyhqsd/ (4%)	34
1178csce322homework03/csce322homeWork03part01/1171/klmyarnktw/ (12%)	1178csce322homework03/csce322homeWork03part01/1171/kozeovyqro/ (13%)	33
1178csce322homework03/csce322homeWork03part01/1171/bpleihwmhs/ (14%)	1178csce322homework03/csce322homeWork03part01/1171/qcmqdxrqrm/ (14%)	34
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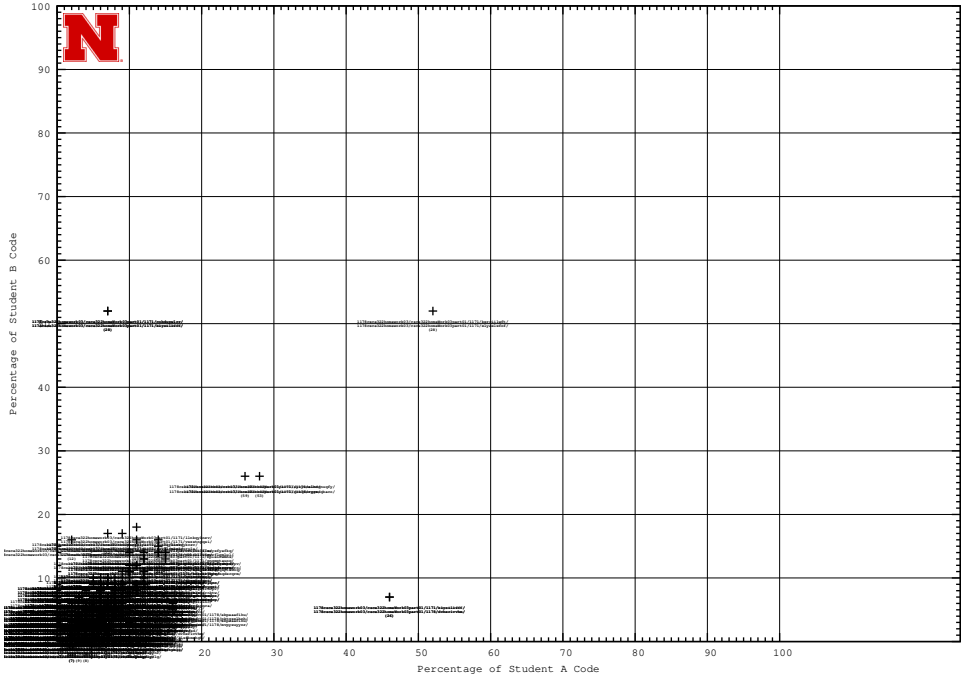
1178csce322homework03/csce322homeWork03part01/1171/kozeovyqro/ (11%)	1178csce322homework03/csce322homeWork03part01/1171/qcmqdxrqrm/ (12%)	21
1178csce322homework03/csce322homeWork03part01/1171/ayoyuzalnc/ (12%)	1178csce322homework03/csce322homeWork03part01/1171/kozeovyqro/ (11%)	25


Percentage of Student B Code
Percentage of Student A Code
100
90
80
70
60
50
40
30
20
10
10
20
30
40
50
60
70
80
90
100

Examples
Harder

1178csce322homework03/csce322homeWork03part01/1178/elbdqnuqfy/ (28%)	1178csce322homework03/csce322homeWork03part01/1178/r/ (26%)
132-142	39-50
146-158	54-66
143-145	53-38
123-129	26-35

```
isX character = do
      if character == 'x' then 1
      else 0

--finds the character at given coordinates

findCharAt:: [[Char]]-> (Integer,Integer) ->  Integer -> Char
findCharAt (lineOne:otherLines) (x,y) depth
    |depth == x = findCharAtRow lineOne y 0
    |otherwise = findCharAt (otherLines) (x,y) (depth+1)

     --finds the character in a row. Used only by "findCharAt," but separated for clarity of design.
findCharAtRow:: (Eq a) => [a] -> Integer -> Integer -> a
findCharAtRow (h:t) index counter
    |index == counter = h
```

