

Puzzle Parade

1) John Conway's Family Puzzle

John says, "I have sons and daughters. Each of my daughters has an equal number of brothers and sisters. Each of my sons has twice as many sisters as brothers. How many sons and daughters do I have?"

Can you solve John's problem? A good strategy might be trial and error. Pick different numbers and see if they work. If you're working as a class or with a group of friends, maybe you can act it out. Explain your solution!

2) Fox, Chicken and Grain

A farmer wants to get across the river with his fox, chicken, and grain. The boat only has enough room for him and one of his possessions. If he leaves the fox with the chicken, the fox will eat the chicken. If he leaves the chicken with the grain, the chicken will eat the grain. How can he get them all across? How can you show your answer?

3) Fault-Free Rectangles

Can you arrange some dominoes into a rectangle that has no fault lines? (Fault lines are cracks between the dominoes that run from top to bottom or side to side.) Make a neat drawing of your solution or solutions. What's the smallest one you can make?

4) Squares around a Triangle

Write the numbers from 1 to 9 along the sides of an equilateral triangle, four to each side. (The corner numbers count for two sides.) In the example shown, the numbers 1, 2, 3, and 4 are along the bottom side. The sum of the squares of these numbers, $1 + 4 + 9 + 16$, equals 30. How can you rearrange the nine numbers so the sums of the squares of the numbers along each side will be equal? Can you discover anything else interesting about that arrangement once you find it? Have fun!

7
 8 6
 9 5
 1 2 3 4

5) The Dark and Stormy Bridge

It was a dark and stormy night. A family had to get to safety across a rickety old bridge. They have only seventeen minutes before the flood destroys the bridge. And they have only one flashlight, which they must use to cross the bridge. Grandpa takes ten minutes

to cross the bridge; Mom takes five minutes; Brother takes two minutes; Sister takes one minute. No more than two people can cross at a time, sharing the flashlight. Can they all make it to the other side in seventeen minutes? Explain how. Is there more than one solution? If you think it's impossible, explain why. (No gimmicks, such as throwing the flashlight back! Someone has to bring the flashlight back to the people who are still waiting to cross.)

6) Romeo and Juliet

Romeo and Juliet live in neighboring castles. Unfortunately, they've been grounded! Fortunately, there is a messenger. Unfortunately, the messenger will steal whatever they send, unless it's in a locked box. Fortunately, Romeo has a box. The box has a big ring on it, and so does its lid, so it can be locked with a padlock. Fortunately, Romeo has a padlock and key, and so does Juliet. Unfortunately, Romeo's key opens only his own lock, and Juliet's opens only hers. How can Romeo send Juliet that special Valentine's present?

(Hint: The answer depends on Juliet's intelligence!)

7) A Simple Multiplication

Here's a straightforward problem! For some reason, not too many students have solved it!

$$116,415,321,826,934,814,453,125 \times 8,589,934,592$$

8) Trees in Rows

Your aid I want, nine trees to plant
In rows just half a score;
And let there be in each row three.
Solve this: I ask no more.

In 1821 John Jackson published this poem in a book called *Rational Amusement for Winter Evenings*. Another way to state this problem is this: arrange nine points on a paper so that there will be ten straight rows of three each. (It *is* possible!) Make a beautiful drawing to show your solution! How did you find it? Can you discover similar problems?

9) Is it Prime?

Is 2,773 prime or composite? Explain how you found out.

10) Have fun!