7

Practicing what we learned

Spring 2018  Meeting 7
May 23

Contents

1) What we learned
2) Contigo Bingo

www.math.uci.edu/mathceo
Meeting 7 Review Session

Tuesday, May 22nd
Please come to one of the following times:

11:00-11:30 AM  1:30-2:30 PM
RH 510M        RH 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.
Introduction

Dear Mentor

In this meeting we will review some of the topics explored during Spring Quarter, through different problems and puzzles.

In Activity 1 (Mi Mini-Zoo), we close our exploration about Data Charts in the context of Zoos.

In Activity 2 (What we learned), we explore, in each part, fundamental concepts treated during the Quarter, including mathematical properties, areas and minimization.

Math Goals

Read and interpret the meaning of different graphic organizers
- Given a chart or bar graph, kids can identify the largest and smallest categories.

Collect and organize data
- Kids will collect information from other teams and be able to intentionally choose a type of representation for the information.

Model a real world situation
- Kids can create a dataset (chart), given a collection of numerical restrictions.
Practicing what we learned
Meeting 7, May 23rd 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)
During the meeting, you as mentor will have the chance to recognize important Math CEO Values to individual students, by providing them with a recognition ticket. We will also have blank tickets in case you want to write a comment. Plan to give no more than 3 tickets per student.

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<th>Ticket</th>
<th>Math CEO Value</th>
<th>Color</th>
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<tbody>
<tr>
<td>I’m happy you’re here</td>
<td>Commitment</td>
<td>Blue</td>
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<td>Thanks for trying hard</td>
<td>Persistence</td>
<td>Yellow</td>
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<td>Good attitude :)</td>
<td>Respect and rapport</td>
<td>Green</td>
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<td>Nice teamwork!</td>
<td>Collaboration</td>
<td>Purple</td>
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<td>That was a great question!</td>
<td>Communication</td>
<td>Pink</td>
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Write the names of the students on the tickets at the end part of the meeting, right before the raffle.
MATERIALS

INSTRUCTOR MANUAL
Green color

STUDENT WORKBOOK
White Color

MEETING REPORT
Blue color
One per table
Online meeting report

STUDENT SURVEYS
Pink Color

NO QUIZ THIS TIME

WHITEBOARDS
One per student

DRY ERASE MARKERS
A pouch with several

AGENDA

2:10 pm Introduction

2:15 pm 1) What we Learned
Understanding information about people

3:05 pm 2) Bingo
Contigo Bingo

3:20 pm Year closure
Students recognitions

3:30 pm Activity 2) closure and Student Survey

3:45 pm End of the meeting
MATERIALS

INSTRUCTOR MANUAL
Green color

STUDENT WORKBOOK
White Color

MEETING REPORT
Blue color
One per table
Online meeting report

STUDENT SURVEYS
Pink Color

NO QUIZ THIS TIME

WHITEBOARDS
One per student

DRY ERASE MARKERS
A pouch with several

AGENDA

2:10 pm Introduction

2:15 pm 1) What we Learned
Understanding information about people

3:05 pm 2) Bingo
Contigo Bingo

3:25 pm Student Survey

3:35 pm Year closure
Students recognitions

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.

Activity to be done in pairs

1. This icon means that the students should work individually in the corresponding problem, before discussing. Be flexible and adapt to your situation.
Our Goals:
To review the concepts and skills learned during the Quarter.
To have fun and learn how to work in groups, cooperating and being focused.

A - Vehicles (Ratios, distributions)
B - Pixels (Areas)
C - Chests (Minimization)
1) WHAT WE LEARNED

Material
Student Workbook

Introduction

In this Activity, students will work as a team by solving three different problems which review some of the Quater’s material. As a mentor, you will be encouraging students to work together.

Students work up to 15 minutes in every part. Each part has includes one or more challenges, to be done if there is time within the 15 minutes time frame.
In this 15-minute part, students have to interpret mathematical properties related to percentages, ratios and distributions.

