

Cake numbers — Up to 10 cuts

Name: _____

Date: _____



A cake is cut by flat planes. Find the most pieces, and show why it stops doubling.

- 1 A round melon is cut 3 times, every cut a flat plane passing right through it, and the melon is not moved between cuts.

What is the greatest number of pieces?

Why The most pieces come from 1 whole melon, plus one for each cut, each PAIR of cuts (a pair meets in a line) and each TRIPLE of cuts (three meet at a point). The cuts are $C(3,1) = 3$; the pairs $C(3,2) = 3$; the triples $C(3,3) = 1$. Adding them, $3 + 3 = 6$, then $6 + 1 = 7$, and the whole melon makes $7 + 1 = 8$. The doubling 2, 4, 8 would say 8 — but from the fourth cut on, it is wrong.

8

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- 2 A cake is cut by 9 straight cuts, each cut going all the way through as a flat plane, and no piece is moved between cuts.

What is the greatest number of pieces?

Why

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A cake is cut by flat planes. Find the most pieces, and show why it stops doubling.

- 3 A cake is cut by 7 straight cuts, each cut going all the way through as a flat plane, and no piece is moved between cuts.

What is the greatest number of pieces?

Why

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- 4 A block of cheese is sliced 4 times, each slice a flat cut straight through the whole block, with nothing rearranged in between.

What is the greatest number of pieces?

Why

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Cake numbers · Up to 10 cuts — Answer key

If they are stuck

- Doubling stops working. Count the cuts, the pairs of cuts, and the triples, then add one.



1. The most pieces come from 1 whole melon, plus one for each cut, each PAIR of cuts (a pair meets in a line) and each TRIPLE of cuts (three meet at a point). The cuts are $C(3,1) = 3$; the pairs $C(3,2) = 3$; the triples $C(3,3) = 1$. Adding them, $3 + 3 = 6$, then $6 + 1 = 7$, and the whole melon makes $7 + 1 = 8$. The doubling 2, 4, 8 would say 8 — but from the fourth cut on, it is wrong.

3. The most pieces come from 1 whole cake, plus one for each cut, each PAIR of cuts (a pair meets in a line) and each TRIPLE of cuts (three meet at a point). The cuts are $C(7,1) = 7$; the pairs $C(7,2) = 21$; the triples $C(7,3) = 35$. Adding them, $7 + 21 = 28$, then $28 + 35 = 63$, and the whole cake makes $63 + 1 = 64$. The doubling 2, 4, 8 would say 128 — but from the fourth cut on, it is wrong.

2. The most pieces come from 1 whole cake, plus one for each cut, each PAIR of cuts (a pair meets in a line) and each TRIPLE of cuts (three meet at a point). The cuts are $C(9,1) = 9$; the pairs $C(9,2) = 36$; the triples $C(9,3) = 84$. Adding them, $9 + 36 = 45$, then $45 + 84 = 129$, and the whole cake makes $129 + 1 = 130$. The doubling 2, 4, 8 would say 512 — but from the fourth cut on, it is wrong.

4. The most pieces come from 1 whole cheese, plus one for each cut, each PAIR of cuts (a pair meets in a line) and each TRIPLE of cuts (three meet at a point). The cuts are $C(4,1) = 4$; the pairs $C(4,2) = 6$; the triples $C(4,3) = 4$. Adding them, $4 + 6 = 10$, then $10 + 4 = 14$, and the whole cheese makes $14 + 1 = 15$. The doubling 2, 4, 8 would say 16 — but from the fourth cut on, it is wrong.