Learn at Home Resource Packet – General Overview
Grade 8

This New York State Next Generation Mathematics Learning Standards aligned packet of resources is designed for students and their caregiver(s) who wish to support in-school learning with activities that can be done independently and/or with a partner at home. This work is not intended to be used for assessment or evaluative purposes.

The packet includes activities that support the major mathematical work of the grade with a particular focus on expressions and equations. In grade 8, students' ability to fluently solve simple 2 x 2 systems by inspection is required as it supports their ability to engage conceptually with important content of the year. These activities should each take 40-60 minutes (although many can be extended) and may be completed in any order.

How to use this guide - For these activities, you will find:

- information about the standards both content and practice that the activity supports;
- a description and/or instructions for the activity;
- questions that will help deepen the learning of the activity;
- and in some cases, suggestions for extending or adjusting the activity.

Activity

Balancing Puzzles

Next Generation Mathematics Practice Standard

MP1: Make sense of problems and persevere in solving them.

MP2: Reason abstractly and quantitatively.

MP7: Look for and make use of structure.

Focus questions for discussion

- How can I balance the puzzles using my knowledge of balancing equations?

Directions:

Basic rules for balance puzzles:

1. All weights have a positive, whole number value.
2. Each shape has a consistent, unique weight within the puzzle.
3. The right and left sides of each horizontal beam must balance.
4. Neither the sizes of the shapes nor the lengths of the vertical rods affects the value of the shapes.

Extension

Solve the challenge puzzle.

Create your own balance puzzle.

Optional Additional Resources:

Virtual Pan Balance Practice: Illuminations

http://illuminations.nctm.org/Activity.aspx?id=3531

Activity: Extending the Definition of Exponents
***Next Generation Mathematics Learning Standard (s)*:** Expressions and Equations NY-8.EE.1 Know and apply the properties of integer exponents to generate equivalent numerical expressions.
Mathematical Practices:
MP8: Look for and make use of structure.
Task from Illustrative Mathematics, www.illustrativemathematics.org

Hours into study				0	1	2	3	4
Population (thousands)				2				

In science class, Aziz and Lupe are lab partners studying bacterial growth. They were surprised to find that the population of the bacteria doubled every hour.

A. The table shows that there were 2,000 bacteria at the beginning of the experiment. What was the size of population of bacteria after 1 hour? After 2, 3 and 4 hours? Enter this information into the table:
B. If you know the size of the population at a certain time, how do you find the population one hour later?
C. Marco said he thought that they could use the equation $P=2t+2$ to find the population at time t. Seth said he thought that they could use the equation $P=2 \cdot 2t$. Decide whether either of these equations produces the correct populations for $t=1,2,3,4$.
D. Assuming the population doubled every hour before the study began, what was the population of the bacteria 1 hour *before* the students started their study? What about 3 hours before?
E. If you know the size of the population at a certain time, how do you find the population one hour *earlier*?
F. What number would you use to represent the time 1 hour before the study started? 2 hours before? 3 hours before? Finish filling in the table if you haven't already.
G. Now use Seth's equation to find the population of the bacteria 1 hour before the study started. Use the equation to find the population of the bacteria 3 hours before. Do these values produce results consistent with the arithmetic you did earlier?
H. Use the context to explain why it makes sense that $2^{-n}=(\frac{1}{2})^n=\frac{1}{2^n}$. That is, describe why, based on the population growth, it makes sense to define 2 raised to a negative integer exponent as repeated multiplication by $\frac{1}{2}$.

Activity: High School Graduation

***Next Generation Mathematics Learning Standard (s)*:** Expressions and Equations NY-8.F - Functions: Use functions to model relationships between quantities.

Mathematical Practices:
MP4 : Model with mathematics.
MP8: Look for and make use of structure.
Task from Illustrative Mathematics, www.illustrativemathematics.orgT

The SLV High School graduation started at 1:00PM. After some speeches, the principal started reading off the names of the students, alphabetically by last name. When he finishes, the graduation will end.

a. Use the bulletin shown below to estimate when the graduation will end.

