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## Can You Imitate a Coin?

1. On the half-sheet provided by your teacher, enter the sort of results you'd expect to get if you were to flip a coin 21 times. Enter what you imagine getting on the first flip above the 1, enter the second flip above the 2, and so on. Write "Fake" on the back of the sheet.

If you're good at making up these data, someone looking at what you wrote wouldn't be able to tell whether they are real results from actually flipping a coin or results you made up.

## Can You Spot Fake Data?

2. Here are four sets of coin-flip data. Some of these results are from actually flipping a coin. But others were made up by students to look like real coin flips.

For each sequence, note whether you think the results are real or fake by circling Real or Fake.

## a. Real Fake

| T | T | H | T | H | T | T | H | H | H | T | H | T | H | H | T | H | T | T | T | H |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 |

## b. Real Fake

| H | T | H | H | T | H | T | T | H | T | H | H | T | T | H | T | H | T | H | T | H |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 |

## c. Real Fake

| H | T | H | H | H | H | T | T | H | T | T | T | H | H | T | T | H | H | T | T | H |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 |

d. Real Fake

| T | T | T | H | T | T | T | T | H | T | T | T | T | T | T | T | H | T | H | T | H |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 |

3. Briefly explain how you think you can tell the difference between the real and fake results.

## Can Your Teacher Spot Fake Data?

4. Now flip a coin 21 times, and keep track of what you get on the new half-sheet provided by your teacher. Write "Real" on the back of the sheet.
5. Your teacher is going to try to tell which sequence you made up and which sequence is real. Place the two sheets face-up on your desk. Then call your teacher over to try to guess which is real and which is made up.

## Look at Results from the Computer

For most of you, your teacher was probably able to tell which was the fake data. That's because people generally are not very good at behaving or thinking randomly, like a flipped coin. To learn more about what random coin-flip data look like, open the document Random Coin Flips.tp.

The sampler is set up to flip a coin 21 times. The data appear both in a table and in a plot. In the plot, red circles are "H's" and green circles are "T's."
6. Click the RUN button to run the sampler several times and observe what happens. Describe some of the results that surprise you.
7. If you have time, run the sampler until you get at least seven " $\mathrm{H}^{\prime} \mathrm{s}$ " or " T 's" occurring in a row. How many times did you have to click RUN for this to occur?

## Can You Spot the Fake Data Now?

8. Here are the same four sequences you saw earlier. Guess again which are fake and which are real. For each sequence, circle Real or Fake.
a. Real Fake

| T | T | H | T | H | T | T | H | H | H | T | H | T | H | H | T | H | T | T | T | H |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 |

b. Real Fake

| H | T | H | H | T | H | T | T | H | T | H | H | T | T | H | T | H | T | H | T | H |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 |

c. Real Fake

| H | T | H | H | H | H | T | T | H | T | T | T | H | H | T | T | H | H | T | T | H |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 |

## d. Real Fake

| T | T | T | H | T | T | T | T | H | T | T | T | T | T | T | T | H | T | H | T | H |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 |

9. Briefly explain how you think you can tell the difference between the real and fake results. (Afterward, your teacher will tell you which are real and which were made up. But you probably already know.)
