
Creative Math Prompts

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How Open-Ended Math Problems Keep on Giving

Imagine open-ended math tasks that get students *asking* questions as well as answering them. *Creative Math Prompts* lead learners to build and test their own ideas.



comparisons? Helping these students reach their full potential may mean challenging some popular beliefs.

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Students Back

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My Background

- B.A. Physics, M.A. Mathematics, M.A.T. Mathematics Education
- Gifted Math Specialist (21 years) in MN
 - teach math classes to gifted learners (primarily upper elementary and middle school)
 - develop and implement deep, challenging math resources for grades 1 – 8
 - train teachers in meeting needs of gifted math students in grades 1 – 8
- Teach Algebra and Calculus courses to highly gifted high-school students in the Minnesota Talented Youth Math Program (Johns Hopkins model) (7 years)
- Write the *Advanced Common Core Math Explorations* book series for grades 5 – 8
- Speak, train, and consult in area of Gifted Math Education (5 yrs)
- Design and teach Mathematical Thinking courses for highly gifted students in India

Goals

Experience math as a *creative* activity.

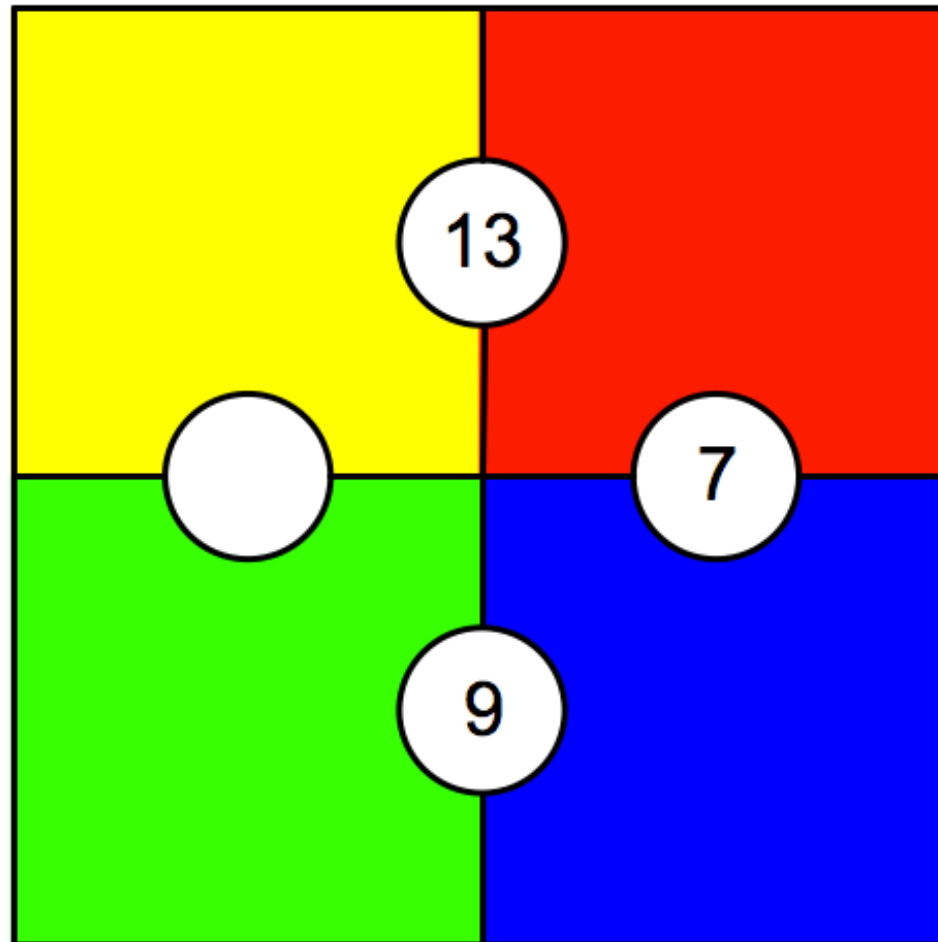
Understand *Creative Math Prompts* as...

- A practical resource for challenging gifted kids.
- A new way of thinking about math and teaching math.

Learn with *Creative Math Prompts*.

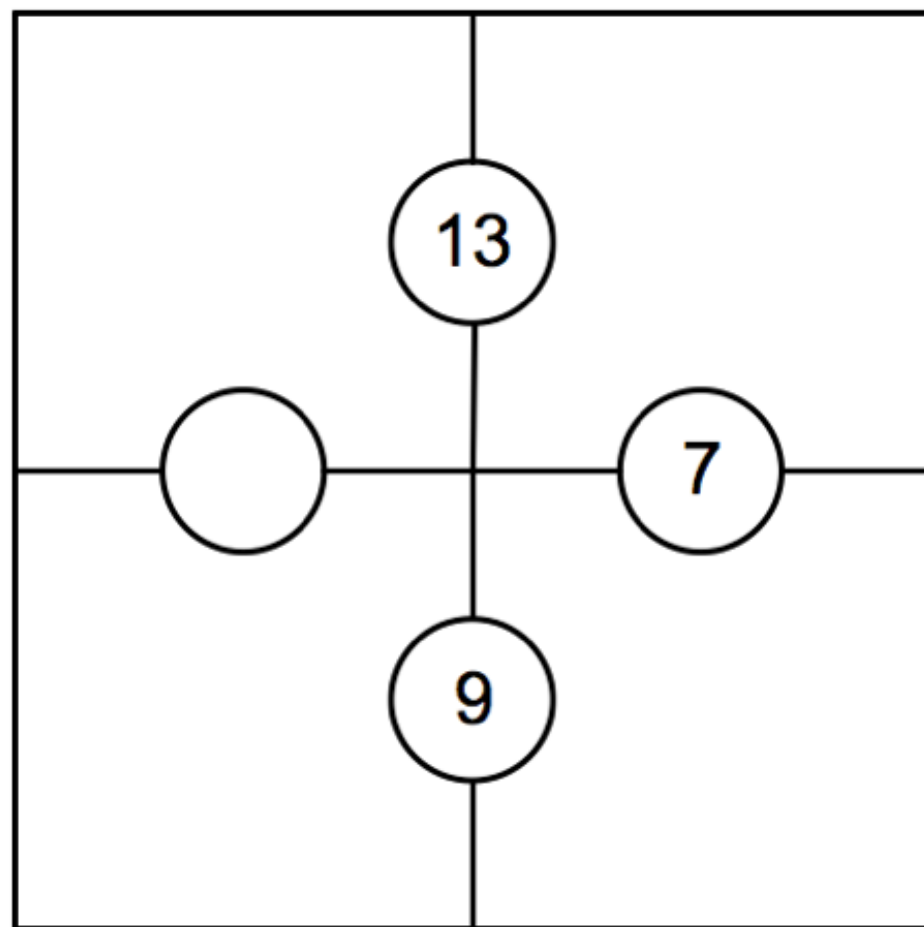
Imagine implementing *Creative Math Prompts*.

