In [1]:
```python
from algebra_with_sympy import *
import JPSLUtils
JPSLUtils.JPSL_Tools_Menu()
JPSLUtils.record_names_timestamp()
# Initialization -- Computer: jonathan-XPS-13-7390 | User: jonathan | T
# Partners: test
# Initialization -- Computer: jonathan-XPS-13-7390 | User: jonathan | T
# Partners: test2
```

Initialization -- Computer: jonathan-XPS-13-7390 | User: jonathan | Time: Thu May 26 13:32:36 2022

Practice Measuring

Solid metal blocks containing 1 mole of atoms

From the four samples provided on your bench each pair should choose one small sample and one large sample. Record the element each sample is made of in the table below. Use the "Table Actions" menu to edit the table. Save after making entries.

Information in Table 1 (2.5 pts)

Table 1: Measurement of solid blocks

Table Actio ⌄	Element	Length (cm)	Width (cm)	Height (cm)	Initial water volume (mL)	Final water volume (mL)	Mass (g)
Sample #1							
Significant Digits (#1)	XXXX						
Decimals (#1)	XXXX						
Sample #2							
Significant Digits (#2)	XXXX						
Decimals (#2)	XXXX						

Liquid water near room temperature

Use the table below to record your measurements on water.

Information in table 2 (2 pts)

Table 2: Measurements of water

Table Actions ⌄	Volume in Grad. Cyl. (mL)	Mass in Cyl. (g)	Buret Initial (mL)	Buret Final (mL)	Mass water delivered (g)
Measurement					
Significant Digits					
Decimals					

Calculations for the metal blocks

1. (1 pt) Calculate the volume of the metal blocks based on the ruler measurements. V = l*w*h , where V = volume, l = length, w = width and h = height. Use the code cell immediately below. **Include Units**. If you ran the example cells since opening this notebook the units of cm and m are already defined. You recorded the dimensions you need in Table 1

In [ ]: ```
Use this cell to calculate the volume of sample 1.
```

In [ ]:  ```
# Use this cell to calculate the volume of sample 2.
```

2. (0.5 pts) Calculate the density of the metal blocks based on your mass measurement and the volume calculated from the ruler measurements. D = m/V , where D = density, m = mass and V = volume. You will have to define the g symbol for the units of grams. Use comments to indicate which block you are doing the calculation on. Note that 1 cm**3 = 1 mL .

In [ ]:

In [ ]:

3. (0.5 pts) Calculate the volume of the blocks measured by water displacement (difference between the final and initial volumes). *You will need to define the unit of mL.*

In [ ]:

In [ ]:

4. (0.5 pts) Calculate the density of the metal blocks using the volume measured by water displacement. Note that 1 cm**3 = 1 mL .

In [ ]:

In [ ]:

Calculations for water (1 pt)

1. Calculate the density of the water using your graduated cylinder measurements. If you need additional *code cells* you can add them using the "Insert" menu. Your data is in Table 2.

In [ ]:

2. Calculate the volume of water delivered from the buret.

In [ ]:

3. Calculate the density of the water using your buret measurements.

In [ ]:

Results summary

Information in table 3 (2 pts)

Table 3: Results of calculations for solid blocks.

Table Action ⌄	Element	Mass (g)	V using ruler (mL)	V using grad. cyl. (mL)	D using ruler (g/mL)	D using grad. cyl. (g/mL)
Sample 1	from table 1	from table 1				
Sample 2	from table 1	from table 1				

Information in table 4 (1 pt)

Table 4: Density of water calculations.

Table Actions ⌄	Mass of water (g)	V of water (mL)	Density (g/mL)
Using grad. cyl.	from table 2	from table 2	
Using buret	from table 2		

Post lab questions

1. (1 pt) For the metal blocks which measurement methode gave the moste precise value for the density? Explain your reasoning.

Double click on this text to replace with your answer

2. (1 pt) Do you think any of your measurements of the metal block were erroneous? If so, which ones and what do you think the error was?

Double click on this text to replace with your answer

3. (1 pt) Which method produced the most precise density for water? Explain your reasoning.

Double click on this text to replace with your answer

4. (1 pt) Compare your water densities with the literature value. Which method produced the most accurate density for water?

Double click on this text to replace with your answer

Prepare this document to turn in

To convert this notebook to a lab report to turn in you need to hide the majority of the instruction and informational cells and make a .pdf document.

1. Your instructor has already chosen the cells they want hidden. To hide them select "Hide Cells" from the JPSL Tools menu.
2. To make a pdf you must use the Browser's print capabilities. In most user interfaces this option is hidden in the little collapsed menu at the upper right of the browser window. On a macintosh it can be found in the file menu. Select "Print" and then set the destination to

"Save to PDF". Make sure to save the file in a location you can find (your "Desktop" or maybe "Documents" directory). **Do Not use the options in the Jupyter "File" menu.**

3. It is a good idea to open the created document to make sure it is OK.
4. When everything is OK, save this document one more time and then close it using the "Close and Halt" option in the Jupyter "File" menu.
5. Turn in both the pdf and ipynb version of this notebook.

NB: Currently, the print to pdf output from Chrome is a little closer to what is displayed on the webpage. Unfortunately, which browser renders the best pdfs changes quite rapidly.

In [ ]: