
Creating Mathematical Thinkers

Using Exemplars in the
Classroom

Heidi Demasi and Jenna Katuziowski
5th grade JBBES

What is an Exemplar?

- "Exemplars performance material provides teachers and administrators with a way of teaching and assessing problem solving and communication skills." <http://www.exemplars.com/education-materials/math-k-12>
- Exemplars are real world problems that encourage students to use their own creative thinking to arrive at a solution.

Why and when should we use Exemplars?

- "Our open-ended material engages students and helps them to develop critical thinking and reasoning skills to solve real-world problems."
<http://www.exemplars.com/education-materials/math-k-12>
- Exemplars are unique math problems that enhance students' use of spoken and written language.
- They offer an opportunity for students to build upon their math talk and share their math thinking with their peers.
- We use them at the end of units and on half days or days when math minutes are cut short. Exemplar questions compliment the curriculum.

Considerations for implementation:

- When introducing the Exemplar, focus instructions on the thinking, not just getting an answer.
- In some exemplars, just being able to determine what is being asked can be a challenge. Celebrate the understanding of the question!
- It's worth considering that you don't always have to tell students the correct answer.
- Don't offer too much support. The struggle is where the thinking happens. If students know you will help, they may give up and wait for your support.

How are Exemplars assessed?

- Students self assess their performance and teacher assesses using the rubric. This is a great formative tool, which provides useful information to the teacher.
- Criteria used by teacher: ***see your standard rubric***
 - Problem solving
 - Reasoning and proof
 - Communication
 - Connections
 - Representation

How do students self assess and what do I look for?

- Levels of Performance: *see your standard rubric*
 - Novice
 - Little to no attempt, no mathematical basis, no strategy
 - Apprentice
 - Partial strategy, some mathematical basis, some attempt made
 - Practitioner
 - Correct strategy chosen, mathematical basis and connections, appropriate representations
 - Expert
 - Efficient strategy, deductive argument, mathematical basis used to make extensions, abstract or symbolic representation

Strategies to Extend Student Thinking:

- Students communicating their thinking to peers is a key element of this type of lesson.
- Quality Questioning gains the highest yield for the student sharing and those listening.

Would you describe how you arrived at your answer?

There is not a single correct solution for this question. who has an alternative response?

Is there anything you tried first that didn't work? How did you change it?

Follow up with questions like, "Why? Do you agree? Can you elaborate? Tell me more. Can you give an example?"

Try it out!

Now it's your turn!

Complete the exemplar as if you were a 5th grade student.

Check your work and show your proof!

Be ready to share with the class.

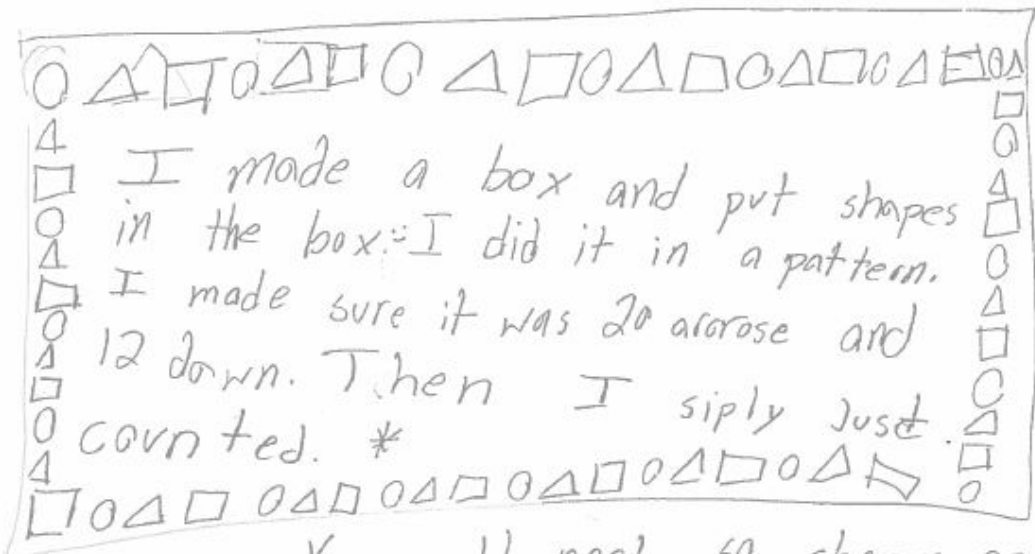
Exemplars

Bulletin Board Border

Please help me. I would like to make a geometry bulletin board that has a border of circles, triangles and squares. I know that 20 shapes will fit across the board and that 12 shapes will fit down the board. If I start in the top left-hand corner with a circle followed by a triangle then a square and repeat this pattern all around the board, how many of each shape will I need?

Explain your solution using words and pictures.

Explain your solution using words and pictures.



