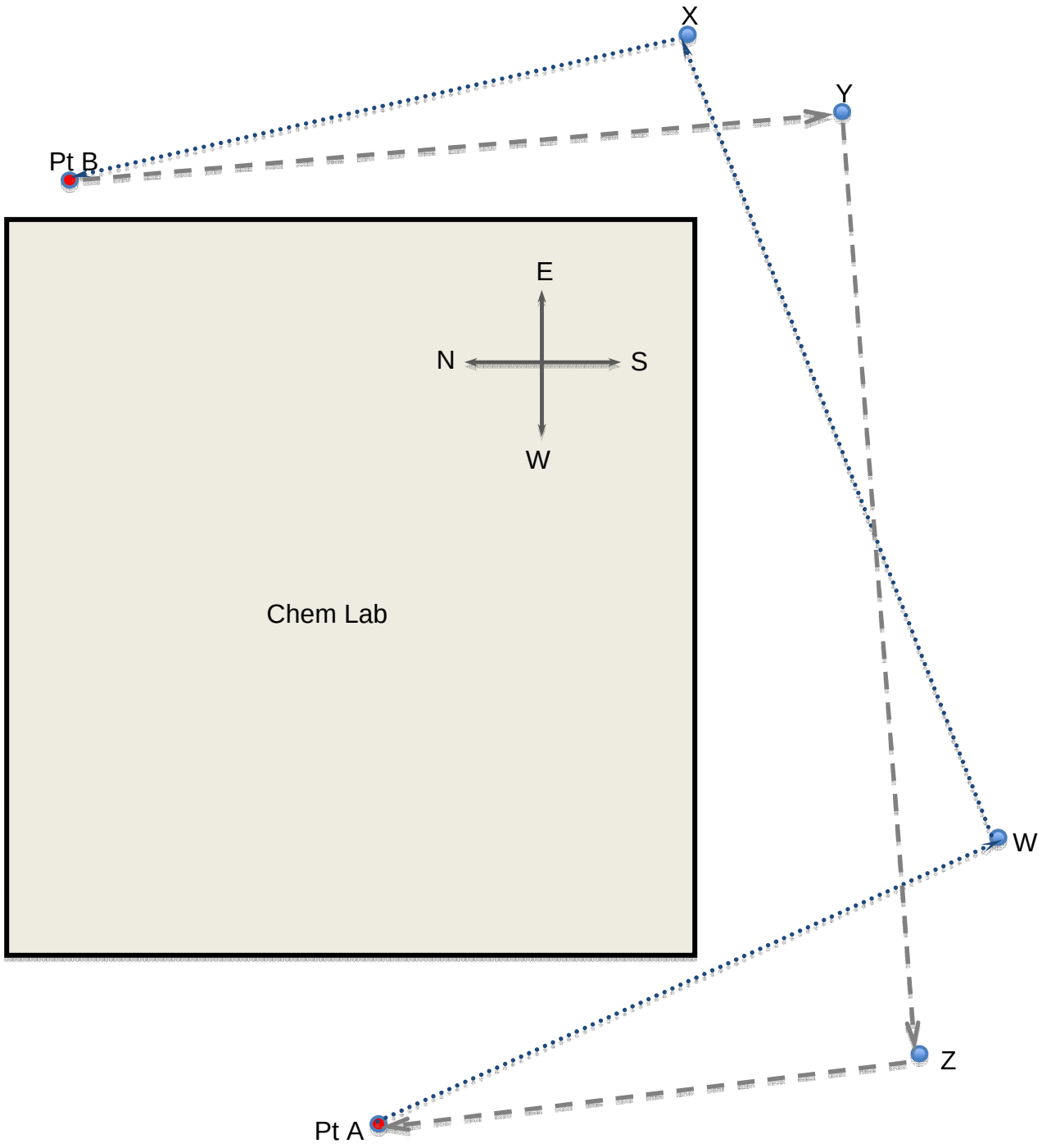
Two points, Pt A and Pt B, have been marked on the floor in the hallway on opposite sides of the Chemistry Lab. The two points have placed such that no direct measurement of the distance between the two points can be made. Four additional points, W, X, Y and Z, have also been strategically placed in the hallway. The ultimate objective of this lab exercise is to determine the distance, in meters, from Pt A to Pt B. The class will divide into two teams, A and B. Team A will start at Pt A and use Pts W and X. Team B will start at Pt B and use Pts Y and Z. Use string and tape to mark out the vectors and a meter stick to determine magnitude of each vector.

For Team A: A→W, W→X, X→B

For Team B: B→Y, Y→Z, Z→A



Then, using compass directions, determine a way to break each vector into N-S and E-W "components." Record the **measured** length of each vector, the length of the components of each vector and the direction of each component vector (N or S; E or W—check your instructor if you cannot figure out how to determine compass directions.). Calculate the length of each vector using the component lengths and the Pythagorean Theorem.

Team A

Vector	Measured Length (m)	x-Component (E-W) (m)	E/W (+/–)	y-Component (N-S) (m)	N/S (+/–)	Calculated Length (m) (by Pythagorean Theorem)
A→W						
W→X						
X→B						
Overall A→B						

Team B

Vector	Measured Length (m)	x-Component (E-W) (m)	E/W (+/–)	y-Component (N-S) (m)	N/S (+/–)	Calculated Length (m) (by Pythagorean Theorem)
B→Y						
Y→Z						
Z→A						
Overall B→A						

TO DO

On graph paper, create scaled vectors and components and add the vectors graphically to find the total displacement vector (**R**). Measure this displacement vector (on your diagram) and determine its length using the appropriate scale. In your lab notebook, add the component vectors (taking into account their directions [N or E: +; S or W: –]) to find the total displacement vector (by the Pythagorean Theorem).

Compare your values for the displacement vectors as found be these two methods (scaled drawing and addition of components) and to the results posted by the lab group that found the displacement by starting at the other end and going "backwards."

QUESTIONS

1. By definition, what two pieces of information must be given in order for you to have a vector?
2. Which has a greater length: the distance you traveled while walking the vectors, or the total displacement vector? Why?
3. Explain how the order in which you add vectors changes the result.
4. Give an advantage and a disadvantage to adding vectors graphically.
5. Give an advantage and a disadvantage to adding vectors by components.
6. Explain whether this statement is true: Any vector can be broken into pieces that lie along the x-axis (east-west) and the y-axis (north-south).
7. A student states: "Three plus four equals five." Describe a situation where this is true.