Game and Puzzle Month (Nov.) Meeting (Multiple Topics)

Topic

There are a variety of math topics covered in the problems used for this meeting.

Materials Needed

- Copies of the Game and Puzzle Month problem set (Problems and answers can be viewed here, but a more student-friendly version in larger font is available for download from www.mathcounts.org on the MCP Members Only page of the Club Program section.)
- Prizes for winners of games you play during the meeting
- Calculators

Meeting Plan

November is Game and Puzzle Month, so we have assembled some of our favorite MATHCOUNTS problems that relate to games and puzzles. They are in order of difficulty, with #11–#14 being pretty challenging. Note: You may wish to start the meeting using the "Possible Next Step" for #14 that is described at the end of this activity.

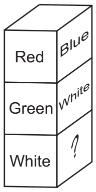
1. Three black chips have been placed on the game board shown. What is the number in the square where a fourth chip should be placed so that it shares neither a row nor a column with any of the existing chips? *2006 Chapter Competition, Sprint #2*

●	1	2	3
4	5	6	7
8	9	10	●
11	12	●	13

		25

2. This addition square is a 3-by-3 grid of 9 numbers such that, in each row from left to right, and in each column from top to bottom, the first number plus the second number equals the third number. When this addition square is filled in completely, what is the largest possible sum of all 9 numbers? *2006–2007 School Handbook, Workout 2-8*

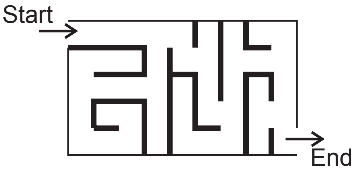
3. The puzzle pictured is a prism consisting of three identical cubes which may be twisted until each vertical face of the prism is a single color. What color is the cube's face marked "?"? *2001–2002 School Handbook, Warm-Up 16-3*



4. In the maze to the right, you may move only vertically or horizontally. Each square you move to must have a fraction that is a value less than the fraction of the square you are currently in. If you start at the indicated square, what fraction is in the last square of your path on the bottom row? *2005–2006 School Handbook, Warm-Up 15-4*

Start

$\frac{34}{8}$	$\frac{32}{8}$	$\frac{24}{5}$	$\frac{23}{6}$	$\frac{18}{4}$	$\frac{9}{2}$
$\frac{20}{5}$	$\frac{25}{5}$	$\frac{22}{4}$	$\frac{11}{3}$	$\frac{18}{5}$	$\frac{20}{5}$
$\frac{21}{10}$	$\frac{5}{2}$	$\frac{12}{5}$	$\frac{24}{8}$	$\frac{20}{6}$	$\frac{33}{9}$
$\frac{4}{2}$	$\frac{9}{3}$	$\frac{7}{3}$	$\frac{8}{2}$	$\frac{34}{9}$	$\frac{15}{8}$

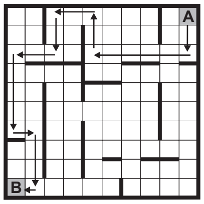


5. When going through this maze, Mikyong may not backtrack. Each time she hits the edge of the grid or runs into a dark blocker, she must turn. If Mikyong comes to a dead end (no options to move), the game is over. How many paths result in a dead end? *2006–2007 School Handbook, Warm-Up 6-9*

6. In this magic square, the product of the three numbers in each row is 4096, and the product of the three numbers in each column is also 4096. When the magic square is filled in, what number is in the shaded region? *2005–2006 School Handbook, Workout 2-8*

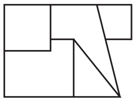
	1	32
	16	64
▨		

7. In the maze to the right, a move is either horizontal or vertical in a single direction. Each move ends when you reach a barrier or the edge of the grid, where you must turn 90 degrees in either direction and then start your next move. You must always remain within the grid. The thicker lines indicate barriers or edges. The 10 moves of one possible route from square A to square B are shown with arrows. What is the least number of moves needed for a route from square A to square B? *2006 School Competition, Sprint Round #4*

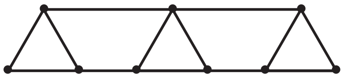


8. In a particular dice game, a player rolls two dice. The player can choose either the sum or the product of the numbers rolled for her score for that turn. To win the game, a player must get a total score of exactly 102 points from the sum of her scores. What is the least possible number of turns needed to win the game? *2005–2006 School Handbook, Warm-Up 3-9*

