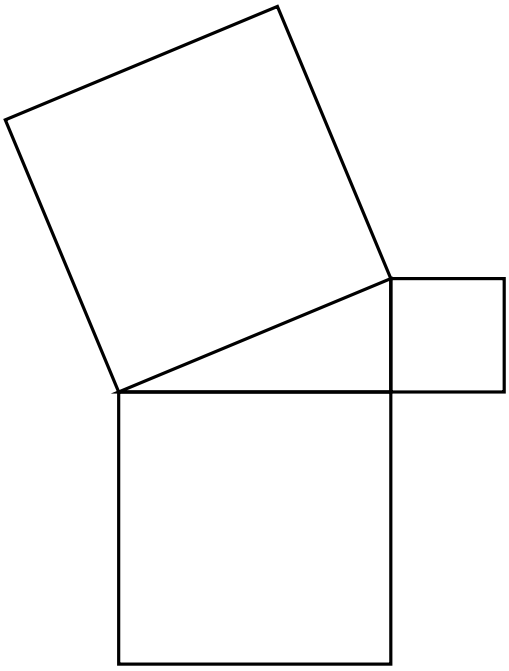
Math 111 - Midterm 1 Review Problems

Here are some review problems for the first midterm. I may add more review problems before the exam, so you might want to check this page again later. Two thirds of the exam will be based on problems just like these. The rest will be similar to the problems in the workshops and homework.

1. 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?



2. Describe in words how to tell if a number is divisible by 300.
3. How many prime numbers are there?
4. What is the difference between a rational and an irrational number.
5. How can you tell that the number $6.\overline{7} = 6.7777...$ is rational?
6. What does the fundamental theorem of arithmetic say?
7. This question has two parts.
   (a) Use the Fundamental Theorem of Arithmetic to prove that there cannot be whole numbers m and n such that $7m^2 = n^2$.
   (b) Prove that $\sqrt{7}$ cannot be a fraction.
8. It is a fact that $17 \times 24 = 408$. Use this information to help find 413 mod 24 without a calculator.

9. If you are 150 degrees west of Greenwich, then what time would a clock set to Greenwich Mean Time say it was when it is high noon where you are?
10. What are three assumptions that Eratosthenes made when he calculated the circumference of the Earth?
11. What are the first 3 positive numbers that are equivalent to -13 modulo 11?
12. Is 67122 divisible by 33? How can you tell without a using a calculator or long division?
13. Explain why calculating mod 10's is so easy.
14. Compute the following moduli (without a calculator)
    (a) 3564 mod 3
    (b) 365723 mod 11
    (c) 455417 mod 9
15. If it is 10 AM now, then what time will it be 17 hours from now? What about 37 hours from now?
16. If today is Monday, then what day of the week will it be 100 days from now? What day of the week would it be 777 days from now?
17. If I tell you that 216 days from now will be a Friday, then what day is it today?
18. What are the first 10 prime numbers?
19. Find the following moduli (without a calculator):
    (a) 13 mod 5
    (b) 7 mod 2
    (c) 42 mod 3
20. Why do bar codes have a check digit? What does the check digit do?
21. Find the following without a calculator, and write your answer in scientific notation.
    (a) $2,000 * (4.0 \times 10^6)$
    (b) $\dfrac{6.0 \times 10^{13}}{2.0 \times 10^5}$
    (c) $(3 \times 10^5)^3$
    (d) 5 billion squared
    (e) 100^6
    (f) 4 million divided by 0.01.
22. List three applications of modular arithmetic.
23. Why is modular arithmetic sometimes called clock arithmetic?
24. What is the Pythagorean theorem? How can you prove it?