Oddly asymmetric whitespace

```
    |otherwise = findCharAtRow (t) (index) (counter+1)

--replaces the character at given coordinates with a different given character
replaceAt:: (Eq a) => a -> [[a]] -> [[a]]-> (Integer,Integer) ->  Integer ->[[a]]
replaceAt char old (lineOne:otherLines) (x,y) depth
    |depth == x = old ++( replaceAtRow char [] lineOne y 0) : otherLines )
    |otherwise = replaceAt (char) (old++[lineOne]) (otherLines) (x,y) (depth+1)

     --replaces the character in a row. Used only by "replaceAt," but separated for clarity of design.
replaceAtRow:: (Eq a) => a -> [a] -> [a] -> Integer -> Integer -> [a]

replaceAtRow char old [] index counter = old
replaceAtRow char old (h:t) index counter
    |index == counter = old ++ (char : t)

    |otherwise = replaceAtRow (char) (old++[h]) (t) (index) (counter+1)

--finds a given symbol in a maze. Only used for players, right?
findInMaze:: (Eq a) => a ->[[a]] ->(Integer,Integer) -> (Integer,Integer)
findInMaze char [] (x,y) = (-1,-1)
findInMaze char (lineOne:otherLines) (x,y)=
    do
      let col = findInRow lineOne char  0
      if col == -1 then findInMaze char otherLines (x+1,y)
      else (x,col)

     --finds a given symbol in a row. Only used by "findInMaze," but separated for clarity of design.
findInRow:: (Eq a) => [a]-> a -> Integer -> Integer
findInRow [] char  n = -1

findInRow (h:t) char  n
    |char == h = n
```

```
showAtCoordInMatrix:: [[Char]]-> (Integer,Integer) ->  Integer -> Char
showAtCoordInMatrix (firstLine:otherLines) (x,y) depth
    |depth == x = showAtIndexInRow firstLine y 0
    |otherwise = showAtCoordInMatrix (otherLines) (x,y) (depth+1)



replaceAtIndexInRow:: (Eq a) => a -> [a] -> [a] -> Integer -> Integer -> [a]
replaceAtIndexInRow char old [] index counter = old
replaceAtIndexInRow char old (h:t) index counter
    |index == counter = old ++ (char : t)

    |otherwise = replaceAtIndexInRow (char) (old++[h]) (t) (index) (counter+1)

replaceAtCoordInMatrix:: (Eq a) => a -> [[a]] -> [[a]]-> (Integer,Integer) ->  Integer ->[[a]]
replaceAtCoordInMatrix char old (firstLine:otherLines) (x,y) depth
    |depth == x = old ++( replaceAtIndexInRow char [] firstLine y 0) : otherLines )
    |otherwise = replaceAtCoordInMatrix (char) (old++[firstLine]) (otherLines) (x,y) (depth+1)



findIndexInRow:: (Eq a) => [a]-> a -> Integer -> Integer

findIndexInRow [] char  n = -1
findIndexInRow (h:t) char  n
    |char == h = n
    |otherwise  = findIndexInRow t char  (n+1)



findCoordsInMatrix:: (Eq a) => a ->[[a]] ->(Integer,Integer) -> (Integer,Integer)
findCoordsInMatrix char [] (x,y) = (-1,-1)
findCoordsInMatrix char (firstLine:otherLines) (x,y)=
    do
      let col = findIndexInRow firstLine char  0
      if col == -1 then findCoordsInMatrix char otherLines (x+1,y)
      else (x,col)


movePlayer:: Char -> Char -> [[Char]] -> [[Char]]
movePlayer player direction matrix
    | direction == 'l' = do
        let (x,y) = findCoordsInMatrix player matrix (0,0)
        movePelper player (x,y) (x,y-1) matrix
```

