Before we begin: Take some dot labels to the *Will it sink or float* chart and make your predictions.

"I'm Your Density!"
The Mathematics of Crowdedness

Eric Appleton & Mark Trushkowsky
CUNY Adult Literacy and HSE Program

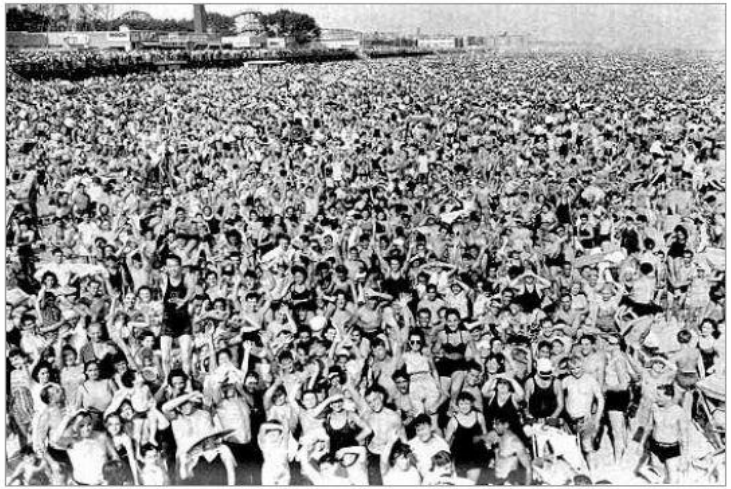
Presentation materials available at

bit.ly/COABE2019CUNY

#ANNMath

Population Density

Fast Track GRASP Math Packet



Version 1.6
Released 3/25/2019

This Fast Track GRASP Math Packet was made possible through support from the New York State Education Department, Office of Adult Career and Continuing Education Services.

Density of Matter

Fast Track GRASP Math Packet

Photo by Ben Stephenson (Wikimedia Commons)

Version 1.6
Released 3/11/2019

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NYSED/CUNY Fast Track GRASP Math Packets

- Population Density & The Density of Matter Done!
- Rigid Transformations: Shapes on a Plane Done!
- The Power of Exponents Done!
- Lines, Angles, & Shapes: Measuring Our World Soon!
- Tools of Algebra: Expressions, Equations, and Inequalities
- Tools of Algebra: Linear Functions
- Tools of Algebra: Non-Linear Functions
- Statistics & Probability

Study packets available at CollectEdNY.org/ftgmp

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What do you notice?

What do you notice?

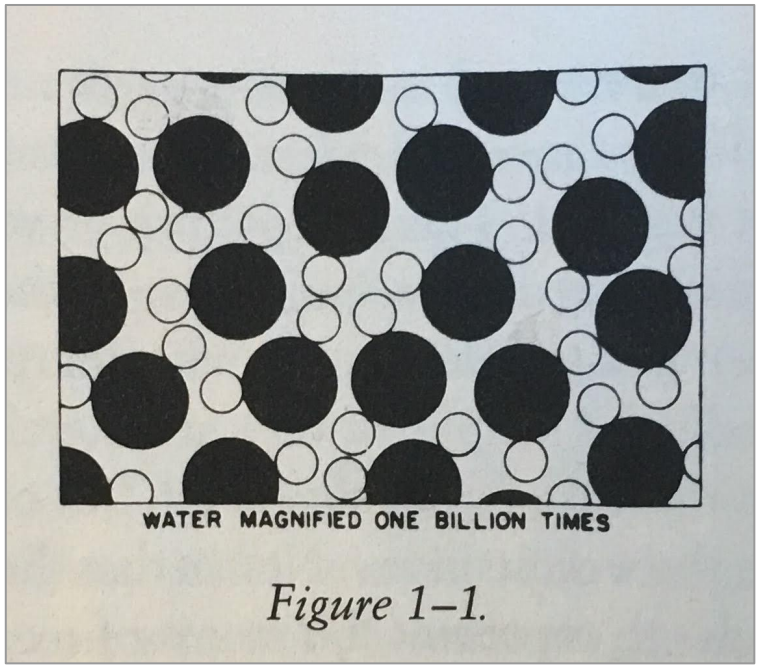


Figure 1–1.

