Index of Challenge Problems

1234 to the 23rd

Name _____ Date _____

The Problem

$(1,234)^2$ means 1,234 * 1,234; $(1,234)^3$ means 1,234 * 1,234 * 1,234; and so forth. When $(1,234)^{23}$ is completely multiplied out, what will the number be in the ones place?

2 Trains Meet

Name _____ Date _____

The Problem

A train leaves Rock City at an average speed of 50 miles per hour and heads for Gnome City. Another train leaves Gnome City at an average speed of 40 miles per hour and heads for Rock City. If the route is 360 miles long, how many hours will it take for the 2 trains to meet?

ABCDEF Equations

Name _____ Date _____

The Problem

Solve for the variables A through F in the equations below, using the digits from 0 through 5. Every digit should be used only once. A variable has the same value everywhere it occurs, and no other variable will have that value.

$$A + A + A = A^2$$
$$B + C = B$$
$$D * E = D$$
$$A - E = B$$
$$B^2 = D$$
$$D + E = F$$

Alicia's Babysitting Job

Name _____ Date _____

The Problem

Alicia was paid $125 for babysitting five days after school for the Smith family. Each day Mrs. Smith paid her $3 more than the day before. How much money did she earn on the first day?

Angelina's Club

Name _____ Date _____

The Problem

Angelina and her friends formed a club named the Extremely Cool Club. They wanted to assign a unique 4-digit secret code number to each member of the club. They decided to use the digits 1, 3, 7, and 9 for their numbering system and each of these digits can appear only once in every secret code number (i.e. 1379 is a valid number, but 1133 is **not** a valid number). What is the maximum number of members who could join the club if everyone is to be assigned a unique secret code number?

Average of a List of 7 Numbers

Name _____ Date _____

The Problem

You have a list of 7 numbers. The average of the numbers is 9. If you take away one of the numbers, the average of the numbers is 8. What number did you take away?

Basketball Bounce

Name _____ Date _____

The Problem

A basketball bounces back up about ½ the height from which it is dropped. If a basketball is dropped from 120 feet and keeps bouncing, what is its vertical height after it hits the floor for the 3rd time?

Best Athlete of the Day

Name _____ Date _____

The Problem

Bakersfield Elementary School has a field day at the end of the school year in which students compete in sporting events. A group of 5 friends wanted to determine who was the "best" athlete of the day based on the results of 3 events – the 50-yard dash, the mile run, and the rope climb. The chart below shows their results in the 3 events. Each of the events is of equal importance. Tell who you think is the "best" athlete of the day based on the results shown in the chart. Explain why you chose that person.

Names	50-yard Dash	Mile Run	Rope Climb
Brei	8 seconds	6.12 minutes	6 feet
Charlie	10 seconds	8 minutes	7.5 feet
Dani	7.5 seconds	12 minutes	5.8 feet
Eddie	9 seconds	5.59 minutes	4.3 feet
Francine	12.2 seconds	10 minutes	8.2 feet

Bikes & Trikes

Name _____ Date _____

The Problem

There are a total of 12 bicycles and tricycles at the park. Together they have a total of 29 wheels. How many are bicycles and how many are tricycles?

Bobby's Mariners Tickets

Name _____ Date _____

The Problem

Bobby has 4 tickets for the Mariners game. He invites 3 friends – Tommy, Larry, and Sam – to go with him. Bobby has the first 2 seats in row 5, and the first 2 seats in row 6. The boys are trying to decide on a seating arrangement. How many different combinations of seating arrangements can the boys choose from?

Brei's Long-Distance Phone Call

Name _____ Date _____

The Problem

Brei likes to call her friend Kiley in California from her home in Washington. Brei's mom makes her pay for all her long-distance phone calls. Last Sunday, Brei called Kiley at 7:00 a.m. and ended the phone conversation at 8:30 a.m. Before 8:00 a.m. on Sundays, it only costs $.35 for the first minute and then $.20 per minute after that to make the call. After 8:00 a.m., the rate goes up to $.40 for the first minute and $.25 per minute after that. How much does Brei owe her mom for the phone call?

Checkerboard Problem

Name _____ Date _____

The Problem

How many squares are there on a standard 8 x 8 checkerboard?

