Name: _____ Date: _____

Five Heads in a Row and the Next Flip

Circle group

Zara flips a fair coin five times. It lands on heads every time. "The next one has to be tails," she says. "Tails is due!" Her brother Idris shakes his head. He says the coin has no memory.

Idris is right. Each flip is its own event. What happened before does not change what happens next. Math calls this independence. The chance of heads is 1 out of 2 on every flip. It does not matter if the coin just landed on heads five times. The sixth flip is still fifty-fifty.

Zara made a common mistake. It even has a name: the gambler's fallacy. It feels like the coin should even things out. But a coin cannot know what it did before.

Is five heads in a row ordinary? Not quite. To find the chance of a streak, multiply the chances. Half times half, five times, makes 1 out of 32. That is unlikely, but it is not impossible. If many people flip a coin five times, a few will see this.

After thousands of flips, heads and tails come out close to even. The coin is not making up for the streak. The streak just gets lost among all the later flips.

Questions

1. What did Zara think the next flip would be?

_____

_____

2. What is the chance of heads on one flip of a fair coin?

_____

_____

3. What does it mean that the coin has no memory?

_____

_____

4. What is the gambler's fallacy?

_____

_____

5. What is the chance of five heads in a row?

_____

6. Why do heads and tails come out close to even after thousands of flips?

Words to know

independence: when one event does not affect another event
fair: equally likely to land on either side
fallacy: a mistaken idea that seems believable
streak: a run of the same result many times in a row
unlikely: not very likely to happen

Talk together (every group has these)

1. Find one fact that every group read. How did your sheet say it?
2. What did your sheet tell you that you think another group's did not? Ask them.
3. What is one question about this topic that none of the sheets answered?

Name: _____ Date: _____

Five Heads in a Row and the Next Flip

Triangle group

Zara flips a fair coin five times, and it lands on heads every single time. "The next one has to be tails," she announces. "Tails is due!" Her brother Idris shakes his head and explains that the coin has no memory of what it did before.

Idris is right. Each flip of a fair coin is its own event, and what happened before does not change what happens next. Math calls this independence. The chance of heads is 1 out of 2 on every single flip, whether the coin has just landed on heads five times or none at all. So the sixth flip is still a fifty-fifty chance.

Zara's mistake is a very common one, and people even have a name for it, the gambler's fallacy. It feels as though the coin should balance things out, but a coin cannot possibly know what it did earlier.

Does that mean five heads in a row is ordinary? Not quite. To find the chance of a whole streak, multiply the chances together. Half times half, five times, makes 1 out of 32. That is unlikely, but it is far from impossible. If many people each flip a coin five times, a few of them will see exactly this.

Over thousands of flips, heads and tails do come out close to even. This happens not because the coin makes up for early streaks, but because a streak gets lost among all the flips that follow.

Questions

1. What did Zara think would happen on the next flip?

_____

_____

2. What is the chance of heads on any single flip of a fair coin?

_____

_____

3. What does it mean to say the coin has no memory?

_____

_____

4. What is the gambler's fallacy?

_____

_____

5. What is the chance of five heads in a row?

_____

_____

6. Why do heads and tails come out close to even over thousands of flips?

_____

_____

Words to know

independence: when one event does not affect another event
fair: equally likely to land on either side
fallacy: a mistaken idea that seems believable
streak: a run of the same result many times in a row
unlikely: not very likely to happen

Talk together (every group has these)

1. Find one fact that every group read. How did your sheet say it?
2. What did your sheet tell you that you think another group's did not? Ask them.
3. What is one question about this topic that none of the sheets answered?

Name: _____ Date: _____

Five Heads in a Row and the Next Flip

Square group

Zara flips a fair coin five times, and on every occasion it lands on heads. "The next one has to be tails," she announces. "Tails is due!" Her brother Idris disagrees, pointing out that a coin has no memory of what it did before.

Idris is correct. Each flip of a fair coin is a separate event, and the outcomes of earlier flips have no influence on the next one. Mathematicians call this independence. The probability of heads remains 1 out of 2 on every individual flip, regardless of whether the coin has just landed on heads five times or not at all. The sixth flip is therefore still an even, fifty-fifty chance.

Zara's error is a remarkably common one, and it even has a name: the gambler's fallacy. It feels as though the coin ought to balance the results, but a coin has no way of knowing what happened earlier.

Does this mean that five heads in a row is perfectly ordinary? Not exactly. To find the probability of an entire streak, you multiply the separate chances together. One half multiplied by itself five times equals 1 out of 32. That outcome is unlikely, yet it is far from impossible. If a large crowd of people each flipped a coin five times, a few of them would witness precisely this.

Over thousands of flips, heads and tails do end up close to even. This is not because the coin compensates for earlier streaks, but because any streak becomes lost among the many flips that follow it.

Questions

1. What did Zara expect to happen on the next flip?

_____

_____

2. What is the probability of heads on any single flip of a fair coin?

_____

_____

3. What does Idris mean when he says the coin has no memory?

_____

_____

4. What is the gambler's fallacy?

_____

_____

5. What is the probability of five heads in a row?

_____

_____

6. Why do heads and tails end up close to even over thousands of flips?

_____

_____

Words to know

independence: when one event does not affect another event
fair: equally likely to land on either side
fallacy: a mistaken idea that seems believable
streak: a run of the same result many times in a row
unlikely: not very likely to happen

Talk together (every group has these)

1. Find one fact that every group read. How did your sheet say it?
2. What did your sheet tell you that you think another group's did not? Ask them.
3. What is one question about this topic that none of the sheets answered?

For the teacher: Five Heads in a Row and the Next Flip

Each student sheet carries a shape, not a level. The same topic and facts, written three ways.

Circle: Five Heads in a Row and the Next Flip

Easier · 200 words · Flesch-Kincaid grade 2.3

1. She thought it had to be tails.
2. 1 out of 2.
3. What happened before does not change the next flip.
4. The mistaken idea that a coin will even things out.
5. 1 out of 32.
6. An early streak gets lost among all the later flips.

Triangle: Five Heads in a Row and the Next Flip

This passage · 240 words · Flesch-Kincaid grade 4.6

1. She thought it had to be tails.
2. 1 out of 2.
3. What happened on earlier flips does not change the next flip.
4. The mistaken belief that a coin will balance out its earlier results.
5. 1 out of 32.
6. An early streak gets lost among the many flips that follow.

Square: Five Heads in a Row and the Next Flip

Harder · 254 words · Flesch-Kincaid grade 6.8

1. She expected tails.
2. 1 out of 2.
3. Earlier flips have no influence on the next flip.
4. The mistaken belief that a coin will balance out its earlier results.
5. 1 out of 32.
6. A streak becomes lost among the many flips that follow it.