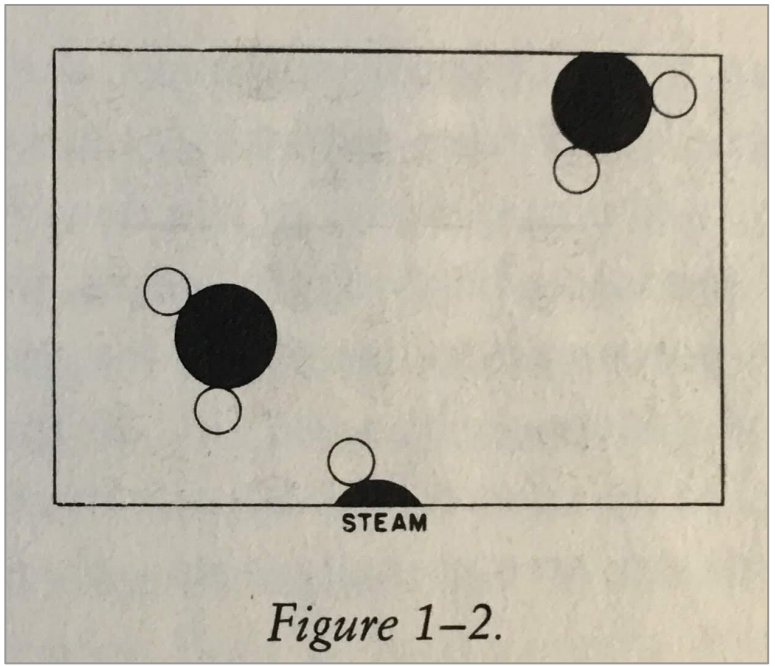


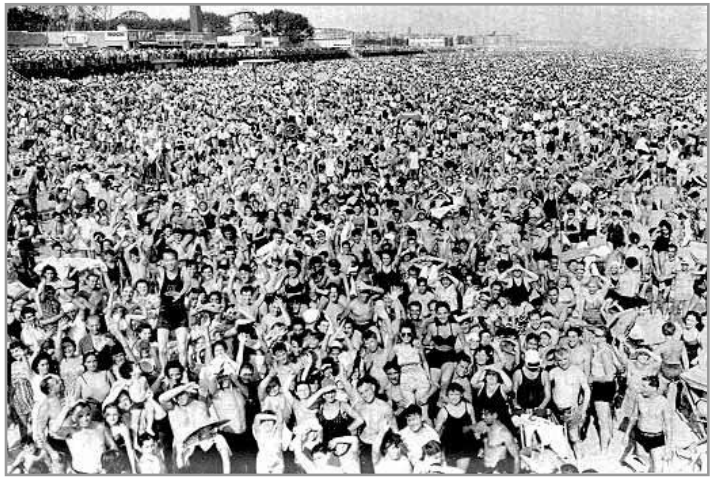
Figure 1–2.

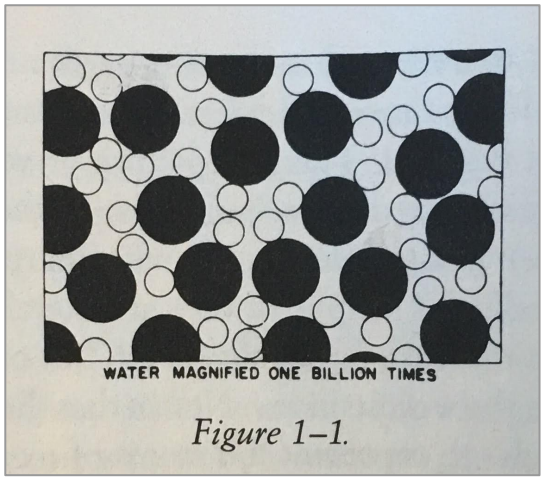
Images from Six Easy Pieces, by Richard Feynman

What is density?