In the first problem, students will encounter 6 different pictures. Each picture is a strip which displays a sequence of vehicles of three types: boats, planes and cars. Students are also given six different properties about the pictures and have to match each picture to a unique property, justifying why. (Each property applies to exactly one picture).

In the second problem (which you can do if there is still significant time left), you give a property to students, and they need to draw a strip satisfying that property, justifying why.

This problem builds on Meeting 1, where mathematical properties were explored visually.
The ratio between planes and non-planes is 16:12. Cars are uniformly distributed in the picture. Planes are never adjacent to each other. If every boat transformed into a car, then the ratio planes: cars would be 2:3. 40% of vehicles are boats, 40% are planes and the rest are cars. Both planes and boats are uniformly distributed in the picture.
Look at the six different pictures 1-6 (see previous page). Each picture is a horizontal strip containing images of vehicles: boats, cars and planes.

On the right you can find six descriptions a-f. Each description applies to one and only one of pictures 1-6.

Your job is to match each property with the picture that applies to. Justify your choices.

- **Clue a**: Cars are uniformly distributed in picture 

- **Clue b**: In picture , 40% of vehicles are boats, 40% are planes and the rest are cars.

- **Clue c**: Boats in picture are uniformly distributed and make up more than 15% of the vehicles.

- **Clue d**: The ratio between planes and non-planes in picture is of 16 : 12.

- **Clue e**: If every boat in picture is transformed in a car, then the ratio planes : cars becomes 2:3.

- **Clue f**: In picture , planes are never adjacent to each other.

Hi Andres,

Good morning!

Can you please double check problem A on vehicles? It seems to me that:

- Clue f (no two planes are adjacent) has 2 solutions: 6 and 3.
- Also, pattern # 6 is supposed to be a solution of clue c (“both planes and boats are uniformly distributed”) but planes are not uniformly distributed.
CHALLENGE 1 Create a strip with 15-25 vehicles (same 3 types: boat, car, plane), that satisfies all the following properties:

- Each type of vehicle, except for one of them, is uniformly distributed.
- One of the three types accounts for 50% of the vehicles.

CHALLENGE 2 Create a strip with 15-25 vehicles (same 3 types: boat, car, plane), that satisfies all the following properties:

- The vehicle that appears after (to the right of) a plane is always a car.
- Whenever a boat appears, the two vehicles appearing after are a car and a boat (in either order: boat, car or car, boat)
There are always 2 vehicles between two consecutive cars.

There are 15 vehicles total. Of those, 6 (=40%) are boats, 6 (=40%) are planes and the remaining 3 (=20%) are cars.

There are always 2 vehicles between two consecutive boats. Exactly 5 vehicles out of 15 are boats (= \( \frac{1}{3} = 33\% \)); this is more than 15%.

There are 8 planes and 6 non-planes (boats or cars). So the ratio planes to non-planes is 8:6. This is the same as 16:12 (and 4:3).

There are 6 planes and 9 non-planes (boats or cars). So the ratio planes to non-planes is 6:9. This is the same as 2:3.

There are never two consecutive planes.
**Teaching Tips**

1. Start by checking that the students understand the meaning of the terms “uniformly distributed” and “adjacent”. Paraphrase and also show them a *non-example* of each concept.

2. There are 6 independent questions. Split them among your students, and encourage each student to take ownership of at least one question, solve it, and share the solution with the rest of the group.

3. Recall that each pattern of vehicles satisfy one (*and only one*) description. So when you try to match the pictures with the descriptions, you can go by elimination. Start with (f), which is the easiest.

4. Encourage students to utilize tools to organize their thoughts. For example, as a hint, you can ask students to fill out the following table:

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<th>Pattern</th>
<th># of cars</th>
<th># of boats</th>
<th># of planes</th>
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5. Be aware that, in matching picture 1 to pattern d, students may be confused by the 16:12 planes to non-planes ratio, because there are only 8 planes and 6 non-planes. Be ready to explain equivalent ratios.
In this 15-minute part, students need to “count the pixels” of a rectangular screen (each pixel being a small unit rectangle), which can be viewed as finding the area of a shape or a collection of shapes. It is very important to encourage students not to count pixels one by one, but rather to use visual and numerical properties, including:

- Multiplicative properties
- Properties of average
- Symmetry properties
- Etc.

