DS623 PE07 – Probability of Dice Sum Simulation

Topic: Discrete and Continuous Probabilities

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Imports & Setup

In [8]:
```
import random
from fractions import Fraction
```

In [9]:
```
# Dice face representations
dice_faces = {
    1: "⚀", 2: "⚁", 3: "⚂", 4: "⚃", 5: "⚄", 6: "⚅"
}
```

In [10]:
```
from IPython.display import display, HTML

def display_medium_dice(d1, d2):
    display(HTML(f"""
    <div style='font-size:28px; line-height:1.2;'>{dice_faces[d1]} + {dice_faces[d2]} = {d1} + {d2} = {d1 + d2}</div>
    """))
```

=== Task 1: Get user input ===

In [11]:
```
while True:
    user_input_str = input("Enter a number between 2 and 12 (or 'q' to quit): ").strip().lower()

    if user_input_str == 'q':
        print("Exiting program. Goodbye!")
        exit()

    if user_input_str.isdigit():
        user_input = int(user_input_str)
        if 2 <= user_input <= 12:
            print(f"You entered: {user_input}")
            break
        else:
            print(f"❌ Invalid input '{user_input_str}'. Number out of range. Please enter a number between 2 and 12.")
    else:
        print(f"❌ Invalid input '{user_input_str}'. Please enter a number between 2 and 12 or 'q' to quit.")

print("✅ Task 1 complete: Valid input received.")
```

```
❌ Invalid input 'a'. Please enter a number between 2 and 12 or 'q' to quit.
❌ Invalid input '!'. Please enter a number between 2 and 12 or 'q' to quit.
❌ Invalid input ''. Please enter a number between 2 and 12 or 'q' to quit.
You entered: 8
✅ Task 1 complete: Valid input received.
```

=== Task 2: Simulate 100 tosses of two dice ===

In [12]:
```
trials = 100
tosses = []
target_sum_count = 0
```

In [13]:
```
print("\nSimulating 100 dice tosses with visual output:")

for i in range(trials):
    die1 = random.randint(1, 6)
    die2 = random.randint(1, 6)
    tosses.append([die1, die2])
    dice_sum = die1 + die2
    if dice_sum == user_input:
        target_sum_count += 1

    # Print dice face and sum expression
    display_medium_dice(die1, die2)

    if (i + 1) % 25 == 0:
        print(f"\n--- {i + 1} tosses completed ---\n")

print("✅ Task 2 complete: Dice toss simulation finished.")
```

```
Simulating 100 dice tosses with visual output:
```