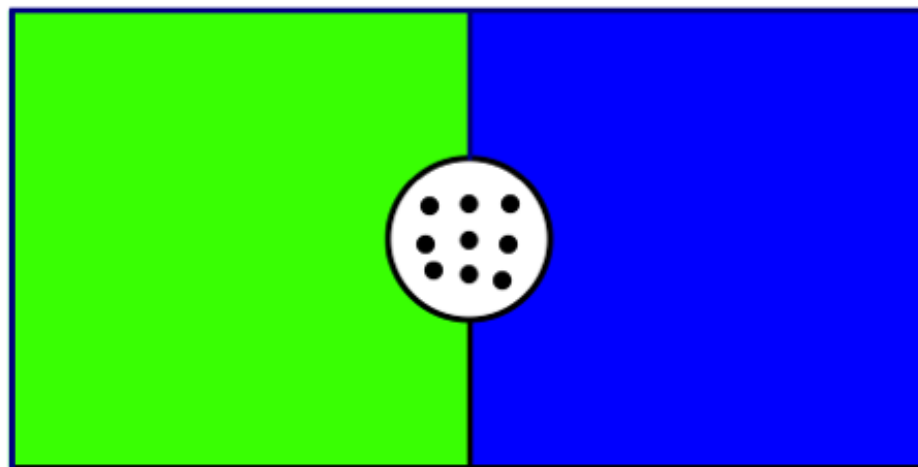
What do you notice? What do you wonder?
What can you create?

