

Crackers

Introduction by Cathy Williams

Maybe some of you recall from childhood, discovering a set of 6 little cardboard cards filled with numbers that came as a prize in a Cracker Jack Box? I clearly remember the day I got this prize. I was fascinated that it always worked, playing it over and over again with anyone who would engage me. I carried the cards with me everywhere and eventually they ended up wet mush after spinning through the washing machine in the pocket of my pants. Decades later they were reintroduced into my life. It was Christmas day in London and everyone was excited about "crackers." I didn't understand the excitement until Jo explained that it was a little game between two people where the winner got a prize – not food. Guess what prize I won? The 6 cards were back in my life!

Here they are presented to you as a low floor/high ceiling task. The name of this task has to be Crackers, since it started with Cracker Jacks and came back to me from pulling and winning a Cracker.

Introducing the Task:

There are different ways to introduce this task. One way is for you to play the game with your students and let them get curious as to how you always know their number. Another way is to give them the directions and let them figure out how to play the game with a partner and then explore how the task works.

Nancy Qushair, Math Department Chair and Algebra Teacher at St. Mary's School, piloted the task with her 6th graders. Here are some student conjectures about the task.

- The top upper left number for each card is doubled from the number in the previous card.
- The cards can create any combo based on the first numbers of each task card.
- Task 1 card: all odds. Every one skips two. There is 1 number between each odd and even. If you said yes to this card, you have an odd number.
- Task 2 card: Every two skips three numbers.
- Task 3 card: Every four skips five numbers
- Task 4 card: Every eight skips nine numbers
- Task 5 card: Every 16 skips 17 numbers
- Task 6 card: all numbers greater than or equal to 32. If your number is not on the card it is less than 32.
- Every number in the top left is one less than the amount of numbers being skipped in the task card.

Nancy tried this task with her students through Zoom and they spent about 30 minutes exploring the number patterns. Reflecting on the activity, Nancy recommends that students should have copies of the cards and should be given ample time to explore. Thank you, Nancy!

A fun addition is to provide a Hundred Chart and/or a multiplication table and see what your students come up with! We have included these as resources in the student pages. If you would like to share we would love to see student work. You can find us on twitter at @youcubed, Jo @joboaler and me, Cathy @chaoskeeper11. Happy pattern seeking!

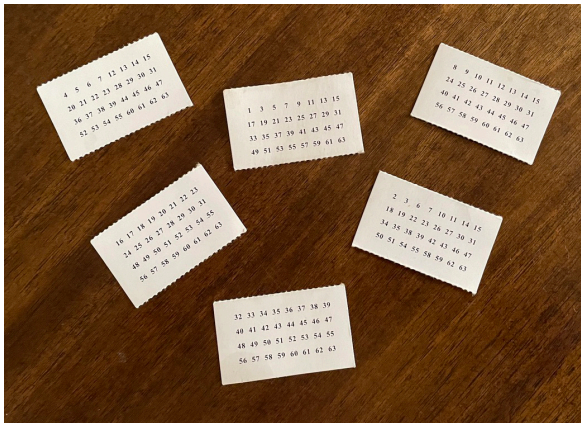
Crackers

Directions:

- Ask a partner to pick a number between 1 and 63 and not tell you.
- Show one of the 6 cards and ask, "Is your number on this card?"
- If they say yes record the first number in the upper left hand corner of the card. If they answer "no", record nothing.
- Show the second card. Ask, "Is your number on this card?"
- If they say yes record the first number in the upper left hand box of the card. If no, record nothing.
- Continue until you have shown all 6 cards.
- The number your partner chose is the sum of the numbers you recorded
- The goal is for students to record and find the sum of the numbers without pencil and paper, however not being there yet should not keep them from playing or make them feel lesser. They just aren't there yet!

Task

- What do you notice & wonder?
- Create a convincing argument showing why this works. Can you make a visual proof?
- Make a presentation showing how this puzzle might have been created.
- If you were going to continue this pattern, what would the 7th card look like? What would be the greatest number your partner could choose if you had 7 cards? Would the puzzle still work?



Crackers

1	3	5	7	9	11	13	15
17	19	21	23	25	27	29	31
33	35	37	39	41	43	45	47
49	51	53	55	57	59	61	63

2	3	6	7	10	11	14	15
18	19	22	23	26	27	30	31
34	35	38	39	42	43	46	47
50	51	54	55	58	59	62	63

4	5	6	7	12	13	14	15
20	21	22	23	28	29	30	31
36	37	38	39	44	45	46	47
52	53	54	55	60	61	62	63

8	9	10	11	12	13	14	15
24	25	26	27	28	29	30	31
40	41	42	43	44	45	46	47
56	57	58	59	60	61	62	63

16	17	18	19	20	21	22	23
24	25	26	27	28	29	30	31
48	49	50	51	52	53	54	55
56	57	58	59	60	61	62	63

32	33	34	35	36	37	38	39
40	41	42	43	44	45	46	47
48	49	50	51	52	53	54	55
56	57	58	59	60	61	62	63

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Hundred Chart

91	92	93	94	95	96	97	98	99	100
81	82	83	84	85	86	87	88	89	90
71	72	73	74	75	76	77	78	79	80
61	62	63	64	65	66	67	68	69	70
51	52	53	54	55	56	57	58	59	60
41	42	43	44	45	46	47	48	49	50
31	32	33	34	35	36	37	38	39	40
21	22	23	24	25	26	27	28	29	30
11	12	13	14	15	16	17	18	19	20
1	2	3	4	5	6	7	8	9	10

Multiplication Table

x	1	2	3	4	5	6	7	8	9	10	11	12
1	1	2	3	4	5	6	7	8	9	10	11	12
2	2	4	6	8	10	12	14	16	18	20	22	24
3	3	6	9	12	15	18	21	24	27	30	33	36
4	4	8	12	16	20	24	28	32	36	40	44	48
5	5	10	15	20	25	30	35	40	45	50	55	60
6	6	12	18	24	30	36	42	48	54	60	66	72
7	7	14	21	28	35	42	49	56	63	70	77	84
8	8	16	24	32	40	48	56	64	72	80	88	96
9	9	18	27	36	45	54	63	72	81	90	99	108
10	10	20	30	40	50	60	70	80	90	100	110	120
11	11	22	33	44	55	66	77	88	99	110	121	132
12	12	24	36	48	60	72	84	96	108	120	132	144