

Name _____

Group: Blue Green Yellow

Summer Educational Enrichment in Math

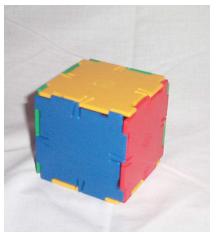
2026 Math Contest

1. **Platonic Solids:** Name the 5 Platonic Solids and say how many faces they have.
(Spelling does not matter.)



Name _____

Faces _____



Name _____

Faces _____



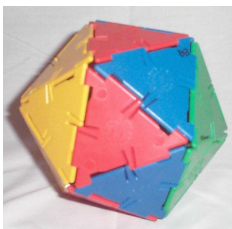
Name _____

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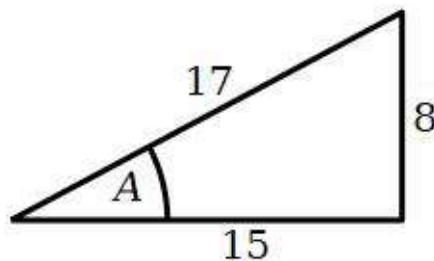
Name _____

Faces _____

2. **Trig Functions:**

For the right triangle at the right, identify the trig functions for the angle A .

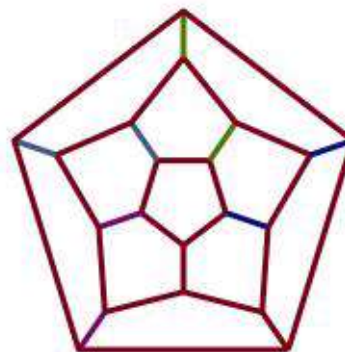
$\sin A = \underline{\hspace{2cm}}$ $\cos A = \underline{\hspace{2cm}}$



3. **Map Coloring:** The map at the right has 11 countries.
Color it with as few colors as possible.
Countries with a common edge must have different colors.
Use the abbreviations:

R =red B =blue G =green Y =yellow P =purple

Explain why you cannot do it with fewer colors.



4. **Euler numbers:** Consider the octahexahedron made from 6 squares and 8 triangles:

The number of faces is:

$$F =$$

The number of vertices is:

$$V =$$

Explain below.

The number of edges is:

$$E =$$

Explain below.

Explain V : (Don't use the Euler number.)

Explain E : (Don't use the Euler number.)

Calculate the Euler number:

Explain how you know the Euler number before counting F , V and E ?



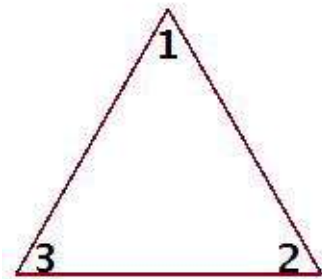
- ## 5. Balderdice:

- If there are 24 dice remaining at the table, how many total dice at the table would you expect to be 5s and 1s?
- If there are 24 dice remaining at the table and you managed to roll a 5 or 1 on all 3 of your own dice, how many total dice at the table would you expect to be 5s and 1s?

- 6. Matrices:** Compute the following matrix product:

$$\begin{pmatrix} 2 & 4 \\ 5 & 3 \end{pmatrix} \begin{pmatrix} 3 \\ 2 \end{pmatrix} = \begin{pmatrix} \underline{\hspace{2cm}} \\ \underline{\hspace{2cm}} \end{pmatrix}$$

7. **Planar Groups:** Let L , R and N be the standard rotations on the triangle at the right (Left rotate, Right rotate, and Nothing)



- a. Complete the Multiplication Table if $\otimes$ means "first apply the rotation at the left of the table, then apply the rotation at the top of the table":

$\otimes$	R	L	N
R			
L			
N			

- b. List the names of the four properties that make this a group. You do not have to show these properties are true.

8. **Manufacturing Matrices:** You have decided you want to use up all of your sugar and flour before your big trip by baking cookies and brownies for your friends. Each cookies requires 7 ounces of flour and 10 ounces of sugar; each brownie requires 2 ounces of flour and 3 ounces of sugar. You have 34 ounces of flour and 50 ounces of sugar on hand. Set up a matrix equation to describe how many cookies and how many brownies you should make to use up all of the flour and sugar.

Extra Credit: Solve it.

9. **Diophantine Equations:** Find the Greatest Common Divisor of 315 and 84 using the Euclidean Algorithm.

10. Birthday Problem:

- a. What is the probability that Polly and Jason have different birthdays (assuming neither was born in a leap year)?

- b. If 5 people are in a room, what is the probability that at least 2 of them have birthdays in the same month?

11. Strings: You hold 4 strings in your hand. You tie off 2 pairs at the top and 2 pairs at the bottom. When you let go, what is the probability that the strings are all in one loop?

12. Sum Fun Puzzle:

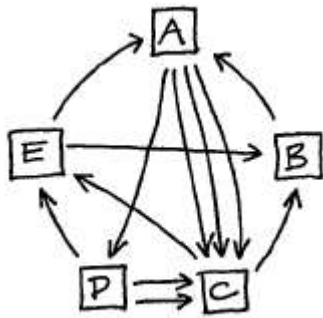
In the square at the right, circle some numbers so that the circled numbers in each row add up to the number at the left and those in each column add up to the number at the top.

	18	6	4	8
7	3	7	4	8
12	5	5	7	7
9	8	1	1	8
8	7	9	3	1

13. **Knights Out:** Assume we are using the the standard "In, Out, In, Out..." method of elimination.
- If there are 27 knights around the round table, which knight survives?

b. If there are K knights around the round table, which knight survives?

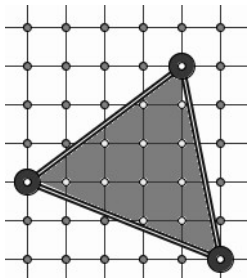
14. **Search & Rank:** The graph below represents a model web with five webpages. Fill in the entries of the corresponding probability matrix M . For example, the entry which lies in row B and column C is the probability of linking from C to B which is $1/2$.



	A	B	C	D	E	
$M =$						A
			$\frac{1}{2}$			B
						C
						D
						E

By examining the graph, try to determine which webpage will be visited most frequently on a random walk through the web. Answer:

15. **Pick's Theorem:** For the shaded region below, state the number of internal points and the number of boundary points, and find the area using Pick's Theorem:



$I =$

$B =$

$A =$

16. **Pigeonhole Principle:** There are 37 students at SEE-Math this year. Is it true that at least 4 of you are born in the same month? Explain why or why not.

17. **Penrose Tilings:** What is one way to check if a tiling is aperiodic?

18. **Kenken:** Solve the Kenken:

1−	2−		10×	
	9+	9+		
4		2−		
6+		2÷		10+
	2÷			

19. Solve the cryptogram:

HS RSX ASVVC EFSYX CSYV,
HMJJMGYPXMIW MR QEXLIQEXMGW.
M GER EWWYVI CSY QMRI EVI
WXMPP KVIEXIV.
– EPFIVX IMRWXIMR

HINT: E → A