San Lorenzo Valley High School
Class of 2011

Micah Stephen Adams	Amber Anne Chase	Nicholas Gregory Hargraves	Matthew Alexander Lipperd
Xavier Josue Alvin	Faye Elise Chavez	Alexander Samuel Harnett	Madeline Elizabeth Lopez
Connor James Antisdel	David Thomas Chesus	David Michael Hart	Emily Marie Madison
David Zachary Baker	Zoe Darlene Chinn	Melissa Lorraine Harvey	Rebecca Lynn Makita
Bradley Garrett Barnard	Emily Elizabeth Clements	Olivia Louise Herrera	Savanna San Mangelsen
Joseph Barnes	Claire Elizabeth Cloud	Kasia Adair Hill	Zane Michael Markham
James Alexander Barnes	Steven Dennis Connelly	Ludmila Eliana Hipsley	Alfredo Martinez
Michael Barton	Conor Thomas D'Amato	Jazelle Gina Hooper	Tyler Cameron Mattson
Sarah Raisha Beasley	Cassandra Suzanne Davis	Mariah Donna May Hopkins	Wayne Thomas McCarthy
Allison Rose Beasley	Lauren Marie Dempewolf	Lindsey Marie Hoppin	Theos Christopher McClish
Emily Anne Bechtle	Blake Bradley Dennis	Bryn Kathryn Horton	Annelise Marie McFarland
Brandon Scott Beevers	Jake Madison Debreuil	Thomas John Housek	Alexander Michael McIntosh
Patrick Fereva Belardi	Shannon Elaine Eisner	Ellen Joanne Innis	Dominique Sharee McIntosh
Kaitlyn Ella Benson	Emily Anne Engel	Jordan Isaacson	Victoria McKenzie
Jordan Starr Thomas Bereman	Samantha Marie Ferguson	Joseph Clifford Jansen	Violett Josette McNally
Taylor Renee Foster Berritto	Dominique Angelina Jones	Allison Kirstine Janus	Kendra Dee Messimer
Ashley Michelle Ann Billington	Cherina Marie Freitas	Nettie Pearl Mitchell Johnson	Marisa Grace Brudnick
Morgen King Biswa	Anju Friend	Lacey Marie Johnson	Sage Nicole Monack
Jaclyn Kate Black	Nathaniel Justin Fruzza	Felipe Johnson	Thomas Ocean Moreno
Xitlali Borreson	Mariah Nichole Galmez	Shelby Danielle Johnson	Rainbow Roxanne Muchamuel
Chere Nicole Brandon	Robin Lavendar Garcia	Zachary David Johnson	Nicholas Jefferey Newberry
Sydney Lauren Garcia Breili	Ronja Andrea Franklin	Dakota Shea Jones	George Austin Norfleet
Curtis Martin Brewer	Mason Garrett	Tanner William Jones	Travis James Nugent
Katherine Evelyn Brown	Kayle Anne Genis	Clara Joy Kamau	Joseph Carl Olson
Annika Bruce	Melanie Lauren Gleim	Mia Anne Kellogg	Lacie Marie Orlando
Amanda Lynn Bruce	Andrea Serena Godbout	Maxine Elaine Kelly	Mary Elaine Ivy Orr
David Michael Burgler	Angela Gonzales	Ryan Scott Kennedy	Austin Leonard Overton
Jourdan Donovan Burk	Chloe Chandler Goodreau	Jenny Rae Kersten	Haley Lauren Pace
Nicholas Ryan Burks	Dakota Makua Gorman	Andrew Benjamin King	James Evan Paolini
Joseph Thomas Burton	Dontae Jessie Greer	Russell Theodore Klair	Timothy William Parker
McLean Avery Camacho	Michael Marie Grindy	Zachariah Waya Tsgifi Klus	Carson Taylor Paynter
Alexander Austin Campbell	Erin Cassidy Groswird	Christina Rose Knoll	Zachary Alan Peabody
Jason William McGregor	Krista Marie Grunberger	Jessica Danielle Kraft	Katrina May Pearce
Taylor James Casey	Tyler Alan Hagen	Jessica Ann Lacy	Samuel Jackson Pelphrey
Kory Daniel Chadwick	Hazel Gladys Jane Haikkila	Joseph Allan Landry	Chandler Elizabeth Perazzo
Audrey Elizabeth Chapin	Marcus Taylor Halversen	Abbie Mae Leveque	Sebastian Thomas Peterson

