If you've mastered division, remainders, integer exponents and basic equations as illustrated in the problems below, then you are ready for the Art of Problem Solving Online Class, **Scholars Math 7.2: Introduction to Number Theory**. (Answers to these problems are on the final page.)

Remainders

1. Find the remainder in each division problem.
   (a) $248 \div 8$
   (b) $399 \div 13$
   (c) $1333 \div 109$

Integer exponents

2. Evaluate the following. Express your answer as an integer or as a fraction in lowest terms.
   (a) $(-1)^6$
   (b) 3^{2+1}
   (c) 12^{-1}
   (d) $2 \cdot (2^3)^2$

Equations

3. Solve each of the following for x.
   (a) $4x + 7 = 23$
   (b) $5x + 10 = 54$
   (c) $3x - 4 = x + 2$
   (d) $x^2 + 2x - 4 = 0$

Algebraic expressions

4. (a) Simplify $(3x + 2) + (5x + 7)$.
   (b) Expand the product $(4n + 1)(4n + 3)$.
   (c) Factor $49 - 16x^2$.
   (d) Factor $3y^2 + 7y + 2$.

Problem solving

5. (a) The sequence $5, 7, 8, 9, 5, 7, 8, 9, \ldots$ continues to repeat with the same pattern. What is the 79th number on the list?

   (b) When the integer n is divided by 12, the remainder is 2. What is the remainder when n is divided by 6?

Don't look at the next page until you've attempted all the problems!

The answers to Are You Ready are below. (The answers to problem sets and challenges given in the class will include full detailed solutions as opposed to the mere answers provided below.)

1. (a) 0
   (b) 9
   (c) 25
2. (a) 1
   (b) 27
   (c) $\frac{1}{12}$
   (d) 128
3. (a) 4
   (b) $\frac{44}{5}$
   (c) 3
   (d) $-1+\sqrt{5}, -1-\sqrt{5}$
4. (a) $8x+9$
   (b) $16n^2+16n+3$
   (c) $(7+4x)(7-4x)$
   (d) $(3y+1)(y+2)$
5. (a) 8
   (b) 2