CATAN SETTLEMENT CHALLENGE

The challenge

In Catan, two fair dice are rolled. A settlement collects one resource when the sum matches the number on an adjacent hexagon. For this simplified investigation, each settlement touches three numbered hexagons, no robber blocks production, and each matching roll produces one resource.



Predict

1. Which settlement would you choose before calculating? □ A (4, 5, 8) □ B (9, 10, 12)

Why? _____

Two-dice sum table

Each cell is the sum of Die 1 (row) and Die 2 (column). There are 36 equally likely ordered outcomes.

Die 1 \ Die 2	**1**	**2**	**3**	**4**	**5**	**6**
1	2	3	4	5	6	7
2	3	4	5	6	7	8
3	4	5	6	7	8	9
4	5	6	7	8	9	10
5	6	7	8	9	10	11
6	7	8	9	10	11	12

Investigating Theoretical Probability

1. Using the two-dice sum table, determine how many possible outcomes produce each of the following sums: 4, 5, 8, 9, 10, and 12.

2. Calculate the theoretical probability that Settlement A will produce a resource on a single roll of two dice.

3. Calculate the theoretical probability that Settlement B will produce a resource on a single roll of two dice.

4. Based on your calculations, which settlement would you choose to maximize your expected resource production? Justify your answer mathematically.

Experiment

Open AZRS Probability Lab: https://www.azrscorp.com/quickfix/simulations/probability-lab/

Record the number of occurrences of each relevant sum, then add them for each settlement.

Total rolls	**4**	**5**	**8**	**9**	**10**	**12**	**A total (4+5+8)**	**B total (9+10+12)**
10								
110								
1110								

5. Experimental production rates after 10 rolls:

   Settlement A: _____ / 10 = _____ % Settlement B: _____ / 10 = _____ %

6. Experimental production rates after 110 rolls:

   Settlement A: _____ / 110 = _____ % Settlement B: _____ / 110 = _____ %

7. Experimental production rates after 1110 rolls:

   Settlement A: _____ / 1110 = _____ % Settlement B: _____ / 1110 = _____ %

Reason and explain

8. How do your experimental percentages compare with your theoretical percentages?

_____

9. Does Settlement A's higher expected resource production guarantee that it will always produce more resources than Settlement B? Explain.

_____

10. Could B produce more resources than A in just 10 rolls? Explain what this tells you about randomness and mathematical predictions.

_____

11. Settlement A has a theoretical production probability of …….%. We rolled the dice 10 times and collected …….resources. Does this mean our theoretical probability was wrong?

_____

Your strategy

I would choose settlement _____ because _____. However,

_____

Note: This activity compares dice probabilities only; real Catan strategy also depends on resource types, trading, ports, and board position.