9. In how many ways can this figure be colored if the five regions must be colored with either red, white or blue and no two bordering regions can be the same color? *2005–2006 School Handbook, Warm-Up 16-1*

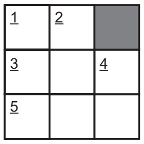


10. Marcus and Al are playing Rock/Paper/Scissors. The first person to win 10 times does not have to do the dishes. The score is now 9 to 7 in favor of Marcus. If ties are ignored and not counted, what is the probability Marcus will not have to do the dishes? Express your answer as a common fraction. *2005–2006 School Handbook, Probability Stretch #6*



11. Each of the nine dots in this figure is to be colored red, white or blue. No two dots connected by a segment (with no other dots between) may be the same color. How many ways are there to color the dots of this figure? *2006–2007 School Handbook, Workout 5-7*

12. In the number puzzle to the right, each of the eight non-shaded unit squares contains one digit. What is the answer to 1-Across? (Note: This works like a crossword puzzle in that the digit placed in the unit square with the 5 in the upper left corner is the first digit of the answer to 5-Across and the third digit of the answer to 1-Down. No digit is placed in the shaded square.) *2005–2006 School Handbook, Workout 5-7*



Across	Down
1. A prime number	1. A multiple of 9
3. A perfect square	2. A perfect cube
5. A perfect fourth power	4. A perfect square

13. Two standard six-faced dice are rolled. Cara scores x points if the sum of the numbers rolled is greater than or equal to their product; otherwise, Jeremy scores one point. What should be the value of x to make the game fair? *2002–2003 School Handbook, Workout 8-8*

14. Ron and Ameka are playing a game in which each player can take 1, 2 or 3 coins on each turn. The game begins with 17 coins in a pile, and the player to take the last coin from the pile wins. If Ameka goes first, how many coins should she take to guarantee that she will win? *2003–2004 School Handbook, Patterns Stretch #9*

Answers: 5; 100; Red; 7/3; 9 paths; 8; 5 moves; 3 turns; 12 ways; 7/8; 54 ways; 61; 2; 1 coin

Possible Next Steps

Students can now create number puzzles like that found in #12. The creation of these is often more difficult than it may first appear. Students need to be able to correctly describe numbers and ensure that there is just one possible solution for the puzzle — if that's a requirement you make. Please share these with us if you get some great ones from your students.

Problem #14 is a great game to play with your students. The frustration of you always winning will certainly spark their curiosity to figure out the trick! (No matter what number of coins you start with, always take enough to leave a multiple of 4 after your turn. Then, no matter how many the next person takes, you can again take enough to leave a multiple of four. This will ensure that there are four left on your opponent's last turn, they can't take all four, and you will be able to take what is left. Always go first if the starting number is not a multiple of 4, and you'll win. If you can't go first, hope your opponent doesn't know the trick, and you can usually get it back on track in your favor.

Game and Puzzle Month Meeting Problem Set

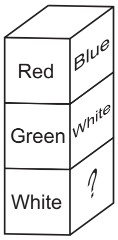
1. __________ Three black chips have been placed on the game board shown. What is the number in the square where a fourth chip should be placed so that it shares neither a row nor a column with any of the existing chips? *2006 Chapter Competition, Sprint #2*

●	1	2	3
4	5	6	7
8	9	10	●
11	12	●	13

		25

2. __________ This addition square is a 3-by-3 grid of 9 numbers such that, in each row from left to right, and in each column from top to bottom, the first number plus the second number equals the third number. When this addition square is filled in completely, what is the largest possible sum of all 9 numbers? *2006–2007 School Handbook, Workout 2-8*

3. __________ The puzzle pictured is a prism consisting of three identical cubes which may be twisted until each vertical face of the prism is a single color. What color is the cube's face marked "?"? *2001–2002 School Handbook, Warm-Up 16-3*



4. __________ In the maze to the right, you may move only vertically or horizontally. Each square you move to must have a fraction that is a value less than the fraction of the square you are currently in. If you start at the indicated square, what fraction is in the last square of your path on the bottom row? *2005–2006 School Handbook, Warm-Up 15-4*

5. __________ When going through this maze, Mikyong may not backtrack. Each time she hits the edge of the grid or runs into a dark blocker, she must turn. If Mikyong comes to a dead end (no options to move), the game is over. How many paths result in a dead end? *2006–2007 School Handbook, Warm-Up 6-9*

