Math Zebra

Spring 2018 Meeting 1
April 11

Contents

1) About Me and You
2) Zebras
Meeting 1
Review Session

Tuesday, April 10th
Please come to one of the following times
11:00-11:30 AM       1:00-1:30 PM
RH 510M                Rowland Hall 340P

If this time does not work, please email
Lucy Dolmadjian for options: ldolmadj@uci.edu
About MATH CEO

UC Irvine Math CEO program is committed to offering free enrichment activities in mathematics for middle school students in underserved communities, and creating free educational material to be used in classrooms around the world. An essential goal of our program is to encourage students in low income, minority communities in Southern California to pursue a college degree in Mathematics, Science or related fields through a solid foundation and adequate planning.

Our Goals

Inspire and support the interest in mathematics of middle school students from nearby communities who might not otherwise have access to math enrichment activities.

Impart the mathematical foundations and critical thinking skills required for students to successfully pursue a college education and a career in STEM areas.

Instill the desire in these young achievers and their families for a college education and share college access information and financial aid opportunities.
Zebra Math
Meeting 1, April 11th 2018

- Identify the Leader mentor
- Write names of any new mentors and students
  (find form inside folder, write new names if needed)
- Place check-marks in the corresponding Meeting column
  (form inside folder)
- Communicate the math goals to the students in each activity
- Learn your students names and call them by name
- Keep your table neat and clean at all times
- Get help if there are behavior problems before they escalate

- Student Survey (pink) (start survey at 3:35 PM)
- Fill Meeting Report (blue) (if you are the Leader)
- Put back into folder: Student Surveys (pink), Meeting Report (blue)
Introduction

Dear Mentor

In this meeting you will get to know your students (or join them again) and so it is very important to establish connections with them and let them know you care.

In Activity 1 (About me and you), you will share experiences with other mentors and students, play a quick game and conduct an activity about different STEM (Science, Technology, Engineering and Math) professions.

In Activity 2 (Zebras), students will get to explore the concept of mathematical properties and mathematical descriptions and put them to use in a logic puzzle.

To see explanatory videos, please visit this link.

Math Goals

Students can describe a situation mathematically in their own words, using different properties relative to quantity, measure and distribution.

Students can determine the ratio between two types of objects, given a particular collection of these, concretely or visually.

Given two different configurations or systems, students can find numeric and spatial similarities and differences and express them with mathematical terminology.

Given a picture showing a collection of identical objects, students can determine if they are spatially distributed or not, giving reasons for this, using the words more, less, concentration, accumulation, among others.
MATERIALS & AGENDA

MATERIALS

INSTRUCTOR MANUAL
Green color

MEETING REPORT
Blue color
One per table
Online meeting report

STUDENT SURVEYS
(NO QUIZ THIS TIME)
Pink & Yellow Color
One per student

WHITEBOARDS
One per student

DRY ERASE MARKERS
A pouch with several

AGENDA

2:10 pm Introduction

2:20 pm 1) About Me... and You
Opportunity for Bonding with students

2:55 pm 2) Zebras
Exploring mathematical properties.

3:35 pm Final thoughts (closure)
Summary and Reflection: what did we learn?

3:40 pm Student Survey

3:45 pm End of the meeting
MATERIALS

- INSTRUCTOR MANUAL
  - Green color

- TRANSPARENCIES
  - One per person

- INSTRUCTOR MANUAL
  - Green color

- MEETING REPORT
  - Blue color
  - One per table
  - Online meeting report

- MEETING REPORT
  - Blue color
  - One per table
  - Online meeting report

- STUDENT SURVEYS (NO QUIZ THIS TIME)
  - Pink & Yellow Color
  - One per student

- WHITEBOARDS
  - One per student

- DRY ERASE MARKERS
  - A pouch with several

AGENDA

2:10 pm Introduction

2:20 pm 1) About Me... and You
  - Opportunity for Bonding with students

2:55 pm 2) Zebras
  - Exploring mathematical properties.

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  - Summary and Reflection: what did we learn?

3:40 pm Student Survey

3:45 pm End of the meeting
TEACHING GUIDELINES FOR MENTORS

1. KNOW YOUR STUDENTS
   Call students by their names most of the time: make sure they know your name, talk briefly about their day before you start the math activities.

2. ASK FOR EXPLANATIONS
   Ask students how they got their answers. Say things like “How do you know?”, “Why?”, “Draw a picture”, “Convince me!”, “Can you explain to Juan?”, etc.

3. MOVE & MONITOR
   Move around your table; monitor all students; use an adequate tone of voice; encourage kids to work in teams.

4. CHECK WORK
   Verify that the students write the answers to the problems and that they are correct and complete.

5. AT THE END
   Ask students to fill out the survey individually (no help), and to help pick up trash from the table and floor.