This activity builds on the topics covered in Meetings 2 and 3, about finding areas of shapes. Although there are no triangles or trapezoids in the strict sense, the same methods of reasoning to find areas apply in the context of this “Pixels” problem, where shapes are collections of rectangles.
We have a small rectangular display (screen). The display has a total of 400 pixels, arranged in a 20 x 20 grid. A pixel is a small rectangle, which is either blank (empty or white) or colored (shaded). So this is a 2-color display.

A hardware engineer is performing several image quality tests in which certain shapes or shapes are displayed in the screen. In each test, she colors certain pixels while leaving the rest blank.

Your task is to first guess, either as a percent or as a fraction, the proportion of pixels colored, and then to find the actual number of pixels colored, without counting 1 by 1, but rather using one or various counting methods.
One way: There are 6 “lines”: 2 diagonals, 2 horizontal and 2 vertical. Each line has 20 pixels. This gives 6 x 20 = 120 pixels. But some lines meet in one pixel, so we need to remove those. Counting, we need to remove 8 pixels. So the answer is 120 - 8 = 112 pixels.

Another solution: The screen has 20 x 20 = 400 pixels. The unshaded pixels form 4 “triangle-like” shapes. The area of each such “triangle-like” figure (in pixels) is 16 + 14 + 12 + 10 + 8 + 6 + 4 + 2, which by average considerations, is equal to 9 x 8 = 72 (9 is the average of 16, 14, 12, 10, 8, 6, 4). So the number of shaded pixels is 400 - 4 x 72 = 400 - 288 = 112.
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Another solution: By symmetry, we need only to count one fourth of the screen (for example, the top left part). The shaded part is composed of three “lines”, each of 10 pixels. Removing the overlap pixels, we count 30 - 2 = 28 pixels. Multiplying by 4, we conclude that there are 112 (=28 x 4) shaded pixels in the screen.
B) PIXELS

Yet another solution: you can squish the diagonals against the wall, producing a screen with two vertical lines of 20 pixels on each side, and a horizontal line of pixels at the top and the bottom. To avoid double counting, you can consider the horizontal line to be made of 16 pixels. This gives:

\[2 \times 40 + 2 \times 16 = 80 + 32 = 112\text{ pixels.}\]
Screen Test #2 (20 x 20 display)
One way: There are three diagonal lines (parallel) of 20, 19 and 18 pixels. The average number of pixels is, thus, 19, so there are $3 \times 19 = 3 \times 20 - 3 = 57$ colored pixels overall.

Another way: there are 18 groups of 3 colored pixels each (each one is a vertical line), plus three more colored pixels.
So there are $18 \times 3 + 3 = 19 \times 3 = 57$ colored pixels.
### Screen Test #3 (20 x 20 display)

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One way: Each row has all but 4 pixels colored, that is, 16. There are 20 rows, so there are 20 x 16 = 320 colored pixels.

Another way: Count the white pixels (20x4 = 80) and subtract that from the total number of pixels (20x20 = 400). This gives you 400 - 80 = 320 colored pixels.

Yet another way: There are two columns of “windows”. Push the left column towards the right column, until the windows are on top of each other, and you get a 4 x 20 giant window.

This giant window contains 80 blank squares. Then the total number of colored pixels is = 400 - 80 = 320.
Screen Test #4 (20 x 20 display)
One way: Use symmetry:
Each fourth of the screen has a total of $1 + 5 + 9 + 13 + 17 = 45$ pixels (split into 5 L-shaped brackets). So there are $4 \times 45 = 2 \times 90 = 180$ colored pixels.