Write a one-sentence definition.

What do we notice about these 3 images?





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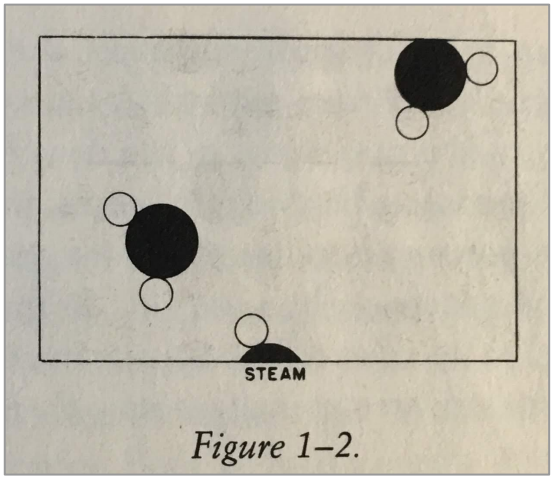


Figure 1–2.

Content Standard

size of a 2-dimensional surface

size of a 3-dimensional space

Apply concepts of density based on **area** and **volume** in **modeling** situations (e.g., persons **per square mile**, BTUs **per cubic foot**). - CCRS, 2013

"for every" - unit rate (proportion)

understanding of linear, square, and cubic units (measurement)

application in the real world

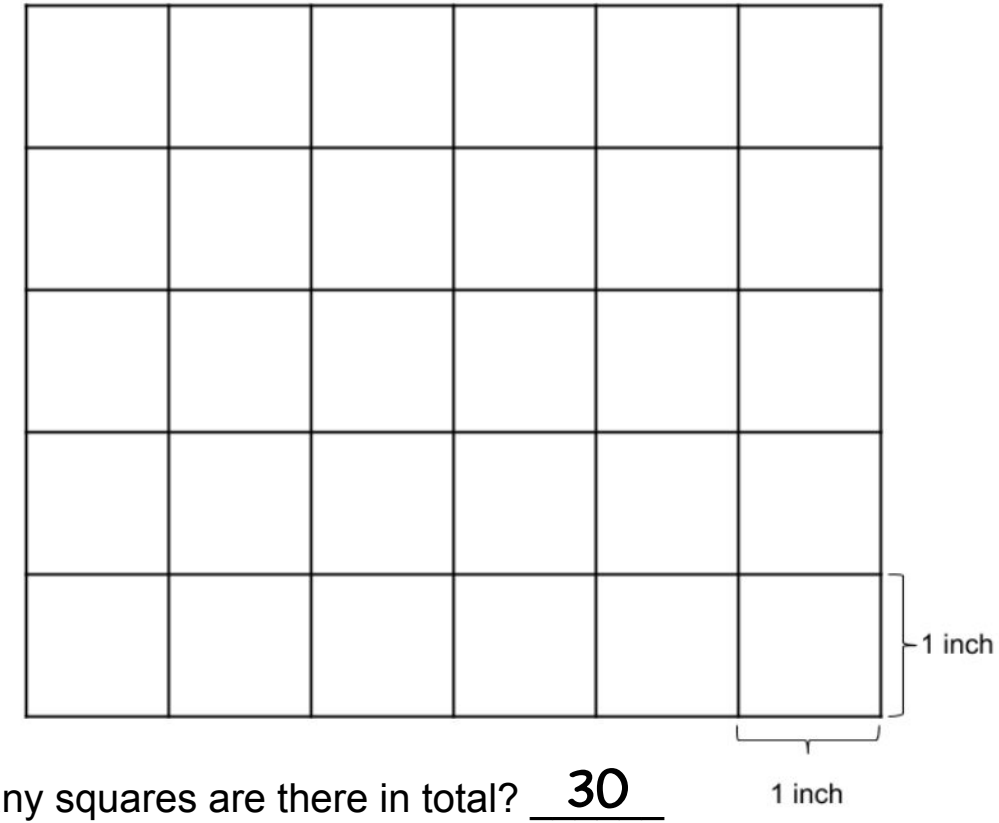
** British Thermal Units (BTUs) are a way of measuring heat.*