TEACHING TIPS

- This icon refers to specific tips which you will find embedded in the booklet activities: procedures, questions to ask to the students, recommended methodologies, and so on.

  
  Can you explain the concept in your own words?
  
  Example: After you introduce a new concept, it is a good idea to ask students to rephrase the concept, explain it in their own words. You can choose particular students, for example those who are disengaged.

  Can someone read the instructions out loud?
  
  Example: It is convenient to ask one student to read out instructions for a problem or definitions of a concept. This keeps your group focused on the task and improves their reading skills if you give feedback on reading.

Note: if not specified, the problem or activity can be done as a group activity involving a discussion.
Consider the expression \((\quad ) + (\quad \times \quad )\). Give a value to each of the three flower symbols (repetitions are allowed) to create an expression whose value is “5”.

This activity has the goals of breaking the ice between mentors and students, and promoting interaction and confidence between Students and Mentors. It is also an opportunity for students to be informed about STEM Careers and practice communication skills.

The activity has three parts. In part A “Introduction”, everyone will fill out an About Me survey, to be collected. In part B “Ha Ha”, students and mentors play a short ice-breaking game, and in part C “I’m a Pro”, students practice communication skills while learning about careers and professions.

MATERIALS

- About Me surveys for mentors
- About Me surveys for students
- 18 STEM Profession Cards
1.A Ha-Oops Game
(5 minutes)

In this game players take turns to count in a weird language of ha’s and Oopses... 5 Ha’s will equal to 1 Oops...

Players form a circle (sitting or standing).
Remind players that they need to remain serious throughout the game.
One player starts the game, by saying “Ha”.
The next player (in clockwise order) says “Ha” twice (“Ha Ha”).
The next player must say “Ha” three times.
In the fifth turn, the player whose turn is must say Oops.
In the next turn, the player must say Oops Ha.
In other words, each Oops is equivalent to a 5, and each Ha is equivalent to a 1.
Examples:
- in the 13th turn, the player should say: Oops Oops Ha Ha Ha.
- In the 20th turn, the player should say: Oops, Oops, Oops, Oops, Oops.

During the game, players who laugh or don’t say the correct words are eliminated, as well as those making any noise when it is not their turn. The last player (who avoided elimination) wins the game.

See an explanation video
1. B About Me Survey (12 minutes)

- Everyone, including the mentors, introduce themselves (1 minutes).
- About Me Survey (5 minutes): Students and Mentors fill out the About Me survey.
  - Leader mentors: Collect both mentor and student answers to put them back into the team folder. Use a clip.
- Students and mentors share something interesting from their survey, for example the dream or the person they admire the most (6 minutes).

Put all the about me surveys back into the folder.
In this activity, students will first select a profession to role-play, and then, pretending to be in that profession, students ask and answer questions amongst themselves. This activity has two goals: to develop communication skills (asking and answering questions) and to inform students about STEM careers through roleplaying a life story.

- Use any method so that students, after looking at all profession cards, choose one each. It is advisable that instead of just giving one random card to each student, they get to choose from options. One possibility is to allow for “trading” (students can exchange cards). Discard those cards that nobody selected.
  - Another option is that players receive an initial card each and rotate every 10 seconds, during which players can at any moment keep the card and wait until all players end up with one choice.

- Each student studies his or her card during about 5 minutes. Students will pretend to be professionals of the corresponding career card. They can add any personality traits to their character, or make up stories along.

- During the rest of time, students talk about their profession, ask and answers questions. The mentor facilitates the discussion. The goal is to inform others about the careers. Before students talk, the mentor can model the activity by choosing another profession, so that students can understand the activity.

- Players vote for their favorite profession. Vote is secret (use papers or post it notes). Note: A player cannot vote for its own profession.
Zebras

Goals:
- Learn how to express properties using math language
- Find ratios between objects, and compare areas of shapes
- Understand the meaning of *distribution* in math.
- If we read a property or description, identify situations that correspond to them (detective-work)

MATERIALS

- Zebra Cards for Students
  - (2 pages, Zebras 1-12)
- 3 Situation Cards
  - Cutlery
  - Shapes
  - Buttons
- Zebra Clues (4 per round, for 3 different rounds)

Discuss in your group... everyone participates.

What is a property? What is a description? Why are they important in life?

