Agenda:

* Announcements:
  1. Quiz on Wednesday, starting with 8.5 content
  2. Reminder: Project write-up due on Monday

* Today:
  - Arithmetic sequences
  - Quadratic sequences
  - *These topics are not in your text.*

Handshakes:

Case 1: Two teams with same number of players shake hands.

How many handshakes with teams of 5 players? 10? *n*?

A 1 $5 \times 5 = h$
B 2 $10 \times 10 = h$
C 3
D 4 $n \times n = h$
E 5

Case 2: Two teams, where one team has one additional player.

e.g. 10 players and 9 players?
e.g. 15 players and 14 players?
e.g. *n* and *n-1*?

$h = n(n-1) = n^2 - n = 10^2 - 10 = 90$ (n is the # on larger team)

$h = n^2 + n?$ (n is # on smaller team)
$81 + 9 = 90$

$n = n - 1$

$h = (n-1)^2 + (n-1)$

$h = n^2 - 2n + 1 + n - 1$

$= n^2 - n$ ✓

Case 3: Members of the same team exchange high fives.

How many high fives on a Quiz Bowl team of 4? 12? *n*?

n=4: $(n-1)! = h$

$(4-1)! = 3! = 6$

$3+2+1=6$

if n=5:

$4+(3+2+1)=10$

$(5-1)! \neq 10$

$24 \neq 10$

if n=12:

$11+10+\cdots+2+1$

Sum of 1st n-integers. $\frac{n(n+1)}{2} = h$

$\frac{11(12)}{2} = 132/2 = 66$

handshakes for n-person team. $\frac{(n)(n-1)}{2} = h$

Handshakes follow-up:

For cases 1, 2, and 3, make a table showing the number of players and number of handshakes/high fives.

HANDOUT

Case 1: (handshakes, same number of players)

Players:	1	2	3	4	5	6	7	8	9	10
~~High fives~~:	1	4	9	16	25	36	49	64	81	100

Case 2: (handshakes, one extra player)

* smaller of 2 teams

Players:	1	2	3	4	5	6	7	8	9	10	11
~~High fives~~:	2	6	12	20	30	42	56			110	

Case 3: (high fives on one team)

Players:	1	2	3	4	5	6	7	8	9	10
High fives:	0	1	3	6	10					

Handshakes follow-up:

For cases 1, 2, and 3, make a table showing the number of players and number of handshakes/high fives.

Case 1: (handshakes, same number of players)

Players:	1	2	3	4	5	6	7	8	9	10
High fives:	1	4	9	16	25	36	49	64	81	100

Case 2: (handshakes, one extra player)
*small team

Players*:	1	2	3	4	5	6	7	8	9	10
High fives:	2	6	12	20	30	42	56	72	90	

Case 3: (high fives on one team)

Players:	1	2	3	4	5	6	7	8	9	10
High fives:	0	1	3	6	10	15	21	28	36	45

Handshakes follow-up:

Case 2: (handshakes, one extra player)
*small team

$h = n(n+1)$

Players*:	1	2	3	4	5	6	7	8	9	10
High fives:	2	6	12	20	30	42	56	72	90	110

1. Is the relationship between players and handshakes linear? No.
How can you tell?

- slope not constant

2. Describe a pattern that would help you predict the number of handshakes for larger teams.

3. Tyler expressed the number of handshakes as n(n-1).
Asuko expressed the number of handshakes as $n^2 - n$.
How might each student have thought about the equation?

Case 3: (high fives on one team)

Players:	1	2	3	4	5	6	7	8	9	10
High fives:	0	1	3	6	10	15	21	28	36	45

$\frac{1-0}{2-1} = 1$

1. Is the relationship between players and high fives <u>linear?</u> No.

2. Describe a pattern that would help you predict the number of high fives for larger teams.

Graph these relationships for players n = 1 to 10: HW

Case 1: (handshakes, same number of players)

Players:	1	2	3	4	5	6	7	8	9	10
High fives:	1	4	9	16	25	36	49	64	81	100

Case 2: (handshakes, one extra player)
*small team

Players*:	1	2	3	4	5	6	7	8	9	10
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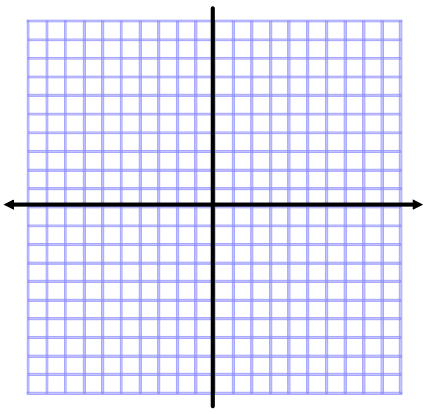


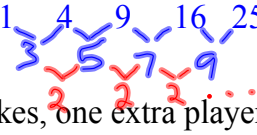
1. Are these relationships quadratic?

First and Second Differences:

Calculate the first difference and second difference for the following tables. What do you notice?

Case 1: (handshakes, same number of players)

Players:	1	2	3	4	5	6	7	8	9	10
High fives:	1	4	9	16	25	36	49	64	81	100



Case 2: (handshakes, one extra player)
*small team

Players*:	1	2	3	4	5	6	7	8	9	10
High fives:	2	6	12	20	30	42	56	72	90	

Case 3: (high fives on one team)

Players:	1	2	3	4	5	6	7	8	9	10
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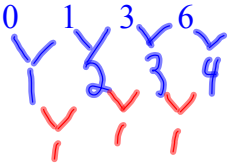

Definition: A sequence is a function whose domain is the set of natural numbers {1, 2, 3, 4, 5, ...}.

A) $f(n) = 5n - 3$ <-- a linear sequence
B) $g(n) = n^2 - n + 3$ <-- quadratic sequence
C) $h(n) = 3^n + 1$ <-- exponential sequence

1. Write out the first few terms of the sequences f, g, and h.
2. Calculate the first and second differences for each sequence.

What do you notice?