Area

Before talking about density, we explore area as the size of a surface, measured in squares.

We encourage students to count the squares to be sure of the area.

Let's think about the area of the figure below. It's made of squares that are 1 inch on each side.



How many squares are there in total? 30

What is the area of the rectangular grid? 30 square inches

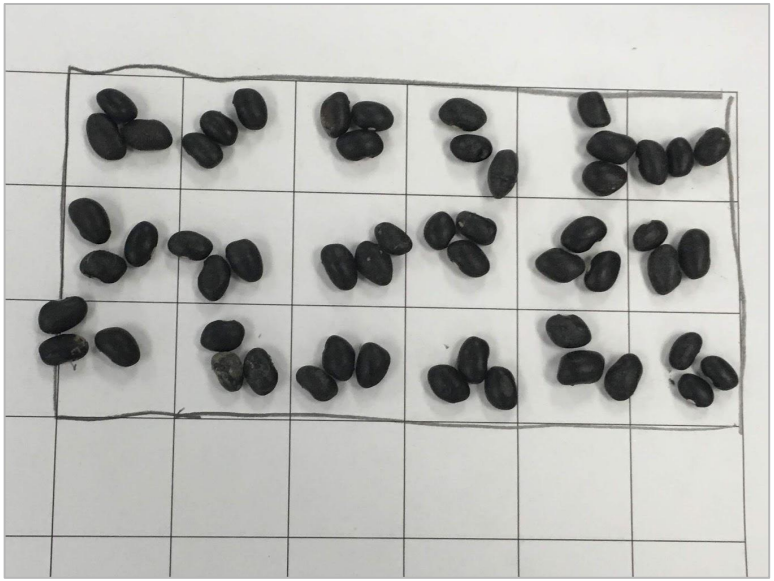
Beans and Density

For this activity, you will need about 100 beans and the grid paper on the next page.

1) On grid paper, fill in an area of 18 square inches.
2) Count out 54 beans and pour them on to your 18 square-inch area.
3) Spread the beans out equally so that there is the same number of beans in each of the 18 squares.

Beans and Density

You should be able to put an equal number of beans on each square. Once you divide up all 54 beans equally, how many are there in each square? ___3___

