4

TEACHING MANUAL

MEET & MATH 4

FALL 2018 MEETING 4

OCTOBER 23-24

Contents

www.math.uci.edu/mathceo

2018 UCI MATH CEO COMMUNITY EDUCATIONAL OUTREACH.
UNIVERSITY OF CALIFORNIA AT IRVINE

Meeting 4

- Tuesday 9:00 AM - 9:50 AM: October 23 (UCI Week 3)
    - Place: **UCI** NS 2 1201 (Marco Forster comes)
- Tuesday 2:45 PM - 3:45 PM: October 23 (UCI Week 3)
    - Place: **SANTA ANA**: Carr Intermediate School
- Wednesday 2:00 PM - 3:45 PM: October 24 (UCI Week 3):
    - Place 1: **UCI,** NS2 1201 (Lathrop comes)
    - Place 2: **UCI,** ALP 2600 : new Anteater Learning Pavillon building (Villa comes)

Tuesday 10/23 , 9AM (50+ minutes)	Wednesday 10/24 (80+ minutes)

• **Activity 1**: 40 minutes
ACTIVITY 1 HAS BEEN MODIFIED (Parts B and C)
• **Survey**: 5 minutes
  ○ Start at 9:40 AM (or 3:35 PM)
Skip Activity 2
Note: David Wych will be giving an ongoing CRASH course from 8:45 - 9:00 on Tuesdays (just before the 9:00 AM meeting at NS2 1201)
	• **Activity 1**: 45 minutes
	• **Activity 2**: 15 minutes
	  ○ Only start this activity if time is 3:15 or earlier
	• **Survey**: 5 minutes
	  ○ Start at 3:40 PM

Tuesday 10/23 , 2:45 PM (50+ minutes) • **Activity 1**: 40 minutes • **Survey**: 5 minutes ○ Start at 9:40 AM (or 3:35 PM) *Skip Activity 2*	

Activity 1: If our class were the world

Time: 45 minutes
https://im.openupresources.org/6/teachers/9/2.html

Activity 2: Division

Time: 30 minutes
http://map.mathshell.org/tasks.php?unit=MA11&collection=9

If Math CEO were the world

A) All 7.4 Billion of Us
There are 7.4 billion people in the world. If the whole world were represented by a 40-person class:

- 19 people would eat rice as their main food.
- 16 people would be under the age of 20.
- 7 people would be from Africa.

i) How many people in the class would not eat rice as their main food?
ii) What percentage of the people in the class would be under the age of 20?
iii) Based on the data in the 40 people class, how many people of the world do you expect to live in Africa?

B) About the People in the World

With the members of your group, write a list of 5 questions about the people in the world. Your questions should begin with "**How many people in the world . . .**" Then, choose 2 or 3 questions on the list that you find most interesting, and that we have a reasonable way to find an answer.

Examples:

- *How many people in the world can read?*
- *How many people in the world speak more than one language?*

For each question, make an estimation of the actual number of persons that fulfill the property. While you do this, your mentors will check for the answer.

C) Suppose Math CEO represents all the people in the world. How many people are in MATH CEO today? (You can the number a little): ____

Use the 2 or 3 questions chosen in the previous task. Find the number of people in MATH CEO that would have the same characteristics. You can work with your estimate, or even better, with the one corrected with the help of your mentor.

Create a visual display that includes a diagram that represents this information. Give your display the title "If MATH CEO Were the World."

IF OUR CLASS WERE THE WORLD	
Description	In this task, students look at ratios of different populations in the world and determine what their class would be like if its ratios were equivalent. In the process, they work with percentages that are not whole numbers. Moreover, the ratios will be “close” to being equivalent because the exact world population is not known and all populations need to be whole numbers.
Materials	● Student’s Workbook
Set up	**Part A:** 15 minutes ● 5 minutes (individual work), ● then 10 minutes to share answers in group **Part B**: 10 minutes, in groups ● 5 minutes to brainstorm questions (make a single list in the table) and estimate ● 5 minutes to select 2-3 questions, and estimate answers. ○ Mentors help check students estimations. Write the “actual” estimates (from reliable internet sources) **Part C**: 15-20 minutes ● Students work in a single group or in two groups of 2-4 students each. Provide guidance throughout, if needed.
My solution	In this space, write your solution to the problem (working out details, not just the final answers). Use as many different approaches as possible! Also, write **discussion questions**: these are questions that help students, at the end, consolidate the math learning. **My solution** 

