

Post-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. How many more prime numbers do you need to know to determine whether an arbitrary natural number is prime if this number is smaller than 10,000? Explain.
4. Give the prime factorization of 240.
5. The prime factorizations of 33,264 and 1,950 are give by $33,264 = (2)^4 (3)^3 (7)(11)$ and $1,950 = (2)(3)(5)^2(13)$. Give the prime factorizations for both **gcd**(33,264 , 1,950) and **lcm**(33,264 , 1,950).
6. Suppose a and b are natural numbers. How are **gcd**(a,b), **lcm**(a,b) and ab related?
7. Give 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. Give the base 10 representation of the base 11 number $\Delta 23_{11}$, where Δ is the single digit representation of the number 10 in base 11.
11. How are rational numbers different from irrational numbers?
12. Which of the sets \mathbb{N} , \mathbb{Q} and \mathbb{R} have the same number of elements? Which of these sets is smaller than the set of irrational numbers?
13. Use the Pythagorean Theorem to give a geometric interpretation of the irrational number $\sqrt{2}$.
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. Write the quotient $\frac{1-i}{1+i}$ in the form $a+bi$.
17. What is the conjugate of the complex number $a+bi$? How is the conjugate of $a+bi$ related geometrically with $a+bi$ (in the complex plane)?
18. Give the value of $(a+bi)(\overline{a+bi})$.
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 $|a+bi| \leq 1$.