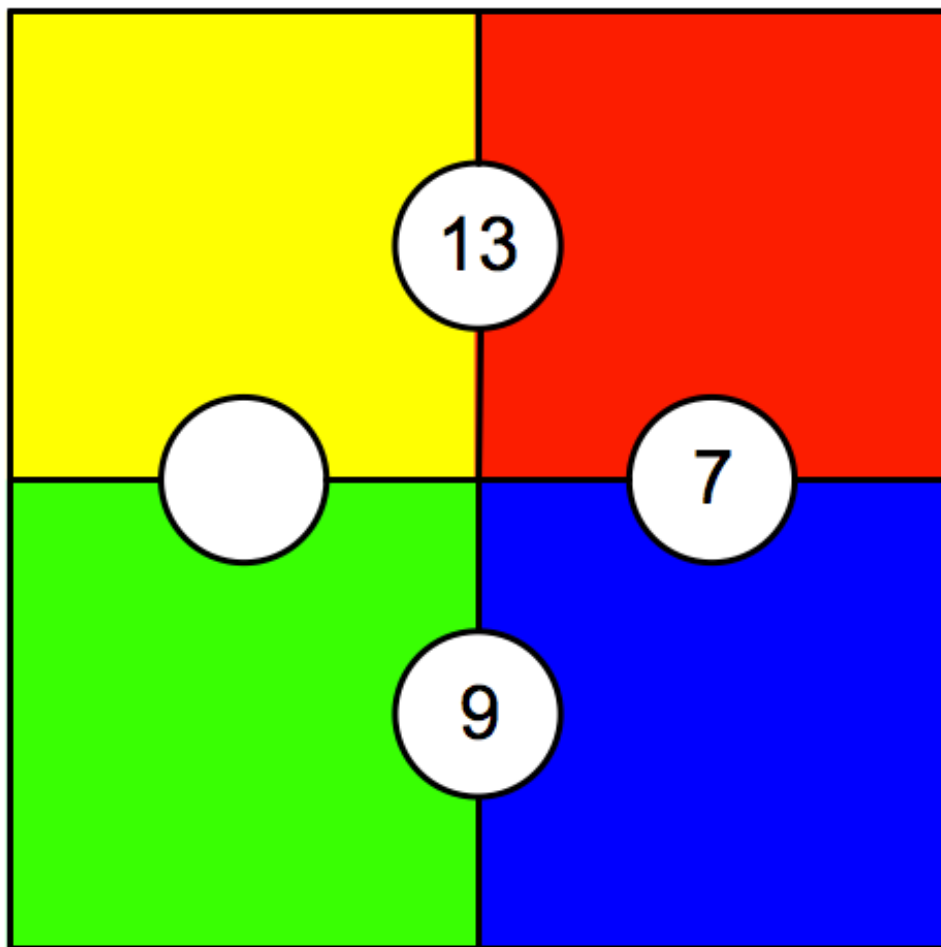


Notice and Wonder chart

I notice	I wonder







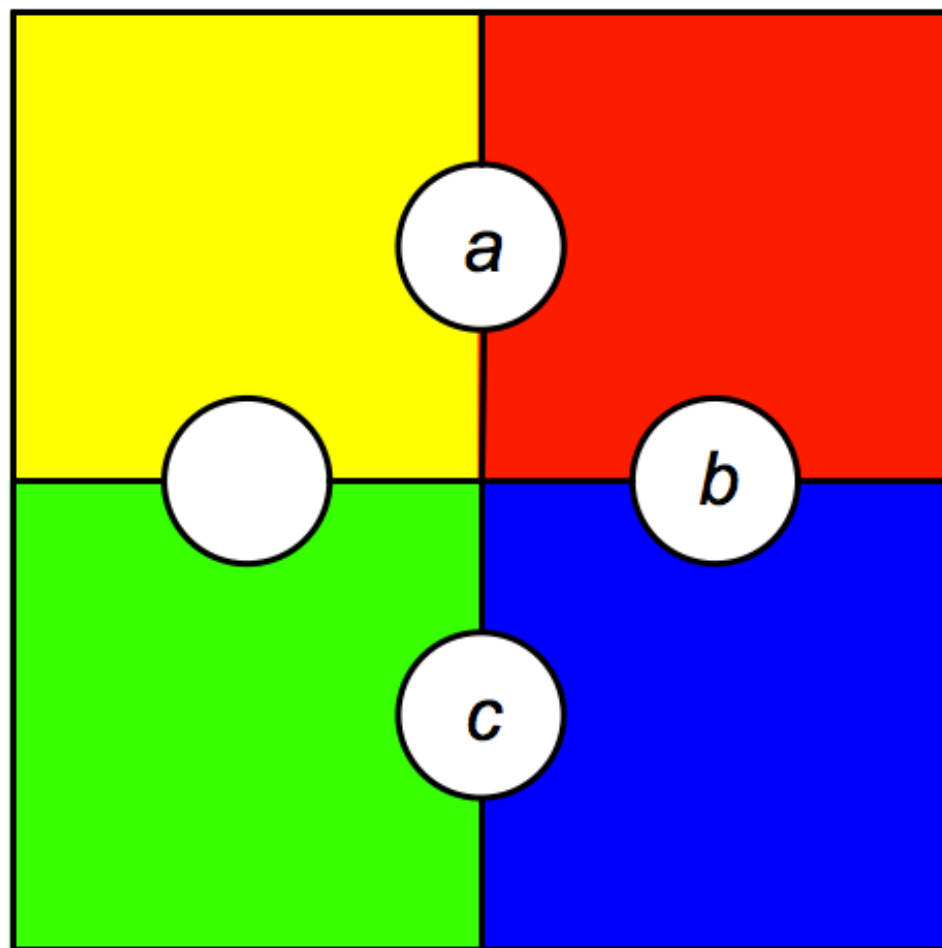
Y	R	B	G
9	4	3	6
7	6	1	8
13	0	7	2

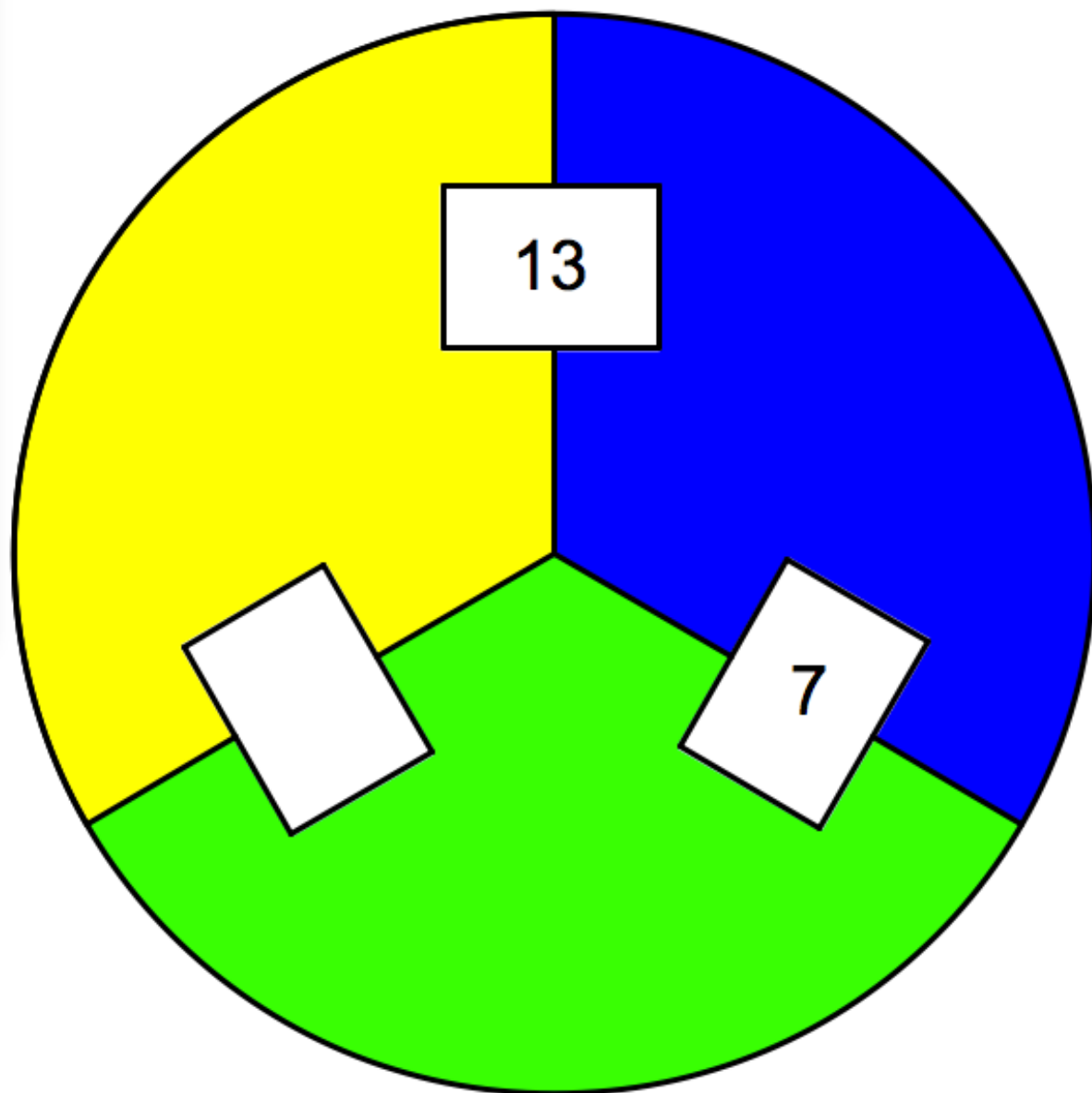
$$Y + R = 13$$

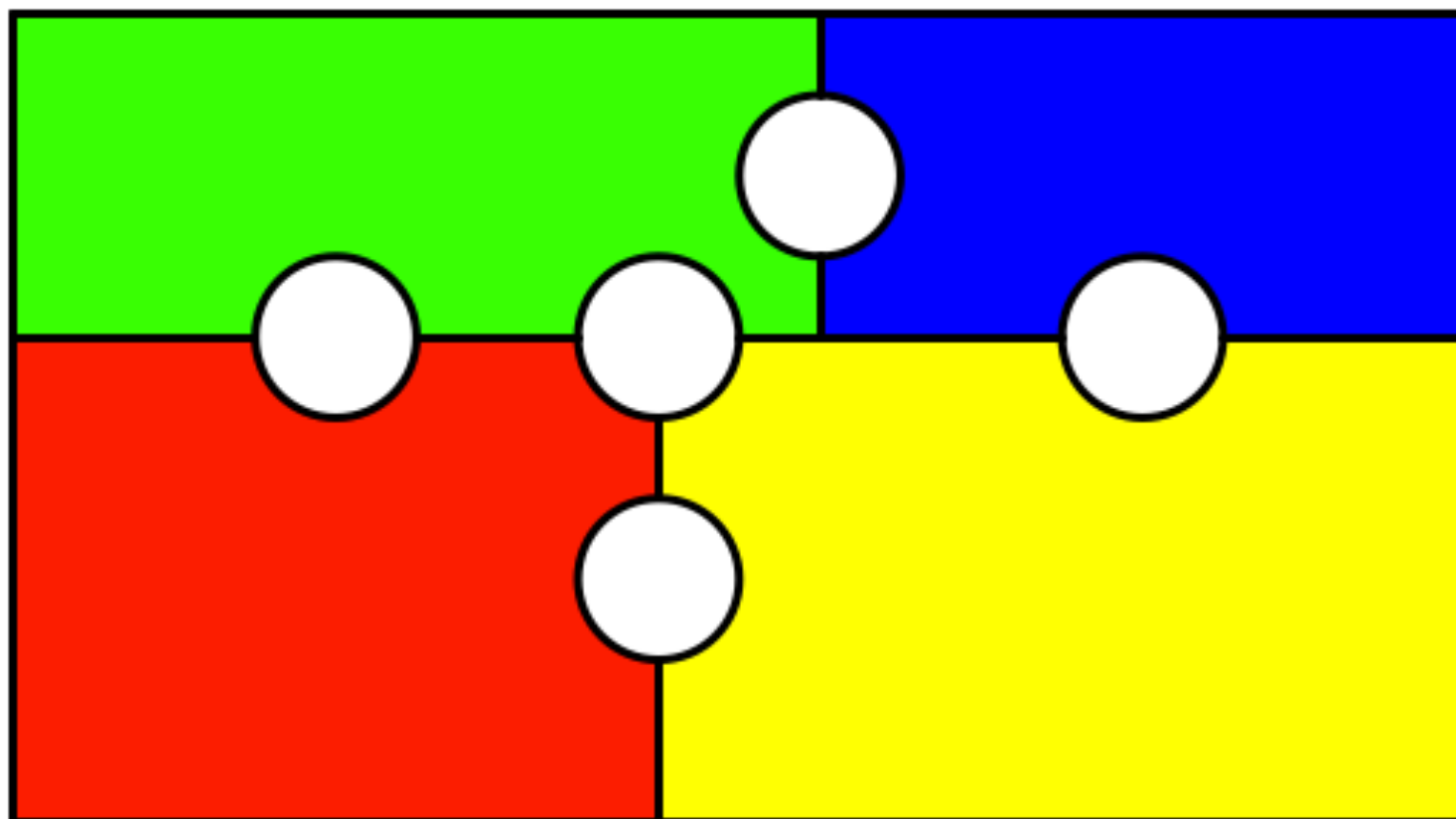
$$R + B = 7$$

$$B + G = 9$$

$$G + Y =$$







Create new...

stories

strategies

equations

lists

tables

explanations

diagrams

designs

drawings

ideas

graphs

plans

questions

problems

patterns

predictions

answers

rules

definition

A **Creative Math Prompt** is an image that contains the seeds of a deep math conversation or investigation.

