CSCI 232:
Data Structures and Algorithms

Lecture 1: Syllabus, and Logistics

Reese Pearsall

Summer 2023

What do you need to dig a hole?

We have many tools that will dig a hole

What do you need to dig a hole?

We have many tools that will dig a hole

Best tool for the job?

What do you need to dig a hole?

We have many tools that will dig a hole

Best tool for the job?

Burying your pet goldfish

What do you need to dig a hole?

We have many tools that will dig a hole

Best tool for the job?

Building Express tunnel to Bridger Bowl

What do you need to dig a hole?

We have many tools that will dig a hole

Best tool for the job?

Creating the foundation for a house

What do you need to dig a hole?

We have many tools that will dig a hole

Best tool for the job?

Digging a Well for water

We can’t use the best tool for the job unless we know that tool exists!

What do you need to dig a hole?

	Pros	Cons
	• Cheap • Precise • No Training • Availability	• Slow • Labor
	• Fast • Labor	• Expensive • Training
	• Really good at digging	• Takes up a lot of garage space

Each tool has their pros, cons, and **tradeoffs**

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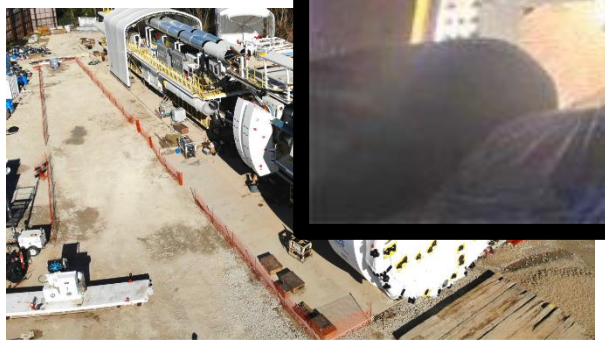
What do you need to dig a hole?



Pros

Cons

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a lot of

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Each tool has their pros, cons, and **tradeoffs**

What do you need to dig a hole?

Pros	Cons
	• Slow • Labor

Each tool has their pros, cons, and **tradeoffs**

We can't use the best tool for the job unless we know <u>how to use</u> that tool

garage space

CSCI 232- Data Structures and Algorithms

“Tools”

- Arrays
- Linked Lists
- Stacks/Queues
- **Hash Tables**
- **Trees**
- **Graphs**

“Use of tools”

- Sorting
- Searching
- Routing

A **data structure** is a mechanism for storing and organizing data

An **algorithm** is a series of instructions to be followed to solve some problem

Our Goals for the Summer

- Code (a lot)
- Learn important data structures we can use in our programs (Trees, Hash Tables, Graphs)
- Learn how we can use those data structures to solve problems (Searching, Sorting, Routing)
- Learn techniques used by algorithms to solve a variety of problems (Greedy, Dynamic Programming, Divide and Conquer)
- Analyze the complexity and runtime of the algorithms that we write (Big-O notation)

Reese Pearsall (pierce-all)

First year Instructor @MSU
B.S & M.S @ MSU

Interests

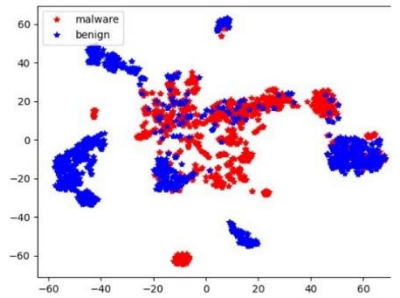
- Cybersecurity
- Malware analysis and detection
- Cybercrime
- Computer Science Education

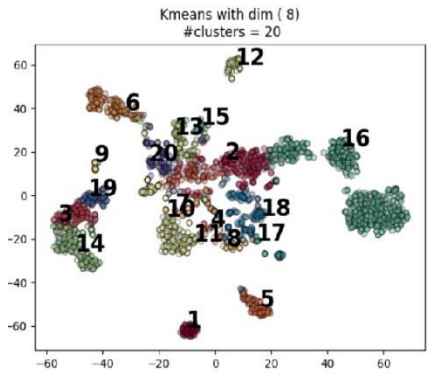
Hometown

- Billings, MT

Teaching

- CSCI 132
- CSCI 455
- CSCI 476





Experience

- Software Engineer and Tester, Techlink (Bozeman)
- Software Engineer, United States Air Force (Hill AFB, Utah)
- Software Engineer, Hoplite Industries (Bozeman)
- Graduate Researcher, MSU (Bozeman)