Another way: Use symmetry again. For each fourth of screen, the vertical lines have 8,6,4,2 pixels each. The horizontal lines have 1,3,5,7,9. Grouping smallest with largest we get: (8+1), (6+3), (4+5), (2+7), (0+9), so 5 groups of 9, so 45 pixels. Multiplying by 4 as in the above solution, there are 180 colored pixels in total.
### Screen Test # 5 (20 x 20 display)

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One way: count the pixels in each figure:

“Parallelogram-like” (P): all 9 rows have 10 pixels, so there are 90 colored pixels.

“Triangle-like” (T): There are 7 rows of “lengths” (in pixels) 1,2,3,4,5,6,7, so the average length is 4. So there are 7x4 = 28 colored pixels.

Rectangle (R): 5x7 = 35 pixels.

“Trapezoid-like” (TT): if has 5 rows of 4, 8, 12, 16 and 20 pixels. Average number of pixels is 12, and so there are 12 x 5 = 60 pixels.

Adding, we have: 90 + 28 + 35 + 60 = 213 pixels
Another way: Split the region into 6 regions, as indicated from the picture below.

Then
- region 4 is already a (5 x 7) rectangle. Leave it alone!
- push region 1 up, until it meets region 2, thus forming an 8 x 8 rectangle
- rotate region 6 and move it next to region 5, to form a 10 x 6 rectangle
- double region 3, to form a new 12 x 9 rectangle.

The total number of colored pixels is equal to: 35 + 64 + 60 + 108/2 = 213.
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Teaching Tips

1. There are 5 independent questions. Split them among your students, and encourage each student to take ownership of at least one question, solve it, and share the solution with the rest of the group.

2. Encourage creativity. The beauty of these problems is that they can be solved in so many beautiful ways. Encourage your group to find as many solutions as possible for the same screen.

3. Discourage students from counting *all* the individual pixels, one by one (unless they need to check some counting hypotheses). Instead, they should use some of the methods discussed in these solutions (symmetry, grouping, shifting squares, etc).
We have 6 different chests. Each one contains a unique combination of Gold, Silver and Platinum coins (G, S, P). You, as a student, already know the contents of each chest. For example, here is chest 1, having 7 Gold, 12 Silver and 1 Platinum:

An explorer will open a certain number of chests, grabbing all coins he finds inside. Unfortunately, the explorer does not know what’s inside a particular chest, so we can think that the explorer chooses chests randomly.

PART C: CHESTS

G: 15+

i) What is the least number of chests that the explorer needs to open in order to guarantee collecting at least 15 Gold coins in total?

G: 44+

ii) What is the least number of chests that the explorer needs to open in order to guarantee collecting at least 44 Gold coins in total?

Coins 100+

iii) What is the least number of chests that the explorer needs to open in order to guarantee collecting at least 100 coins in total?

Each type: 20+

iv) What is the least number of chests that the explorer needs to open in order to guarantee collecting at least 20 coins of each type in total (i.e., 20+ Gold, 20+ Silver and 20+ Platinum)?
Challenge

Suppose now that the chests are open so that the explorer can see the contents of each chest. In other words, now he can choose having all the information.

Answer the previous questions again, adapted to this new situation. (Example: i) What is the least number of chests that the explorer needs to open so that he gets at least 15 coins?
Answer: One chest (since there is a chest with 20 Gold coins, so he can choose that one).
i) What is the least number of chests that we need to open in order to be sure to have at least 15 Gold coins?

**Solution:** The idea is to sort the chests according to number of Gold Coins offered, in increasing order, to think of a worst case scenario. This gives: 7, 7, 8, 11, 15, 20. This means that, in the worst case scenario, if we select the chests with 7, 7 and 8 Gold coins respectively, we will obtain $7 + 7 + 8 = 22$ Gold coins. So the answer is: **3 chests**.

ii) What is the least number of chests that we need to open in order to be sure to have at least 44 Gold coins?

