

## SELF-ASSESSMENT: MATH SKILLS FOR CS 260

Take the following test to determine whether you have the math prerequisites for CS 260. Note that passing this test will not guarantee success in CS 260.

- (1) Let  $a$  and  $b$  be real numbers. Prove that

$$\lfloor a \rfloor + \lfloor b \rfloor \leq \lfloor a + b \rfloor \leq \lfloor a \rfloor + \lfloor b \rfloor + 1.$$

- (2) What is  $\log_8 1/4$ ?  
(3) Prove by contradiction that there are infinitely many prime numbers.  
(4) Find a closed form for the sum  $1 + 2 + 3 + \dots + n$ .  
(5) Find a closed form for the sum  $1 + q + q^2 + q^3 + \dots + q^n$ .  
(6) Represent  $1/5$  as a binary fraction.  
(7) Prove by induction that

$$(a + b)^n = \sum_{k=0}^n \binom{n}{k} a^k b^{n-k}.$$

### COMMENTS

Question 1 tests your ability to use floor and ceiling functions. Question 2 tests whether you understand the definition of the logarithm. Question 3 tests your ability to prove by contradiction. Question 4 tests whether you can sum a finite arithmetic series. Question 5 tests whether you can sum a finite geometric series. Question 6 tests your understanding of the binary number system. Question 7 tests your ability to prove by induction, to use the summation symbol, to manipulate indices, and your knowledge of the binomial coefficients.