MEASURING THE CLASSROOM

Performance Standards (7A/7B).H

Measure the dimensions of the classroom and calculate area; determine the maximum error present in their distance measurements and in their calculated area:

- *Mathematical knowledge*: Measure to the greatest degree of accuracy and compute area; determine the maximum error based on measurements and tools;
- *Strategic knowledge*: Determine greatest degree of accuracy and solve problem using a systematic process;
- *Explanation*: Explain completely what was done and why it was done.

Procedures

1. Provide students with sufficient learning opportunities to develop the in order to (7A) measure and compare quantities using appropriate units, instruments and methods, and (7B) estimate measurements and determine acceptable levels of accuracy:
   - Determine derived measurements
   - Measure any quantity to the greatest degree of accuracy determined by the tool.
   - Determine the maximum error in measurements.
2. Provide students with the assessment task sheet.

   Use the measurement tools provided by your teacher to measure your classroom and determine its area. You will need to decide what measurements to make, and be as accurate as possible using the tools provided. Explain the procedures you used and how you obtained your results. Discuss the error present in each of your measurements. Discuss the maximum error present in your calculated value for area.

   Have students work with a partner to make measurements. Each person should write up his or her results and calculations separately. Provide the students with any convenient type of measurement tool you have available. Yard or meter sticks, or measuring tapes would be best. Calculators may be used.
3. Use the standard scoring rubric. Give each student a score in each of the three categories. A score of 4 should indicate completely correct solutions to all parts of the problem, with complete and correct justifications of their reasoning. A three should represent correct or nearly correct solutions to all parts, with only minor computational errors making their solutions inaccurate, their rationale should be sound, but may not be completely explained. A two would indicate that students have some idea about how to answer the questions, but make major errors in computation and or reasoning that effect their answers. A one may have a correct answer for one part, but generally shows little understanding in their rationale for their procedures and processes. A score of zero generally reflects no correct responses and no logical rationale for their procedures and processes.
4. Minor errors in computation include making errors in the actual addition or multiplication, rounding incorrectly. Major errors include using the wrong operations or formulas to relate terms.
5. Each teacher's classroom will have slightly different dimensions and shapes. Students should make sure that they account for any deviations from the general rectangular shape of the class. When judging the correctness of the student work you should check the accuracy of their measurements, and their calculations. Make sure their reporting of measurements matches the accuracy possible with the tool they used. For instance, if a measuring tape is marked in eights of an inch, then their measurements should be accurate to the nearest eighth of an inch. They should not round measures to the nearest whole inch. Also if that same measuring tape were used, then the error in each measurement would be plus or minus a sixteenth of an inch, since anything between the markings would be simply rounded up or down, and we assume the measurement is be rounded to the nearest marked unit. The calculation of area involves multiplication of length times width, and thus the error will be multiplied as well. One way to calculate this error is to calculate the area using the largest actual values for each distant measure (that is if the measured amount has been rounded down the sixteenth of an inch), and then calculate the area using the smallest actual values that could have been possible. The difference in the two areas is the greatest error possible based on your measurements and tools.

Examples of Student Work follow

Time Requirements

- Students should be allowed 10-15 minutes to complete their actual measurements
- The students should then be provided another 15-20 minutes to complete their calculations of area and write up their solutions.

Resources

- Copies of the "Measuring Your Classroom" task sheet
- Writing utensil
- Calculators may be used
- Measuring devices
- Mathematics Rubric

NAME _____ DATE _____

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Student Task Sheet

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2. Discuss the error present in each of your measurements.

3. Discuss the maximum error present in your calculated value for area.

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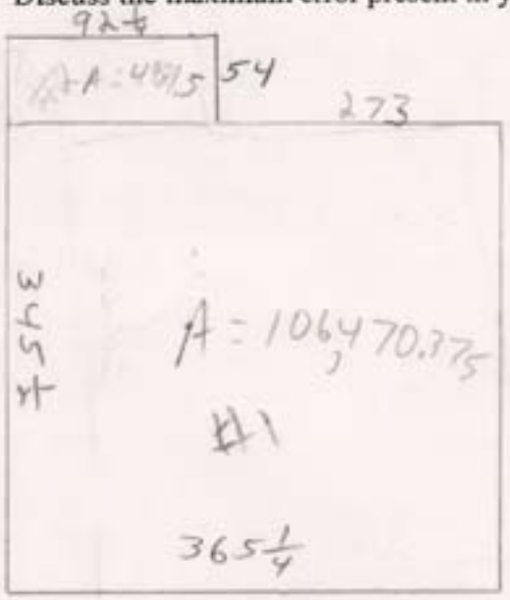
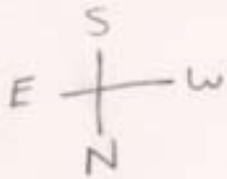


estimate = 96,000 in²



In order to figure out how big our classroom was, my partner and I used a variety of tools. First, I began my work by estimating what I thought was the area of the room. To measure the room, we used yard sticks as well as 12 x 12 inch tiles as an easier guide to measure. To organize my work, I drew a bird's-eye view of the room and drew a compass so I know which wall I was measuring.

I estimated that the room was 96,000 $in.^2$. I did this by counting the tiles in the room, converting them into inches, and then multiplying them to get my estimate. I ran into a couple of problems while trying to measure. There were cabinets that we couldn't move. We measured either the width or length of the cabinet, convert the # of tiles to inches, and add them together to get the side of a specific wall. We went through the same process for each wall. Then, we broke the room up into 2 parts to make the calculating job easier. The north wall was $365\frac{1}{4}$ inches and the west wall was $291\frac{1}{2}$ inches. The area of rectangle #1 is 106,470.375 $in.^2$. For the smaller rectangle, the south wall was $92\frac{1}{4}$ inches and the west wall was 52 inches. The area of rectangle #2 is 4,981.5 $in.^2$. Adding the two areas together, the area of the classroom would be 111,451.875 $in.^2$. My estimate was <u>way</u> off. You would need to figure this out if you wanted to put some sort of floor covering in a room. The error present in each of my measurements was $\pm\frac{1}{2}$. The maximum error would be $+\frac{1}{2}$ because it's greater than $-\frac{1}{2}$. The total area would be 111,451.875 $in.^2$.