Checkerboard Problem (continued)

Solution Strategy: Find a Pattern

Once we have examined our simpler problems, we may begin to see a pattern that will help us solve the larger problem. Let's review what we found:

Size of square	Number of squares found within the larger square
1x1	1
2x2	1 + 4
3x3	1 + 4 + 9
What comes next?	
4x4	1 + 4 + 9 + 16
5x5	1 + 4 + 9 + 16 + 25
6x6	1 + 4 + 9 + 16 + 25 + 36
And so on and so forth…	

Do these numbers look familiar to you? If we look closely, we can see that the pattern is the sum of the perfect squares from 1 to the number that we're working on. Let's look more closely at the pattern for a 6x6 square.

1□ + 2□ + 3□ + 4□ + 5□+ 6□ = 1 + 4 + 9 + 16 + 25 + 36 = 91 squares

Now that we know the pattern, we can solve for any size square. Our original problem asked the question: How many squares on an 8x8 checkerboard? Using our pattern, we can set up our number model as follows:

1□ + 2□ + 3□ + 4□ + 5□ + 6□ + 7□ + 8□ = 1 + 4 + 9 + 16 + 25 + 36 + 49 + 64 = 204

ANSWER: The number of squares on a checkerboard is 204.

Comparing Ages of Collin & Anthony

Name _____ Date _____

The Problem

Anthony's age plus the cube of Collin's age is 1,739. Collin's age plus the cube of Anthony's age is 1,343. How old are Collin and Anthony?

Comparing Weights of a Group of 4th Graders

Name _____ Date _____

The Problem

A group of 4th graders were comparing their weight. Jeremy weighed more than Sam. Sam weighed more than Kim and Sarah. Mary and Donny weighed the same but less than Kim. Derek weighed more than Kim but less than Sam. Alyssa and Ashley weighed the same, which was less than Mary and Donny. Sarah weighed the least. Who weighed the most?

Courtney's Rectangular Blocks

Name _____ Date _____

The Problem

Courtney had 36 identical rectangular blocks. Her teacher instructed her to put the blocks together to make larger rectangles so that short sides of the rectangles are only matched up with short sides, and long sides of the rectangles are only matched up with long sides. How many larger rectangles can Courtney make with the 36 blocks?

Dice Game

Name _____ Date _____

The Problem

Lisa, Rob, and Dave are playing a game with 3 dice. The object is to roll the 3 dice and then use the 3 numerals rolled make as many unique 3-digit numbers as possible. Each numeral can only be used once in the number (unless you roll more than one of a certain number; i.e.if you roll 2 fives, your answer will contain 2 fives). A player scores 10 points for each different 3-digit number that he/she is able to form. In this game, the players rolled the following:

Lisa rolled a 2, 4, and 6.
Rob rolled a 3, 5, and 5.
Dave rolled a 1, 1, and 1.

Who earned the most points in the game?

Father & Sons Crossing the Lake

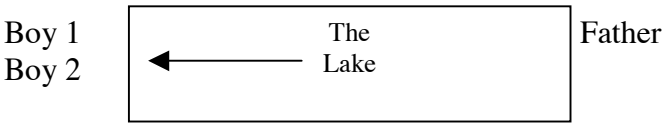
Name _____ Date _____

The Problem

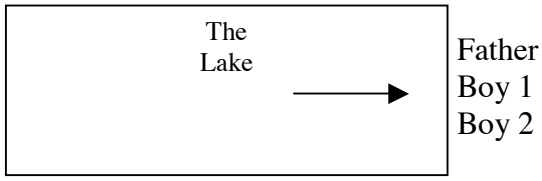
There are 2 boys and their father trying to cross the lake in a boat. Each of the boys weighs 100 pounds, and the father weighs 200 pounds. The boat can only hold 200 pounds at a time. How many trips will it take them to get everyone over to the other side?

Father & Sons Crossing the Lake (continued)

Step 4. Now let's have the boy who is with the father take the boat back and pick up the other boy. That makes 4 trips.



Step 5. Now both boys can take the boat back to the side where the father is and everyone will be on the same side. That is a total of 5 trips.



ANSWER: It took a total of 5 trips to get everyone over to the other side.

