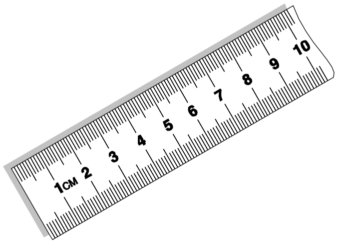
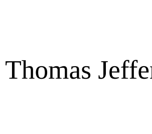


A Different Way of Measuring



Thomas Jefferson National Accelerator Facility - Office of Science Education
http://education.jlab.org/

A Different Way of Measuring

HOW CAN YOU MEASURE SOMETHING THAT YOU CAN'T SEE?

Follow the instructor's directions to measure the size of a dime.

10 cm

10 cm

Number of dots in the box =

Number of dots on dimes =

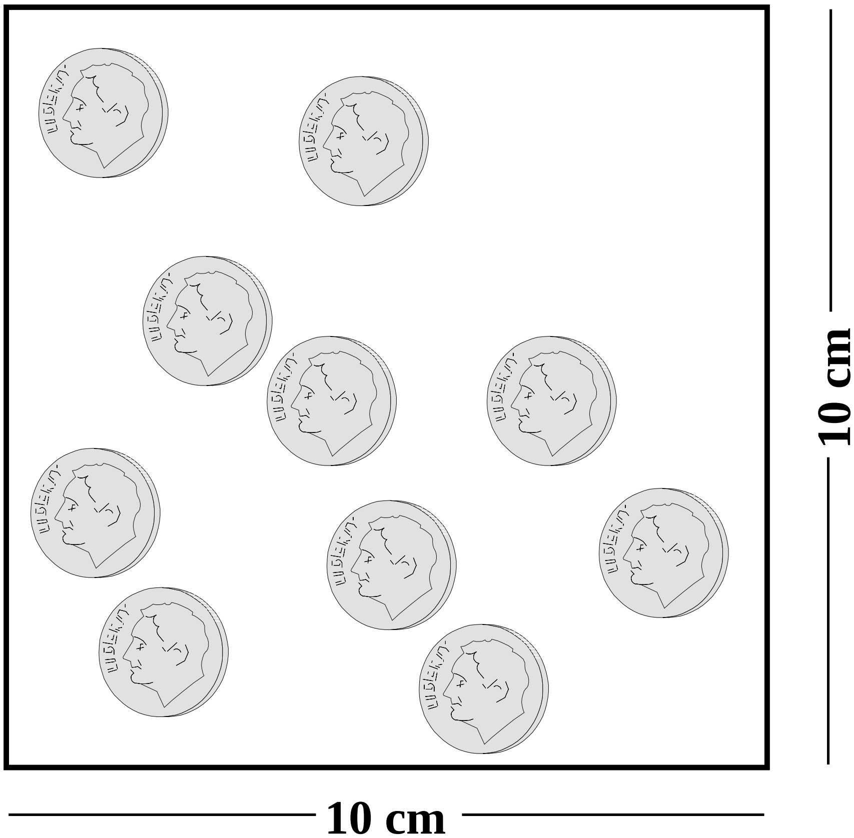
Area of the square =

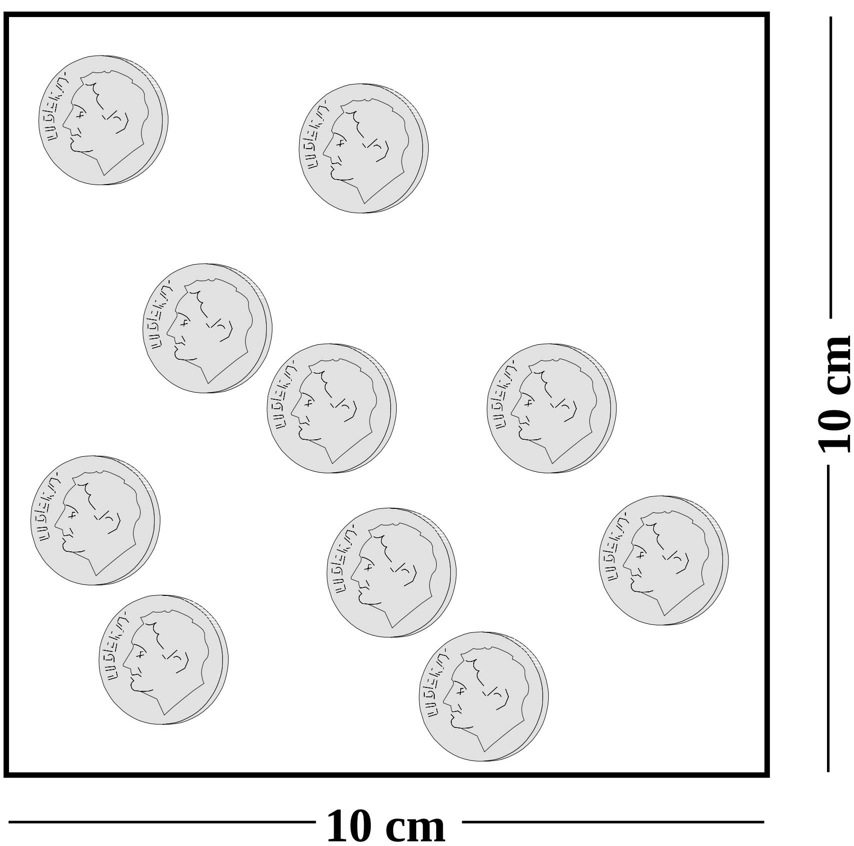
Area covered by dimes = ???