**Solution:** We add the numbers of the sequence 7, 7, 8, 11, 15, 20 until we obtain 48 or more. Note that $7 + 7 + 8 + 11 + 15 = 48$. So the answer is: **5 chests**.

iii) What is the least number of chests that we need to open in order to have at least 100 coins?

**Solution:** We find the number of chests in each coin, then sort in increasing order. This gives: 16 (chest 5), 20 (chest 1), 32 (chest 6), 33 (chest 3), 34 (chest 2), 35 (chest 4). Since $16 + 20 + 32 + 33 = 101$, we conclude (by a similar argument as in previous problems) that the answer is **4 chests**.
iv) What is the least number of chests that we need to open in order to have at least 20 coins of each type in total (i.e., 20+ Gold, 20+ Silver and 20+ Platinum)?

**Solution:** Let’s first try to see what can happen if, say, we would choose 4 chests. We choose 4 since is not too much but not too little (we could have also started with 3 or 5).

The worst case scenario for Gold (meaning choosing the 4 chests with the least amount of gold) would be getting 33 Gold, and in the choice of those chests one would get 47 Silver and 24 Platinum. In this case, we would reach the goal of a minimum of 20 coins in each type.

Similarly, the worst case scenario for Silver is 29 S, 53 G and 33 P. So far it seems that 4 chests will help us reach our gold. However, when we compute the worst case scenario for Platinum (Chests 1, 2, 5 and 6) we get: 17 P, 42 G and 46 S, which is not enough (since we don’t yet have 20 Platinum). Since each of chests 3, 4 and 7 have 3+ platinum coins, choosing one more chest would help us reach the goal. So the answer is: 5 chests.
Extra challenge 1: Open chests

Suppose now that the chests are open so that the explorer can see the contents of each chest. Answer the questions again, adapted to this new situation. (Example: i) What is the least number of chests that the explorer needs to open so that he gets at least 15 coins? Answer: One chest (since there is a chest with 20 Gold coins).
Teaching Tips

1. All the problems and activities in this meeting build on previous topics and skills that students have seen and developed in previous meetings. Use this to your advantage, as you know your students well already and know which aspects of learning to focus on, which misconceptions to attend to, and how to challenge those students who have understood the material very well so far.
Our Goals:
To practice mental math
To have fun and learn how to work in groups, cooperating and being focused

Make 3 in a line,
4 in a line, 5 in a line,
or try to get the whole table
Introduction

In this activity, students will be playing a math bingo. The game is a simplified version of the contigo game. Each table received three dice, and a different bingo card for each student. The mentor rolls three dice, and the students try to utilize these dice rolls to create a number on their card. They can use any mathematical operation, like in contigo. However, they do not accrue points at each step.

The goal of each student is to make 3 numbers in a line, 4 in a line, 5 in a line, possibly covering the whole card. Note: lines can be vertical or horizontal. No diagonal.

Students will be receiving lottery tickets for completing 3 (or 4 or 5) numbers in a line. The same line cannot count for, say, 3 and 4 numbers in a line.

Just like in contigo, encourage students to record the rolls and the computations on the space provided. This is essential for receiving lottery tickets, as the mentor needs to verify that the computations are correct before handling tickets.

Materials:

1 bingo card per student
+ space to record rolls and computations

3 dice per table
2) MATH BINGO

Sample card

Math Bingo

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<th>Dice Rolls</th>
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Practicing what we learned

Spring 2018    Meeting 7
May 23

Contents

1) My Mini - Zoo

2) What we learned
What we Learned

Our Goals:
To review the concepts and skills learn during the Quarter.
To have fun and learn how to work in groups, cooperating and being focused

A - Vehicles (Ratios, distributions)
B - Pixels (Areas)
C - Chests (Minimization)
Look at the six different pictures 1-6 (see previous page). Each picture is a horizontal strip containing images of vehicles: boats, cars and planes.

On the right you can find six descriptions a-f. Each description applies to one and only one of pictures 1-6.

Your job is to match each property with the picture that applies to. Justify your choices.