Look at the 12 Zebras in the zebra cards. Describe a few of them (as if you were to describe them to someone that is not seeing them). Discuss similarities and differences

In your discussion above, which key words or concepts were mentioned? List them.
Describing properties

In this part, kids will explore different properties of situations that can be expressed using mathematical language. The properties have to do with the following notions:

- Ratios and percentages
- Distribution
- Areas

1) Exploring Ratios
Show Picture 1 (Cutlery) to students. Ask about differences between the two situations. Let them discuss.
If students have not identified the difference in terms of ratios, ask students to focus on the ratio of objects to discover the difference.
Students should discover that in one situation the ratio knives to forks is 3:5, while in the other the ratio is 1:1. You may ask students how to express this using percentages,

2) Exploring Areas
Show Picture 2 (pieces). Ask about differences in the two situations. Let them discuss.
If students have not identified the difference in terms of relative areas, ask students to focus on the area or size of objects to discover the difference.
Students should see that in one situation all pieces have the same area while in the other not all pieces have the same area.
Quick explanation: After students have explored situation 2, bring their attention to how to check whether two given triangles have the same area or not, by looking at their bases and heights. The key fact is that if two triangles have the same values for base and heights (even if the values are switched), then the triangles have the same area. More generally, if the product BASE x HEIGHT is the same in two triangles, then they have the same area. For example, you may explain that a triangle of B=3 and H=6 has the same area as a triangle of B=6 and H=3.

Explain to students why in the picture shown (draw it in the whiteboard) both triangles have the same area. You can assign concrete values to x and y. For example: x=4, y=8. Visually, you can say: if we duplicate each triangle, we can form a rectangle of dimensions x and y. So each triangle has one half of the area of this rectangles, and so the triangles must have the same area.

3) Exploring Distributions
Show Picture 3 (Buttons). Ask about differences in the two situations. Let them discuss.
If students have not identified the difference in terms of how the buttons are spatially distributed (non-uniformly or uniformly), ask students to focus on the spatial distribution of objects to discover the difference.
Students should see that in one situation the buttons are uniformly distributed.
2) ZEBRAS

B Zebra detectives

In this activity, students will be receiving clues which describe properties of a zebra, and will have to find the one that fits all properties (there is a unique such one). The activity has three rounds. In each one, the mentor will secretly select one zebra from the collection of 12 zebras (Zebra 9 in 1st round, Zebra 10 in 2nd round and Zebra 9 in 3rd round) and write its name in a post it or piece of paper. Students don’t know which one was chosen, but they can see all pictures at all times.

Note: all shapes in the zebras are either rectangles or triangles.

Setup:
Make 4 groups of 1-2 players each. Give each team a 2-page collection of zebras (numbered 1-12) (you can give them more in later stages of the activity). Tells the students that they are detectives looking for a secret Zebra, and that each group will receive a clue about the secret zebra, which they have to find. Start by showing the 12 zebras to the students.

Round 1 (Demonstration)
Secretly select Zebra #9
In round 1, all students will share the clues from the start and together, with the help of the mentors, will discover the secret Zebra. Round 1 will help students understand the dynamics of the activity, so you can do lots of demonstrations and offer help. This is also an opportunity to practice the notions from part A.

Round 2:
Secretly select Zebra #10
In round 2, start again by giving one clue to each group, but this time let students work individually and then in groups to solve the puzzle and find the secret zebra. Remember that the zebra needs to satisfy all the conditions in all the clues simultaneously.
**Round 3** (Optional if you still have time)

*Secretly select Zebra #9*

In round 3, The students will also collaborate to find the chosen Zebra. However, the clue cannot be directly shown or read to other groups, and thus this round is more challenging than the previous ones.

Taking turns, a group asks a question about some characteristic of the Zebra. Whichever other group may answer the question, talking only about the aspect or characteristic involved in the question. Then, the group that answered gets to ask a question for the other groups about another characteristic.

At any moment, the students can declare that they know the Zebra’s name. The mentor reveals the name to see if the players, as a team, won or lost. There is only one chance to guess.
FIRST ROUND
Clue 1: In the secret Zebra, there are some rectangles that are not squares.
Clue 2: In the secret Zebra, there are twice as many triangles than rectangles.
Clue 3: In the secret Zebra, not all triangles have the same area.
Clue 4: In the secret Zebra, rectangles are not uniformly (equally) distributed.
Solution: Zebra 9

SECOND ROUND
Clue 1: In the secret Zebra, all the rectangles are actually squares.
Clue 2: In the secret Zebra, for each 2 triangles, there is a square.
Clue 3: In the secret Zebra, all triangles have the same area.
Clue 4: In the secret Zebra, rectangles are not uniformly (equally) distributed.
Solution: Zebra 10

THIRD ROUND
Clue 1: In the secret Zebra, there are some rectangles that are not squares.
Clue 2: In the secret Zebra, 20% of the shapes are rectangles.
Clue 3: In the secret Zebra, all triangles have the same area.
Clue 4: In the secret Zebra, rectangles are uniformly (equally) distributed.
Solution: Zebra 12
2) ZEBRAS

Teaching Tips

1. One important goal of this activity is that students familiarize with mathematical terminology and can improve their skills of stating properties using mathematical language.

