

1. **LEVEL ONE:**

The BROKEN CALCULATOR....  
How many of these numbers  
can you still make?



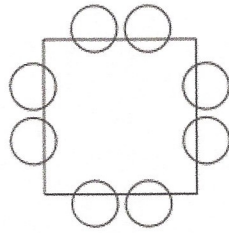
Answers  
vary

|  |   |      |      |
|--|---|------|------|
| 4 =<br>$2 \times 2$<br>$6 - 2$<br>$2 \times 5 - 2 - 2$ | 11 =<br>$16 - 5$<br>$9 \times 2 - 8$<br>etc | 23 = | 30 = |
| 32 =   | 33 =  | 34 = | 35 = |

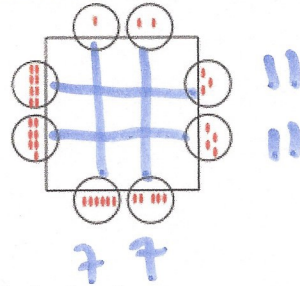
I give marbles for quantity & creativity. Students put their answers on the white board.

2. **LEVEL TWO:** PARTYTIME!

So, you are at the party and sitting around the table with seven friends.



At the top left-hand corner is the friend who is giving the party. She or he has a bag of sweets and starts giving them out in a clockwise direction: one for themselves, two for the next person and three for the next and so on.



a) How many sweets did the host pass out altogether?

$$22 + 14 = 36$$

b) How many sweets (in total) do children sitting across from each other have? What are the possibilities?

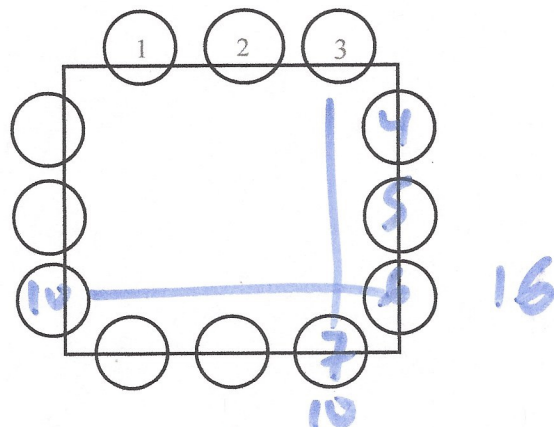
7, 11

c) Are these "opposite totals" always even, or always odd? Why? ? *discuss*

2. What if there are THREE people on each side of the table? Draw this situation:

How many sweets did the host pass out altogether?

$$3 \times 10 + 3 \times 16 = 30 + 48 = 78$$



3. What if there are FOUR people on each side of the table? Draw this situation:

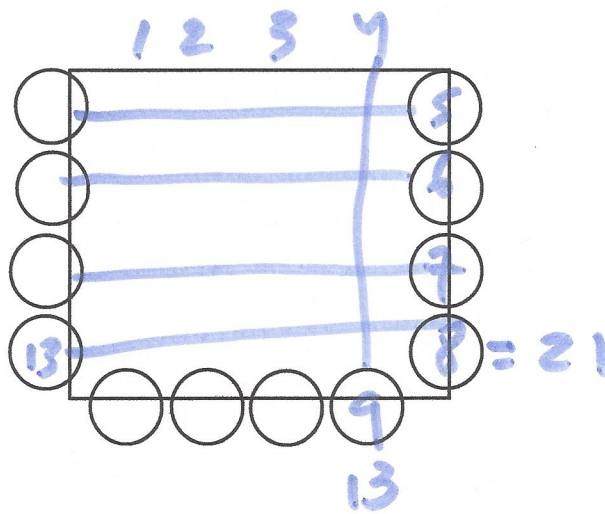


How many sweets did the host pass out

$$4 \times 13 + 4 \times 21$$

$$52 + 84$$

$$= 136$$



4. What if there are FIVE people on each side of the table? Draw this situation:

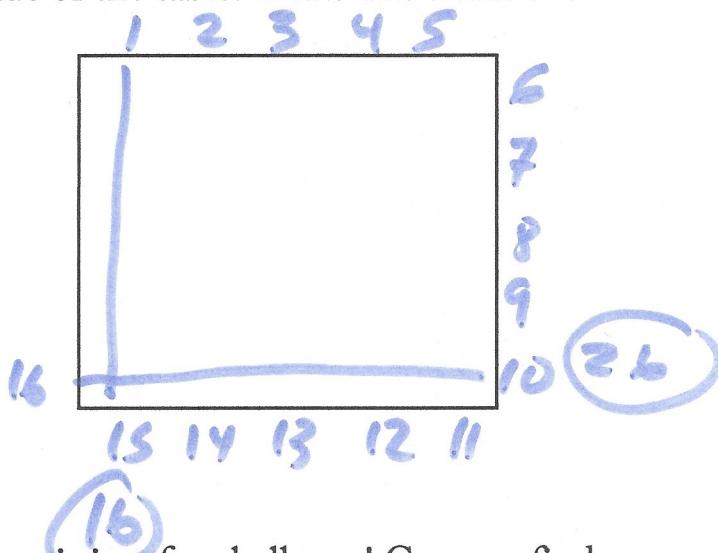
How many sweets did the host pass out altogether?

