

# Math Tricks Workshop for Grades 5-8 (Event Planning and Preparation)

Volunteers : Ayden H., Bryan Y., Jason S, Will L. Kyler W., Steven S., Newman S., Kevin S.

Various stations were set up and each volunteer was assigned to a station responsible for teaching a math concept. During the event, students were encouraged to choose a concept they were interested in and to ask volunteers to help them learn. In the end, students were even able to receive prizes for their hard work - snacks, keychains, and adorable squishy mochi animals! This project was to help students enjoy doing math while having fun with each other.

## Creating a flyer and advertising

$M = \left( \frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right)$

### Math Tricks Workshop

- Divisibility Rules
- Factoring Trinomials
- Number Sense Tricks
- Sums of Arithmetic Sequences
- Sums of Geometric Sequences
- Pythagorean Triples
- Angle Bisector Theorem
- Right Triangle Altitude Theorem
- Median to Hypotenuse Theorem
- Ptolemy's Theorem
- Bonus: Make an Origami Turtle

Presented by Ayden H., Bryan Y., Jason S, Will L. Kyler W., Steven S, Newman S., Kevin S.

December 22 2023  
1:00-3:00pm  
At Indian Trails Branch  
Library- 8400 Delpolt  
Dr, St. Louis

NATIONAL MATH CLUB

## Making an event activity guide

### MATH TRICK WORKSHOP

COMPLETE ALL THE TASKS IN THE MATH WORKSHOP. THEN SHOW THIS SHEET AT THE PRIZE TABLE TO CLAIM YOUR PRIZE.

<b>Divisibility Rules</b> 2-Last digit is even 3-Sum of the digits is divisible by 3 4-Last 2 digits divisible by 4 5-Last digit is 0 or 5 6-Last 2 digits are divisible by 6 9-Sum of the digits is divisible by 9 11-Calculate the sum of every other digit and subtract it by the sum of everything else. If it is divisible by 11, then the original number is also divisible by 11.	If the number $N = 123456789AB$ is divisible by 99, find $A + B$ .
<b>Factoring Trinomials</b> $4x^2 - 5x - 6$ $x^2 - 5x + 4$ $(x-5)(x+4)$ $(x-2)(x+3)$	$9x^2 + 4x - 5 =$
<b>Number Sense Tricks</b> How to square of any two-digit number $(21)^2 = 441$	$22^2 =$ $23^2 =$ $24^2 =$ $25^2 =$ $26^2 =$
<b>Sums of Arithmetic and Geometric Sequences</b> Arithmetic Sequences $n$ th Term: $a_n = a + (n-1)d$ Sum: $S_n = \frac{n}{2}(a_1 + a_n) = \frac{n}{2}(2a + (n-1)d)$ Geometric Sequences $n$ th Term: $a_n = ar^{n-1}$ Sum: $S_n = \frac{a(1-r^n)}{1-r}$	Find the sum of arithmetic sequence $-4, -1, 2, 5, \dots$ up to 10 terms. Find $S_{10}$ of the geometric sequence $24, 12, 6, \dots$

NAME \_\_\_\_\_ DATE \_\_\_\_\_

## Preparing prizes for participation

<b>Pythagorean Triples</b> $a^2 + b^2 = c^2$ $3^2 + 4^2 = 5^2$ Pythagorean Triples = (3,4,5)	7... .. 8... .. 9... .. 11... .. 12... .. 20... ..
<b>Right Triangle Altitude Theorem</b> Altitude $h$ in terms of $x$ and $y$ $h = \sqrt{xy}$	Consider a right triangle such that the altitude divides the hypotenuse into two equal length sides of length 6. Use the altitude formula to find $h$ .
<b>Angle Bisector Theorem</b> $\frac{AD}{DB} = \frac{AC}{CB}$	In $\triangle XYZ$ , $XE$ is the bisector of $\angle X$ . Let $XY = 4$ units, $YE = 2$ units, and $EZ = 3$ units. Can you find the length of $XZ$ ?
<b>Median to Hypotenuse Theorem</b> $CD = \frac{1}{2}AB$	Determine the length of the median $AM$ of the triangle $ABC$ , whose sides are $AB=4$ units, $BC=5$ units, and $AC=3$ units.
<b>Ptolemy's Theorem</b> $AB \cdot CD + AD \cdot BC = AC \cdot BD$	In triangle $ABC$ , we have $AB=7$ , $AC=8$ , $BC=9$ . Point $D$ is on the circumscribed circle of the triangle so that $AD$ bisects angle $BAC$ . What is the value of $AD/CD$ ? (2004 AMC 10B Problem 24)
<b>Origami Turtle</b>	

### PRIZES

Complete the checklist or get a Countdown Question to win awesome prizes!

Mathcounts Club

# Math Tricks Workshop for Grades 5-8 (Event Planning and Preparation )

- Making posters for each activity
- Holding Zoom meetings with volunteers to assign host to each activity

### Divisibility Rules

2-Last digit is even  
 3-Sum of the digits is divisible by 3  
 4- Last 2 digits divisible by 4  
 5- Last digit is 0 or 5  
 8-Last 3 digits are divisible by 8  
 9-Sum of the digits is divisible by 9  
 11-Calculate the sum of every other digit and subtract it by the sum of everything else. If it is divisible by 11, then the original number is also divisible by 11.

**Exercise**

If the number  
 $N = 123456789\overline{AB}$   
 is divisible by 99, find  $A + B$ .

Steven S.