Outside of academia

- Video games, New England Patriots, Fantasy Football, ~~TikTok~~, Movies, Memes, *The Bachelor*, Naps

Contact

Email: reese.pearsall@montana.edu (I will respond as soon as I can)

Office Hours: Tuesdays and Thursdays 12:30 – 1:30 PM and during lab time

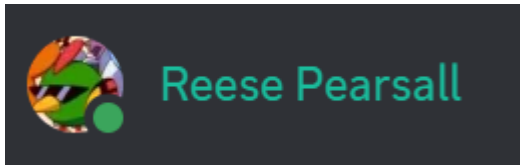
Office: Barnard Hall 361

Webex Room: https://montana.webex.com/meet/b37k331

You can schedule a time to meet with me via my appointment scheduler (Link TBD)

Not available on Fridays

I am also very responsive on Discord! (Reese#7171)



Course Logistics (Lecture)

Class Meetings
MTWR: 10:00 AM – 12:20 PM
Barnard Hall 126
*there will be a few days where we must meet somewhere else

- All lectures will be recorded and put on the website (this class can be taken fully remotely), and maybe even livestreamed?

- I will lecture for about 60-90 minutes each day, and remaining time will be “lab time”

- We will be doing lots of live coding during lecture, so it might be helpful if you bring your own laptop to class (if you would like to code along)

Course Logistics (“Lab”)

- 11:00/11:30-ish to 12:20 PM

(depending on how long I lecture for)

Locations: Barnard Hall 254

Attendance is not required

I will be available virtually (via Webex) and in-person to help with any assignments

Taking a Summer Class

This is a 6-week Summer class. We cover 16-weeks of content in only 6 weeks.

This class moves fast, and you can expect 1-2 assignments due every week.

Do not fall behind, and do not slack off, otherwise this class will be tough

You probably won't learn as much compared to a 16-week offering of 232 ☺

Be ready to put in several hours a week into this class.

I am very flexible– I understand people have summer plans and are working part-time/full-time. If you need anything just let me know

This class can be taken fully online/remotely

Course Logistics

You will be visiting this website a lot… be sure to bookmark it!

https://www.cs.montana.edu/pearsall/classes/summer2023/232/main.html

(This schedule will change a lot)