Fraction of dots hitting dimes = ________

Fraction of square covered by dimes = ________

Area of 1 dime ≈ ________________


10 cm
10 cm


10 cm
10 cm

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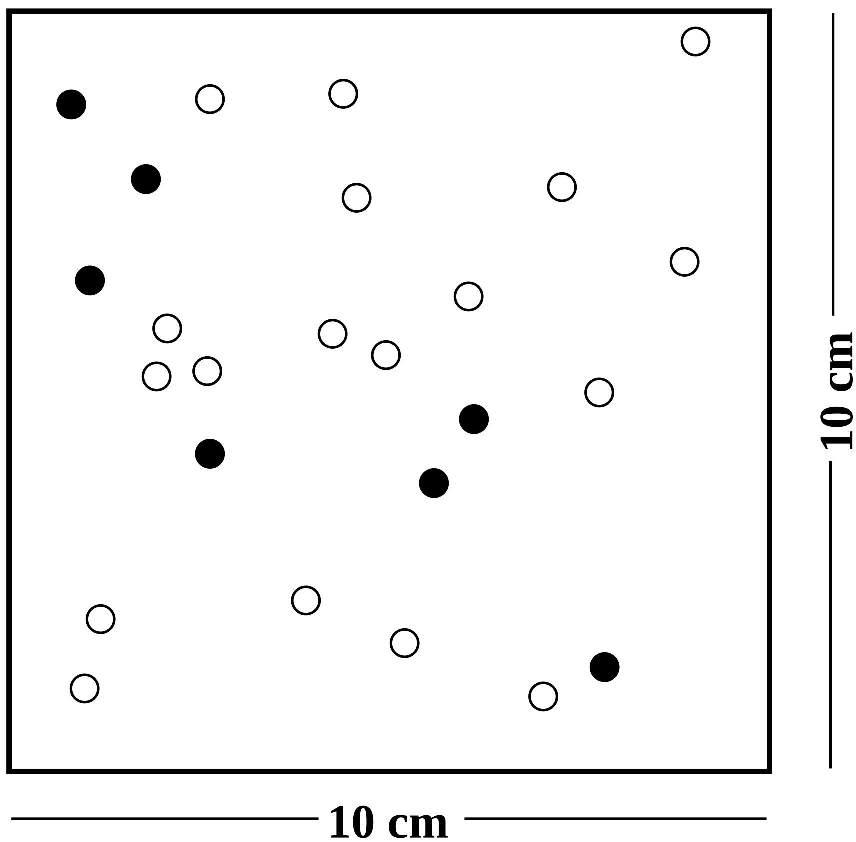

Number of dots in the box = **25**

Number of dots on dimes = **7**

Area of the square = **$100\ cm^2$**

Area covered by dimes = **???**

Fraction of dots hitting dimes = $\frac{7}{25}$

Fraction of square covered by dimes = $\frac{x\ cm^2}{100\ cm^2}$

$$100\ cm^2 * \frac{7}{25} = x\ cm^2 = \text{area of 10 dimes} = 28\ cm^2$$

Area of 1 dime ≈ $2.8\ cm^2$

A Different Way of Measuring

This is an activity in which students determine the area of a dime using a method similar to one used by nuclear physicists to determine the cross-sectional area of a nucleus.

Objectives:

In this activity students will:

- use creative problem-solving to determine the area of a dime
- multiply fractions
- compare two sets of data
- record data

Questions to Ask:

1. How does this experiment and method of calculation measure the size of a dime?
2. Why is it important that the pencil marks are not in any particular pattern?
3. How could you make this experiment more accurate?

Virginia State Standards of Learning

Math 6.2 Number and Number Sense

- by comparing areas and ‘hits’ within them

Math 6.6 Computation and Estimation

- by solving problems involving multiplication of fractions

Math 6.10 Measurement

- by determining the area of a dime using a nonstandard method of measuring

A Different Way of Measuring
Teacher Overview and Materials List

Background:

When working with atoms, scientists sometimes have to invent new ways of doing simple things. For instance, scientists can't use a ruler to measure the size of an atom's nucleus. This activity shows how ratios can be used to calculate the area covered by an object.

Minimum Materials Needed for Each Student Group:

Student data sheet

Dime sheet

Notes:

- A real dime has an area of ~2.54 cm^2

Detailed Directions:

1. Have each student place a number of dots (50 is a good number) within the large square on their data sheet. The dots should be as small as possible and should be randomly scattered over the area of the square.
2. Record the number of dots used.
3. Place the dime sheet under the data sheet and align the squares.
4. Circle every dot that landed on a dime and circle half of the dots that partially landed on a dime.
5. Record the number of dots circled.
6. Find the fraction of dots that are circled. This is related to the area covered by the dimes. For example, if 20% of your dots are circled, you can assume that 20% of the square is covered by dimes.
7. Use the fraction of dots that are circled to calculate the fraction of the square covered by dimes.
8. Since there are 10 dimes on the dime sheet, you must divide the area covered by dimes by 10 to find the area of one dime.