How Many Handshakes

Name _____ Date _____

The Problem

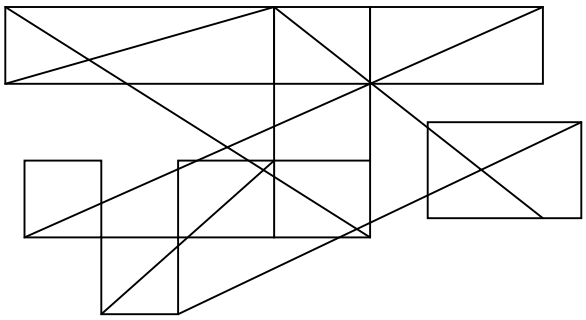
At the first meeting of the House of Eccentricities in the government of the Gnomes, each member shook hands with each other member. There are 25 members of the House. How many handshakes took place?

How Many Squares & Rectangles?

Name _____ Date _____

The Problem

If you remove all the diagonal lines, how many different squares and rectangles are there in the figure below?

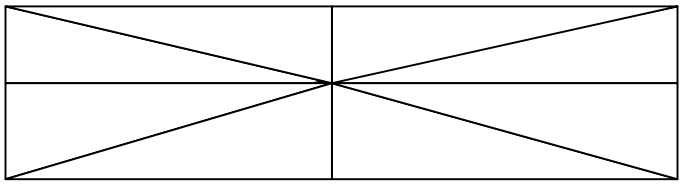


How Many Triangles?

Name _____ Date _____

The Problem

How many different triangles can you find in the diagram below?



Jeremy's Hondas

Name _____ Date _____

The Problem

Jeremy likes Hondas. He owns some cars and some motorcycles. There are 9 Hondas all together. They have a total of 26 tires. How many of the Hondas are motorcycles?

Magic Number Box

Name _____ Date _____

The Problem

Fill in the rest of the table by determining the next logical numbers in the pattern.

1	1	3
2	5	13
8	?	?

Making Whole Numbers from 2,4,6 and 8

Name _____ Date _____

The Problem

How many different whole numbers less than 10,000 can be made from the set of digits {2, 4, 6, 8}? (NOTE: It's okay to use a digit more than once in a number.)

Monica's Square Blocks

Name _____ Date _____

The Problem

Monica was given a container of plastic square blocks. She was instructed to make a series of consecutively larger squares by adding blocks each time. The first thing Monica did was put down 1 block to make a 1 x 1 square. Next, Monica added 3 more blocks to make a 2 x 2 square. Then she added 5 more blocks to get a 3 x 3 square, and so on and so forth. What is the size of the square in front of Monica if she has just added 27 blocks?

Mr. Mayer's Shirts & Ties

Name _____ Date _____

The Problem

Mr. Mayer has 3 shirts and 4 ties. How many different combinations of shirts and ties can he make?

