CodeHS

Hour of Code: Teacher Guide

Important Note: If students are accessing this hour of code without logging in to a CodeHS account, the programs they write during each exercise will **NOT SAVE** when they continue on to a new exercise. They should be reminded to **copy** their code from each exercise to use in the following exercises or they will not have access to it once they continue on with the activity.

This is an advanced Hour of Code. It is designed for first or second year Computer Science students. While many concepts and ideas are covered in this lesson, students should understand how to create variables, use data structures and print before attempting this Hour of Code.

Before the Hour of Code:
- Make sure student computers have an up-to-date browser (Chrome, Safari, or Firefox).
- Read through teacher notes in this document. Download notes to have exercise solutions ready.

During the Hour of Code:
1. Direct students to **codehs.com/hoc/data_visualization**
2. Allow students to work through Hour of Code at their own pace, providing encouragement and support when needed. See tips below for handling student questions.
3. Tweet pictures or stories at @CodeHS #ReadWriteCode #HourOfCode!
4. If time allows at the end of the period, facilitate a discussion around the Hour of Code using the following guiding questions:
   - Before today, what did you think about programming or coding?
   - Did any of these ideas change during the Hour of Code?
   - What was your favorite part of the Hour of Code?
   - Did any parts of the Hour of Code challenge you? How?

Hour of Code Tips:
If students get stuck or have questions, it is okay if you don't have the answer! Ask questions to activate their problem-solving skills such as:
- What can we try differently?
- What do you want the program to do? What are you telling the program to do?
- How can we break this problem into smaller steps?

Thank you for your dedication to Computer Science Education!

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Interested in going beyond the Hour of Code?
Reach out to us at hello@codehs.com.

In this Hour of Code, students will learn about how data visualizations are created, and how they are used to help represent data in meaningful ways. Students will get practice developing data visualizations using a graph generator, as well as coding their own visualizations by hand.

Objective

Students will be able to …
- Create data visualizations from pre-existing datasets
- Analyze datasets and draw conclusions based on data visualizations
- Discover meaningful datasets and present them visually

Link to Activity: codehs.com/hoc/data_visualization

Discussion Questions Before Class
- What is data? What opinions do you have about it?
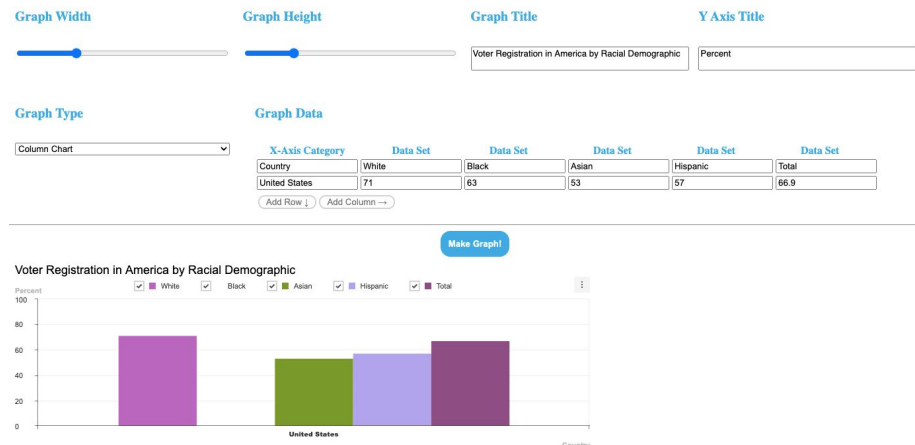- What is data visualization? How is it used, and why is it important?

Discussion Questions After Class
- What are some types of visualizations that you learned about today, and how can they be used to represent data?
- Did you learn anything from the data visualizations that you created? What conclusions were you able to make?
- Is data always used for good? Why or why not?