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Ideas for Your Classes

iClicker

- SRS (Student Response System) at UNL
  https://its.unl.edu/services/srs/
- Available in all General Purpose (GP) Classrooms
  https://its.unl.edu/services/srs/iclicker-channel-assignments-gp-rooms/
- Free Instructor Clickers and Base Stations available from 472-5511 or classrooms@unl.edu

iClicker

iClicker Cloud

- https://instructor.reef-education.com/#/instructor/courses/active
- Software available in every GP classroom
- Link with Canvas Class through "iClicker Sync" in Canvas
- (In Theory) Syncs to Canvas Gradebook after every session
  Can always export and upload to Canvas manually

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APIs

- **A**pplication **P**rogramming **I**nterface

  a set of functions and procedures allowing the creation of applications that access the features or data of an operating system, **application, or other service.**

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APIs
The Canvas API

- Canvas LMS API Documentation

  Not the most intuitive organization of information
- Light on Examples

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Outside Resources

- Significantly Better Resources from Other Institutions
  Search Google for `site:github.com canvas api` for Tools from Other Universities/Organizations
- Easier to Build Off Existing Tools
  More Examples

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Basics of Using the Canvas API

- Get an Access Token
- Request Course Information
- Modify Course Information

  Update the Gradebook

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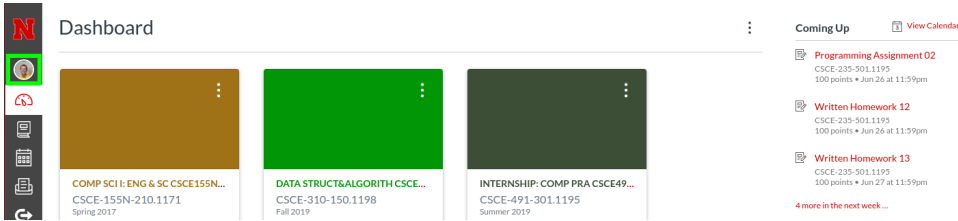
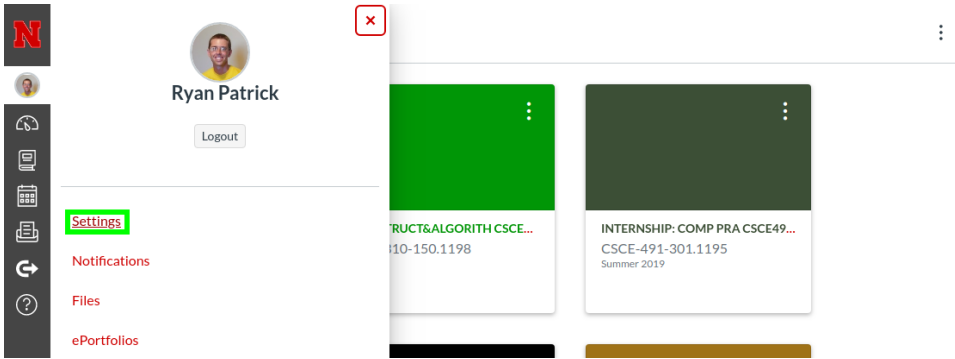
Get an Access Token



Get an Access Token



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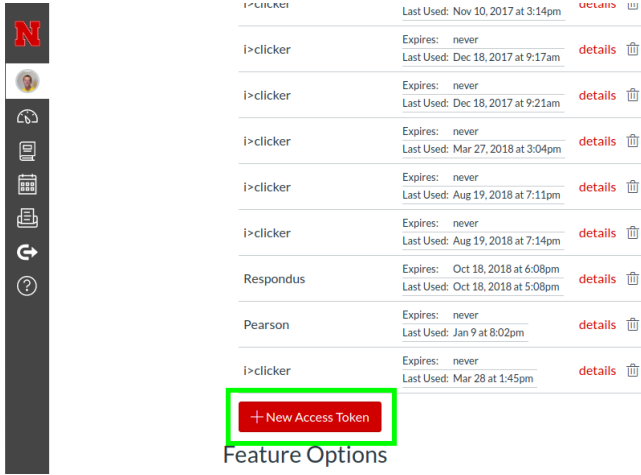


