Perhaps you've seen a chart like this, which shows **blood alcohol content** (BAC) in terms of body
weight and number of alcoholic drinks consumed.
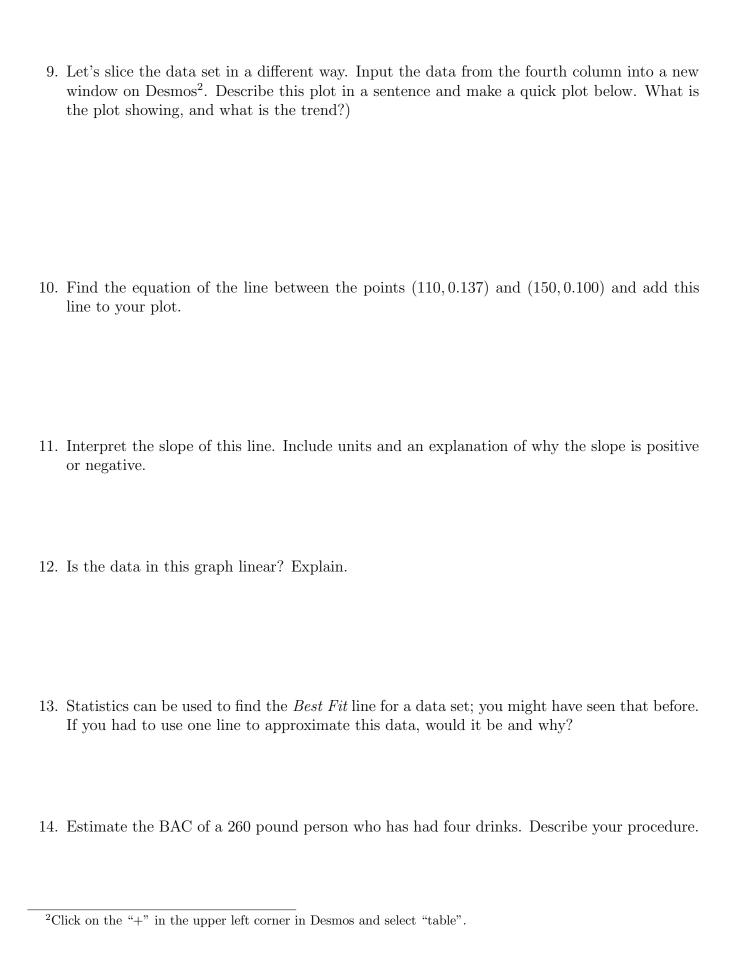
NUMBER OF DRINKS

BODY WEIGHT	1	2	3	4	5	6	7	8	9	10	11	12
100 lb.	.038	.075	.113	.150	.188	.225	.263	.300	.338	.375	.413	.450
110 lb.	.034	.066	.103	.137	.172	.207	.241	.275	.309	.344	.379	.412
120 lb.	.031	.063	.094	.125	.156	.188	.219	.250	.281	.313	.344	.375
130 lb.	.029	.058	.087	.116	.145	.174	.203	.232	.261	.290	.320	.348
140 lb.	.027	.054	.080	.107	.134	.161	.188	.214	.241	.268	.295	.321
150 lb.	.025	.050	.075	.100	.125	.151	.176	.201	.226	.251	.276	.301
160 lb.	.023	.047	.070	.094	.117	.141	.164	.188	.211	.234	.258	.281
170 lb.	.022	.045	.066	.088	.110	.132	.155	.178	.200	.221	.244	.265
180 lb.	.021	.042	.063	.083	.104	.125	.146	.167	.188	.208	.229	.250
190 lb.	.020	.040	.059	.079	.099	.119	.138	.158	.179	.198	.217	.237
200 lb	.019	.038	.056	.075	.094	.113	.131	.150	.169	.188	.206	.225
210 lb.	.018	.036	.053	.071	.090	.107	.125	.143	.161	.179	.197	.215
220 lb.	.017	.034	.051	.068	.085	.102	.119	.136	.153	.170	.188	.205
230 lb.	.016	.032	.049	.065	.081	.098	.115	.130	.147	.163	.180	.196
240 lb.	.016	.031	.047	.063	.078	.094	.109	.125	.141	.156	.172	.188

Note that this data is not a perfect predictor: "factors like how much food the person has eaten,
how much sleep the person has gotten, and even the person's overall physical and mental health
all affect how the person responds to alcohol and drug use." (dmv.org) Note that in Minnesota the
legal limit for driving is 0.08 %, and an arrest can result in 90 days in jail and/or a $1,000 fine.
Consequences are harsher at a BAC of 0.16 %, and drivers (especially those under 21 years old) can
be charged even with a BAC under 0.08 %.

1. What is the meaning of the value .132 from near the middle of the table?

2. Let's focus on a small piece of this table, the second row. This represents the BAC for a
   person who weighs 110 pounds. Does BAC increase by roughly the same amount for each
   additional drink? Explain.

3. We will call the number of drinks d and the BAC a. Find the equation of the line through the points $(1, 0.034)$ and $(4, 0.137)$. Write your line in the standard form of $a = md + b$.

4. What is the slope of your line? What are the units of that slope? What does the value mean?

5. In this course we will refer to that slope as the average rate of change. So we found the average rate of change between 1 and 4 drinks. Now find the average rate of change between 4 and 8 drinks.

6. Are your two rates of change the same? How do they compare? What does it mean if they are different?

7. Let's look at this data visually. We will use the online tool (or phone app) Desmos[1] to make plots and graphs this semester. Use the link or make your own plot of this row of data, and include the point $(0, 0)$. Add your line from question 3 to the graph. No need to write anything down yet.

8. In question 2 we asked if the BAC increases by the same amount for each additional drink. What are we looking for on the graph to answer this question?

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[1] https://www.desmos.com/calculator/ssp360bsrq

9. Let's slice the data set in a different way. Input the data from the fourth column into a new window on Desmos[2]. Describe this plot in a sentence and make a quick plot below. What is the plot showing, and what is the trend?)

10. Find the equation of the line between the points $(110, 0.137)$ and $(150, 0.100)$ and add this line to your plot.

11. Interpret the slope of this line. Include units and an explanation of why the slope is positive or negative.

12. Is the data in this graph linear? Explain.

13. Statistics can be used to find the *Best Fit* line for a data set; you might have seen that before. If you had to use one line to approximate this data, would it be and why?

14. Estimate the BAC of a 260 pound person who has had four drinks. Describe your procedure.

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[2]Click on the "+" in the upper left corner in Desmos and select "table".

15. Suppose your body metabolizes alcohol at a rate of about 0.015 BAC per hour.

    (a) How many hours will it take for a 240 pound person who had four drinks to have a BAC of zero?

    (b) How about for a 140 pound person?

    (c) Do these answers seem reasonable? Explain.