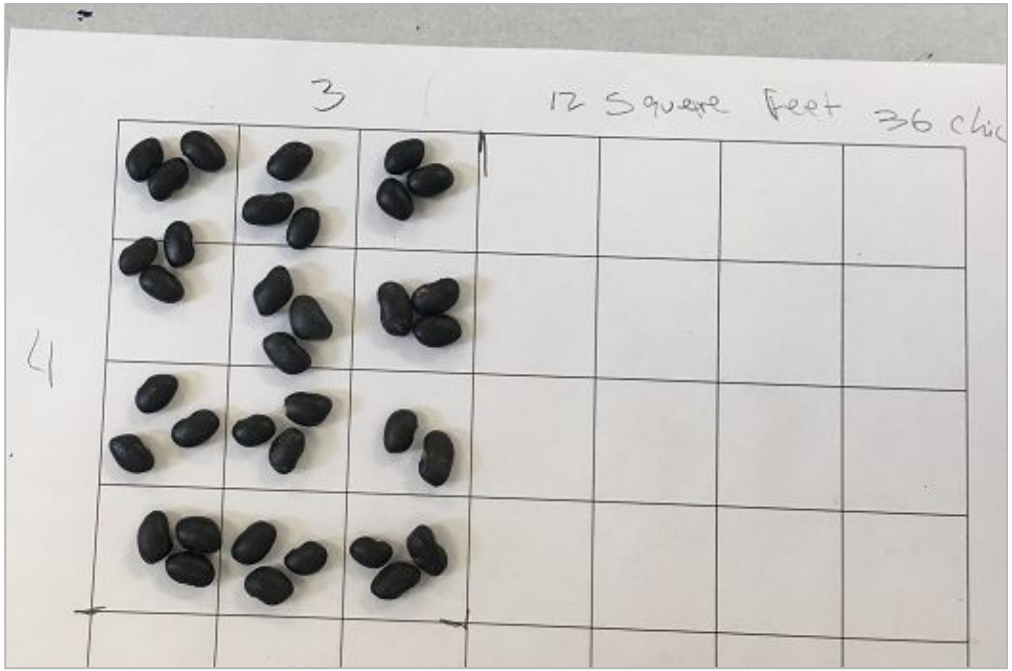


This grid has a density of ___3___ beans per square inch. (In other words: *How many beans are in each square?*)

Ideas

Population Density

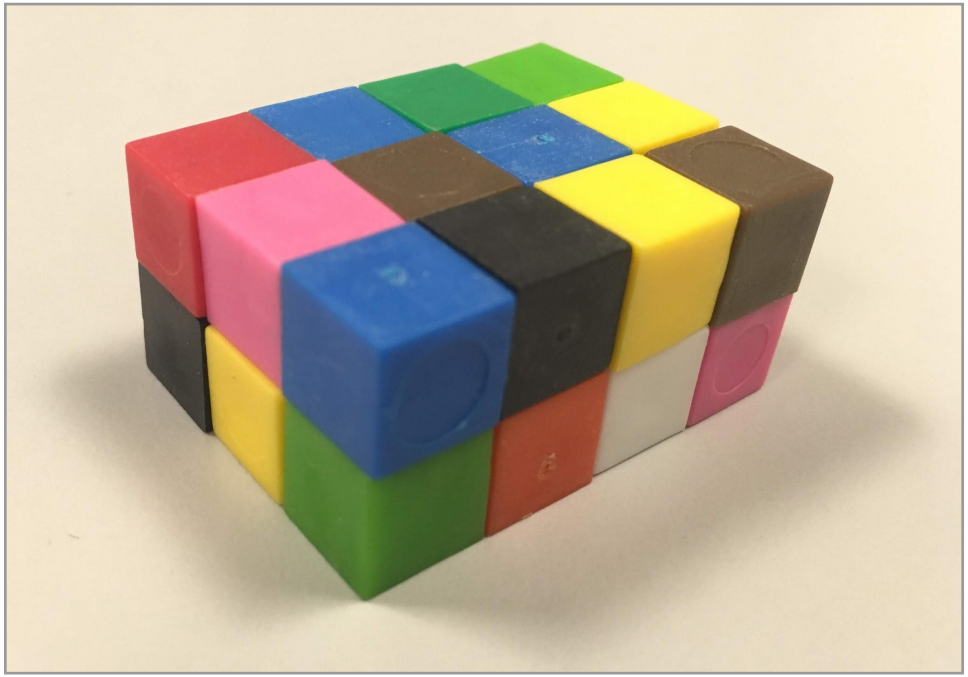
- **area**: measurement of 2-dimensional surfaces by counting squares
- **division of population**: separate into a number of groups that matches the area



