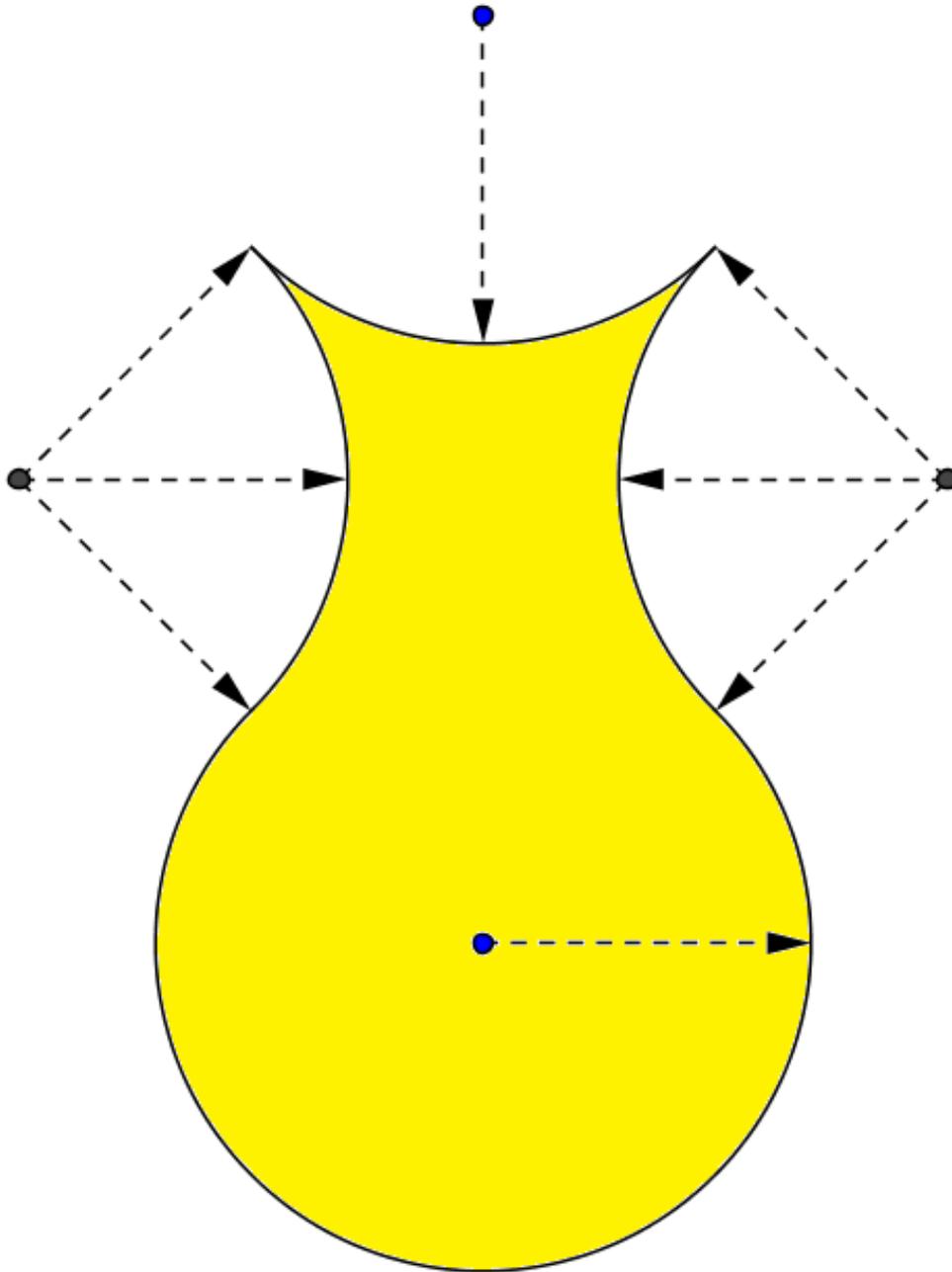


FAU Math Circle  
2022/10/8

Math Warm Up

Cut the jug into 3 pieces by two **straight** cuts, and form a square out of the parts. The dashed arrows could be a nuisance, or of some help. We have additional pictures available for experimentation, and to take home.