Request Course Information

- `curl -H "Authorization: Bearer MY_ACCESS_TOKEN" -X GET https://canvas.unl.edu/api/v1/courses`
  GET all information about all courses I'm affiliated with
- **Everything Returned in JSON Format**
  Java**S**cript **O**bject **N**otation
- JSON - Introduction
- Courses with the Canvas API
- `curl -H "Authorization: Bearer MY_ACCESS_TOKEN" -X GET https://canvas.unl.edu/api/v1/courses/61126/assignments`
  Get all information about all assignments in the Summer 2019 offering of CSCE 235 (Results are Paginated)
  Useful to get Canvas IDs for Assignments (match with Names of Assignments)
- `curl -H "Authorization: Bearer MY_ACCESS_TOKEN" -X GET https://canvas.unl.edu/api/v1/courses/61126/students`
  Get all information about all students in the Summer 2019 offering of CSCE 235
- `curl -H "Authorization: Bearer MY_ACCESS_TOKEN" -X~GET https://canvas.unl.edu/api/v1/courses/61126/students/151211`
  Get all information about user (student) in the Summer 2019 offering of CSCE 235 with this **Canvas ID**
- `curl -H "Authorization: Bearer MY_ACCESS_TOKEN" -X GET https://canvas.unl.edu/api/v1/courses/61126/users/92368`
  SIS: Student **I**nformation **S**ystem ID is the NUID

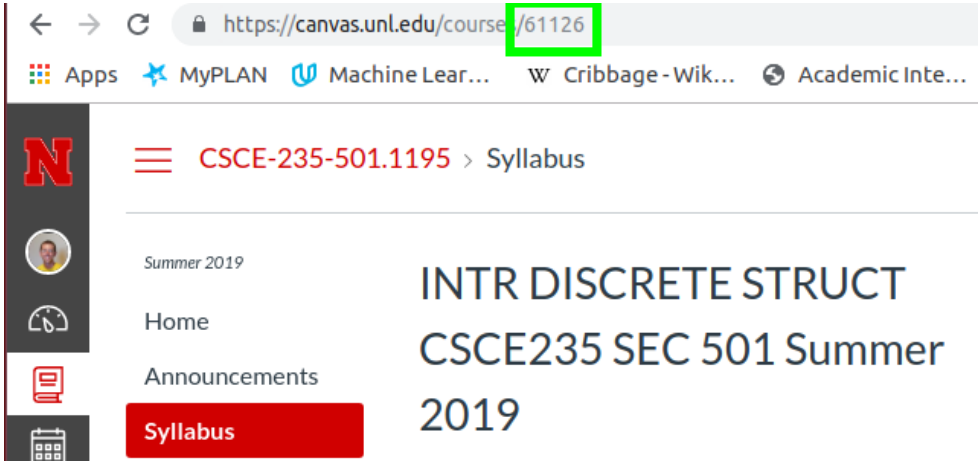
Modify Course Information

- Almost anything can be modified through the Canvas API
- Uploading files is a bit of a process
  We'll focus on updating grades
-

```
curl -X POST -F "grade_data[151211][posted_grade]=0" -H "Authorization: Bearer MY_ACCESS_TOKEN" https://canvas.unl.edu/api/v1/course
```

  Canvas API Example for Grading Multiple Submissions
- **POST** (or **PUT**) Something to/on Canvas
- Change grade of student with Canvas ID 151211 on assignment with Canvas ID 486573 in Course with Canvas ID 61126 to a 0
- Test Student on Programming Assignment 01 in the Summer Offering of CSCE 235

Modify Course Information



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Modify Course Information

Student	ID	SIS User ID	SIS Login ID	Section			Programming Assignment 01 (486573)	Programming Assignment 02 (48797
Points Possible							100	
[redacted]								
Test Student	151211		211305d1b5a4728c25ff1a6c2dfc9b3a8d7e34f2	INTR DISCRETE STRUCT	CSCE235	SEC 501 Summer 2019		

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Other Useful Tools

- JSON Parser
  Good for making data user-friendly
- Cron jobs (Mac/Linux) and Windows Scheduler (Windows)
  Good for doing things on a particular schedule

