Pre-Test
Numbers, Operations and Quantitative Reasoning

1. Describe the set of natural numbers.
2. What are prime numbers?
3. There are exactly 25 prime numbers less than 100. Suppose a is a natural number less than 10,000. How many more prime numbers do you need to know to determine whether a is prime or not? Explain.
4. Find the prime factorization of 240.
5. The prime factorizations of 1,950 and 33,264 are given by $1{,}950=(2)(3)(5)^2(13)$ and $33{,}264=(2)^4(3)^3(7)(11)$. Give the prime factorizations for both **gcd**(1950 , 33264) and **lcm**(1950 , 33264). (**gcd**: greatest common divisor, **lcm**: least common multiple)
6. Suppose a and b are natural numbers. What is the relation between **lcm**(a,b), **gcd**(a,b) and ab ?
7. State three methods for computing the **gcd**) of two natural numbers.
8. What method is used by many calculators and computers to compute the greatest common divisor of two natural numbers?
9. Write the base 10 number 123 in base 6.
10. What is the base 10 representation of the base 11 number $23\blacktriangle_{11}$? (Here ▲ is the single digit representation of the number 10 in base 11.)
11. State how rational numbers are different from irrational numbers.
12. Which of the sets $\mathbb{R}$, $\mathbb{Q}$ and $\mathbb{N}$ have the same number of elements? Which of these sets is(are) smaller than the set of irrational numbers?
13. Give a geometric interpretation of the irrational number $\sqrt{2}$ by using the Pythagorean Theorem.
14. What is the triangle inequality?
15. Give a definition of absolute value. Then use this definition to solve the inequality $|2q-1|\geq 5$.
16. Express the quotient $\frac{1-i}{1+i}$ in the form $a+bi$.
17. What is the conjugate of the complex number $a+bi$? Explain how the conjugate of $a+bi$ is related geometrically with $a+bi$ (in the complex plane).
18. Find $(a+bi)(\overline{a+bi})=?$
19. Graph the complex numbers $2-3i$ and $-4+i$ in the complex plane.
20. Graph the set of points $a+bi$ in the complex plane satisfying $|a+bi|\leq 1$.