1. (+5) As pointed out, you lose if the pile has 1, 6, 11 or 16 sticks. How many sticks are in the next two piles for you to lose?

21, if you take 4, your opponent can take 1 leaving you with 16

If you take 3, your opponent can take 2 leaving you with 16

if you take 2, your opponent can take 3 leaving you with 16

if you take 1, your opponent can take 4 leaving you with 16

26, if you take 4, your opponent can take 1 leaving you with 21

If you take 3, your opponent can take 2 leaving you with 21

if you take 2, your opponent can take 3 leaving you with 21

if you take 1, your opponent can take 4 leaving you with 21

1. (+10) ***Given the pattern n = 4k - 3 with k = 1, 2, 3, 4, etc. results in the set { 1, 5, 9, 13 … }***

Is n = 195 in the set? **Explain**

195 = 4k - 3

192 = 4k

K = 48

Yes, 195 is in the set

Is n = 237 in the set ? **Explain**

237 = 4k – 3

234 = 4k

K = 58.5

No, 237 in NOT in the set

1. (+5) Identify the pattern for our game of Nim . For a pile containing *n* sticks, which ones are bad for you? Express the pattern in the most general way possible using n = number of sticks in the pile Your answer should include n and k. See discussion above

***n = ??? with k = 0,1,2,3 should result in the set { 1, 6, 11, 16, etc }***

**The pattern is:**

**(5 x 0) + 1 = 1**

**(5 x 1) + 1 = 6**

**(5 x 2) + 1 = 11**

**(5 x 3) + 1 = 16**

**(5 x 4) + 1 = 21**

**N = (5 x K) + 1**

1. (+5) Is a pile with 286 sticks a good pile or a bad pile for you? **Explain Using your pattern**

**286 = (5 x k) + 1**

**285 = 5 x k**

**K = 57**

**286 is a good pile because using the equation the answer was a integer**

1. (+5) Is a pile with 285 sticks a good pile or a bad pile for you? **Explain Using your pattern**

**285 = (5 x k) +1**

**284 = 5 x k**

**K = 56.8**

**285 is NOT a good pile because the answer using the equation doesn’t equal a integer**