I made a box and put shapes in the box. I did it in a pattern. I made sure it was 20 across and 12 down. Then I simply just counted. *

You would need 60 shapes, 20 shapes each.

$$\begin{array}{l} \square = 20 \\ \triangle = 20 \\ \bigcirc = 20 \end{array} \left. \vphantom{\begin{array}{l} \square \\ \triangle \\ \bigcirc \end{array}} \right\} 60$$



You could do The Math
By adding 20, 20, 10, 10

$$\begin{array}{r} 20 \\ 20 \\ + 20 \\ \hline 60 \end{array}$$

You get the total and you can divide by 3 to get the number of \square , \triangle , and \bigcirc .

$$\begin{array}{r} 60 \\ \div 3 \\ \hline 20 \end{array}$$

Then you have your answer.

$$\begin{array}{l} \square = 20 \\ \triangle = 20 \\ \bigcirc = 20 \\ \text{Total} = 60 \end{array}$$

Bulletin Board Border

Fractions

3/62 Please help me. I would like to make a geometry bulletin board that has a border of circles, triangles and squares. I know that 20 shapes will fit across the board and that 12 shapes will fit down the board. If I start in the top left-hand corner with a circle followed by a triangle then a square and repeat this pattern all around the board, how many of each shape will I need? (64)



Explain your solution using words and pictures.

$$\begin{array}{r} 20 \\ \times 2 \\ \hline 40 \end{array}$$

$$\begin{array}{r} 40 \\ + 24 \\ \hline 64 \end{array}$$

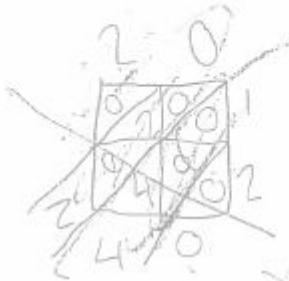
$1=0$ $2=\Delta$ $3=\square$

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

I drew a square and put the shapes around them and then labeled each line with numbers 1-20. I also tried dividing 64 by 3 and I got 21.333 etc. which means the average answer is 21.3. Rounding down to 21 and I got 21, 21, 20.

12 13 14 15 16 17 18 19 20

Explain your solution using words and pictures.



First I multiplied 20 by 12 because there are 12 rows that can fit 20 in each then I divided the answer by 3 because there are 3 shapes and then I got the answer 20



~~You will need 30 of each shape~~

I double checked my work by drawing a frame and following the pattern 20 across then 12 down then 10 across

my work

$$(20 \times 2) + (12 \times 2) =$$



$$40 + 24 = 64$$

$$\begin{array}{r} 217 \\ 3 \overline{)64} \end{array}$$

- 20 Circles
- 20 Squares
- 20 Triangles



First I multiplied $(20 \times 2) + (12 \times 2)$ because 12 can fit down the board and I can fit 20 across the board but to make a full square I need to have 4 even sides so I multiplied each number by 2. $20 \times 2 = 40$ so I multiplied 40 and $12 \times 2 = 24$ so I added 40 and 24 which got me 64. I divided 64 by 3 which got me 21 r 1. ~~the first one was a mistake~~ I put 20 circles, 20 squares, and 20 triangles but I still checked my work.

Bulletin Board Border

Please help me. I would like to make a geometry bulletin board that has a border of circles, triangles and squares. I know that 20 shapes will fit across the board and that 12 shapes will fit down the board. If I start in the top left-hand corner with a circle followed by a triangle then a square and repeat this pattern all around the board, how many of each shape will I need?

Explain your solution using words and pictures.

he will need 43 more shapes

he knows 20

20	12	?
----	----	---

made a square with triangles and squares with circles my answer was 43.

334

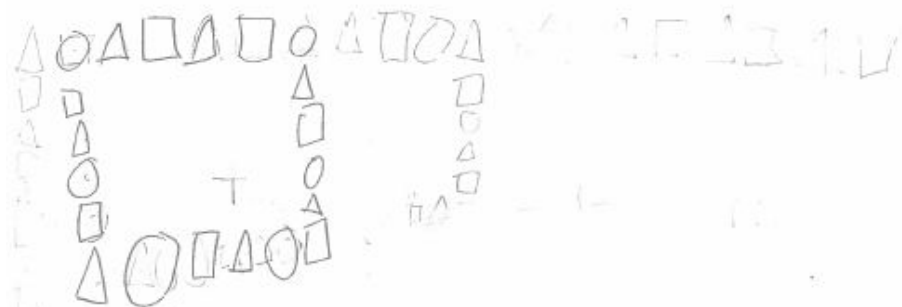
$$\begin{array}{r} 20 \\ + 12 \\ \hline 32 \end{array}$$

I did addition and subtraction and got 32 I did I did let's see but I got 334 so I swited the place and got 433 it was to high of a number so I took away 3 and got

Bulletin Board Border

Please help me. I would like to make a geometry bulletin board that has a border of circles, triangles and squares. I know that 20 shapes will fit across the board and that 12 shapes will fit down the board. If I start in the top left-hand corner with a circle followed by a triangle then a square and repeat this pattern all around the board, how many of each shape will I need?

Explain your solution using words and pictures.



there are 20 shapes

in all or total.

Bulletin Board Border

Please help me. I would like to make a geometry bulletin board that has a border of circles, triangles and squares. I know that 20 shapes will fit across the board and that 12 shapes will fit down the board. If I start in the top left-hand corner with a circle followed by a triangle then a square and repeat this pattern all around the board, how many of each shape will I need?

Explain your solution using words and pictures.



You would need 64
Shapes

$$\begin{array}{r} + 20 \\ 20 \\ \hline + 40 \\ + 24 \\ \hline 62 \end{array}$$

$$\begin{array}{r} + 12 \\ 12 \\ \hline 24 \end{array}$$

Curriculum Considerations:

21st Century Skills

“Learning and innovation skills increasingly are being recognized as the skills that separate students who are prepared for increasingly complex life and work environments in the 21st century, and those who are not. A focus on creativity, critical thinking, communication and collaboration is essential to prepare students for the future.”

What is your biggest takeaway?

Would you be willing to try this in your school?

How will you need to adapt this to work your school?

What extension ideas do you have?

When do you think would be a great opportunity to use an Exemplar in your school?

Do you foresee any barriers to trying this in your school?

Thank you!

Contact us with any questions or further information you might need!

Heidi.Demasi@wjccschols.org

Jenna.Katuziensi@wjccschools.org