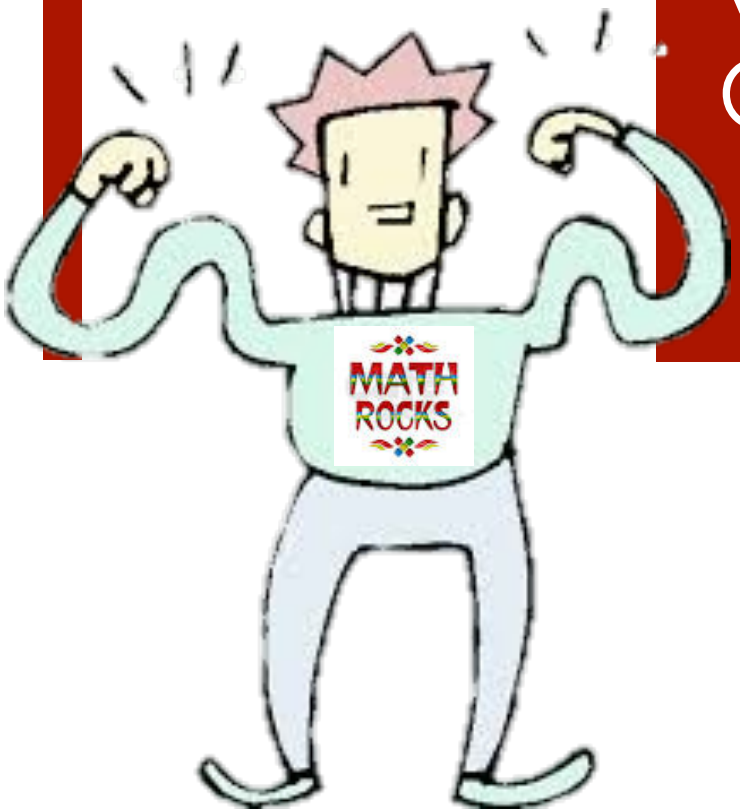
How to build your students' mathematical muscle with Low Floor High Ceiling Tasks



By Stephanie Bernander and Jennifer Metke

How many numbers can you find between 1 and 20 using only four 4's and any operation?

Activity Debrief

- What number did you first attempt to find?
- What number did you find the most solutions for? The least? Why do you think that is?
- Why might this activity feel safe?
- What benefits can you see using a tasks like this?

Planning for Tasks

What is the learning intention of this tasks?

How will you know if students are successful?

What mathematical knowledge/skills did this problem uncover?

What roadblocks might come up with this tasks? What questions could you use to nudge students' thinking without lowering the cognitive level of the tasks?

How could this activity be adapted for the primary grades?

What supplies will you have available for this task?

Low Floor High Ceiling Tasks

- Low floor High Ceiling Tasks are those that all students can access but can be extended to high levels (taken from You Cubed).

- Low Threshold High Ceiling Tasks are activities that everyone in a group can begin, and then work on at their own level of engagement, but which has lots of possibilities for the participant to do much more challenging math (taken from nrich.maths.org).

Is four 4's a LFHC task?

Why or why not?

Folding Problem

1. Construct a square with exactly ¼ the area of the original square. Convince yourself that it is a square and has ¼ of the area.
2. Construct a triangle with exactly ¼ the area of the original square. Convince yourself that it has ¼ of the area.
3. Construct another triangle, also with ¼ the area, that is not congruent to the first one you constructed. Convince yourself that it has ¼ of the area.
4. Construct a square with exactly ½ the area of the original square. Convince yourself that it is a square and has ½ of the area.
5. Construct another square, also with ½ the area, that is oriented differently from the one you constructed in 4. Convince yourself that it has ½ of the area.

LFHC Reflection

- What is the learning intention of this task?
- What mathematical concepts surfaced that you didn't expect?
- What questions could you ask that might help nudge students that were stuck without lowering the cognitive level of this task?

Benefits

- Allows learners to show what they can do, not what they can't
- Provides Differentiation to nearly all learners, high flyers can explore and challenge themselves and less confident students can consolidate their thinking
- Learners often raise their game when participating in discourse about the activity since they too had spent time on the same topic
- Promotes positive classroom culture

Benefits

- Offers many possibilities for learners to focus on more sophisticated process skills rather than more knowledge.
- Mirrors real life math
- Hits numerous Math Practice Standards *
- Promotes the belief that "I can do math!"
- Helps students see that Math Is Fun!

Practice Standards

MP 1: Make sense of problems and persevere in solving them

MP 2: Reason abstractly and quantitatively.

MP 3: Construct viable arguments and critique the reasoning of others.

MP 4: Model with mathematics.

MP 5: Use appropriate tools strategically.

MP 6: Attend to precision.

MP 7: Look for and make use of structure.

MP 8: Look for and express regularity in repeated reasoning.

Can you adapt tasks to become LFHC tasks?

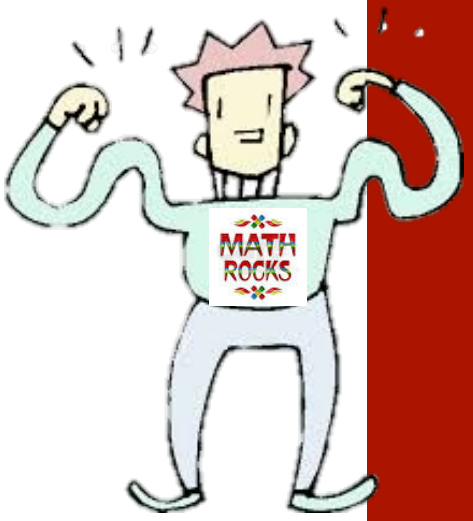
Lucy has measuring cups of sizes 1 cup, ½ cup, 1/3 cup, and ¼ cup. She is trying to measure out 1/6 of a cup of water and says, "if I fill up the ½ cup and then put that into the 1/3 cup until it is full, there will be 1/6 cup of water left.

- Is Lucy's method correct? Explain.
- Lucy wonders if she can measure out 1/12 of a cup. Is it possible? Explain.
- What other amounts of water can Lucy measure?

Taken from Illustrative Mathematics "Measuring Cups"

Where can I find more tasks like this?

- www.youcubed.stanford.edu/tasks
- nrich.maths.org/7701/index
- www.illustrativemathematics.org
- www.insidemathematics.org/problems-of-the-month



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