Planet Grumble & the 1,000-Day War

Name _____ Date _____

The Problem

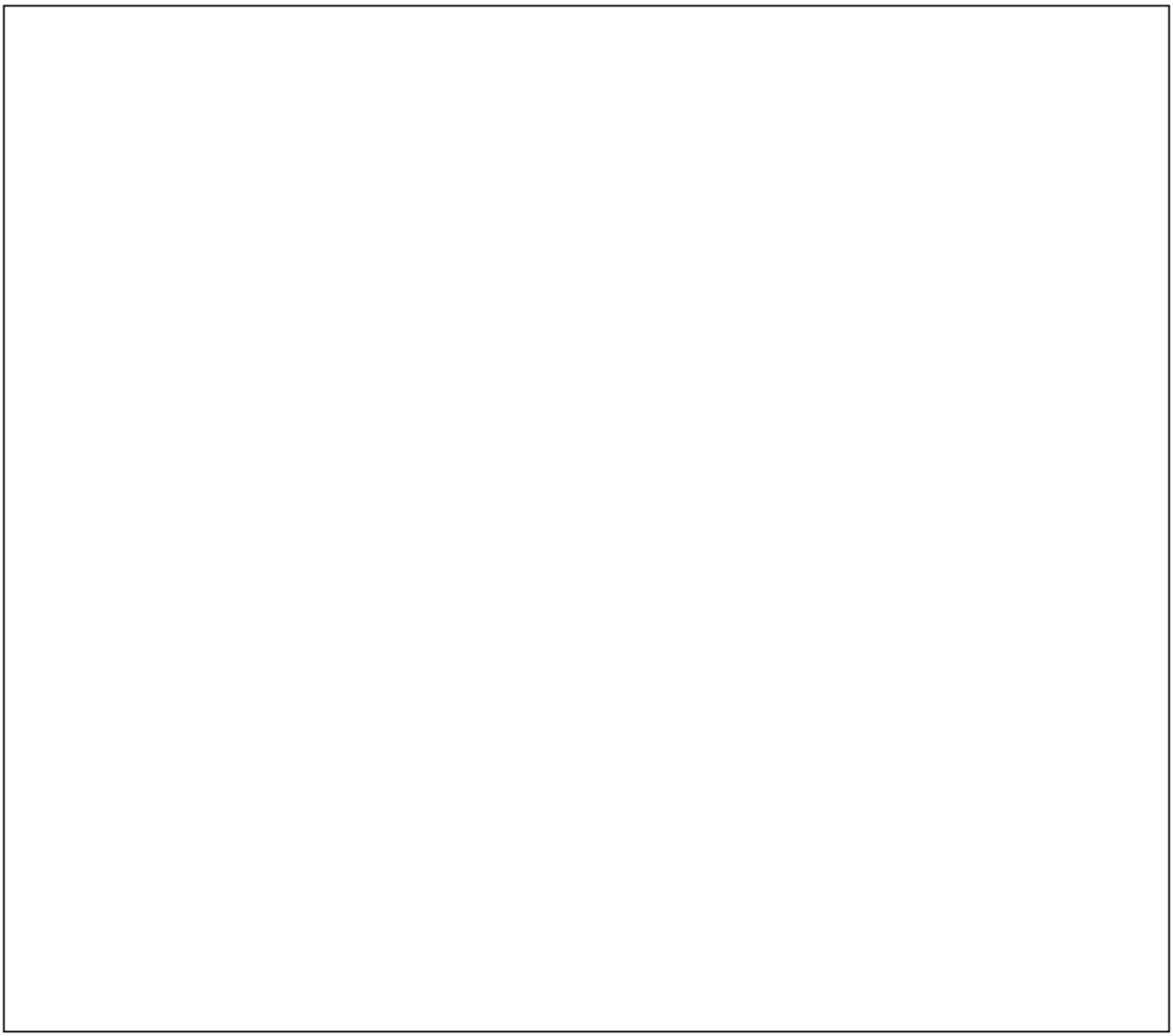
There was a war on the planet Grumble. It lasted 1,000 days. If the planet Grumble uses the same calendar that we use on Earth, and the 1,000-day war started on a Monday, what day of the week did the 1,000-day war end?

Rectangular Patterns

The Problem

If you continue with the pattern shown below, what would the 20th figure look like?

Figure 1	Figure 2	Figure 3	Figure 4
o o	o o o o o o	o o o o o o o o o o o o	o o o o o o o o o o o o o o o o o o o o



Rectangular Patterns (continued)

Let's use a table to determine the number of dots in the 20^{th} figure.

Figure Number	Number of Dots Added	Total Number of Dots
1	--	2
2	4	6
3	6	12
4	8	20
5	10	30
6	12	42
7	14	56
8	16	72
9	18	90
10	20	110
11	22	132
12	24	156
13	26	182
14	28	210
15	30	240
16	32	272
17	34	306
18	36	342
19	38	380
20	40	420

ANSWER: There are 420 dots in the 20^{th} figure when this pattern is continued.