CSCI 232: Data Structures and Algorithms

Summer 2023

Quick Links

-Syllabus

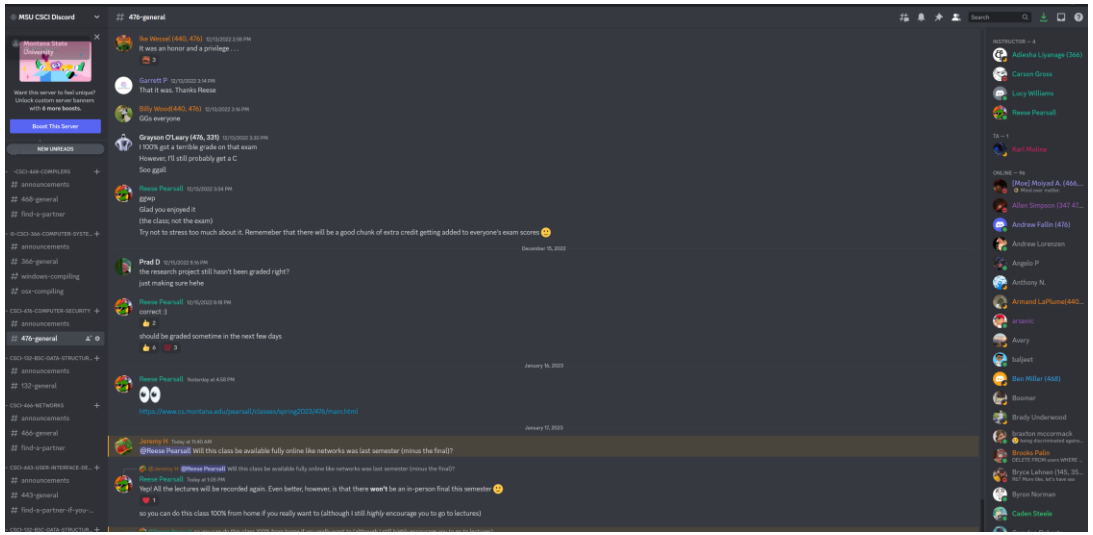
-Reese's Webex Room

-Reese's Appointment Scheduler

-Discord

Date	Topic	Reading	Slides + Lecture Recording	Assignment
Monday May 15th	Syllabus, Java Review			Please fill out the course questionnaire
Tuesday May 16th	Stacks, Queues, LinkedLists			
Wednesday May 17th	Trees			Lab 1
Thursday May 18th	Trees			
Sunday May 21st				
Monday May 22nd	Trees			Lab 2
Tuesday May 23rd	Trees			
Wednesday May 24th	Trees			Lab 3
Thursday May 25th	Trees/Quiz 1			
Sunday May 28th				Program 1 Due (Trees)
Monday May 29th	Hash Tables			
Tuesday May 30th	Hash Tables			
Wednesday 31st	Hash Tables			Lab 4
Thursday June 1st	Hash Tables			

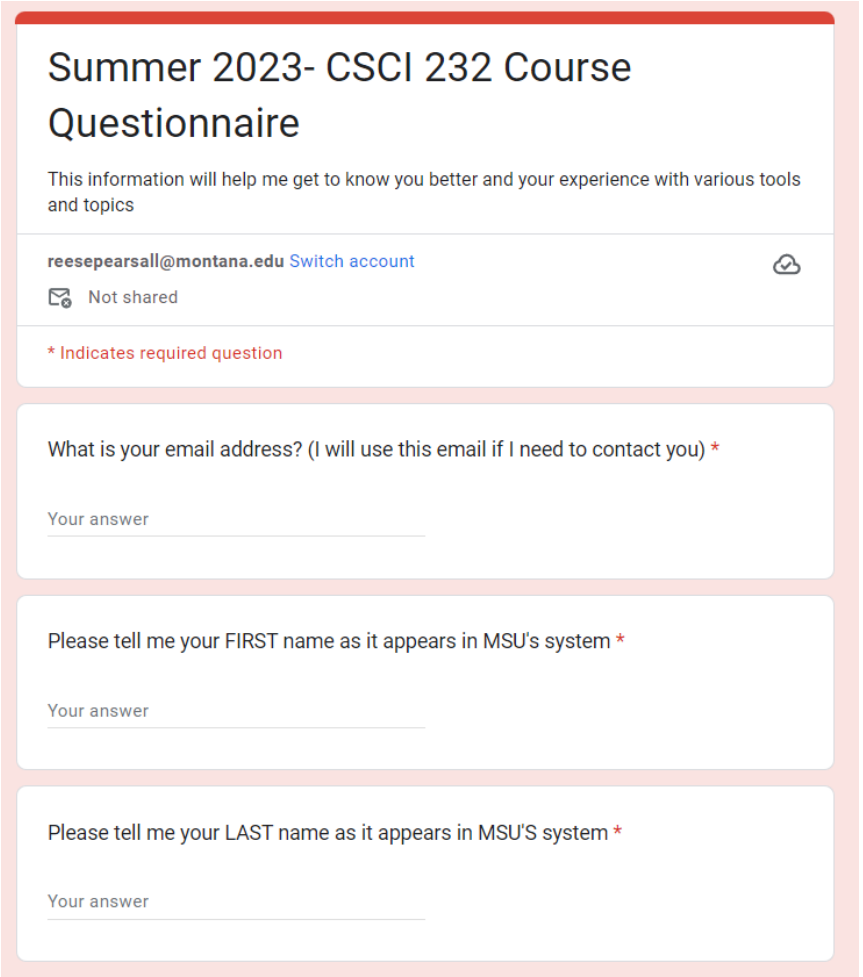
You also will need to join our **discord** server!



