

# Probability Problem: Throwing a Fair Die

Data Science and A.I. Lecture Series

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# Problem Statement

A fair die is thrown. Find the probability of:

- 1 A prime number
- 2 An even number
- 3 A number multiple of 2 or 3
- 4 A number multiple of 2 and 3
- 5 A number greater than 4

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**Sample Space:** The sample space  $S$  for throwing a fair die is:

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**Sample Space:** The sample space  $S$  for throwing a fair die is:

$$S = \{1, 2, 3, 4, 5, 6\}$$

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**Sample Space:** The sample space  $S$  for throwing a fair die is:

$$S = \{1, 2, 3, 4, 5, 6\}$$

The total number of outcomes is:

$$|S| = 6$$

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**Prime Numbers:**

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**Prime Numbers:** The prime numbers on a die are:

$$\{2, 3, 5\}$$

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$$3$$



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**Prime Numbers:** The prime numbers on a die are:

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The number of favorable outcomes is:

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The probability is:

$$P(\text{Prime number}) = \frac{\text{Favorable outcomes}}{\text{Total outcomes}} = \frac{3}{6} = \frac{1}{2}$$

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**Even Numbers:**

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- 4 A number multiple of 2 and 3
- 5 A number greater than 4

**Even Numbers:** The even numbers on a die are:

$$\{2, 4, 6\}$$

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**Even Numbers:** The even numbers on a die are:

$$\{2, 4, 6\}$$

The number of favorable outcomes is:

$$3$$

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- 4 A number multiple of 2 and 3
- 5 A number greater than 4

**Even Numbers:** The even numbers on a die are:

$$\{2, 4, 6\}$$

The number of favorable outcomes is:

$$3$$

The probability is:

$$P(\text{Even number}) = \frac{\text{Favorable outcomes}}{\text{Total outcomes}} = \frac{3}{6} = \frac{1}{2}$$

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**Multiples of 2 or 3:**

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**Multiples of 2 or 3:** The numbers that are multiples of 2 or 3 are:

$$\{2, 3, 4, 6\}$$

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- 4 A number multiple of 2 and 3
- 5 A number greater than 4

**Multiples of 2 or 3:** The numbers that are multiples of 2 or 3 are:

$$\{2, 3, 4, 6\}$$

The number of favorable outcomes is:

$$4$$

The probability is:

$$P(\text{Multiple of 2 or 3}) = \frac{\text{Favorable outcomes}}{\text{Total outcomes}} = \frac{4}{6} = \frac{2}{3}$$

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**Multiples of 2 and 3:**

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**Multiples of 2 and 3:** The only number that is a multiple of both 2 and 3 is:

{6}

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{6}

The number of favorable outcomes is:

1

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- 5 A number greater than 4

**Multiples of 2 and 3:** The only number that is a multiple of both 2 and 3 is:

{6}

The number of favorable outcomes is:

1

The probability is:

$$P(\text{Multiple of 2 and 3}) = \frac{\text{Favorable outcomes}}{\text{Total outcomes}} = \frac{1}{6}$$

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**Numbers Greater Than 4:**

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**Numbers Greater Than 4:** The numbers greater than 4 on a die are:

$\{5, 6\}$

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- 4 A number multiple of 2 and 3
- 5 A number greater than 4

**Numbers Greater Than 4:** The numbers greater than 4 on a die are:

$$\{5, 6\}$$

The number of favorable outcomes is:

$$2$$



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- 4 A number multiple of 2 and 3
- 5 A number greater than 4

**Numbers Greater Than 4:** The numbers greater than 4 on a die are:

$$\{5, 6\}$$

The number of favorable outcomes is:

$$2$$

The probability is:

$$P(\text{Greater than 4}) = \frac{\text{Favorable outcomes}}{\text{Total outcomes}} = \frac{2}{6} = \frac{1}{3}$$

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**Results:**

- Probability of a prime number:  $\frac{1}{2}$

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**Results:**

- Probability of a prime number:  $\frac{1}{2}$
- Probability of an even number:  $\frac{1}{2}$

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**Results:**

- Probability of a prime number:  $\frac{1}{2}$
- Probability of an even number:  $\frac{1}{2}$
- Probability of a number multiple of 2 or 3:  $\frac{2}{3}$

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- Probability of a prime number:  $\frac{1}{2}$
- Probability of an even number:  $\frac{1}{2}$
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**Results:**

- Probability of a prime number:  $\frac{1}{2}$
- Probability of an even number:  $\frac{1}{2}$
- Probability of a number multiple of 2 or 3:  $\frac{2}{3}$
- Probability of a number multiple of 2 and 3:  $\frac{1}{6}$
- Probability of a number greater than 4:  $\frac{1}{3}$