2. If you can, ask students how to convert from a ratio to a percentage and vice versa. When explaining these conversions, it is a good idea to draw a bar representing the total of 100%, and break it into equal parts. For example, for a ratio of 3:5, you may break the bar into 8 equal parts (5+3).

3. Some students might be confused about the notions of square and rectangle, thinking that a rectangle cannot be a square, when in fact, every square is a rectangle. This activity is a great opportunity to discuss this misconception, and convince students that every square is a rectangle but some rectangles are not squares.

4. Remember that Part 2 has three different rounds (1, 2 and 3) and each has a different purpose:
   - Round 1 serves as demonstration, and you can demonstrate how to reason, combine clues, etc.
   - In round 2 you can guide less and let students cooperate (after an initial moment for each small group to make sense its clue).
   - In round 3, there is more challenge as students cannot directly reveal the clues. It is ok to only start this round, or even not to start if there is no time left.
Meeting 1  Additional Resources

(We will have these resources at the meeting in your table)

- Pages 1-20: **Teaching Manual**
  45 copies, Green (2 per table + extras)

- Pages 21-23: **Situations**
  40 copies, 1-sided, Yellow
  2 kits per table (each kit has 1 copy of each page)

- Pages 24-25: **Zebras**
  200 copies, 1-sided, Grey. 10 kits per table (plus extras). Clip each package for each table.

- Page 26: **Clues**
  20 copies, White
  Cut and form 1 kit for each table. Each kit should have the 12 different clues.

- Page 27
  - **Student Survey** PINK
    120 copies, 1-sided, DO NOT STAPLE, 8 per table

- Pages 29-30: **Meeting Report**
  20 copies, 2-sided, **BLUE**, (1 per table + 2 extra)
<table>
<thead>
<tr>
<th>1st ROUND</th>
<th>2nd ROUND</th>
<th>3rd ROUND</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clue 1: In the secret Zebra, there are some rectangles that are not squares.</td>
<td>Clue 1: In the secret Zebra, all the rectangles are actually squares.</td>
<td>Clue 1: In the secret Zebra, there are some rectangles that are not squares.</td>
</tr>
<tr>
<td>Clue 2: In the secret Zebra, there are twice as many triangles than rectangles.</td>
<td>Clue 2: In the secret Zebra, for each 2 triangles, there is a square.</td>
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<td>Clue 3: In the secret Zebra, not all triangles have the same area.</td>
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</tr>
<tr>
<td>Clue 4: In the secret Zebra, rectangles are not uniformly or equally distributed.</td>
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<td>Clue 4: In the secret Zebra, rectangles are uniformly (equally) distributed.</td>
</tr>
</tbody>
</table>
1) Today activities were:
2) How good were you at solving today's activities?
3) While I was solving the activities, I felt:
4) How hard did you try in today's activities?
5) How often do you feel you can really talk to your mentor?
6) How often do you feel that you and your peers are really a group?

**Scale from 1 to 5 (Please circle your answers):**
- 1 = no fun at all
- 2 = somewhat fun
- 3 = very good
- 4 = lots of fun
- 1 = not good at all
- 2 = somewhat good
- 3 = very good
- 4 = very hard
- 1 = not anxious at all
- 2 = somewhat anxious
- 3 = very anxious
- 4 = always
- 1 = not hard at all
- 2 = somewhat hard
- 3 = always
- 1 = never
- 2 = sometimes
- 3 = always

**Feedback for your mentor:** ____________________________

**3 words to describe Math CEO:** ____________________________

**2 things which I learned today:** ____________________________________________

**2 things that I found interesting:** ____________________________

**1 question that I still have:** ____________________________________________

_Clean your table when you finish, return the dry-erase markers, pick up your trash and take your belongings. Thank your mentor!_

**Thanks for your responses!**
Meetings Report
(Blue paper)
Dear leader mentor,

Please complete this survey about each of the students at your table. Circle the number that better reflects how you feel. We really value your input. THANK YOU for your thoughtful answers, and for your amazing contribution to Math CEO.

**STUDENT'S FIRST NAME:** ___________  **LAST NAME:** ___________

| Compared to his/her peers, how good was this student at solving today's math activities? | 1 (worse) | 2 | 3 (average) | 4 | 5 (a lot better) |
|--------------------------------------------------------------------------------------------|
| How much innate ability or talent in math did this student show today?                     | 1 (not at all) | 2 | 3 (a little) | 4 | 5 (very much)    |
| How much effort did this student put in today’s math activities?                          | 1 (not at all) | 2 | 3 (a little) | 4 | 5 (very much)    |
| How much did this student participate in today’s math activities?                         | 1 (not at all) | 2 | 3 (a little) | 4 | 5 (very much)    |
| How interested was this student in today’s math activities?                               | 1 (not at all) | 2 | 3 (a little) | 4 | 5 (very much)    |

**Note or comments about this student:** __________________________________________________________________________________________

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