Day 1: Four 4's

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Introduction

In day 1 we have a video and 2 activities. The first activity helps students work well in groups all year, the second is one of my favorite inquiry tasks that helps to set norms on the first day of the year. The timing for the lesson is given after my description of the tasks.

Video

The messages of the video are that everyone can learn math, with important brain and mindset evidence that will encourage students in math. It will be good if you have time to discuss the video, after the video or at the end of the lesson. Or you could ask the students to reflect on the ideas in writing later.

Activity: Good Group Work

I always use this activity before students work on math together as it helps improve group interactions. Teachers who have tried this activity have been pleased by students' thoughtful responses and found the students' thoughts and words helpful in creating a positive and supportive environment. First I ask students to reflect on things they don't like people to say or do in a group when they are working on math together. Students come up with quite a few really important ideas, such as not liking people to give away the answer, or to rush through the work, or to ignore other people's ideas. After they have thought of a few of the ideas I ask them to think of the converse – what DO they like people to do and say when working in a group. When students have had enough time in groups brainstorming the teacher then collects the ideas. I usually do this by making a "What we don't like" list/poster and asking each group to contribute one idea, moving around the room until a few good ideas have been shared (usually about 10). Then I do the same for the "what we do like" poster/list. I usually present the final posters to the class as our agreed upon classroom norms that we will refer back to through the year. If any student shares a negative comment, such as "I don't like waiting for slow people" do not put it on the poster, instead use it as a chance to discuss the issue. This rarely or never happens and students are usually very thoughtful and respectful in the ideas they share.

Activity: Four 4's

I chose four 4's as a first day activity as it is exciting and engaging for students and it also provides a gentle way to encourage reluctant students to come to the board to share their thinking. I always start the activity by putting the numbers 1 to 20 on the board with plenty of space in between them:

1.	6.	11.	16.
2.	7.	12.	17.
3.	8.	13.	18.
4.	9.	14.	19.
5.	10.	15.	20.

Write the numbers 1 - 20 on the board so students can share their solutions.

Ask students to include as many examples as they can think of for each solution.

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I then tell students we are going to try and find every number from 1 to 20 using only four 4's – all four of them have to be used each time – and any operation.

I ask them to think of operations and together we make a list. Usually they come up with:

$$+ \quad - \quad \times \quad \div$$

In grades 5 and above I suggest reminding students of the square root symbol which they can use, giving them $\sqrt{4}$ or the number 2. If this is not appropriate for your students then I would not introduce it and just ask students to try and get as many numbers as they can using the operations they know. In our trials the 3rd graders loved this task. They worked in groups to come up with as many numbers as they could. The teacher, Nick, reported that it was really helpful to have the students use ¼ as they used this in their inquiry work, allowing them to develop a deeper understanding of its meaning.

You could give students an example of a solution to one of the numbers eg $$\frac{4}{4} + 4 - 4$$

I tell students to put on the board as many solutions they can think of for each number, and to come and put their solution up on the board whenever they think of one.

If a student puts up an incorrect solution do not correct it, wait as students will often see it for themselves, as more solutions are shared.

Another strategy that you may or may not want to teach 3rd and 4th graders is the factorial operation. When I have the gave the four 4's task to 6th graders I did not show this initially. Instead I waited for them to become stuck on some numbers (11, 13, 19) that they could not find and used that as a teach-able moment to introduce factorial.

Factorial is something that younger children can understand so it may be appropriate to introduce it to your students after they have found some of the solutions.

Factorial

$2! = 2 \times 1 = 2$

$3! = 3 \times 2 \times 1 = 6$

$4! = 4 \times 3 \times 2 \times 1 = 24$

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This activity has many extensions. If students have found the 20 numbers and you have more lesson time, ask them if they can think of other questions to try. Or pose other questions, such as, extending beyond 20, extending into negative numbers, or five 5's.

Activity	Time	Description/Prompt	Materials
Day 1 Video: Mindset	4 min	Video https://www.youcubed.org/wim-day-1/	
		Possible video discussion	
Good Group Work	15 min	1. Reflect on the things you do not like people to say and do when you are working on math in a group 2. Reflect on the things you do like people to say and do when you are working on math in a group	• Paper, pencil/pen • 2-4 pieces of large poster paper to collect the students' ideas
Four 4's	20 min	Find the numbers 1 - 20 using only four 4's and any operation. Students work in groups and come up to the board to share solutions whenever they find them.	• Paper, pencil/pen
Closing	5 min	Review the key concepts: Having a growth mindset for mathematics is important. We can all learn math to any level we choose. Self belief is really important.	

Extensions:
- Can you continue using Four 4's to find numbers greater than 20?
- Make a number challenge of your own that is similar to Four 4's
- Can you use Four 4's to make negative numbers?
- How many numbers can you make with Five 5's?