Ideas

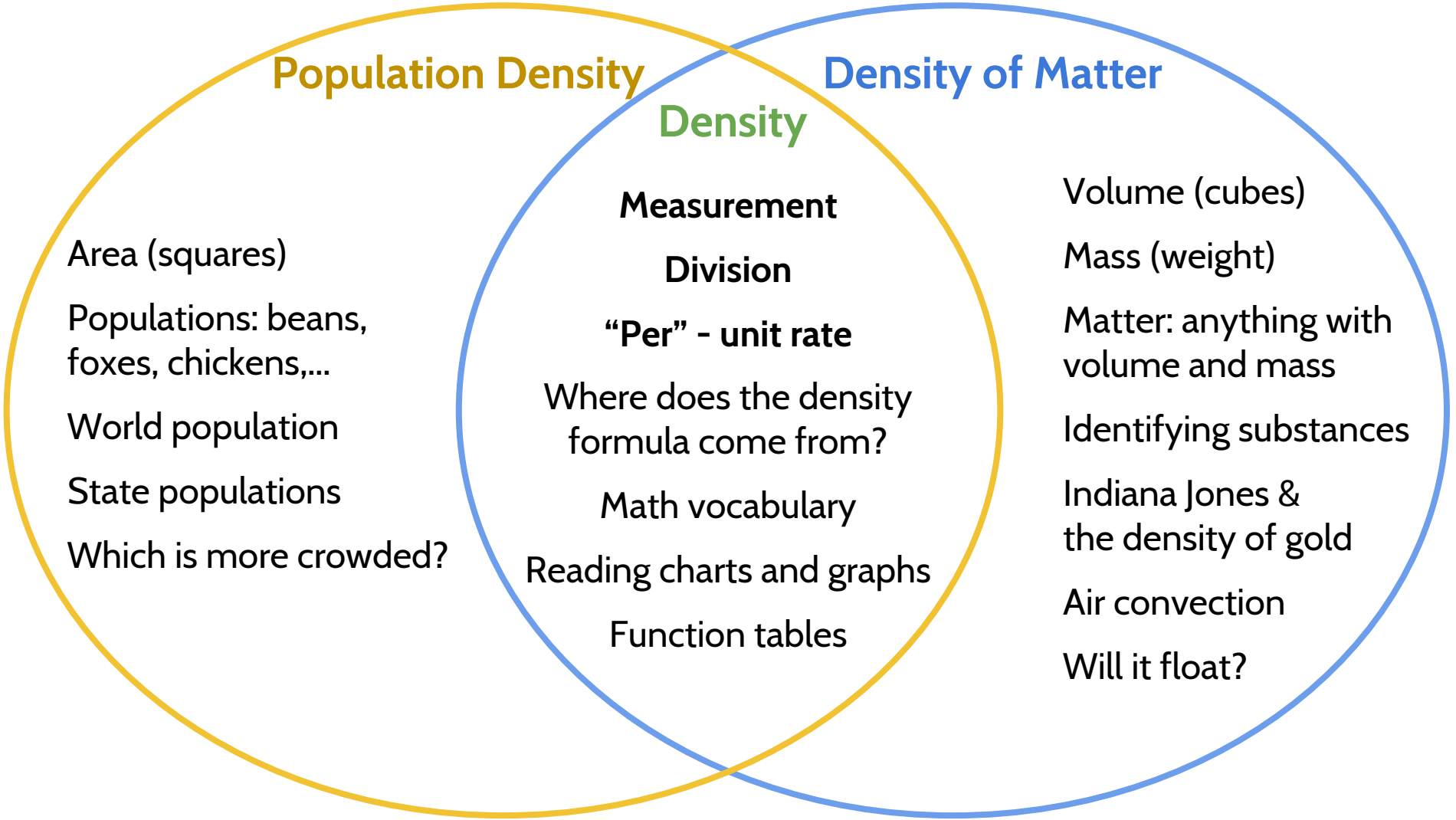
Density of Matter

- **volume**: measurement of 3-dimensional space by counting cubes
- **division of mass**: separate into a number of groups that matches the volume



Activities from the Packets

	Population Density	Density of Matter
Concept	Finding Density from Area and Population	What is the Density of Matter?
Application	Chicken Coops	Density of Common Substances
HSE Practice	2-3 exam-style questions	2-3 exam-style questions
Language	What does the word “per” mean?	Fill in the Blanks summary

