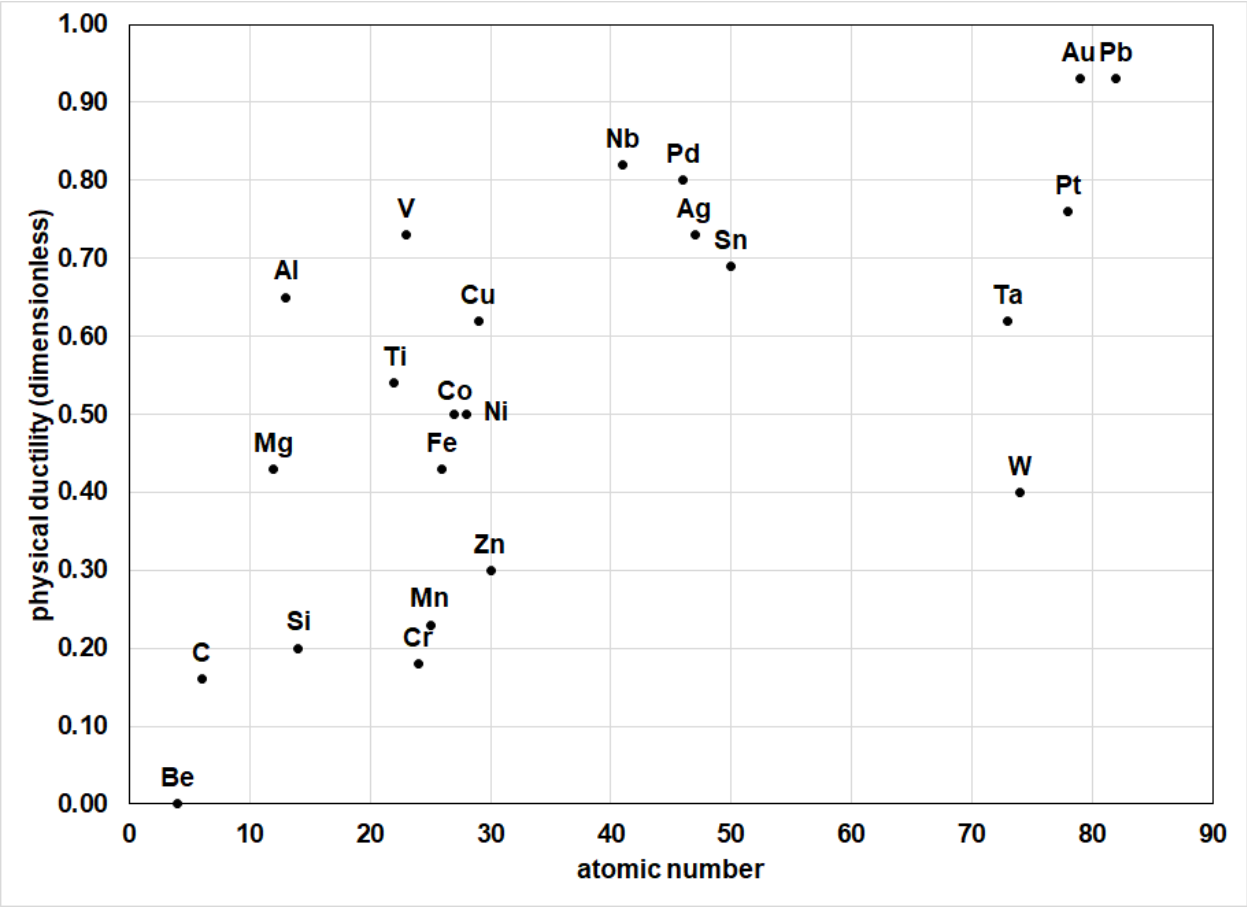
Exam I
Administered: Monday, September 15, 2025
24 points

For each problem part: 0 points if not attempted or no work shown,
1 point for partial credit, if work is shown,
2 points for correct numerical value of solution

Problem 1. (12 points)

The "physical ductility" is a dimensionless parameter that ranges from 1 (perfectly ductile) to 0 (completely brittle). Consider the data for the following **23** materials plotted below. The data in this plot is available electronically on the course website in a spreadsheet file.