- Creative Math Prompts have no directions. The learner asks and answers the questions.
- Learners spend their time noticing, wondering, and creating.
- Creative Math Prompts are open-ended yet may be targeted to learning goals and standards.
- Teachers and students become co-learners.

Do you know talented math students who...

...give up when they are unable to solve a math problem quickly?

..."melt down" when they get stuck on a problem?

...care mostly about finishing their math tasks as quickly as possible?

...like to "show off" their speed and accuracy during math discussions?

...underperform in order to avoid challenging math tasks or classes?

...say they know the answer but don't know how they got it?

When Math Adventurers use Creative Math Prompts,
they develop *productive* math mindsets and behaviors.

What is a Math Adventurer?



Math adventurers
are **curious!**



Math adventurers
are **flexible thinkers!**



Math adventurers
take risks!



What do you notice? What do you wonder?
What can you create?

$$64 - 46$$

$$52 - 25$$

$$73 - 37$$

$$92 - 29$$

$$91 - 19$$

$$85 - 58$$

Math Adventurers want to know!

- Why (or why not)?
- What if...?
- Is that *always* true?
- Is that *ever* true?
- How do I know?
- Is there another *answer*?
- Is there another *way* to think about it?
- Can I find a pattern?
- Does that make sense?

What do you notice? What do you wonder?
What can you create?

$$64 - 46 = 18$$

$$52 - 25 = 27$$

$$73 - 37 = 36$$

$$92 - 29 = 63$$

$$91 - 19 = 72$$

$$85 - 58 = 27$$

What do you notice? What do you wonder?
What can you create?

$$64 - 46 = 18$$

$$52 - 25 = 27$$

$$73 - 37 = 36$$

$$92 - 29 = 63$$

$$91 - 19 = 72$$

$$85 - 58 = 27$$

18, 27, 36, 63, 72
Multiples of 9?

$$98 - 89 = 9$$

$$87 - 78 = 9$$

$$76 - 67 = 9$$

$$65 - 56 = 9$$

$$54 - 45 = 9$$

$$43 - 34 = 9$$

$$32 - 23 = 9$$

$$21 - 12 = 9$$

$$10 - 01 = ?$$

$$97 - 79 = 18$$

$$86 - 68 = 18$$

$$75 - 57 = 18$$

$$64 - 46 = 18$$

$$53 - 35 = 18$$

$$42 - 24 = 18$$

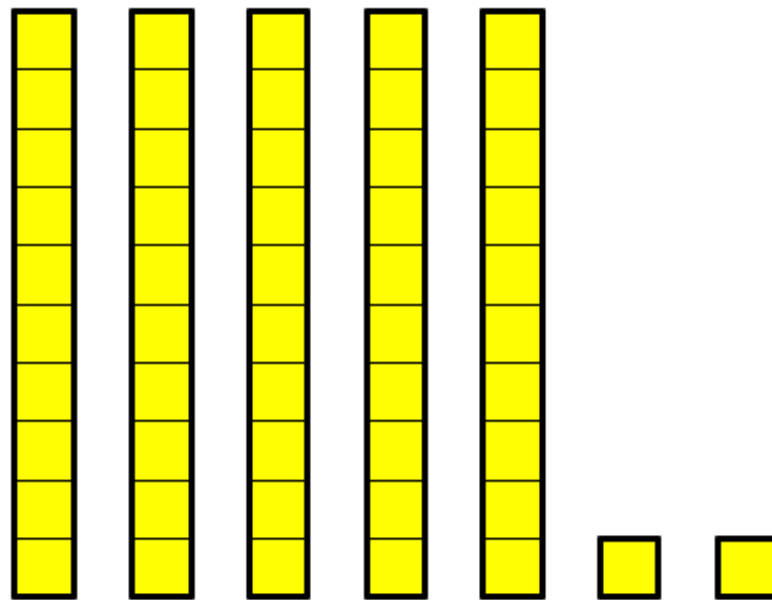
$$31 - 13 = 18$$

$$20 - 02 = ?$$

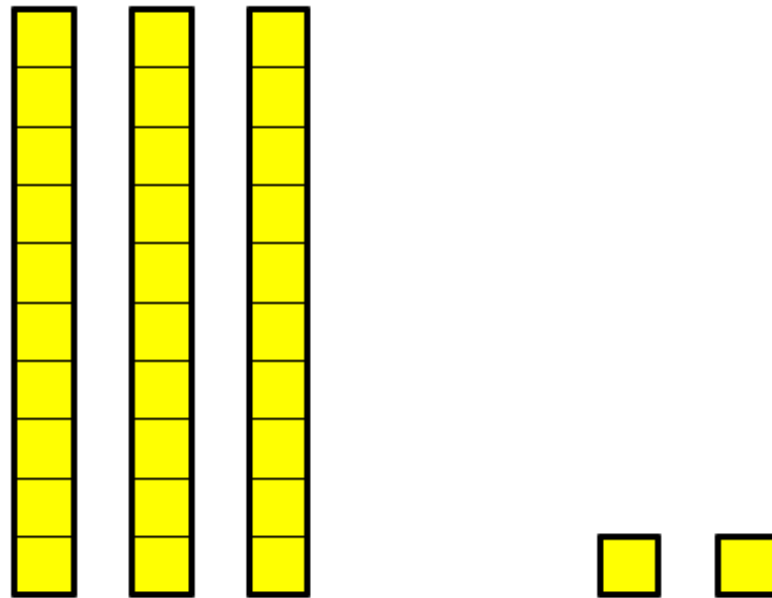
... ,9, 18, 27, 36, 45, 54, 63, 72, 81, ...

