MATHEMATICS · GRADES 7-9

Theoretical Probability

Difficulty level: Intermediate

Mathematics: Grades 7-9

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Overview of the concept

This is how you work out a chance before you try it, like the chance of rolling a six, drawing an ace, or winning a raffle, from what is possible rather than what already happened. You count how many outcomes you want, and how many outcomes there are altogether, and the chance is the first out of the second (see Probability of Complementary Events). No experiment is needed, because the answer comes from the setup itself. That is how you judge a game, a raffle, or a draw before you play, instead of guessing.



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Rule

Theoretical probability: the probability of an event is

$$P = \frac{\text{number of favourable outcomes}}{\text{total number of possible outcomes}}.$$

Count how many outcomes you want, count how many there are altogether, and divide.

Worked examples

EXAMPLE 1

Q Find P(rolling a 6) on a fair die

SOLUTION

Count the favourable outcomes: there is one favourable outcome, rolling a 6, out of six total outcomes, like the fraction 1 out of 6.

Count total outcomes: 6 faces.

$P = \frac{1}{6}$

EXAMPLE 2

Q Find P(drawing a red card) from a standard deck with 26 red cards

SOLUTION

Favourable outcomes: 26 red cards.

Total outcomes: 52 cards.

$P = \frac{26}{52} = \frac{1}{2}$

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Practice questions

1. A die is rolled. Find P(rolling a 3).

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2. Find P(drawing a face card) from a standard deck.

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3. Find P(heads) on a fair coin.

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4 Find P(rolling an even number) on a die.

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5 Find P(rolling a 1 or 2) on a die.

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6 Find P(drawing an ace) from a standard deck of 52 cards.

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7 Find P(rolling a 7) on a die.

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8 Find P(rolling a number from 1 to 6) on a die.

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9 A bag has 3 red and 2 blue marbles. Find P(red).

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10 **From the same bag of 3 red and 2 blue marbles, find P(blue).**

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ANSWER KEY

1. $\frac{1}{6}$

2. $\frac{3}{13}$

3. $\frac{1}{2}$

4. $\frac{1}{2}$

5. $\frac{1}{3}$

6. $\frac{1}{13}$

7. 0

8. 1

9. $\frac{3}{5}$

10. $\frac{2}{5}$

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