Get 232 notifications
by typing `!join-232`

Course Questionnaire

Please take some time this week to fill out the course questionnaire ☺



Summer 2023- CSCI 232 Course Questionnaire

This information will help me get to know you better and your experience with various tools and topics

reesepearsall@montana.edu Switch account

Not shared

* Indicates required question

What is your email address? (I will use this email if I need to contact you) *

Your answer

Please tell me your FIRST name as it appears in MSU's system *

Your answer

Please tell me your LAST name as it appears in MSU'S system *

Your answer

Prerequisites

- CSCI 132- Basic Data Structures and Algorithms (Required)
- CSCI 246- Discrete Structures (Recommended)

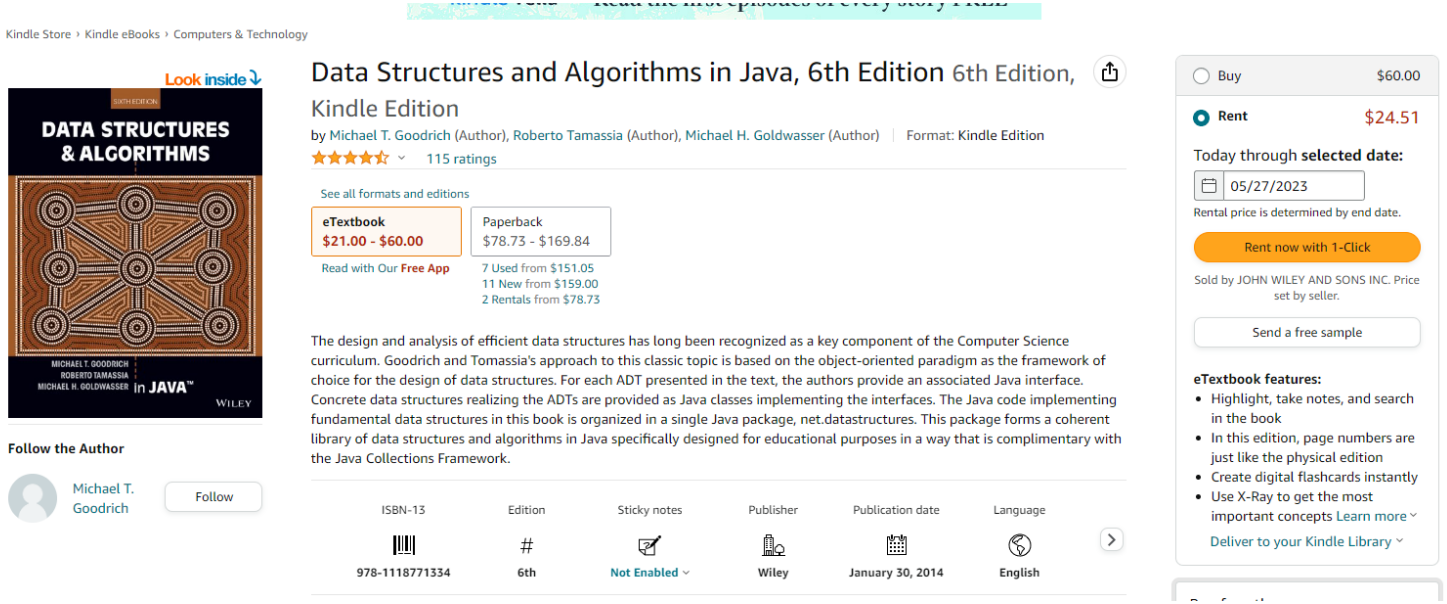
*You will be totally fine if you have taken 246

Before taking this class, you should feel comfortable basic Java programming, be comfortable using the following data structures: arrays, linked lists, stacks, queues, be comfortable with basic recursion, and how to analyze an algorithm using big-O notation

(If you are not familiar with any of this stuff, you should take some time to review it this week. My CSCI 132 course is available and may be helpful)

Textbook

- (Optional) Algorithms (4th Edition) by Sedgewick and Wayne.
- (Optional) Data Structures and Algorithms in Java, 6th Edition by Goodrich, Tamassia, and Goldwasser (CSCI 132 textbook)



unfortunately, a very relatable meme

This textbook is **not** required
(but it does have tons of great stuff!!)