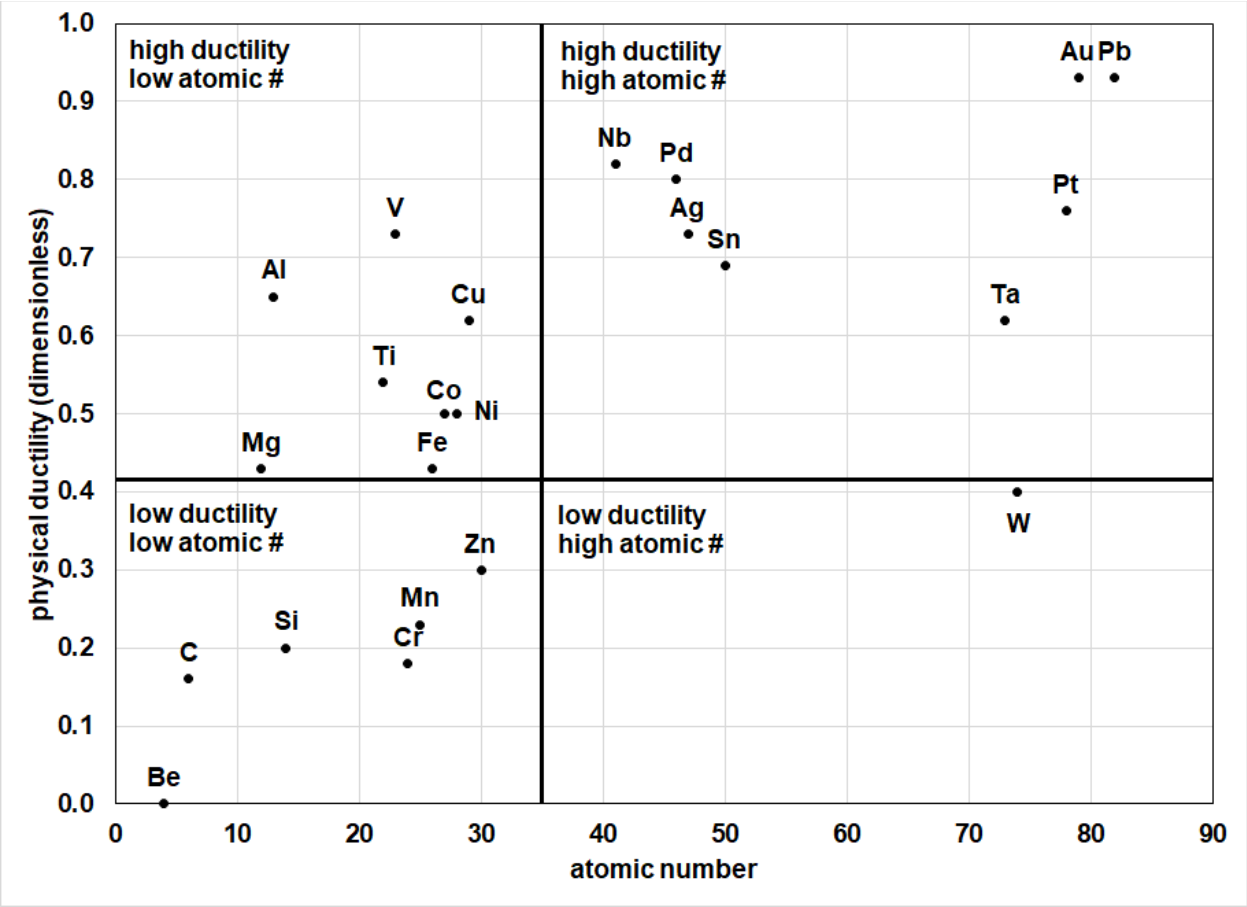
Answer the following questions for the materials in this table.

(a) Determine the mean atomic number.
(b) Determine the mean physical ductility.
(c) Determine the standard deviation of the atomic number.
(d) Determine the standard deviation of the physical ductility.
(e) Determine the correlation coefficient between the physical ductility and the atomic number.
(f) What is the physical significance of your answer to part (e)?

*Physical ductility data taken from https://www.failurecriteria.com/physicalductilit.html.

Problem 2. (12 points)

Consider the **23** materials in the plot below. We are evaluating these materials in terms of physical ductility and atomic number. We have created a definition of low and high physical ductility and low and high atomic number as indicated by the horizontal and vertical lines in the plot.



Using this information, answer the following questions.

(a) Draw a Venn Diagram of the sample space for this data.
(b) What is the probability that a material has high atomic number and high physical ductility?
(c) What is the probability that a material has high atomic number?
(d) What is the probability that a material has high physical ductility given that it has high atomic number?
(e) What is the probability that a material has high atomic number given that it has high physical ductility?
(f) Given this classification, prove that physical ductility and atomic number are not independent of each other.