$$5 \times 26 + 5 \times 16$$

$$= 5 \times 42$$

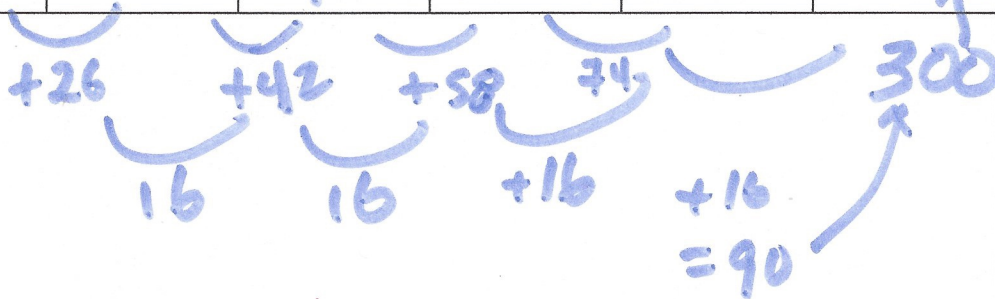
$$= 10 \times 21$$

$$= 210$$



5. Can you fill out this table? (the last column is just for challenge! Can you find a pattern?)

|                        |    |    |    |     |     |    |
|------------------------|----|----|----|-----|-----|----|
| Number of total guests | 4  | 8  | 12 | 16  | 20  | 24 |
| Number of total sweets | 10 | 36 | 78 | 136 | 210 | ?? |



Note: Only about  $\frac{1}{2}$  of the students made it this far, which IS FINE. They were all thinking!

# for fast finishers only:

## WHO LET THE DOGS OUT?

Someone let the family dogs out, and they ran away ☹️

Everyone misses them.

The four people in the family make the following statements.

THREE statements are true, and FIVE are false.

Who let the dogs out?

A: 1. I did not let them out.  
2. C let them out.

B: 1. I did not let them out.  
2. A let them out.

C: 1. B let them out.  
2. I miss them.

D: 1. I did not let them out.  
2. I don't miss them.

D did it.

If A did it, then ...

|   | 1 | 2 |
|---|---|---|
| A | F | F |
| B | T | T |
| C | F | T |
| D | T | F |

} 4 True  
X

If B did it, then ...

|   | 1 | 2 |
|---|---|---|
| A | T | F |
| B | F | F |
| C | T | T |
| D | T | F |

} 4 True  
X

If C did it, then ...

|   | 1 | 2 |
|---|---|---|
| A | T | T |
| B | T | F |
| C | F | T |
| D | T | F |

} 5 true  
X

If D did it, then ...

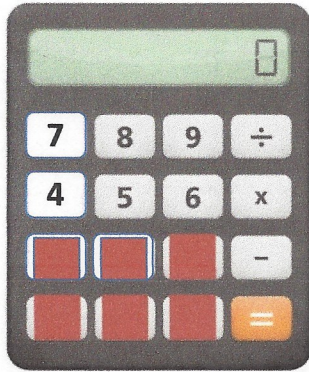
|   | 1 | 2 |
|---|---|---|
| A | T | F |
| B | T | F |
| C | F | T |
| D | F | F |

} 3 true  
✓

1. **LEVEL ONE:**

Which of these numbers can you make???

The Broken Calculator



19: \_\_\_\_\_

43: \_\_\_\_\_

13: \_\_\_\_\_

65: \_\_\_\_\_

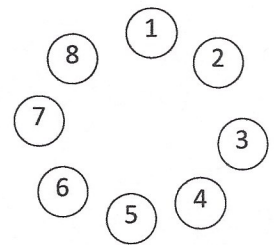
33: \_\_\_\_\_

84: \_\_\_\_\_

source: Ask Dr. Math

2. **LEVEL TWO:**

Knights in a circle...



King Arthur says to the first knight: You stay.

He says to the 2<sup>nd</sup> knight: You leave.

He says to the 3<sup>rd</sup> knight: You stay.

etc..... Who is the last knight standing?

Draw circles!

Can you fill out this table? (the last 14 columns are just for challenge- can you find a pattern?)

|                          |   |   |   |   |   |   |   |   |   |    |    |    |    |    |
|--------------------------|---|---|---|---|---|---|---|---|---|----|----|----|----|----|
| <b>Number of knights</b> | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 |
| Which # knight survives? | 1 | 1 | 3 | 1 | 3 | 5 | 7 | 1 | 3 | 5  | 7  | 9  | 11 | 13 |

|                          |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
|--------------------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| <b>Number of knights</b> | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 |
| Which # knight survives? | 15 | 1  | 3  | 5  | 7  | 9  | 11 | 13 | 15 | 17 | 19 | 21 | 23 | 25 |

29 |  
27

↪ 30 | 31 | 32  
29 | 31 | 1 ...

### LEVEL 3 - One Puzzle Point

#### Liars and Truth-tellers

You're on an island where each inhabitant is a *truth-teller* or a *liar*.  
Truth-tellers always tell the truth; liars always lie.

Ms. A and Mr. B are on the island.

- Ms. A says: "One or both of us is a liar."

Determine whether each person is a truth-teller or a liar.

Use a logic table if you like:

| A   | B                  |
|---|--------------------|
| $T \overset{LT}{.} T \overset{?}{.} ?$<br>or $LT$ |                    |
| <del>F: no liars</del>                            | contra-<br>diction |

My Answer:

Ms. A is a T

Mr. B is a L

Possibilities  
if A is  
truthful:

$\begin{matrix} \textcircled{A} \textcircled{B} \\ \text{LT} \\ \text{TL} \\ \text{LL} \end{matrix}$

Feedback on

Part 2 - "Knights"

Things students noticed

- All the numbers are odds
- They are "consecutive odds"
- They go up by 2 UNTIL they get too big to fit in the table size
- They're in groups that start at 1, and the group SIZES are 1, 2, 4, 8, 16... etc.