Exercise Solutions

Charting Voter Registration	
Description	Data visualizations can be helpful to see differences and trends in data that might not be visible when looking at the raw numbers. In this activity, we are going to create a data visualization to better understand voter registration data in the United States. To start, we are going to look at registration data for the United States as a whole. Here is some data about U.S voter registration by demographic from the Kaiser

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	Family Foundation: https://www.kff.org/other/state-indicator/voting-and-voter-registration-as-a-share-of-the-voter-population-by-raceethnicity/?currentTimeframe=0&sortModel=%7B%22colId%22:%22Location%22,%22sort%22:%22asc%22%7D Plug this data into the chart generator tool to create a data visualization. You will need to add a few columns in order to get all of the demographic data added to the graph. Once the graph is created, consider the following questions: 1. Which of the demographics have a higher percentage of registered voters than the national average? Which have a lower percentage? 2. What factors do you think contribute to the differences in voter registration between demographic groups? 3. Do you think voter registration in the United States is higher than you expected or lower? Why or why not? 4. What solutions can you think of to increase voter registration in America?
Motivation	Students get practice using a data visualization tool to analyze a basic data set. This visualization should allow them to draw conclusions about America's voter registration system.
Solution	This is a snapshot of the data correctly input into the data visualization tool:
Common Questions	**How am I supposed to input the data?** The X-axis category should have the x-axis label in the first column, and any x-axis categories in the columns that follow. Each data-set column is a different dataset that is

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	associated with that x-axis category. In this example, the United States should be the x-axis, and each racial demographic should be a dataset associated with the United States. Take a look at the solution for more guidance!

Coding the Registration Data	
Description	In this exercise, we are going to create the same voter registration graph as we did with the chart generator, except this time you are going to code the data into a working JavaScript program. There are two files in this exercise, `index.html` and `graph.js`. You will only have to make changes to `graph.js` in order to get your graph to work. To complete this exercise, you will have to complete three tasks - 1. Input the data - In the variable `data` there is an attribute called `series`. Follow the directions in the comment to successfully input the voter registration data: 2. Label your Y-axis - The variable `options` has an attribute `yAxis` - follow the comments and plug in the y-axis label there. 3. Label your X-axis - The variable `options` has an attribute `xAxis` - follow the comments and plug in the x-axis label there. When you've input all the data, click the Run Code button - your data visualization will appear in the console! **Challenge!** Can you figure out how to change the graph's width and height? Check out the `options` variable!
Motivation	Students get an opportunity to recreate the previous visualization, this time by coding the solution. Students learn how the graph generator is built and relies on computer science to work correctly.

Solution	```//The data object has two properties - categories and series```
	
	```//categories stores a list of values that will be used as the name of each data point```

```
//series contains the different data sets. Each index in the data corresponds
to an index in categories

var data = {

    //The categories attribute should be filled with the x-axis value

    categories: ["United States"],

    //The series attribute has two values, name and data.

    //name is the name of the data category and the data should be the data
entry

    //In our case, name should be "White", and data should be [71]

    series: [

        {

            name: 'White',

            data: 71

        },

        {

            name: 'Black',

            data:63

        },

        {

            name: 'Asian',

            data:54

        },

        {

            name: 'Hispanic',

            data:53

        },

        {

            name: 'Total',

            data:66

        }

    ]
```

```
};


//options contains options for formatting the chart.

//Try playing around with the different options to see how the chart changes!

var options = {

    chart: {

        width: 1000,

        height: 500,

        title: 'Voter Registration Data by Demographic',

        format: '1,000'

    },

    yAxis: {

        //Label the y-axis here!

        title: 'Percent',

        min:0,

        max:100

    },

    xAxis: {

        //Label the x-axis here!

        title: 'Location',

    },

     series: {

         showLabel: true

    }

};

//Initialize a chart object

//Don't worry about this code!

var chart = tui.chart;

var container = document.getElementById('chart-area');