## Today's Problems

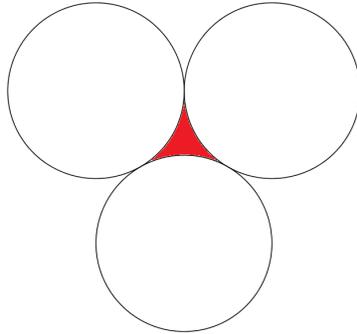
We will be dealing with numbers followed by a little bit of geometry.

1. Find a three digit number such that when you subtract 7 from it, the result is divisible by 7; if 8, the result is divisible by 8; and if 9, by 9.
2. Four cruise ships leave the port of Miami at noon, January 2, 2014. The first ship returns to this port every 4 days, the second every 8 days, the third every 12, and the fourth every 16. When did all four ships meet again in this port?
3. Find all two digit numbers (are there any?) such that the number equals the product of its digits plus the sum of its digits. Be sure you find all of them.
4. When Peter broke his piggy bank it contained no more than 100 coins. He divided the coins into piles of 2 coins each, but was left with one extra coin. The same happened when Peter divided the coins into piles of 3 coins, piles of 4 coins, and piles of 5 coins. Each time he was left with an extra coin. How many coins were in the piggy bank?
5. Together Winnie the Pooh, Owl, Rabbit and Piglet ate 70 bananas. Each ate a whole number of bananas and each ate at least one. Pooh ate more than each of the others. Owl and Rabbit together ate 45 bananas. How many bananas did Piglet eat?
6. While walking in a park, Jack and Jill come upon a large round clearing surrounded by a ring of palm trees. They decide to count the trees. Both walk around the clearing and count all the trees, but beginning at different trees. Jill's 20th tree was Jack's 7th, while Jill's 7th tree was Jack's 94th. How many trees were growing around the clearing?
7. Which is greater:

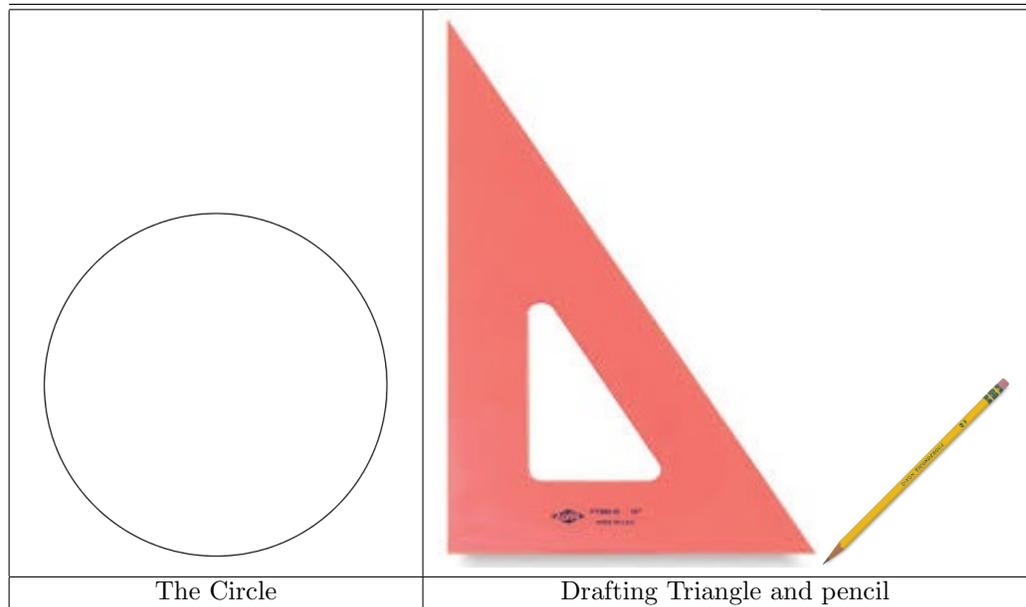
$$\frac{12345678765432199987}{12345678765432199988} \quad \text{or} \quad \frac{12345678765432199988}{12345678765432199989}?$$

## A Bit of Geometry

8. Three equal circles of radius 3 are tangent to each other, as shown. Find the area of the shaded region.



9. You visited the far away country of Noplacia, and now you are not allowed to leave. Emperor Lunaticus will let you go if you can do one thing for him, find the center of a circle. All he allows you to use is a drafting triangle and a pencil. How can you do it?



(A couple of very primitive drafting triangles are available if you decide to try)

# Jugs Galore