1:28pm

1:33pm

San Lorenzo Valley High School
Class of 2011

Hannah Mae Petras
Rachael Danielle Pfister
Jesse Dean Phillips
Saree Iris Potter
Kirstin Jane Prather
Haley Brooke Prunella
Brittany Lynette Ramirez
Sondra Marie Raymond
Nathan Dawes Reader
Kristy Marie Rector
Sergio Aldo Ringelman
Christopher Ross Rinkert
Joshua David Roberts
Lara Elaine Rodriguez
Brandon Bouchard Ruiz
Kaiya Irene Salangsang
Erik Mark Sanchez
Fiona Darlene Sans
James Trevor Sawyer
Jared Warrior Schell
Lisi Melissa Sherrell
Jessica Marie Simonson
Megan Danielle Skrabak
David Tayamen Sladwick
Logan James Smith
Elizabeth Smith
Dillon Sean Sohoza
Nicolas Aaron Sovulewski
Miles Random Staggs
Bruce Louis Steinberg
Matthew McCrea Stewart
Kelsey Anne Stiller
Daniel Todd Sutton
Deanna Marie Tindell
Ariannna Jordan Townsend
Joseph Ryan Tumbale

Rachel Ana Unti
Natalie Vernazza
Rochelle Whitney Viele
Carson Alexander Walker
Daniel Herrera Wetterhorn
Quillan Arthur White
Jessica Lynn Whitehill
Stephanie Anne Wildman
Jessica Kayla Wood
Alajha Kathleen Wyllie
Peter Francis Zavaroni

Graduation coordinators:

Class President - Hazel Haikkila
Vice President - Lindsey Hoppin
Secretary - Morgen Biswa
Treasurer - Bradley Barnard

Principal — Michael Billings

Assistant Principal — Keri Arredondo

Counselors — Leslie Ebbage, Noreen Rorden, Annabel Nolan, Jeff Burns

Board of Trustees — Kip Dakota, President; Lea Tellez, Clerk; Laura Ritchie, Trustee; Kathy Wylie, Trustee; George Dolson, Trustee

Superintendent — Julie Belardi

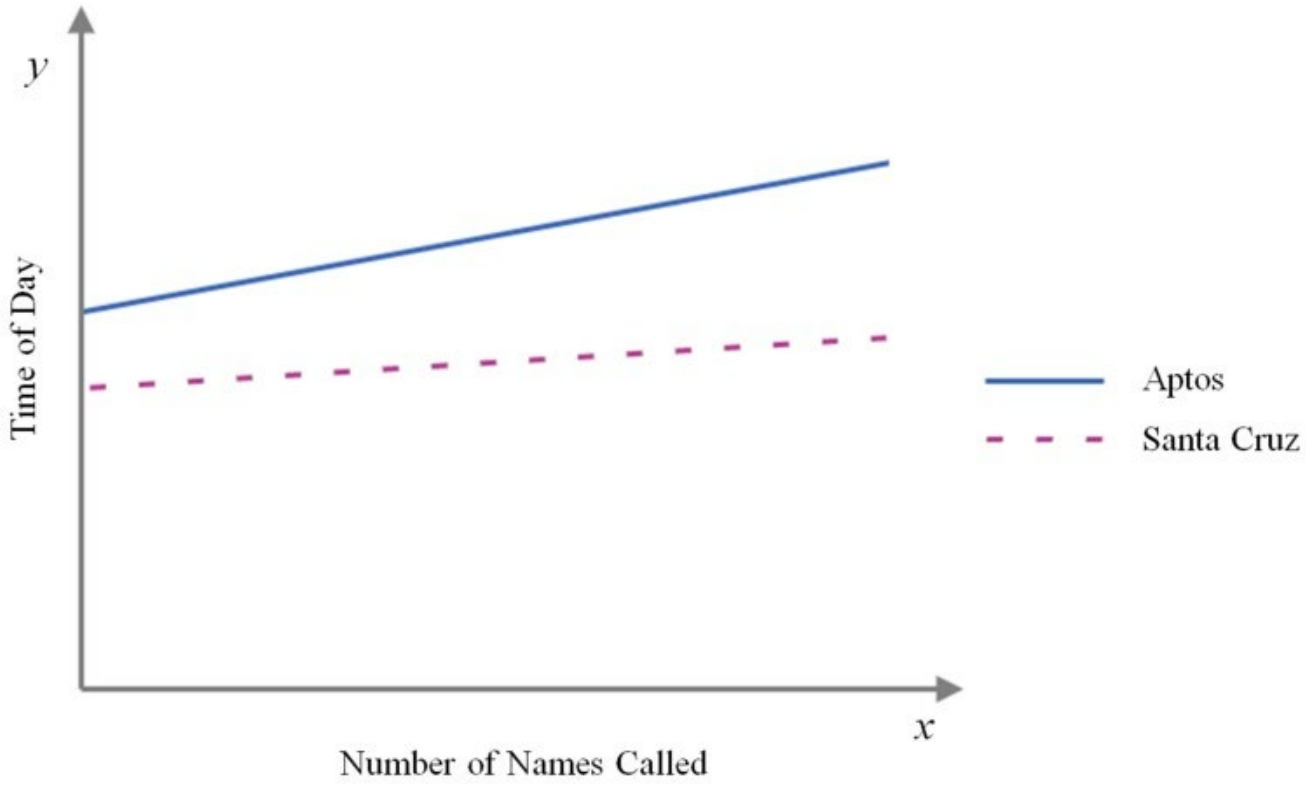
Director Student Activities — Leslie Ebbage