	My discussion questions (some examples are included) • Which new method did you learn from your mentor or from other students? Why did you enjoy discovering it? • This task was not about finding an exact answer. In which ways, then, do you think that we were doing math? **Write your own discussion questions here:** • ____ ____ ____ • ____ ____ ____
Productive discussion	This section gives you examples of prompts, cues and questions that you may ask students during or at the end of the problem solving process. Before you continue, please watch:

[Communication in the Teaching and Learning of Math](www.math.uci.edu/mathceo/teachingvideos.php)
More Math 192 Series Videos:
(www.math.uci.edu/mathceo/teachingvideos.php)

- **If some students are stuck and cannot begin to make progress**
  - You may ask: suppose that the world has only (for example) 40.000 people. Would that help you make sense of the problem?

- **Providing scaffolding**
  - In part A, you can suggest students that they use bar diagrams to make sense of the problem.

Teaching tips

- For the third question in part A, students may not recognize that the ratio of people from Africa to the world population is only approximately equal to the ratio of students in the class from Africa to the total number of students. Ask these students ***about*** how many people they think live in Africa.
  - Ask students if the ratio for the world population is equivalent to the population for people in the class. The answer is no. But 7.4 billion is only an approximate value of the population, so what we are looking for here is a value of people from Africa that gives a ratio close to 5 out of 30 (or equivalent).

- Make sure that students recognize "12 students out of 20" as what is called a benchmark percentage. Point out to them that the fraction 12/20 is equivalent to 3/5 (a benchmark fraction) and also to 60/100 (showing 60% explicitly).

- For part B, you can encourage students to make a table like the one below:

Our question	My estimation	Actual value
How many...		

Explain that "Actual value" means a more accurate estimation upon researching the question. You may encourage students to make a table and let them figure out the structure of the table.

Going deeper (optional)

Invent a question of the same form as before, whose answer can be estimated using logic and numerical reasoning. (Example: how many women aged 40 or more are in the world? Or: How many men aged 50 or more that live in Africa are in the world? You would use previous information here!) Then, find out how many people in Math CEO would correspond to the estimated value.

Solutions (If MATH CEO Were the World)

See also: https://im.openupresources.org/6/teachers/9/2.html

Part A

Remember that in this part we assume that the class has 40 people.

i) 21. There are 40 students: we are given that 19 eat rice as their main food, so the other 21 do not eat rice as their main food.

ii) 40% since 16 ÷ 40 = 8 ÷ 20 = 4 ÷ 10 = 40 ÷ 100.

iii) About 1.22 billion.

About 17.5% of the world's population live in Africa since
7 ÷ 40 = 0.175 = 17.5%
(alternatively: 7 ÷ 40 = 3.5 ÷ 20 = (3.5 x 5) ÷ 100 = 17.5 ÷ 100 = 17.5%.

Now , 17.5% of 7.4 billion people in the world is about 1.2 billion.

Reasoning:
10% of 7.4 : 0.74
5% of 7.4 : half of 0.74 = 0.37
1% of 7.4 : one tenth of 0.74 = 0.074
2.5% of 7.4 : 0.074 x 2 + 0.037 = 0.185
Add: 10% + 5% + 2.5% : 0.74 + 0.37 + 0.185 = 1.295
Note: 1.295 billions (which means 1.295 x 1,000 = 1,295 millions).

 **Alternative reasoning, to avoid working with decimals:**
A billion is equal to 1,000 millions.
So 7.4 billions is equal to 7,400 millions.
10% of 7,400 millions is = 740 millions
1% of 7,400 millions is = (one tenth of 740 million) = 74 million
.5% of 7,400 millions is = (half of 74 million) = 37 million
This gives:
17.5% of 7,400 millions is = 17 x 1% + .5% = (17 x 74) + 37 millions = 1,295 millions

Part B

Here is a sample. Remember that actual values are also estimations. We have researched them, but you may find a more accurate estimation and work with that.

