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1. Let k = first integer, k + 1 = second integer, k + 2 = third integer

k + (k + 1) + (k + 2) = 3k + 3 = 3(k + 1)

Therefore 3(k + 1) is always divisible by 3

1. Let k = all integer

Even = 2k

Odd = 2k + 1

P = 2k + 1 (1)

p2 = (2k + 1)(2k + 1) = 4k2 + 4k + 1 (2)

p3 = (4k2+ 4k + 1)(2k + 1) = 8k3 + 12k2 + 6k + 1

= 2(4k3 + 6k2 + 3k) + 1 (3)

P = 2k (1)

p2 = 4k2 (2)

p3 = 8k3 = 2(4k3) (3)

Therefore p3 will be odd if and only if p is odd. And p3 is even if and only if p is even.

1. Let x, y, z be rational and let a, b, c, d, e and f be integers.

For b, d , f ≠ 0

Since a, b, c, e, d, f is integer and d ≠ 0, f ≠ 0, b ≠ 0

So x + yz is rational.

1. Let xyz = rational and x, y is rational

Since a, b, c, d, e, f is integer, and

Therefore, if xyz is rational, then z is rational. So z is irrational when xyz is irrational.

You cannot use direct proof because there is no way of showing irrational number.

1. If 3n + 11 is even, then n is odd

Let n be even.

n = 2k

3n + 11 = 3(2k) + 11

= 6k + 11

= 2(3k +5) + 1

Therefore, if 3n + 11 is even, then n is odd.

1. Proof by contradiction: she has to schedule at most 6 on same day.

So each day gets 6 lessons, and there are 7 days in a week. So 6 x 7 = 42

So the statement is proven because she only have 40 lessons over the week.

1. Proof by contradiction: Assuming square root of 7 is rational.

For a, b is integer, and in reduced form with no common factors. B ≠ 0

Since left side is divisible by 7, so right side will also be divisible by 7. So, we can let a = 7k for k ≠ 0.

B2 is multiple of 7, which means b is also multiple of 7

But a and b should not have common factor. Therefore, it contradicts with the assumption and square root of 7 is irrational

1. X is irrational and y is non-zero rational but xy is rational

Let x = because we know that is irrational and y = 2

Therefore, it is proven that when x is irrational and y is non-zero, xy is rational.