Program cover artwork — Shannon Haff '11

a. Estimate how long the speeches took. Show how you know.

b. Write an equation that the parents could use to find the approximate time the principal will call their child's name given the child's position in the list in the graduation program.

c. Aptos High School and Santa Cruz High School started their graduations at the same time. The graphs shown below show the time of day as a function of the number of names the principal has read at each school. Write down as many differences between the two graduations as you can based on differences in the two graphs. Give your reasons for each.



Activity: The 4's Game

Description: *You can play this game with someone else.*

Hint: *write down the numbers 1- 20 and write a solution for each, crossing off the numbers as you find a solution.*

Next Generation Mathematics Learning Content: *Number Sense*

***Mathematics Practice Standards*:** MP1 - Make sense of problems and persevere in solving them.

Adapted from: You Cubed www.youcubed.org

Task Instructions: Can you find every number between 1 and 20 using only four 4's and any operation? Here's an example $\sqrt{4} + \sqrt{4} = 4$ for the number 4.

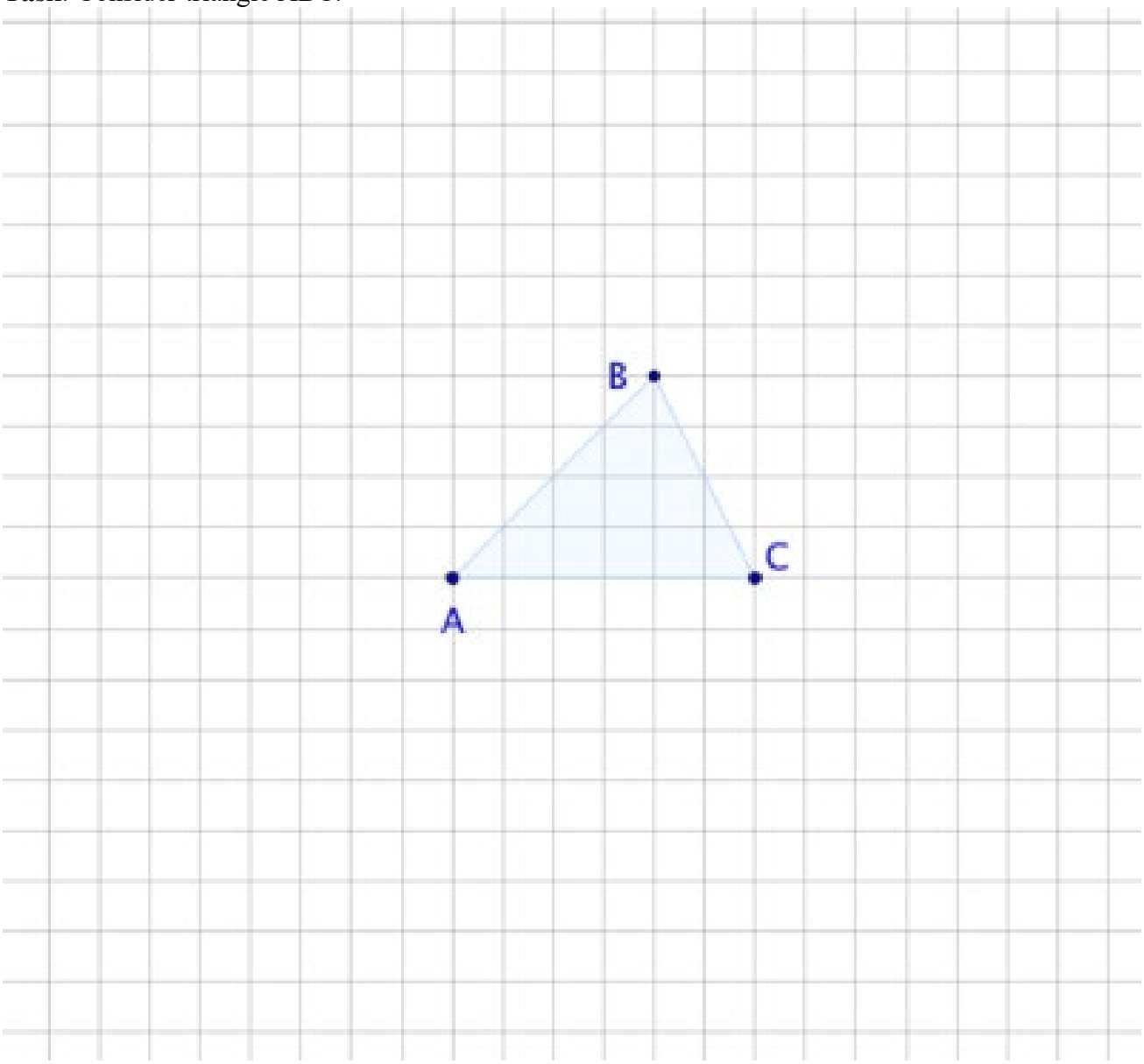
Call or text a friend to see what they come up with. Together, you can find all the number 1- 20?