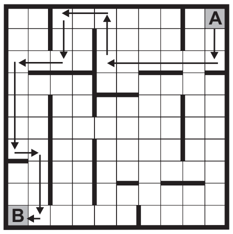
Start

$\frac{34}{8}$	$\frac{32}{8}$	$\frac{24}{5}$	$\frac{23}{6}$	$\frac{18}{4}$	$\frac{9}{2}$
$\frac{20}{5}$	$\frac{25}{5}$	$\frac{22}{4}$	$\frac{11}{3}$	$\frac{18}{5}$	$\frac{20}{5}$
$\frac{21}{10}$	$\frac{5}{2}$	$\frac{12}{5}$	$\frac{24}{8}$	$\frac{20}{6}$	$\frac{33}{9}$
$\frac{4}{2}$	$\frac{9}{3}$	$\frac{7}{3}$	$\frac{8}{2}$	$\frac{34}{9}$	$\frac{15}{8}$

6. __________ In this magic square, the product of the three numbers in each row is 4096, and the product of the three numbers in each column is also 4096. When the magic square is filled in, what number is in the shaded region? *2005–2006 School Handbook, Workout 2-8*

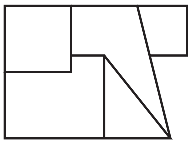
	1	32
	16	64
▨		

7. __________ In the maze to the right, a move is either horizontal or vertical in a single direction. Each move ends when you reach a barrier or the edge of the grid, where you must turn 90 degrees in either direction and then start your next move. You must always remain within the grid. The thicker lines indicate barriers or edges. The 10 moves of one possible route from square A to square B are shown with arrows. What is the least number of moves needed for a route from square A to square B? *2006 School Competition, Sprint Round #4*

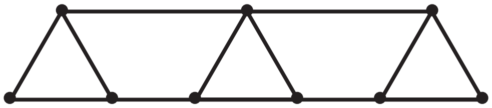


8. __________ In a particular dice game, a player rolls two dice. The player can choose either the sum or the product of the numbers rolled for her score for that turn. To win the game, a player must get a total score of exactly 102 points from the sum of her scores. What is the least possible number of turns needed to win the game? *2005–2006 School Handbook, Warm-Up 3-9*

9. __________ In how many ways can this figure be colored if the five regions must be colored with either red, white or blue and no two bordering regions can be the same color? *2005–2006 School Handbook, Warm-Up 16-1*

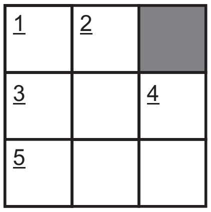


10. _________ Marcus and Al are playing Rock/Paper/Scissors. The first person to win 10 times does not have to do the dishes. The score is now 9 to 7 in favor of Marcus. If ties are ignored and not counted, what is the probability Marcus will not have to do the dishes? Express your answer as a common fraction. *2005–2006 School Handbook, Probability Stretch #6*



11. _________ Each of the nine dots in this figure is to be colored red, white or blue. No two dots connected by a segment (with no other dots between) may be the same color. How many ways are there to color the dots of this figure? *2006–2007 School Handbook, Workout 5-7*

12. _________ In the number puzzle to the right, each of the eight non-shaded unit squares contains one digit. What is the answer to 1-Across? (Note: This works like a crossword puzzle in that the digit placed in the unit square with the 5 in the upper left corner is the first digit of the answer to 5-Across and the third digit of the answer to 1-Down. No digit is placed in the shaded square.) *2005–2006 School Handbook, Workout 5-7*



Across	Down
1. A prime number	1. A multiple of 9
3. A perfect square	2. A perfect cube
5. A perfect fourth power	4. A perfect square

13. _________ Two standard six-faced dice are rolled. Cara scores x points if the sum of the numbers rolled is greater than or equal to their product; otherwise, Jeremy scores one point. What should be the value of x to make the game fair? *2002–2003 School Handbook, Workout 8-8*

14. _________ Ron and Ameka are playing a game in which each player can take 1, 2 or 3 coins on each turn. The game begins with 17 coins in a pile, and the player to take the last coin from the pile wins. If Ameka goes first, how many coins should she take to guarantee that she will win? *2003–2004 School Handbook, Patterns Stretch #9*

****Answers to these problems are on page 32 of the *2008-2009 Club Resource Guide*.****

A complete solution to each problem can be found in the MCP Members Only section of www.mathcounts.org.

Each coach who signs up a math club will be granted access to this members-only section of the site that contains all of the materials and resources necessary to conduct a math club and/or reach Silver Level Status in the MATHCOUNTS Club Program.