//columnChart creates the chart in the index.html file
```

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	`chart.columnChart(container, data, options);`

Common Questions	**I can't get the data to load correctly!**
	
	Make sure that each dataset has its own bracket. The structure should be:
	
	{
	   name: 'Demographic',
	   data: Percent
	}
	There should be a comma after the name, which may give students trouble if they accidentally delete it.
	
	What's the index.html file for?
	That's where the graph is actually being created. If students want to learn more about this, we recommend checking out our Web Development course!

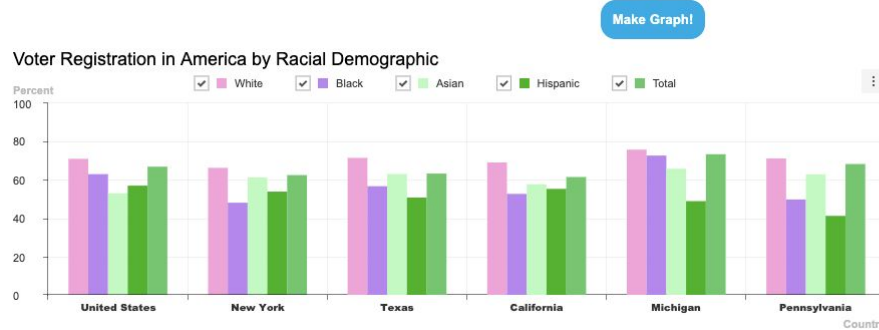|	
Charting Registration Data by State	
Description	Now that we are more familiar with the chart generator, let's add some additional data points to the voter registration graph. For this exercise, you are going to choose **5 States** and add their registration data. To find individual state data, head to the Kaiser Family Foundation's website: (https://www.kff.org/other/state-indicator/voting-and-voter-registration-as-a-share-of-the-voter-population-by-raceethnicity/?currentTimeframe=0&sortModel=%7B%22colId%22:%22Location%22,%22sort%22:%22asc%22%7D . Here you will find the racial demographic data by state. Choose 5 states to add to your chart and plug in the information appropriately. You will need to add 5 additional rows to your chart in order to log the state data. When your chart is complete, answer the following questions: 1. Was the national trend similar to the trend that you notice in each individual state? 2. Were there any states who's voter registration data stood out to you? Why? 3. Why is it important for states to have similar voter registration data? 4. What steps should we take to increase voter registration across states?
Motivation	Students get practice developing more sophisticated data visualizations that allow them to compare multiple datasets side by side.

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Solution	This is a snapshot of the data correctly input into the data visualization tool: **Graph Data** | X-Axis Category	Data Set	Data Set	Data Set	Data Set	Data Set
---	---	---	---	---	---
Country	White	Black	Asian	Hispanic	Total
United States	71	63	53	57	66.9
New York	66.3	48.1	61.3	53.9	62.5
Texas	71.5	56.7	63.1	50.8	63.3
California	69.1	52.7	57.7	55.3	61.5
Michigan	75.8	72.7	65.8	48.9	73.4
Pennsylvania	71.2	49.8	62.9	41.2	68.3	 (Add Row ↓) (Add Column →) **Make Graph!** Voter Registration in America by Racial Demographic ☑ ■ White ☑ ■ Black ☑ ■ Asian ☑ ■ Hispanic ☑ ■ Total Percent 100 80 60 40 20 0 United States New York Texas California Michigan Pennsylvania Country
Common Questions	**How am I supposed to input the data?** The X-axis category should have the x-axis label in the first column, and any x-axis categories in the columns that follow. Each data-set column is a different dataset that is associated with that x-axis category. In this example, the United States should be the x-axis, and each racial demographic should be a dataset associated with the United States. Each subsequent state should be a new row in the table. Simply add a new row, input the state name, and then input the data in the correct field for each demographic. Take a look at the solution for more guidance!

The subsequent activity - **Chart Your Own Graph!** enables students to create their own data visualization by retrieving data from a dataset of their choosing. Students can choose their data from one of the following:

1. Kaiser Family Foundation: https://www.kff.org/statedata/
2. Five Thirty Eight: https://data.fivethirtyeight.com/

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3. Socrata: https://opendata.socrata.com/
4. GitHub's Awesome Public Data Sets: https://github.com/awesomedata/awesome-public-datasets

Once students have chosen a dataset, they can feel free to create a visualization of their choice!