Activity: Effects of Dilations on Length, Area and Angles.

NYS Next Generation Standards Content: Geometry
Standards for Math Practice:
MP1: Make sense of problems and persevere in solving them
MP 8: Look for and make use of structure:

Activity from: illustrativemath.org

Task: Consider triangle ABC.



1. Draw each dilation of ABC with:
    a. Center A and scale factor 2.
    b. Center B and scale factor 3.

c. Center C and scale factor 12.

2. For each dilation, answer the following questions:
   a. By what factor do the base and height of the triangle change? Explain.
   b. By what factor does the area of the triangle change? Explain.
   c. How do the angles of the scaled triangle compare to the original? Explain.

Activity: Irrational Numbers on the Number Line
NYS Next Generation Math Learning Standards: 8.NS. 2
From Illustrative Mathematics illustrativemathematics.org

Without using your calculator, label approximate locations for the following numbers on the number line.

a.

π

b.

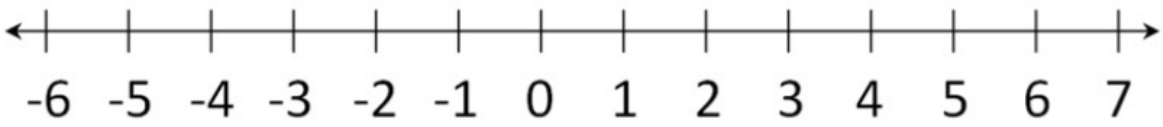
$-(\frac{1}{2} \times \pi)$

c.

$2\sqrt{2}$

d.

$\sqrt{17}$



Resources

Hooda Math - http://www.hoodamath.com/
Fun online math games for grades k - 8. Also includes iPad Games and works on Kindle and Android - HTML5 games. Select by grade, category and subject!

Math Play - http://www.math-play.com/Middle-School-Math-Games.html
Fun Middle School Math games. Choose from a range of games to practice your skills and fluency.

Johnnie's Middle School Math - http://jmathpage.com/middleschoolmath/jmsmnumberoperations.html
Interactive fun math games for grades middle school. Scroll down the page and see the games get more challenging. Games for Algebra, Number Sense, Geometry, Logic and Problem Solving and Statistics and Probability.

Calculation Nation, http://calculationnation.nctm.org/, is a free education service that uses the power of the Web to let students play games and challenge opponents from anywhere in the world.

You Cubed - www.youcubed.org
Provides engaging mathematics puzzles and games for students of all ages.

Math Pickle - www.mathpickle.com
MathPickle.com is a free online resource of original mathematical puzzles, games and unsolved problems for K-12 teachers. It is supported by the American Institute of Mathematics.

Math 42 - http://math-42.com/
MATH 42 helps students from the 5th to the 12th grade with math.

Monkey in the Middle - http://www.monkeyinthemiddleapps.com/
Grades 6 -8. Play a cool game or practice your math skills. You can compete against your friends using Game Center leader boards and achievements. Can access tutorials and study notes too!

Figure This! - https://figurethis.nctm.org/index.html. Find interesting math challenges that middle-school students can do at home with their families.

NCTM Games for Middle School- http://www.nctm.org/uploadedFiles/Conferences/Annual_Meetings/pdfs_for_jumpstarts/SarahNSarahMiddle.pdf
These games require paper and scissors. Games are great to play with friends and family. Grades 6 – 8.