Our questions	**My estimation**	**Actual value**
How many people live in Asia?	3 billion	4.463 billion
How many people speak Spanish?	600 million	437 million
How many babies are in the world?	80 million	130 million
How many people play Badminton?	40 million	220 million
How many people live in Brazil?	140 million	209 million

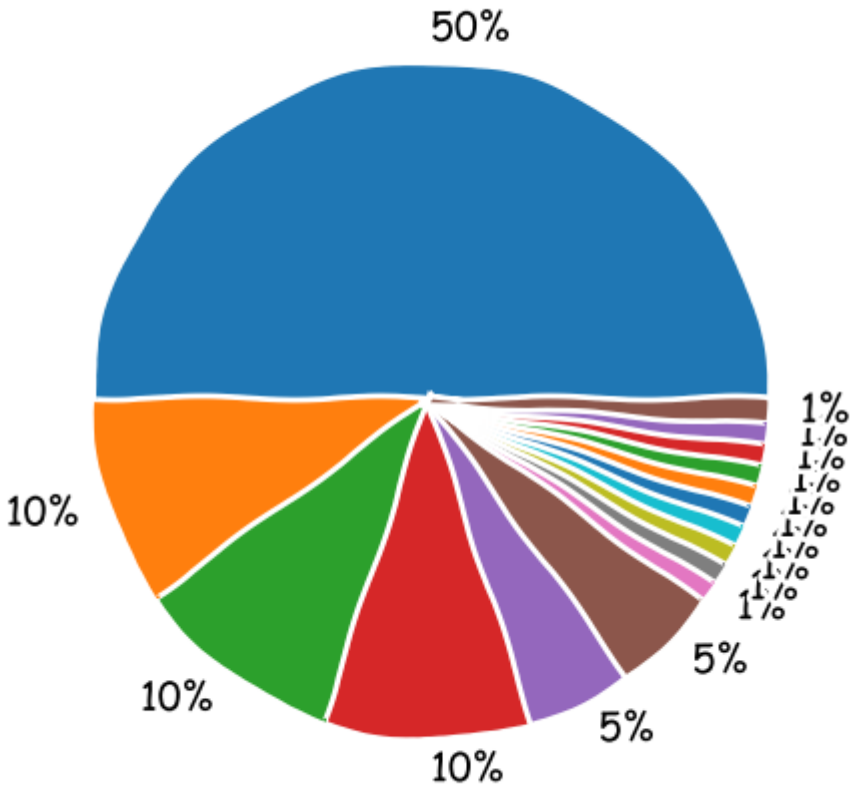
Note: it is OK to change the actual values just a bit. For example, we could change 437 million to 440 million or even 450 million, to make computations a bit simpler in part C.

Part C

Let's assume there are **20 students** in Math CEO today.

- 50% = 10 students
- 10% = 2 students
- 5% = 1 student
- 1% = 1/5th of a student
    - **Round to the nearest 5% for each question (if possible) and if it's below, find the nearest fraction**

Our Question	**Percentage**	**# of Math CEO students**
How many people live in Asia?	4.463/7.4 = 0.603 = 60%	60% = 50% + 10% = **12 students**
How many people speak Spanish?	435 million / 7.4 billion = 435 million/ 7,400 million 435/7400 = 0.0588 = 5.88%	5% = **1 student**
How many babies are in the world?	130 million / 7.4 billion = 130 million/ 7,400 million 139/7400 = 0.0176 = 1.76%	1%-2% = **0 or 1 student**
How many people play Badminton?	220 million/ 7,400 million 220/7400 = 0.0297 = 2.97%	2%-3% = **0 or 1 student**
How many people live in Brazil?	209 million/ 7,400 million 209/7400 = 0.0282 = 2.82%	2%-3% = **0 or 1 student**



Students: (100% = 20 students)

100% = 🚶🚶🚶🚶🚶🚶🚶🚶🚶🚶🚶🚶🚶🚶🚶🚶🚶🚶🚶🚶

50% = 🚶🚶🚶🚶🚶🚶🚶🚶🚶🚶

10% = 🚶🚶

5% = 🚶

Remember to round up or down so that you always get a whole number of students.
Example: 7.5% will represent either 1 student or 2 students (but not 1.5 students).