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Drawbacks of the Canvas API

- **POST/PUT**s Definitely **NOT** Instantaneous
  Can be mitigated with scheduled jobs (or patience)

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Other Functions

- All API Resources

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Mobius Assessment

- Formerly MapleTA
- "External Tool" for Assignments on Canvas
- Geared Towards Math/Science
  Low-level control over question appearance, LaTeX-compatible

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CSCE 310
Objectives

- Generalized Problem Solving
- Organizing Data

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CSCE 310
Test Questions

- Demonstrate Understanding of How Specific Algorithms or Data Structures Work
- Solve Specific Instances of Problems from Programming Assignments

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Question 6 (16 points)

Construct a $2-3$ tree for the list `s,w,i,t,z,e,r,l,a,n,d`. Use alphabetical order of the letters for comparison and insert them (in the order provided) starting with the empty tree.

Question

Q6 5/5.0

Fully Graded:	✔
Grade Overridden:	✖
Parts Ungraded:	0

View **Original Response** **Unfiltered Response**

How many ways are there to choose three (3) names from **avery**, **schorr**, **othmer**, **scott**, and **nebraska** so that no more than two (2) names contain an **e**?

Your response	Correct response
9	**9**

Grade: 1/1.0

Total grade: 1.0×1/1 = 100%

Q7 18/18.0

Fully Graded:	✔
Grade Overridden:	✖
Parts Ungraded:	0

View **Original Response** **Unfiltered Response**

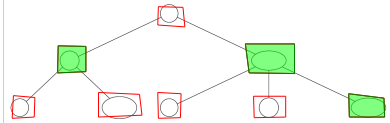
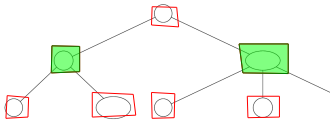
If a 2-3 tree is created from the letters in

```
workmanship
```

such that letters are inserted in the order they appear in the word and are compared by their order in the alphabet, select the nodes that hold **w**, **o**, **s**, and **h**.

For reference, the alphabet is

```
abcdefghijklmnopqrstuvwxyz
```

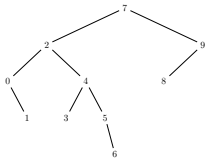
Your response	Correct response
	

Grade: 1/1.0

Total grade: 1.0×1/1 = 100%

Question 5 (16 points)

Inserting values $4, 2, 0, 9, 7, 8, 3, 1, 5, 6$ into an AVL tree results in the following tree (after inserting 6).



This tree violates the definition of an AVL tree. Show the resulting tree after completing a *double left-right rotation (LR-rotation)* on this tree.

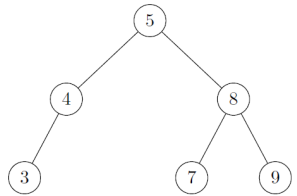
Question

Q5 18/18.0

Fully Graded:	✔
Grade Overridden:	✖
Parts Ungraded:	0

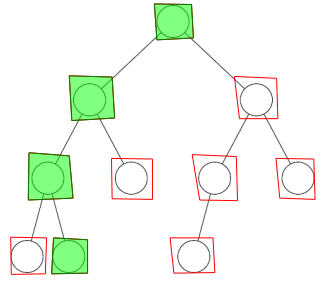
View ◉ **Original Response** ○ **Unfiltered Response**

After inserting the values **5 4 3 8 9 7** into an AVL tree (in that order), the tree looks like this

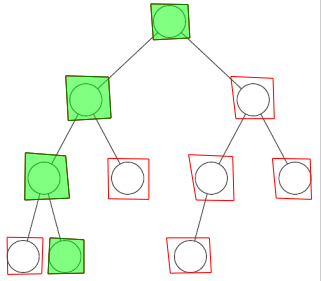


If the values **6 0 2 1** are additionally inserted (in that order), choose the nodes that correspond to **3**, **5**, **1**, and **2**.