⚅ + ⚀ = 6 + 1 = 7

⚃ + ⚃ = 4 + 2 = 6

⚀ + ⚂ = 1 + 2 = 3

⚀ + ⚀ = 1 + 1 = 2

⚃ + ⚀ = 4 + 1 = 5

⚃ + ⚄ = 4 + 5 = 9

⚂ + ⚀ = 2 + 1 = 3

⚂ + ⚂ = 3 + 2 = 5

⚅ + ⚅ = 6 + 6 = 12

⚃ + ⚄ = 4 + 5 = 9

⚅ + ⚂ = 6 + 3 = 9

⚃ + ⚄ = 4 + 5 = 9

⚂ + ⚀ = 2 + 1 = 3

⚀ + ⚃ = 1 + 4 = 5

⚂ + ⚂ = 2 + 2 = 4

⚀ + ⚀ = 1 + 1 = 2

⚄ + ⚂ = 5 + 3 = 8

⚂ + ⚅ = 3 + 6 = 9

⚃ + ⚄ = 4 + 5 = 9

⚃ + ⚂ = 4 + 2 = 6

⚃ + ⚂ = 4 + 2 = 6

⚃ + ⚂ = 4 + 2 = 6

⚃ + ⚂ = 4 + 2 = 6

⚀ + ⚂ = 1 + 2 = 3

⚂ + ⚅ = 2 + 6 = 8

--- 25 tosses completed ---

⚀ + ⚄ = 1 + 5 = 6

⚄ + ⚅ = 5 + 6 = 11

⚃ + ⚄ = 4 + 5 = 9

⚀ + ⚂ = 1 + 3 = 4

⚃ + ⚄ = 4 + 5 = 9

⚃ + ⚂ = 4 + 2 = 6

⚃ + ⚃ = 4 + 4 = 8

⚀ + ⚂ = 1 + 3 = 4

⚂ + ⚂ = 2 + 2 = 4

⚀ + ⚂ = 1 + 3 = 4

⚀ + ⚃ = 1 + 4 = 5

⚂ + ⚂ = 2 + 3 = 5

⚀ + ⚅ = 1 + 6 = 7

⚂ + ⚃ = 2 + 4 = 6

⚅ + ⚃ = 6 + 4 = 10

⚄ + ⚂ = 5 + 3 = 8

⚂ + ⚂ = 2 + 3 = 5

⚀ + ⚂ = 1 + 3 = 4

⚂ + ⚄ = 2 + 5 = 7

⚄ + ⚂ = 3 + 2 = 5

⚂ + ⚄ = 2 + 3 = 5

⚂ + ⚅ = 2 + 6 = 8

⚀ + ⚅ = 1 + 6 = 7

⚂ + ⚅ = 2 + 6 = 8

⚅ + ⚂ = 6 + 3 = 9

--- 50 tosses completed ---

⚂ + ⚃ = 2 + 4 = 6

⚄ + ⚀ = 3 + 1 = 4

⚄ + ⚂ = 3 + 2 = 5

⚄ + ⚂ = 3 + 2 = 5

⚀ + ⚄ = 1 + 5 = 6

⚀ + ⚂ = 1 + 2 = 3

⚃ + ⚂ = 4 + 2 = 6

⚄ + ⚃ = 5 + 4 = 9

⚄ + ⚀ = 5 + 1 = 6

⚂ + ⚄ = 2 + 5 = 7

⚄ + ⚀ = 5 + 1 = 6

⚅ + ⚀ = 6 + 1 = 7

⚃ + ⚂ = 4 + 2 = 6

⚃ + ⚅ = 4 + 6 = 10

⚀ + ⚂ = 1 + 2 = 3

⚃ + ⚅ = 4 + 6 = 10

⚄ + ⚃ = 5 + 4 = 9

⚂ + ⚅ = 4 + 6 = 10

⚅ + ⚂ = 6 + 2 = 8

⚂ + ⚄ = 3 + 5 = 8

⚃ + ⚅ = 4 + 6 = 10

⚅ + ⚂ = 6 + 2 = 8

⚀ + ⚄ = 1 + 5 = 6

⚅ + ⚀ = 6 + 1 = 7

⚂ + ⚂ = 2 + 3 = 5

--- 75 tosses completed ---

⚄ + ⚄ = 4 + 4 = 8

⚅ + ⚅ = 6 + 6 = 12

⚅ + ⚂ = 6 + 3 = 9

⚄ + ⚁ = 4 + 2 = 6

⚁ + ⚂ = 2 + 3 = 5

⚅ + ⚁ = 6 + 2 = 8

⚄ + ⚄ = 4 + 4 = 8

⚁ + ⚁ = 2 + 2 = 4

⚃ + ⚃ = 5 + 3 = 8

⚄ + ⚁ = 4 + 2 = 6

⚀ + ⚅ = 1 + 6 = 7

⚃ + ⚁ = 5 + 2 = 7

⚅ + ⚂ = 6 + 3 = 9

⚃ + ⚃ = 3 + 3 = 6

⚃ + ⚁ = 5 + 2 = 7

⚄ + ⚄ = 4 + 4 = 8

⚀ + ⚅ = 1 + 6 = 7

⚃ + ⚅ = 3 + 6 = 9

⚀ + ⚃ = 1 + 5 = 6

⚁ + ⚀ = 2 + 1 = 3

⚀ + ⚂ = 1 + 3 = 4

⚃ + ⚅ = 5 + 6 = 11

⚂ + ⚀ = 3 + 1 = 4

⚃ + ⚃ = 5 + 4 = 9

⚂ + ⚁ = 3 + 2 = 5

```
--- 100 tosses completed ---
```

✅ Task 2 complete: Dice toss simulation finished.

=== Task 3: Calculate and print results ===

In [14]:
```python
probability = round(target_sum_count / trials, 2)
print(f"\n=== Simulation Results ===")
print(f"Target sum: {user_input}")
print(f"Occurrences of target sum: {target_sum_count}")
print(f"Probability of the sum equal to {user_input} in decimal: {probability}")
print(f"Probability as a fraction: {Fraction(target_sum_count, trials)}")
```

```
=== Simulation Results ===
Target sum: 8
Occurrences of target sum: 14
Probability of the sum equal to 8 in decimal: 0.14
Probability as a fraction: 7/50
```

=== REFERENCE ===

OpenAI. (2025). ChatGPT's assistance with DS623 PE07 - Probability of Dice Sum Simulation [Large language model].
https://openai.com/chatgpt