Division

When you calculate 100 ÷ 6 using a calculator, the result is 16.6666667.

This result can be used to give a **sensible** answer to all the following questions except one.

1. Write down the sensible answers and find the question that cannot be answered using this result.

   a. How much does each person pay when 6 people share the cost of a meal costing $100?

   _____

   b. 100 children each need a pencil. Pencils are sold in packs of 6. How many packs are needed?

   _____

   c. What is the cost per gram of shampoo costing $6 for 100 grams?

   _____

   d. How many CDs costing $6 each can be bought for $100?

   _____

   e. What is the average distance per day, to the nearest mile, traveled by a hiker on the Appalachian Trail, who covers 100 miles in 6 days?

   _____

2. Write another question, together with its sensible answer, that can be answered using 100 ÷ 6.

DIVISION	
Description	In this task, students explore division by 6 in different contexts. They are given the result of a division, and then use this to solve different real-world problems.
Materials	• Student's Workbook
Set up	• Have students work as they wish, but all students should answer in their own workbook.
My solution	In this space, write your solution to the problem (working out details, not just the final answers). Use as many different approaches as possible! Also, write discussion questions: these are questions that help students, at the end, consolidate the math learning. **My solution** 

My discussion questions (some examples are included)

- From $100 \div 16 = 6.666\cdots$, which other divisions can you derive? (Example: $100 \div 32 = \cdots$, $1 \div 16 = \cdots$).

Write your own discussion questions here:

- ____
  ____
  ____
- ____
  ____
  ____

Productive discussion

This section gives you examples of prompts, cues and questions that you may ask students during or at the end of the problem solving process.

Before you continue, please watch:

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- **If some students are stuck and cannot begin to make progress**
  - You may suggest that they change 6 to 2 and try the same problem or draw it out.

Teaching tips

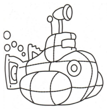
- You may discuss, if there is time, why there are infinitely many 6 in the decimal expansion of $100 \div 16$.

Reflection tasks

Mentor reflection: Goals

What are some goals that you identify in this activity? Name 3

- ____
  ____
  ____

	● ____ ____ ____ ● ____ ____ ____ Name different ways in which you can make sure, as a mentor, that the learning goals will be fulfilled ____ ____ ____ ____ ____ ____ ____ ____ ____
Going deeper (optional) 	Create a situation that can be represented by the following equation: ● $(100\,x) \div 16 = 4y$. What do x and y represent in your situation?

Solutions (Division)

See also: http://map.mathshell.org/download.php?fileid=1085

Division

T1

This problem gives you the chance to:
• relate a given division calculation to appropriate practical situations

When you calculate 100 ÷ 6 using a calculator, the result is 16.6666667.

This result can be used to give a **sensible** answer to all the following questions except one.

1. Write down the sensible answers and find the question that cannot be answered using this result.

   a. How much does each person pay when 6 people share the cost of a meal costing $100?

   $16.67 ✓ 1

   b. 100 children each need a pencil. Pencils are sold in packs of 6. How many packs are needed?

   17 packs ✓ 1

   c. What is the cost per gram of shampoo costing $6 for 100 grams?

   this can't be answered ✓ 1

   d. How many CDs costing $6 each can be bought for $100?

   16 CD's ✓ 1

   e. What is the average distance per day, to the nearest mile, traveled by a hiker on the Appalachian Trail, who covers 100 miles in 6 days?

   17 miles per day ✓ 1

2. Write another question, together with its sensible answer, that can be answered using 100 ÷ 6. 1

There are 100 pieces of Starburst that need to be divided between 6 kids, how many pieces does each kid get. 16 pieces ✓ 1

7 (7)

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