**a**  Cars are uniformly distributed in picture .

**b**  In picture , 40% of vehicles are boats, 40% are planes and the rest are cars.

**c**  Boats in picture are uniformly distributed and make up more than 15% of the vehicles.

**d**  The ratio between planes and non-planes in picture is of 16 : 12.

**e**  If every boat in picture is transformed in a car, then the ratio planes : cars becomes 2:3.

**f**  In picture , planes are never adjacent to each other.

Hi Andres,

Good morning! Can you please double check problem A on vehicles?

It seems to me that:

- Clue f (no two planes are adjacent) has 2 solutions: 6 and 3.
- Also, pattern # 6 is supposed to be a solution of clue c (both planes and boats are uniformly distributed) but planes are not uniformly distributed.
A) VEHICLES

The ratio between planes and non-planes is 16:12. Cars are uniformly distributed in the picture. Planes are never adjacent to each other. If every boat transformed into a car, then the ratio planes: cars would be 2:3.

40% of vehicles are boats, 40% are planes, and the rest are cars. Both planes and boats are uniformly distributed in the picture.

CHALLENGE 1  Create a strip with 15-25 vehicles (same 3 types: boat, car, plane), that satisfies all the following properties:

- Each type of vehicle, except for one of them, is uniformly distributed.
- One of the three types accounts for 50% of the vehicles.

CHALLENGE 2  Create a strip with 15-25 vehicles (same 3 types: boat, car, plane), that satisfies all the following properties:

- The vehicle that appears after (to the right of) a plane is always a car.
- Whenever a boat appears, the two vehicles appearing after are a car and a boat (in either order: boat, car or car, boat)
In this 15-minute part, students need to “count the pixels” of a rectangular screen (each pixel being a small unit rectangle), which can be viewed as finding the area of a shape or a collection of shapes. It is very important to encourage students not to count pixels one by one, but rather to use visual and numerical properties, including:

- Multiplicative properties
- Properties of average
- Symmetry properties
- Etc.

This activity builds on the topics covered in Meetings 2 and 3, about finding areas of shapes. Although there are no triangles or trapezoids in the strict sense, the same methods of reasoning to find areas apply in the context of this “Pixels” problem, where shapes are collections of rectangles.
We have a small rectangular display (screen). The display has a total of 400 pixels, arranged in a 20 x 20 grid. A pixel is a small rectangle, which is either blank (empty or white) or colored (shaded). So this is a 2-color display.

An hardware engineer is performing several image quality tests in which certain shape or shapes are displayed in the screen. In each test, she colors certain pixels while leaving the rest blank.

Your task is to first guess, either as a percent or as a fraction, the proportion of pixels colored, and then to find the actual number of pixels colored, without counting 1 by 1, but rather using one or various counting methods.
One way: There are 6 "lines": 2 diagonals, 2 horizontal and 2 vertical. Each line has 20 pixels. This gives 6 x 20 = 120 pixels. But some lines meet in one pixel, so we need to remove those. Counting, we need to remove 8 pixels. So the answer is 120 - 8 = 112 pixels.

Another solution: The screen has 20 x 20 = 400 pixels. The unshaded pixels form 4 "triangle-like" shapes. The area of each such "triangle-like" figure (in pixels) is 16 + 14 + 12 + 10 + 8 + 6 + 4 + 2, which by average considerations, is equal to 9 x 8 = 72 (9 is the average of 16, 14, 12, 10, 8, 6, 4). So the number of shaded pixels is 400 - 4 x 72 = 400 - 288 = 112.
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PART C: CHESTS

We have 6 different chests. Each one contains a unique combination of Gold, Silver and Platinum coins (G, S, P). You, as a student, already know the contents of each chest. For example, here is chest 1, having 7 Gold, 12 Silver and 1 Platinum:

An explorer will open a certain number of chests, grabbing all coins he finds inside. Unfortunately, the explorer does not know what’s inside a particular chest, so we can think that the explorer chooses chests randomly.

i) What is the least number of chests that the explorer needs to open in order to guarantee collecting at least 15 Gold coins in total?

