PFS 26-11 4/16/13 _____

A Mishmash

I. Double or Erase

Let's play a game where you start with a number and can do one of two things to it: double it, or erase the ones digit. (Another way to think of the second possibility is divide by ten and throw away any remainder.) Using these rules, we could go from 32 to 12 as follows:

	32
double:	64
erase:	6
double:	12

1) How can you go from 6 to 4?

2) Is there another way from 32 to 12?

3) Can you make up your own starting and ending numbers and show the route?

4) Can you go from 71 to 17?

5) Can you reach any counting number starting at any counting number? Explain?

II. A Number Trick from Noah S.

Tell your audience member to write a five-digit number. Then you write a secret number on a slip of paper, fold it, and give it to the audience member to hold. You ask the audience member to write another five-digit number under the first, and under it you put a number of your own. Repeat with another number from the audience and one of your own. Then add up the five numbers. Ask the audience member to open the slip of paper. Amazing! You predicted the sum correctly before four of the numbers were even written down!! Here's an example:

Audience:	14,773
Audience:	43,378
You:	56,621
Audience:	13,942
You:	86,057
Sum:	214,771

1) Study the example! Can you learn to perform the trick by studying the example? If not, ask Noah S. or RAF. Try the trick out on someone. How did it work out?

2) Can you explain mathematically why the trick works?

III. A Story Problem from Raeed

Jack sells his cow for some magic baked beans. His mother throws them out the window and Jack goes to sleep. The next morning Jack sees a baked-bean stalk that grew while he was sleeping. It's 1,000 feet tall. Jack slept for six hours. How fast did the baked-bean stalk grow? For some odd reason Jack wants to climb it. He starts at 8:00 AM, and he climbs at 2 mph. When will he reach the top?

At the top he sees a castle 3 miles away. When he gets to it, he sees a sleeping Cyclops. He also sees a golden chicken laying golden eggs 1,000 feet away. Jack can run at 10 mph. The Cyclops's alarm clock will wake him in half an hour. The Cyclops can run at 20 mph. Can Jack grab the chicken and get to the bean stalk in time? (The Cyclops cannot climb down it.)

IV. A Paradox

Two animals are some distance apart on a very large open plain or prairie. The animals, A and B, are of different species. If A tries to pursue B, and B flees as fast as it can, A can catch B. On the other hand, if B tries to pursue A, and A flees as fast as it can, B can catch A! Explain how that can be! (These are ordinary animals of the kind you know, like cat, dog, horse, cow, etc. No magical powers or tricks!)

V. Points on a Circle

1) Make some diagrams. Each diagram will have a circle, points on the circle, and straight lines connecting each point on the circle to every other point on the circle. Count the number of regions you get for each number of points on the circle. Start with a two-point diagram and work your way up. With six or more points, be sure to use large full-page diagrams. Use a protractor to draw neat circles and to measure arcs. Use a ruler for your straight lines. Work neatly please!

2) Make a function chart like the one shown below. How far can you get? Check your chart with a friend.

points	regions
2	2
3	4
4	8

3) Can you find a rule or formula to help you understand this function?

4) Does it matter if the points are equally spaced around the circle?

5) Can you create a work of art using one of your diagrams?

6) Hints for the ambitious: This problem is related to the rule for the number of diagonals in a polygon with n sides. Can you find that formula? There is also a formula that relates all the points, segments and regions (vertices, edges and faces) in any network. Can you find it?

Have fun!