Why multiples of 9?

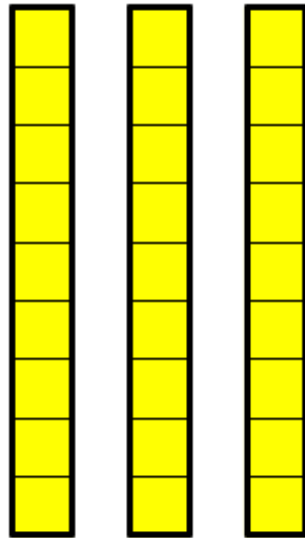
52



$$52 - 20$$

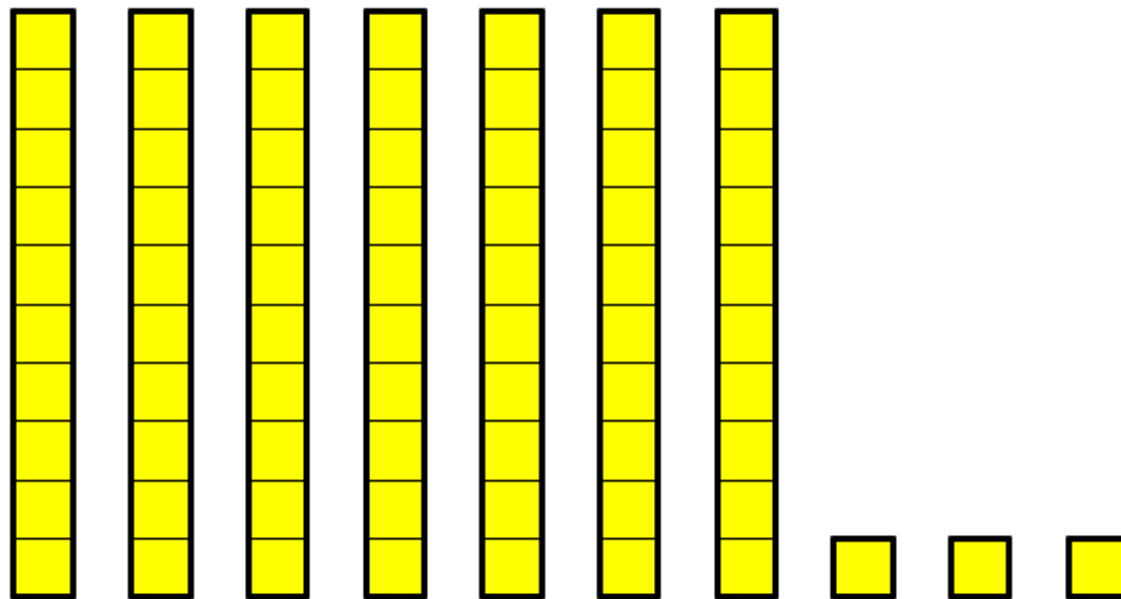


$$52 - 20 - 5$$

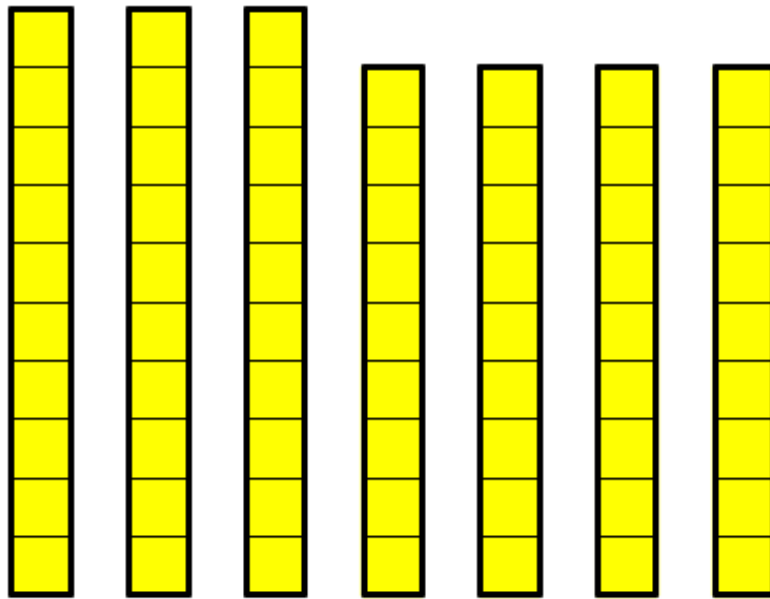


3 groups of 9!

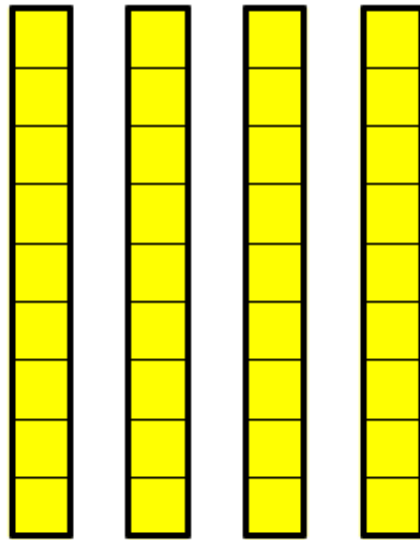
73



$$73 - 7$$



$$73 - 7 - 30$$



4 groups of 9!