Sam the Soccer Man

Name _____ Date _____

The Problem

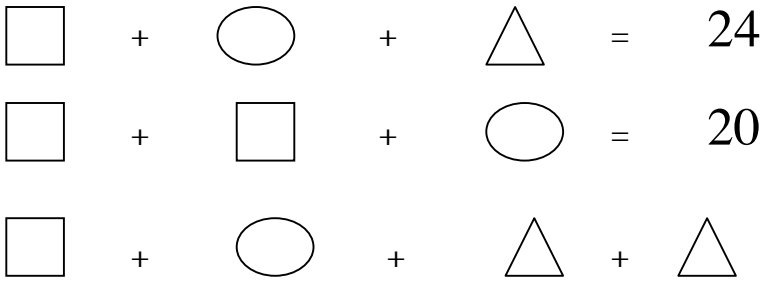
Sam, the soccer man, has soccer balls for sale. He travels to the first soccer field and sells half of the soccer balls plus a half of a ball. Then he travels to the next soccer field and sells half of the remaining balls and half of a ball. He travels to a third soccer field and sells half of the remaining soccer balls and a half of a ball. Finally, he returns home with no soccer balls left. Sam accomplishes all of this without cutting any of the balls in half. How many soccer balls did Sam start with?

Shape Equations

Name _____ Date _____

The Problem

In the 3 equations below, each of the shapes represents a number. Each shape represents the same number everywhere it occurs. What is the numerical value of the square?



The Sliding Slug on the Slanted Sidewalk

Name _____ Date _____

The Problem

A slug is at the bottom of a slanted sidewalk which is 10-feet long. The slug crawls 3-feet each day, but slides backwards 1-foot each evening. How many days will it take the slug to make its way to the end of the sidewalk?

Soccer Teams

Name _____ Date _____

The Problem

A group of 4 soccer players, each from a different team, stopped at the same restaurant to eat after a tournament. They began to discuss how their teams did at the tournament. Determine what order their teams placed in the 4-team tournament (1st through 4th place) based on the discussion below. (Note: The players from the 1st and 2nd place team did not want to brag about their victories, so the statements they made are NOT truthful!)

Player A: "We did not come in last place."
Player B: "We did not come in 1st place."
Player C: "We came in 3rd place."
Player D: "My team did not come in 3rd place."

Stacey's Schedule

Name _____ Date _____

The Problem

River Wood Junior High School uses the following master schedule for scheduling each of the students in the school. The first 5 classes listed (including lunch) are mandatory; that is, everyone must take these classes. The last 4 classes are electives and students may choose 2 of these classes. An asterisk (*) indicates what periods the classes are available. Using the information in the master schedule, create a schedule for Stacey. She wants to take Keyboarding and Spanish as her electives. She is also involved in Student Council and they meet during the 1st lunch period. What will Stacey's schedule look like?

Class	Period 1	Period 2	Period 3	Period 4	Period 5	Period 6	Period 7
English		*		*			
Math	*		*			*	
Science		*		*		*	*
PE	*		*		*		*
Lunch				*	*		
Band		*					*
Spanish			*		*		
Keyboarding		*				*	
Shop			*		*	*	*

Tennis Tournament

Name _____ Date _____

The Problem

There are 4 people in a singles tennis tournament. If each player only plays one match with each other player, how many matches are played in all?

Tommy's 12-Hour Clock

Name _____ Date _____

The Problem

Tommy has a 12-hour clock. The clock runs continuously without stopping. It is currently 2:00 p.m. What time will be shown on Tommy's clock 1,000 hours from now? Will it be a.m. or p.m.?