G: 15+

ii) What is the least number of chests that the explorer needs to open in order to guarantee collecting at least 44 Gold coins in total?

G: 44+

iii) What is the least number of chests that the explorer needs to open in order to guarantee collecting at least 100 coins in total?

Coins 100+

iv) What is the least number of chests that the explorer needs to open in order to guarantee collecting at least 20 coins of each type in total (i.e., 20+ Gold, 20+ Silver and 20+ Platinum)?

Each type: 20+
Challenge

Suppose now that the chests are open so that the explorer can see the contents of each chest. In other words, now he can choose having all the information.

Answer the previous questions again, adapted to this new situation. (Example: i) What is the least number of chests that the explorer needs to open so that he gets at least 15 coins?
Answer: One chest (since there is a chest with 20 Gold coins, so he can choose that one).
C) CHESTS

1
7 G
12 S
1 P

2
20 G
8 S
6 P

3
11 G
9 S
13 P

4
8 G
21 S
6 P

5
7 G
5 S
4 P

6
15 G
7 S
10 P
Extra challenge 1: Open chests

Suppose now that the chests are open so that the explorer can see the contents of each chest. Answer the questions again, adapted to this new situation. (Example: i) What is the least number of chests that the explorer needs to open so that he gets at least 15 coins? Answer: One chest (since there is a chest with 20 Gold coins).
Our Goals:
To practice mental math
To have fun and learn how to work in groups, cooperating and being focused

Make 3 in a line,
4 in a line, 5 in a line,
or try to get the whole table
2) MATH BINGO

Sample card

Example:

<table>
<thead>
<tr>
<th>Dice Rolls</th>
<th>Expression</th>
<th>= Number</th>
</tr>
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<tbody>
<tr>
<td>[5] [3] [2]</td>
<td>(5*2)+3</td>
<td>= 13</td>
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Meeting 7 Resources
(We will have these resources at the meeting in your table)

- Pages 1-43: Teaching Manual
  50 copies, Green (2-3 per table + extras)

- Pages 44-61: Student Workbook
  100 copies, 2-sided, stapled, White
  6-7 copies per table plus extras

- Page 63: Student Survey  PINK
  110 copies, 1-sided, DO NOT STAPLE, 8 per table

- Pages 65-66: Meeting Report   BLUE
  20 copies, 2-sided, BLUE, (1 per table + 2 extra)

Hi Andres, and hi Aghavni,
Please note: the meeting resources page
needs to be updated.
We need copies of the attached bingo cards
(print 2 slides per page so each students get
two tables to record data).
We probably need a total of 2 copies of the
attached file, one per room.
The folder for each table should have
enough pages for each student, plus some
extra.
We also need 3 dice for tables.
Questions:
1) How enjoyable were today’s tasks?  
   1 = not at all enjoyable  2  3 = somewhat enjoyable  4  5 = very enjoyable
2) How competent did you feel on today’s tasks?  
   1 = not competent at all  2  3 = somewhat competent  4  5 = very competent
3) How did you feel while solving today’s tasks?  
   1 = not pressured at all  2  3 = somewhat pressured  4  5 = very pressured
4) How important was for you to do well on today’s tasks?  
   1 = not important at all  2  3 = somewhat important  4  5 = very important
5) How close do you feel to your mentor at Math CEO?  
   1 = not close at all  2  3 = somewhat close  4  5 = very close
6) How close do you feel to your peers at Math CEO?  
   1 = not close at all  2  3 = somewhat close  4  5 = very close

Feedback for your mentor: ____________________________  
3 words to describe Math CEO  ________________________________

2 THINGS WHICH I LEARNED TODAY

2 THINGS THAT I FOUND INTERESTING

I 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: ________________________________________________________________

STUDENT’S FIRST NAME: ___________  LAST NAME: ___________
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