You can even take it to
the level of algebra!

Tens digit: A
Ones digit: B

$$\begin{aligned}(10A + B) - (10B + A) &= \\(10A - A) + (B - 10B) &= \\9A - 9B &= \\9(A - B)\end{aligned}$$

$$614 - 416$$

$$793 - 397$$

$$921 - 129$$

$$532 - 235$$

$$783 - 387$$

$$902 - 209$$

<https://www.middleweb.com/37260/use-student-questions-to-spark-math-adventures/>

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How Open-Ended Math
Problems Keep on Giving

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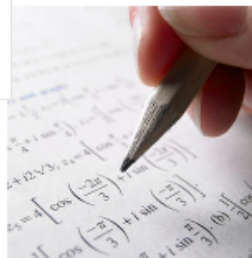
International comparisons? Helping these students reach their full potential may mean challenging some popular beliefs.

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Creative Math Prompts main page

Creative Math Prompts

There is a lot of talk in math education circles about the power of *noticing* and *wondering*. And (pardon the pun) it's no wonder! When we ask math students to notice and wonder, we shift the focus from teachers' explanations to students' ideas. Observing (noticing) and questioning (wondering) are simple, powerful habits that enliven and enrich every aspect of instruction. For the teacher, they support formative assessment, lesson design, classroom discourse, differentiation, and the potential for greater rigor. For the student, they develop self-reliance, confidence, curiosity, perseverance, problem-solving, conceptual understanding, and reasoning.

Does it seem strange that such a simple idea has such profound potential? Try it! As you and your students spend more time observing, questioning, and creating, you develop new habits of mind that transform the learning environment, leading to more productive beliefs about math and how we learn it.

So where to start? A fun and practical approach is to begin with *Creative Math Prompts*. These are just images—sometimes very simple ones—that you show to students in order to elicit their observations and questions. Images like these open a space for mathematical *creativity*. The immediate goal is simple—to get students comfortable expressing their thoughts and realizing that their ideas matter. Ultimately, you would like the habits of noticing, wondering, and creating to extend beyond the prompts and become an everyday part of your teaching and your students' thinking.

Please bear in mind that, in keeping with the theme of this website, the *Creative Math Prompts* below are designed with advanced learners in mind. However, prompts like these are appropriate for all learners, and I encourage you to try them with others! You will discover students whose mathematical insights and creativity blossom even though their strengths may not show up well in traditional tasks and assessments. If you find that some prompts are too complex or advanced, you can usually modify them to suit other needs. All learners benefit from noticing, wondering, and creating!

Read about tips and suggestions for [Using Creative Prompts](#).

See the [5280 Math Content Guide](#) to help you align Creative Math Prompts with the content that you teach.

Click on an image to get more information about a prompt.

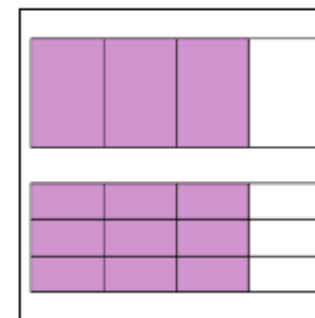
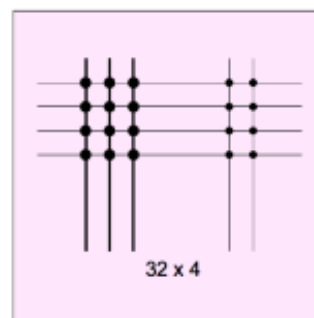
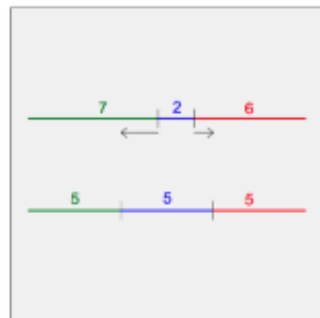
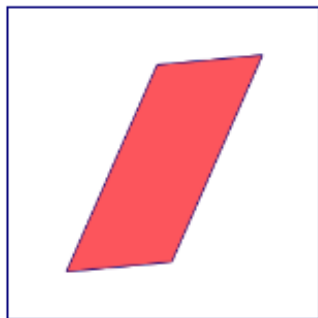
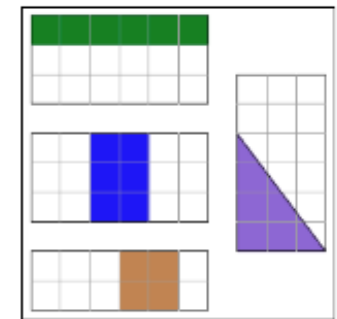
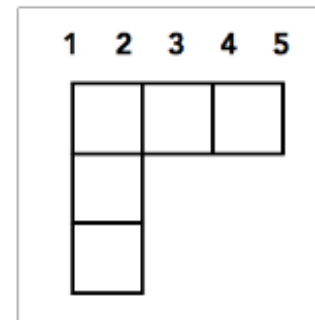
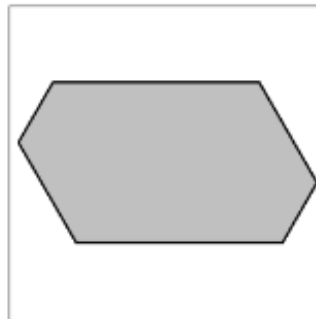
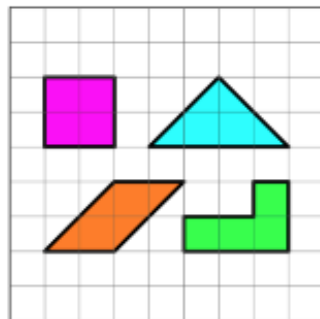
Creative Math Prompts main page

EARLY GRADES

What do you notice? What do you wonder?

