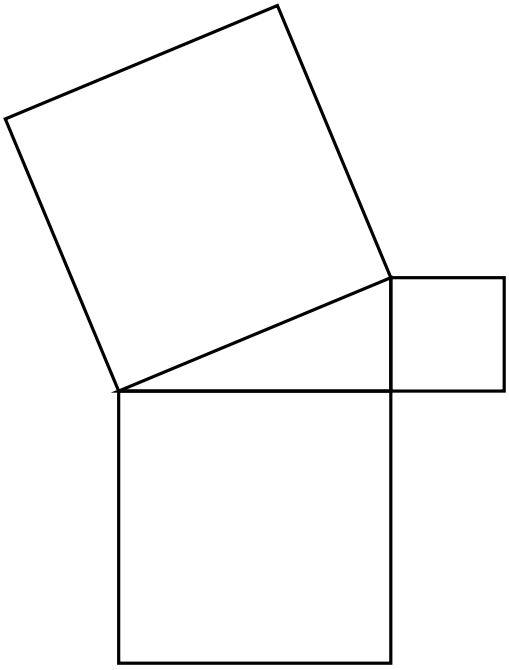
Name: _____

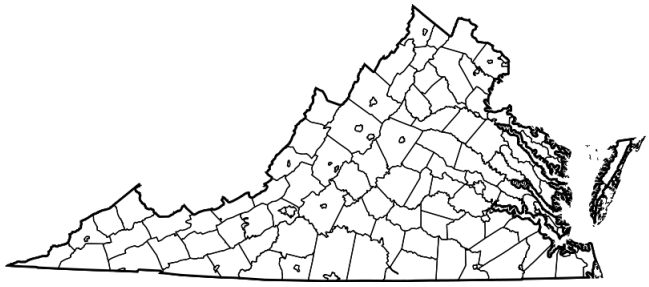
Math 111 - Midterm 1 Review Problems

1. Suppose that Local Apparent Noon occurs at 2 PM GMT where you are. Are you East or West of Greenwich? What is your longitude?

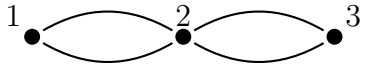
2. This pictures depicts (but does not prove!) a famous theorem from geometry. What theorem is it, and what does it say about the three squares in this picture?

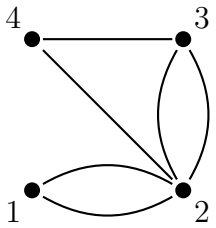


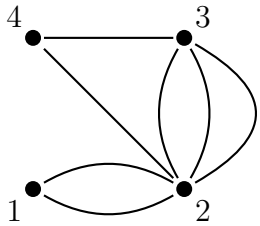
3. What theorem tells us the minimum number of colors necessary to color this map of Virginia so that no two counties that share a border have the same color?



4. For each graph below,
   (a) Find the degree of each vertex.
   (b) Is it possible to travel around the graph, crossing every edge exactly once, and return to the vertex where you started? Why or why not?







5. What is the Euler characteristic $(V-E+F)$ for a Cube? What is the Euler characteristic for a Tetrahedron? What about for an Octahedron, or a Dodecahedron?

6. Describe in words how to tell if a number is divisible by 300.

7. It is a fact that $17 \times 24 = 408$. Use this information to help find 413 mod 24 without a calculator.

8. If a 1/2 scale model of a tank holds 10 gallons, how many gallons does the full sized tank hold?

9. A giant who is twice as tall as a 200 lbs. man, but otherwise proportional would weigh how much?

10. The radius of the sun is 100 times the radius of the Earth. How much bigger is the surface area of the sun?

11. Find the prime factorization of each of the following numbers
    (a) 330
    (b) 2088
    (c) 2860

12. If n is an odd number greater than or equal to 3, can $n+1$ ever be prime? Why or why not?

13. Is 67122 divisible by 33? How can you tell without a calculator?

14. If it is 10 AM now, then what time will it be 17 hours from now? What about 37 hours from now?

15. If today is Monday, September 27, then what day of the week will it be 30 days from now? What day of the week will it be on October 27?

16. What are the first 10 prime numbers?

17. Find the following moduli (without a calculator):
    (a) 13 mod 5
    (b) 7 mod 2
    (c) 42 mod 3

18. Find a formula for the area of any regular n-gon, as a function of the perimeter (P) and the distance from the center to one of the sides (h).

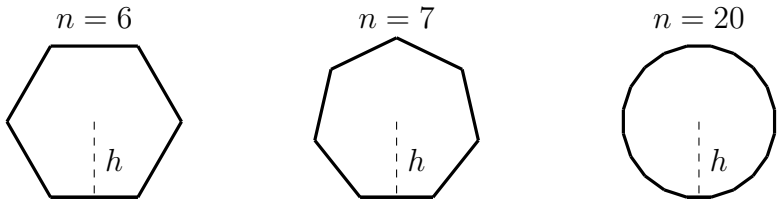
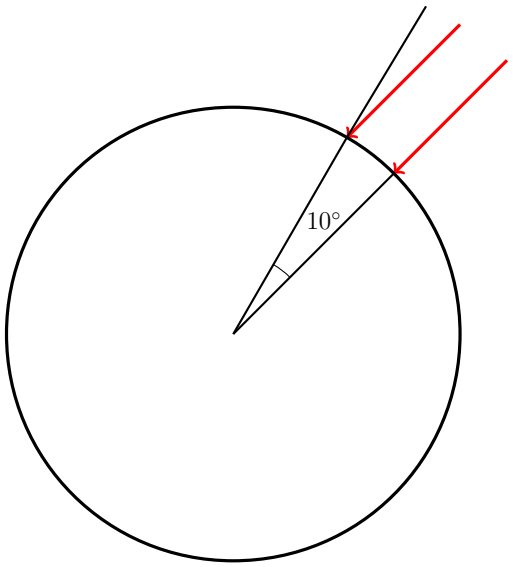


Figure: Different regular n-gons

19. A martian standing at the equator on Mars observes the sun directly overhead. At the same time, a martian who is 370 miles due North sees the sun at an angle of 10° from zenith:



    (a) Complete the following proportion

$$\frac{\text{? miles}}{\text{Circumference}} = \frac{\text{? degrees}}{\text{?}}$$

    (b) What is the circumference of Mars?