Your response



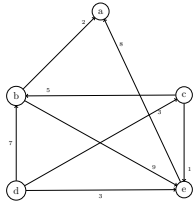
Correct response



Grade: 1/1.0

Question 2 (16 points)

Given the flow network below



What is the maximum flow that can be achieved from the source to the sink?

Question

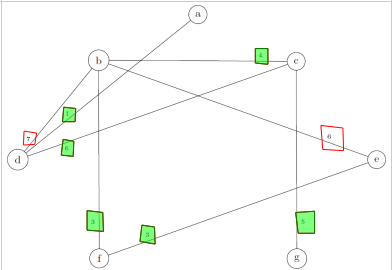
Q8 15/15.0

Fully Graded:	✔
Grade Overridden:	✖
Parts Ungraded:	0

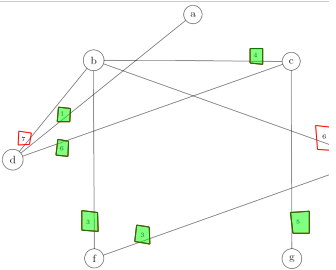
View **Original Response** **Unfiltered Response**

Select the edges (numbers) that will make up the minimum spanning tree for this graph.

Your response



Correct response



Grade: 1/1.0

Total grade: 1.0×1/1 = 100%

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CSCE 322
Objectives

- Generalized Problem Solving
- Processing Data

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CSCE 322
Test Questions

- Demonstrate Understanding of How Specific Programming Languages Processes Work
- Solve Specific Instances of Problems from Programming Assignments

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Question 1 (12 points)

Consider the following pseudocode:

```
1  x : integer

3  procedure set_x(n : integer)
4              x = n

6  procedure print_x
7              write_integer(x)

9  procedure first
10             set_x(3)

12 procedure second
13             print_x
14             set_x(9)
15             first

17 procedure third
18             x : integer
19             x = 8
20             second
21             print_x
22             first

24 set_x(1)
25 first
26 print_x
27 third
28 second
29 print_x
```

(a) What does this program print if the language uses static scoping?

(b) What does it print if the language uses dynamic scoping with deep binding?

(c) What does it print if the language uses dynamic scoping with shallow binding?

```
x : integer

procedure set_x(n : integer)
          x = n

procedure print_x
          write_integer(x)

procedure foo(S,P : function, n : integer)
          x : integer = 5
          if n in {2,4}
             x = n
          else
             S(n)
          if n in {2,7}
             write_integer(x)
          else
             P

set_x(0); foo(set_x,print_x,2)
set_x(8); foo(set_x,print_x,5)
set_x(4); foo(set_x,print_x,7)
set_x(3); foo(set_x,print_x,4)
```

What does this program print if the language uses static scoping?

(a) 0

(b) 2

(c) 3

(d) 4

(e) 5

(f) 7

(g) 8

Question 2 (12 points)

Consider this grammar for prefix notation

$$
\begin{array}{rcl}
EXPR & \rightarrow & NUM \mid ID \mid -NUM \\
EXPR & \rightarrow & OP\ EXPR\ EXPR \\
NUM & \rightarrow & \texttt{0-9} \\
ID & \rightarrow & \texttt{a-z} \\
OP & \rightarrow & + \mid - \mid * \mid /
\end{array}
$$

(a) Provide the parse tree for the input `+-4*2y`, starting with rule $EXPR$.

(b) Is this language ambiguous? If so, provide an alternate parse tree for `+-4*2y` to prove it. If not, why not?