What can you create?

$$\begin{aligned}0 &= 4 - 4 \\1 &= 4 - 3 \\2 &= 4 - 2 \\3 &= 4 - 1\end{aligned}$$



$$\begin{aligned}11 \times 19 &= 209 \\11 \times 28 &= 308 \\11 \times 37 &= 407 \\11 \times 46 &= 506\end{aligned}$$

[more early grades...](#)

MIDDLE GRADES

What do you notice? What do you wonder?

What can you create?

Thought for the day: Patterned lists of equations can help students discover meanings and make connections.

Concepts: meanings of subtraction; properties of subtraction (possibly negative numbers)

Beginning

I notice four subtraction equations.

I notice that the only numbers are 0, 1, 2, 3, and 4.

I notice that the answer is always on the left. I wonder if that matters.

I notice patterns in the equations.

The first number on the right (minuend) stays the same.

The number being subtracted (the subtrahend) goes down by 1 each time.

The answer (difference) goes up by 1 each time.

Note: difference = minuend – subtrahend

I wonder if these equations mean something.

Exploring

I wonder if the difference will always go up by 1 when the subtrahend goes down by 1.

I wonder what happens to the difference when the minuend goes up by 1.

I wonder if the pattern keeps going when I put more equations into the list.

I wonder what causes the pattern.

I wonder what happens if the minuend or subtrahend go up or down by other amounts.

I notice that the 1 and the 3 trade places in two of the equations.

I wonder if numbers will always trade places when I keep the pattern going.

Creating

$$0 = 4 - 4$$

$$1 = 4 - 3$$

$$2 = 4 - 2$$

$$3 = 4 - 1$$

[full-size pdf](#)

etc...

A Process for *Creative Math Prompts*

- Begin
- Explore and Create
- Reflect
- Extend
- Share

Using Creative Math Prompts

[Creative Math Prompts Main Page](#)

[5280 Math Content Guide](#)

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What is a Creative Math Prompt?

A *Creative Math Prompt* is an image that contains the seeds of a deep, open-ended math investigation. Students and teachers use the prompts to generate their own observations and questions to explore. *Creative Math Prompts* develop mathematical creativity along with problem-solving and reasoning skills. They lead to questions around specific mathematical content goals while simultaneously addressing broader goals of mathematical inquiry. The investigations often have no clear endpoint, because there are always more questions to ask! A single prompt may lead to investigations that last days, weeks, or even months.

Why don't Creative Math Prompts have directions?

Most Creative Math Prompts have few, if any, words! The prompts are designed to help children (and adults!) learn how to ask their *own* mathematical questions. Some questions may help to clarify the meaning(s) of an image. Others may relate to learning goals that underlie a prompt.

Expect the unexpected! When students create questions that you did not anticipate, follow up on their ideas.

What if my students have trouble thinking of things to notice and wonder?

Be patient. Students will gradually become more comfortable sharing once they realize that the focus is not on right or wrong responses and that you really want to hear *their* ideas. Accept their initial responses without judgment, either positive or negative. Show a genuine interest in the ideas themselves—*all* of the ideas! (Some teachers like to leave a copy of a prompt posted for a couple of days in front of the classroom so that students have plenty of time to look at it and think about it before sharing their ideas.)

What are some different ways to use Creative Math Prompts?

Here are three possibilities. You may think of more!

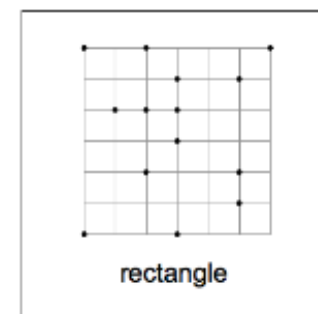
Selection from 5280 Math Content Guide grade 4

CONTENT

Polygons and Circles

angles; triangles, quadrilaterals; drawing circles

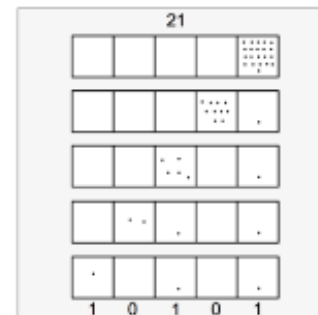
CREATIVE MATH PROMPTS



Whole Number Place Value

renaming numbers; multi-digit addition and subtraction

17 x 3	13 x 7
14 x 8	18 x 4
12 x 9	19 x 2
27 x 3	23 x 7
32 x 9	39 x 2

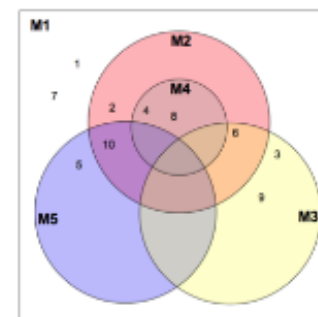


$$\begin{array}{r} 614 - 416 \\ 793 - 397 \\ 921 - 129 \\ 532 - 235 \\ 783 - 387 \\ 902 - 209 \end{array}$$

Algebra

multiplication patterns and facts; multiples; multiplication-division connections;
true/false/open sentences; parentheses

$$\begin{array}{r} 614 - 416 \\ 793 - 397 \\ 921 - 129 \\ 532 - 235 \\ 783 - 387 \\ 902 - 209 \end{array}$$



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from a middleweb.com post
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 - recognize mathematical talent in new places

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