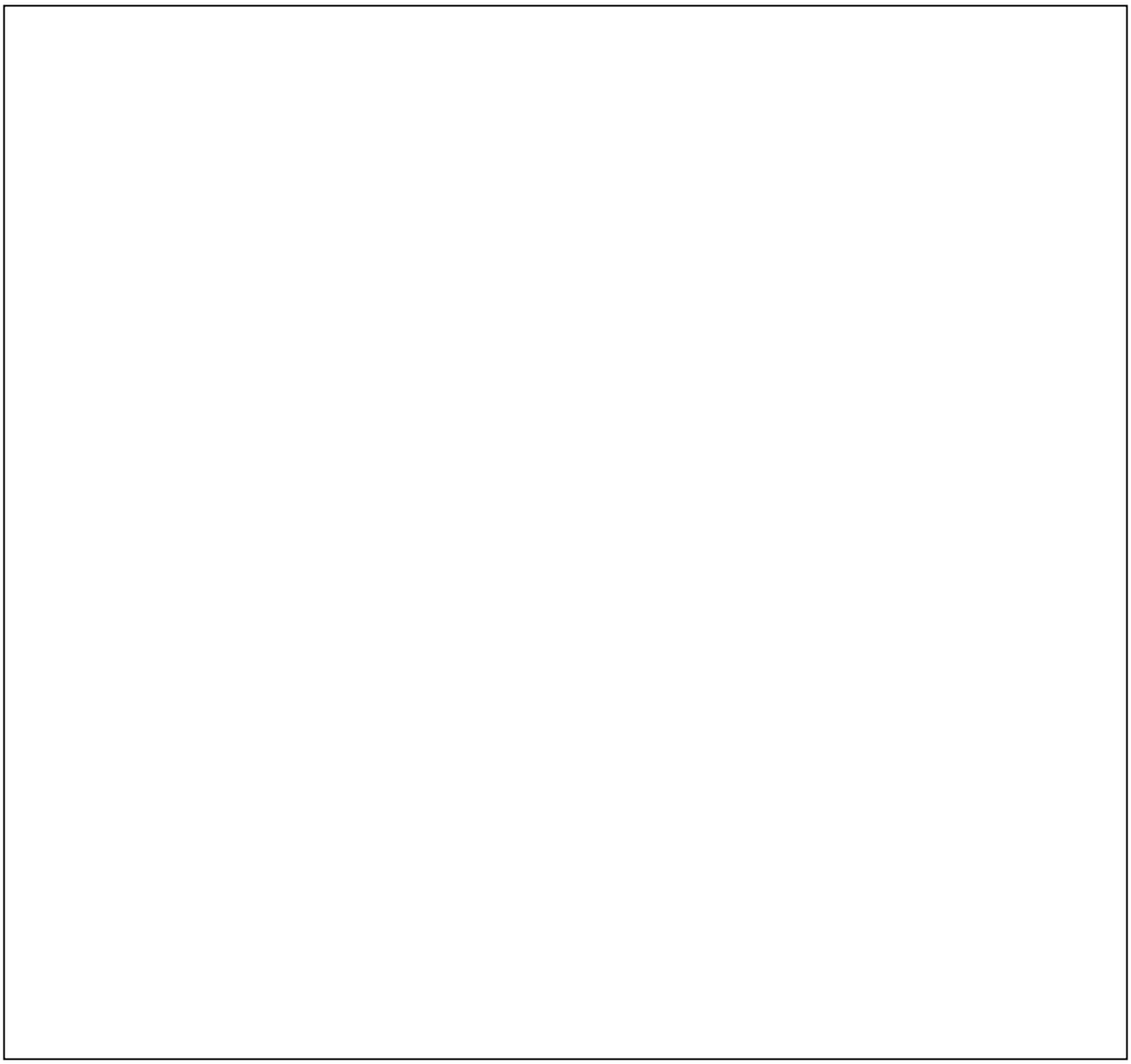
Triangular Patterns of Circles

Name _____ Date _____

The Problem

If you continue with the pattern shown below, what would the 8th figure look like?

Figure 1	Figure 2	Figure 3
o o o	o o o o o o	o o o o o o o o o o



What Number Am I?

Name _____ Date _____

The Problem

A palindrome is a number or a word that is read the same forward or backward. A few examples of words that are palindromes are: mom, dad, and racecar. A few examples of numbers that are palindromes are: 11, 202, and 41014.

Find the following number. I am a palindrome. I am between 50,000 and 60,000. I am evenly divisible by 9. The number in my hundreds place is 0. What number am I?

Work Schedules for Sammy & Elyse

Name _____ Date _____

The Problem

Sammy and Elyse work at the same grocery store. They are both part-time employees. Elyse is always scheduled to work 1 day and then has 2 days off. Sammy works 1 day and then has 3 days off. The store is open every day. If Elyse and Sammy both worked on Wednesday, when is the next time they will both be scheduled on the same day?

XYZ Equation

Name _____ Date _____

The Problem

In the following equation, the sum of two 3-digit numbers is represented. The variables X, Y, and Z represent the digits 7, 8, and 9, but not necessarily in that order. Each digit can only be used once. What is the largest value the sum can be?

$$\begin{array}{r} X\ Y\ Z \\ +\ Z\ Y\ X \\ \hline \end{array}$$