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Grade Level/Subject: Pre-Algebra (but I have used it in most classes if a filler was needed)

Topic: Measurement, fractions, and following directions

Objectives (P.A.S.S.): HS Process Standards of Problem Solving, Communication, Reasoning, Connections & Representation are all addressed to some extent. Geom. Standard 2:2 Drawing 2 dimensional figures is the most addressed of content standards.

Introduction: This is a very good lesson to use for students with problems dealing with fractions, especially in measurements, and for learning to read carefully, follow instructions and work in a sequence of instructions that must be done in order. This is not original with me, but was received at an NCTM conference many years ago. I have since lost the original author's name, but a similar project could be designed by anyone with the time and patience to draw out and measure and give directions for any straight line drawing.

Materials needed: Rulers measured in inches and divided at least in 8ths. An instruction sheet and the worksheet with a large rectangle labeled ABDC.

Instructional process: I start by handing out rulers. Generally this lesson is one of my most limited in giving student direction. We may start with a discussion of the ruler that they have been given and how it is divided on the inches side (the different length marks for  $\frac{1}{2}$ ,  $\frac{1}{4}$ ,  $\frac{1}{8}$ , and  $\frac{1}{16}$ ). I then let them know they need to read and follow the instructions in order, labeling as they go. At this point I pass out the two sheets of paper (they need to be separate, not a front and back). I let them know that the box in front of each number is so that they can check it off as they complete that instruction. I then let them know they will have the class period to complete the project and to be very careful to notice which segment they are on and which point they measure from.

Closure: We generally share and discuss the pictures, possibly posting them on the wall, including a discussion of what made some come out different than others which is usually an error in measurement or mislabeling of point(s) as they worked.

Assessment: I give a homework letter grade for this paper. It is very easily graded since the closer their lines are to intersecting in one point in the center, the more accurately they have measured and drawn. As long as they have worked throughout the hour and seemed to have made a good attempt, they are given at least a "C", with a few "A+"s to those with near perfect results.

Modifications/Accommodations: Usually none are needed, although some students with learning disabilities might need a little one-on-one help initially with locating measurements on their ruler and guidance in how to interpret the instructions. If the

actual drawing of the lines was a problem for a student because of motor skills lacking or even an injury of some kind to a hand or arm, they could be paired with a student who would normally need someone to help them follow the instructions. Students showing special interest or abilities in this area might be challenged to make their own drawing giving instructions similar to what they have been presented to turn in for bonus credit. This would allow them practice with writing problems and instructions and might give you (with their permission) a little wider scope of activities for the future. You would probably want to given a maximum as well as minimum number of instruction lines required for the extra credit project.

Reflection: This lesson gives some students a chance to shine in a math class where they often feel they cannot succeed like the other students. Sometimes the very best in the normal homework and testing papers, rushes enough to lose accuracy in his/her drawing and will be overshadowed by the student who excels at hands on and takes time to make sure of accuracy as he/she measures and draws. The outcome is often good for both.

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1. Point E is on Line AB,  $3\frac{5}{8}$ " from Point A.
  2. Point F is on Line BD,  $1\frac{3}{8}$ " from Point B.
  3. Point G is on Line BD, 5" from Point B.
  4. Point H is on Line BD,  $8\frac{5}{8}$ " from Point B.
  5. Point I is on Line CD,  $3\frac{5}{8}$ " from Point C.
  6. Point J is on Line AC,  $8\frac{5}{8}$ " from Point A.
  7. Point K is on Line AC, 5" from Point A.
  8. Point L is on Line AC,  $1\frac{3}{8}$ " from Point A. Connect Points K and G and E and I.
  9. Point M is where Line KG crosses Line EI. Point N is on Line KG, 2" from Point K.
  10. Point O is on Line KG,  $5\frac{1}{4}$ " from Point K.
  11. Connect Points J and F, L and H, and L and N.
  12. Connect Points L and G, K and F, and K and H.
  13. Connect Points N and J, N and I, and I and O.
  14. Connect Points O and F, O and E, and E and N.
  15. Connect Points J and G and O and H.
  16. Point P is where Line JG crosses Line NI. Connect Points P and M.
  17. Point Q is where Line JN crosses Line KH. Connect Points Q and M.
  18. Point R is where Line LN crosses Line KF. Connect Points R and M.
  19. Point S is where Line NE crosses Line LG. Connect Points S and M.
  20. Point T is where Line EO crosses Line KF. Connect Points T and M.
  21. Point U is where Line OF crosses Line LG. Connect Points U and M.
  22. Point V is where Line OH crosses Line JG. Connect Points V and M.
  23. Point W is where Line OI crosses Line KH. Connect Points W and M.

What does your picture show? \_\_\_\_\_

A

B

C

D