

Homework Foundations 1/21/05

The understanding is that n represents an integer, and x a real number, unless otherwise stated.

1. If n is even, then n^2 is even.
2. If n is odd, then n^2 is odd.
3. If n^2 is even, then n is even.
4. If n^2 is odd, then n is odd.
5. The product of an even number and an odd number is even.
6. The product of two odd numbers is an odd number.
7. If n is divisible by 2 and m is divisible by 3, then $n + m$ is divisible by 5.
8. If n is divisible by 2 and m is divisible by 3, then $n \cdot m$ is divisible by 6.
9. The square of any integer has a remainder of either 0 or 1 when divided by 4.
10. The product of any four consecutive integers is divisible by 24.
11. For any $n > 0$, the n^{th} triangular number is the number $\frac{n(n+1)}{2}$. Prove that the sum of any two consecutive triangular numbers is a perfect square.
12. For any $n > 0$, the difference of the n^{th} and $n + 1^{\text{st}}$ triangular numbers is $n + 1$.
13. The sum of two rational numbers is rational.
14. The sum of two irrational numbers is irrational.
15. The product of two rational numbers is rational.
16. The product of two irrational numbers is irrational.
17. Between any two integers there is another integer.
18. Between any two rational numbers there is another rational number.
19. Between any two irrational numbers there is an irrational number.
20. The solution x to any equation of the form $ax + b = c$ is unique.
21. The additive inverse of any integer is unique.
22. The square of any integer is unique.