### Factoring Trinomials

**Exercise**

$$9x^2 + 4x - 5 = (3x-1)(3x+5)$$

### Number Sense Tricks

How to square of any two-digit number

$$(21)^2 = 4 \ 4 \ 1$$

**Exercise**

$$22^2 =$$

$$23^2 =$$

$$24^2 =$$

$$25^2 =$$

$$26^2 =$$

Ayden H.

### Sums of Arithmetic and geometric Sequences

**Arithmetic Sequences**  
 $n$ th Term:  $a_n = a + (n-1)d$   
 Sum:  $S_n = \frac{n}{2}(a_1 + a_n)$  or  $S_n = \frac{n}{2}[2a + (n-1)d]$

**Geometric Sequences**  
 $n$ th Term:  $a_n = ar^{n-1}$   
 Sum:  $S_n = \frac{a(1-r^n)}{1-r}$   $S_\infty = \frac{a}{1-r}$

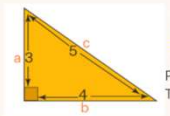
**Exercises**

Find the sum of arithmetic sequence  $-4, -1, 2, 5, \dots$  up to 10 terms.

Find  $S_{10}$  of the geometric sequence  $24, 12, 6, \dots$

Will L.

### Pythagorean Triples



$a^2 + b^2 = c^2$   
 $3^2 + 4^2 = 5^2$

Pythagorean Triples=(3,4,5)

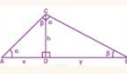
**Exercise**

7 \_\_\_      8 \_\_\_  
 9 \_\_\_      11 \_\_\_  
 12 \_\_\_     20 \_\_\_

Bryan Y.

### Right Triangle Altitude Theorem

**Exercise**

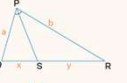


consider a right triangle such that the altitude divides the hypotenuse into two equal length sides of length 6. Use the altitude formula to find h.

Altitude h in terms of x and y  
 $h =$

### Angle Bisector Theorem

**Exercise**



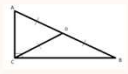
In  $\triangle XYZ$ , XE is the bisector of  $\angle X$ . Let  $XY = 4$  units,  $YE = 2$  units, and  $EZ = 3$  units. Can you find the length of XZ?

$$\frac{a}{b} =$$

Newman S.

### Median to Hypotenuse Theorem

**Exercise**




Determine the length of the median AM of the triangle ABC, whose sides are  $AB=4$ units,  $BC=5$ units, and  $AC=3$ units.

$CD=AD=BD$

### Ptolemy's Theorem


**Exercise**



In triangle ABC, we have  $AB=7$ ,  $AC=8$ ,  $BC=9$ . Point D is on the circumscribed circle of the triangle so that AD bisects angle BAC. What is the value of  $AD \cdot CD$ ? (2004 AMC 10B Problem 24)

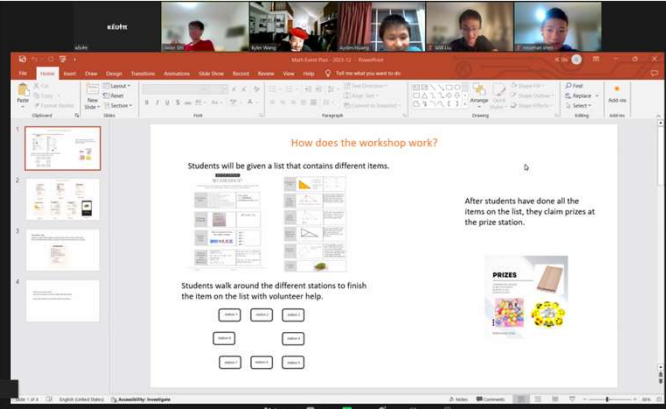
$AB \cdot CD + AD \cdot BC = AC \cdot BD$

Kyler W.



## Origami and Mathematics

Jason S.



**How does the workshop work?**

Students will be given a list that contains different items.

After students have done all the items on the list, they claim prizes at the prize station.

Students walk around the different stations to finish the item on the list with volunteer help.

PRIZES

## Reflection on our community service project

Our club tutors students year-round. With the goal of stimulating students' interest in math, we often solve problems together at our club's weekly meetings, exploring different ideas and encouraging them to share their own. Thus, students are offered the opportunity to receive help with whatever mathematical concepts they're struggling with.

Besides our tutoring program, our club also tries to create unique community service projects in order to help young students enjoy doing math while having fun with each other. Quite recently, we held a workshop called "Math Tricks." With a group consisting of some of our more experienced club members as well as a few high school friends, we were able to brainstorm ideas for a club project together, ultimately deciding on doing a community service project in which various stations were set up and each volunteer assigned to a station responsible for teaching a math concept. During the event, students were encouraged to choose a concept they were interested in and to ask volunteers to help them learn. In the end, students were even able to receive prizes for their hard work - snacks, keychains, and adorable squishy mochi animals! Through this event, students were able to form connections with other like-minded (math-y) friends. By incorporating math with fun activities like origami, our workshop created an environment in which students could associate math with enjoyment. In fact, one particularly memorable event happened after the actual project, when some parents revealed that their kids chose origami over video games at home! This was one of our favorite moments throughout the whole project, as it let us know that we had made an indelible mark on our community. The ability to persuade kids to be interested in more than just video games was definitely a lesson that we'll keep far into the future. Some club members were even motivated to introduce their friends from other school districts, thus helping the club grow.

Hosting this community service project has provided us with a great opportunity to not only have a positive impact on my community but also gain self-growth. This club has allowed us to work with young students, and, as a result, we have become more flexible and can communicate better with others. Even though some of our schedules have been getting busy, we plan on continuing to put great effort into this wonderful activity. We are truly thankful for this program!