We have one TA, who will grade all your labs and programs

Adiesha Liyanage

Email: (see syllabus)

Office Hours: (see syllabus)

If you have any questions about grades, you should ask him first. He can also help with 232 assignments

Grading

- 35% - Labs (7 labs @ ~5% each, I will drop your lowest grade)
- 40% - Programs (4 programs @ 10% each)
- 15% - Online Quizzes (3 quizzes @ 5% each)
- 10% - Participation/Check-in

Grading

Labs (35%)

- Shorter, weekly assignments (1-2 a week)
- Can generally be finished within 1-2.5 hours
- Due @ 11:59 PM on specified day to D2L (submit .java files)
- I will post the labs a few days ahead of time
- You can get help by coming to “lab”, office hours, or my Webex room
- 8 labs in total, but I will drop your lowest lab grade at the end of the semester
- You can work alone or with a partner

Grading

Programs (40%)

- Longer, more complicated programming assignments
- Will likely take 2+ hours to complete
- I will try to give you at least a week to complete them
- Programs will usually be at 11:59 PM on the specified date (submit .java files)
- Much higher stakes, make sure you give yourself plenty of time to complete them
- You can get help by coming to “lab”, office hours, or my Webex room
- You can work alone or with a partner

Quizzes (15%)

Three quizzes (End of weeks 2, 4, and 6)

Will be administered through D2L

- Will open at 6 AM, must be completed by 11:59 PM
- Not timed, but you only get 1 attempt

Should take less than 1 hour. Questions consist of multiple choice, true/false, and short answer, maybe a little bit of coding

Participations/Check-in (10%)

Helps me make sure you are keeping up and doing ok in the class

Very easy 10%. You can earn these points in a variety of ways

- Attend lecture (don't need to attend all of them)
- Attend "lab" or office hours

- Schedule a check-in meeting with Reese (Office hours or appointment scheduler)

If you are taking the class fully online, you need to meet with me at least <u>twice</u> during the summer (short check-in meeting)

Late assignment policy

- If you submit late, but you are within < 24 of the original. You will face a -25% penalty
- If you submit late, but you are within < 48 of the original. You will face a -50% penalty

Any assignment submitted 48+ hours after the deadline will **not** be accepted

Grading Scale

- 93+: A
- 90+: A-
- 87+: B+
- 83+: B
- 80+: B-
- 77+: C+
- 73+: C
- 70+: C-
- 67+: D+
- 63: D
- 60: D-

At the end of the semester, if you are within 1% of the next letter grade, I will bump you up

IDE

You will need to download an IDE that you can write Java programs in

- Eclipse (I will use this one)
- Netbeans
- IntelliJ

Grading Deductions

You must submit code that **compiles**. Code that does not compile will receive an automatic 0%.

If your code compiles and runs, but doesn't work, or has errors later on, that is ok.

Adiesha or I should not need to fix your code in order for it to compile

Plagiarism and cheating is very not cool

You are **not** allowed to submit something that is not your own, and you are **not** allowed to steal solutions from another person and modify it

I have a Chegg and Course Hero membership. **Don't try it**

Do not use any tools or AI that will write code for you

Using small snippets of code from the internet is acceptable *(but should not be needed).* If you do use a small snippet of code from the internet, you should leave a reference as a comment in your code

Collaboration Policy

All labs will be individual submissions.
For programs, you are allowed to work with **one** partner.

When it comes to labs, you *may*

- Share ideas with other students in the class.
- Work together on labs in the same physical location.
- Help other students troubleshoot problems.
- Give hints or provide textbook page numbers/slide numbers to students seeking help

You may *NOT*

- Share your code and solutions directly with other students.
- Submit solutions that you did not write.
- Modify another student's solution and claim it as your own.
- Share your report or solutions directly on Discord

Additional MSU Resources:

https://www.cs.montana.edu/pearsall/classes/msu_resources.html

Diversity Statement

Montana State University's campuses are committed to providing an environment that emphasizes the dignity and worth of every member of its community and that is free from harassment and discrimination based upon race, color, religion, national origin, creed, service in the uniformed services (as defined in state and federal law), veteran's status, sex, age, political ideas, marital or family status, pregnancy, physical or mental disability, genetic information, gender identity, gender expression, or sexual orientation. Such an environment is necessary to a healthy learning, working, and living atmosphere because discrimination and harassment undermine human dignity and the positive connection among all people at our University. Acts of discrimination, harassment, sexual misconduct, dating violence, domestic violence, stalking, and retaliation will be addressed consistent with this policy.

Inclusivity Statement

I support an inclusive learning environment where diversity and individual differences are understood, respected, appreciated, and recognized as a source of strength. We expect that students, faculty, administrators and staff at MSU will respect differences and demonstrate diligence in understanding how other peoples' perspectives, behaviors, and worldviews may be different from their own.