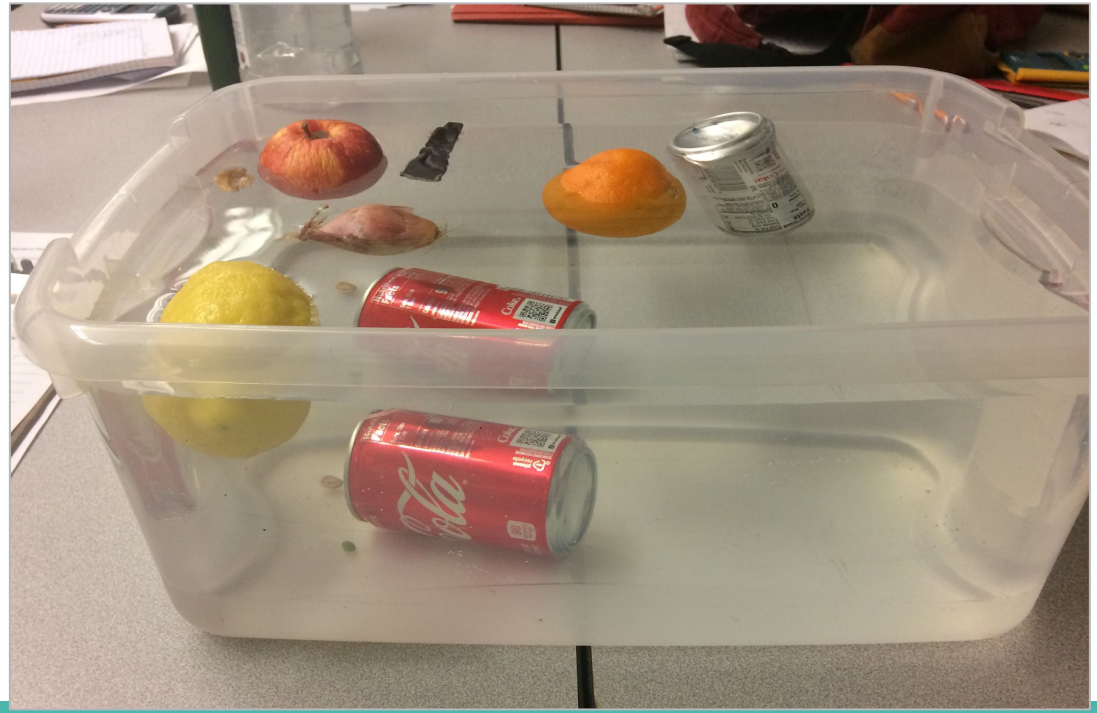

Population Density
Area (squares)
Populations: beans, foxes, chickens,...
World population
State populations
Which is more crowded?
Density
Measurement
Division
"Per" - unit rate
Where does the density formula come from?
Math vocabulary
Reading charts and graphs
Function tables
Density of Matter
Volume (cubes)
Mass (weight)
Matter: anything with volume and mass
Identifying substances
Indiana Jones & the density of gold
Air convection
Will it float?

Reflection

One thing I learned about density is...	One thing I learned about teaching density is...
One question I have about density is...	One question I have about teaching density is...

Patricia Helmuth's class

Hudson Valley, New York State



	Sink	Float
Regular Coke	7	
Diet Coke	2	5
Apple		7
Lemon	7	
Orange	3	4
Cabbage		7
Walnut	4	3
Shallot	7	
Green Pea		7
Pinto Bean		7
Rice	7	

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Study packets available at
CollectEdNY.org/ftgmp

Websites
CollectEdNY.org
AdultNumeracyNetwork.org

10 ANN
Rhythms 1
5:30-6:30PM

Presentation materials available at
bit.ly/COABE2019CUNY