Question 5: (12 points)

Consider this grammar for prefix notation

```
expr -> number | id | -number

expr -> op expr expr

number -> 0-9

id -> a-z

op -> + | - | * | /
```

Select the valid parse tree(s) for the input (starting with the expr rule)

```
+-4*2y
```

(a)

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General Goals

- Partial Credit for Partial Understanding
- Minimal Hints from Form of Response

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Testing Platforms

- Canvas “Quizzes”
- Mobius Assessment (through Canvas)

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"Multiple Answer" Question Scoring

$$\max\left(\frac{\text{Correct Chosen} - \text{Incorrect Chosen}}{\text{Correct Possible}}, 0\right)$$

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Canvas "Quizzes" Questions

- Pretty Simple Interface
- No Clickable Images
- No Choice of Horizontal/Vertical Answer Orientation (Vertical by Default)

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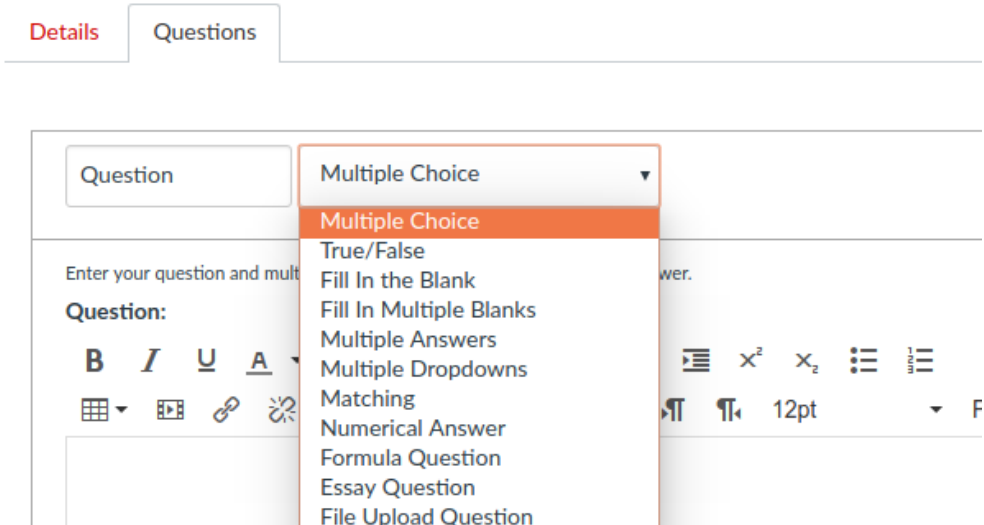
Canvas "Quizzes" Questions



Testing Platforms
MapleTA

- Low-level Control over Presentation
- LaTeX and MathML

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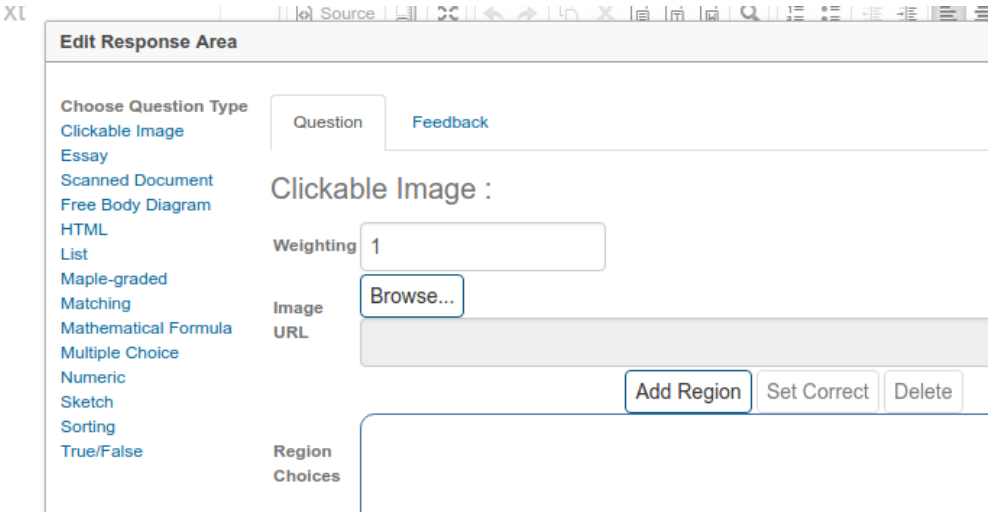

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Clickable Images

- Any Image Format (Should) Work

  Could screenshot vector graphics and insert cropped image
- Wikimedia Commons
- TEXample.net
- Demos for gnuplot

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