Counseling

In addition to eating right, taking breaks when you need them, and getting enough sleep, you may benefit from talking to a professional counselor if you think stress could be impacting your health. Here is a blurb and some links from MSU's Counseling & Psychological Services: MSU strives to create a culture of support and recognizes that your mental health and wellness are equally as important as your physical health. We want you to know that it's OK if you experience difficulty, and there are several resources on campus to help you succeed emotionally, personally, and academically:

- Counseling & Psychological Services: montana.edu/counseling
- Health Advancement: montana.edu/oha
- Insight Program (Substance Use): montana.edu/oha/insight
- Suicide Prevention: montana.edu/suicide-prevention
- Medical Services: montana.edu/health/medical.html
- WellTrack: montana.welltrack.com/register

Civil Rights

There should be no discrimination or harassment for anyone at MSU. If you notice anything that seems to violate that principle, the Office of Institutional Equity can help. As an employee of MSU, I am a mandatory reporter, which means if I learn of any discrimination or harassment at MSU, I am obligated by my contract to report it.

Hamilton Hall, Offices 114, 116, and 118

How to do well in this class

- Keep up. Come to class or watch the lectures *the day of*

- Get started on assignments early (especially programs)!
- Get help when you need it
- Enjoy your summer first

Questions?

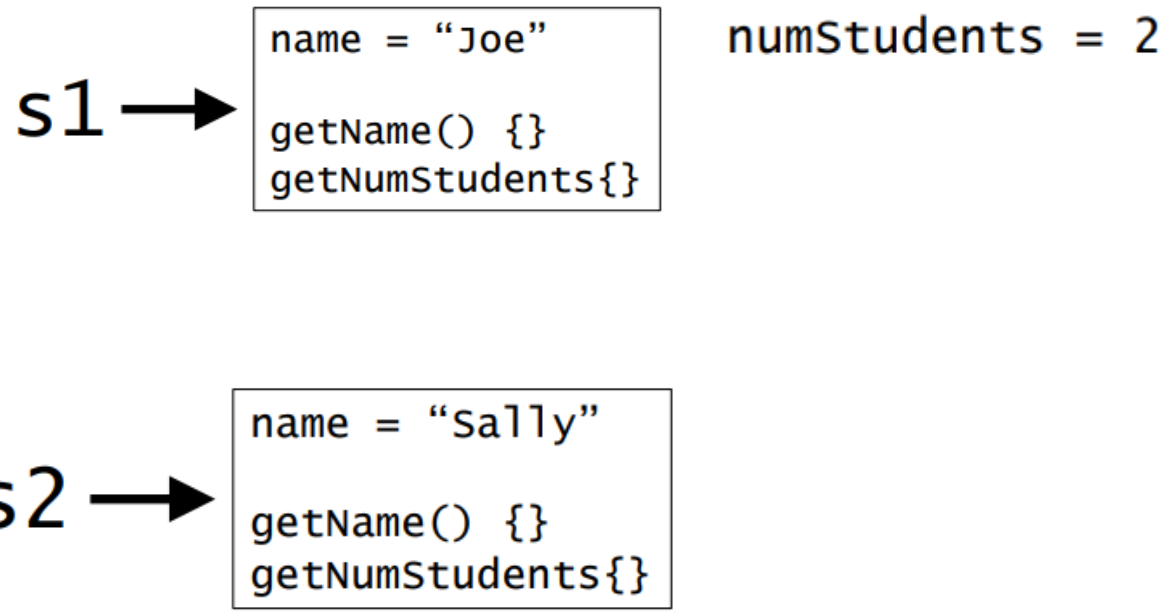
Student.java

```
public class Student {

      private String name;

      private static int numStudents;

      public Student(String name) {
            this.name = name;
            numStudents++;
      }

      public String getName() {
            return name;
      }

      public int getNumStudents() {
            return numStudents;
      }
}
```

Java Class: Blueprint for an object (i.e., a "thing").

StudentDatabaseDemo.java

```
Student s1 = new Student("Joe");
Student s2 = new Student("Sally");

System.out.println(s1.getName());
System.out.println(s1.getNumStudents());
```



Java Objects: Instances of classes. Program entities.