

GRADE 8

PROBABILITY

Complete Worksheet Pack

6 Practice Worksheets • 6 Answer Keys

Worksheet 1 — Probability Foundations & Sample Spaces

1. A fair six-sided die is rolled. Find the probability of rolling an even number.
2. A bag contains 5 red, 3 blue and 2 green counters. Find $P(\text{red})$, $P(\text{blue})$ and $P(\text{green})$.
3. A card is chosen from the numbers 1 to 20. Find the probability that it is a multiple of 3.
4. Write the sample space for choosing one letter from A, B, C and D followed by one number from 1 or 2.
5. From the sample space in Question 4, how many outcomes are possible?
6. Explain why a probability must always lie between 0 and 1.
7. Challenge: Give an event with probability $\frac{1}{2}$ using a standard six-sided die.

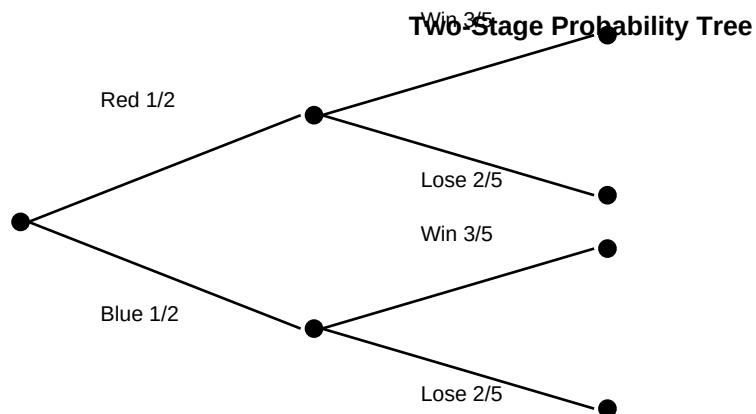
Worksheet 2 — Experimental vs Theoretical Probability

1. A coin is tossed 200 times and lands heads 108 times. Find the experimental probability of heads.
2. Compare your answer with the theoretical probability of $\frac{1}{2}$. Give one possible reason for the difference.
3. A die is rolled 300 times. The number 6 appears 56 times. Find the experimental probability of rolling a 6.
4. If the die is fair, what would you expect the experimental probability to approach after a very large number of trials?
5. A spinner is tested 100 times: A = 24, B = 31, C = 20, D = 25. Which outcome occurred most often?
6. Explain why experimental probability does not have to equal theoretical probability.
7. Challenge: Predict what might happen to the experimental probability if the number of trials is increased from 100 to 10,000.

Worksheet 3 — Complementary Probability & Combined Events

1. If $P(A) = 0.35$, find $P(\text{not } A)$.
2. The probability that a bus is late is 0.18. Find the probability that it is not late.
3. A bag contains 4 red and 6 blue counters. One counter is selected. Find $P(\text{red or blue})$.
4. A number from 1 to 30 is chosen. Find the probability it is not a multiple of 5.
5. A survey finds $P(\text{student cycles to school}) = 0.22$. Find $P(\text{student does not cycle})$.
6. Explain the relationship between an event and its complement.
7. Challenge: $P(A) = 0.4$ and $P(B) = 0.25$. If A and B are mutually exclusive, find $P(A \text{ or } B)$.

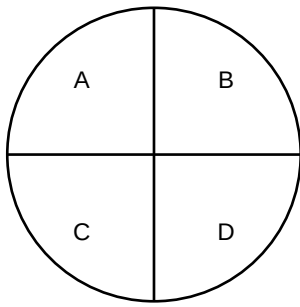
Worksheet 4 — Two-Step Probability & Tree Diagrams



1. A coin is tossed twice. List all equally likely outcomes and find $P(\text{two heads})$.
2. A fair coin is tossed twice. Find $P(\text{exactly one head})$.
3. A bag contains 3 red and 2 blue counters. A counter is selected, replaced, then another is selected. Find $P(\text{two red})$.
4. For Question 3, find $P(\text{one red and one blue in either order})$.
5. A fair die is rolled and then a coin is tossed. How many equally likely outcomes are there?
6. Find $P(\text{rolling an even number and getting heads})$.
7. Challenge: A game has a $\frac{2}{5}$ chance of winning each round. Assuming independent rounds, find the probability of winning both of two rounds.

Worksheet 5 — Probability from Diagrams & Real Life

Spinner



Each section is equally likely.

$$P(A) = P(B) = P(C) = P(D) = 1/4$$

1. A spinner has four equal sections A, B, C and D. Find $P(A)$, $P(A \text{ or } C)$ and $P(\text{not } B)$.
2. A school raffle has 500 tickets. One ticket is chosen at random. If you own 4 tickets, what is your probability of winning?
3. A weather forecast gives a 70% chance of rain. What is the probability of no rain, assuming these are complementary outcomes?
4. A game awards a prize with probability 0.15. Over many plays, what percentage of plays would you expect to produce a prize?
5. A box contains 8 working and 2 defective bulbs. One is chosen at random. Find the probability of selecting a working bulb.
6. Explain why a 70% chance of rain does not mean it will rain for 70% of the day.
7. Challenge: A school says an event has probability 1.2. Explain why the statement cannot represent a valid probability.

Worksheet 6 — Probability Reasoning Challenge

1. A fair die is rolled twice. Find the probability that the sum is 7.
2. A fair die is rolled twice. Find the probability that both results are even.
3. A bag contains 5 red, 4 blue and 1 green counter. One counter is chosen at random. Find $P(\text{not blue})$.
4. A card numbered 1 to 40 is chosen. Find $P(\text{multiple of 4 or multiple of 5})$. Be careful not to double-count common multiples.
5. A machine has a 0.08 probability of producing a defective item. Find the probability of producing a non-defective item.
6. Explain the difference between mutually exclusive events and independent events.
7. Challenge: Design a fair game in which a player wins with probability exactly $\frac{1}{3}$. Describe the rules and justify your answer.

Answer Key 1 — Probability Foundations & Sample Spaces

1. $\frac{1}{2}$.
2. $P(\text{red})=\frac{1}{2}$, $P(\text{blue})=\frac{3}{10}$, $P(\text{green})=\frac{1}{5}$.
3. $\frac{6}{20} = \frac{3}{10}$.
4. A1, A2, B1, B2, C1, C2, D1, D2.
5. 8 outcomes.
6. 0 represents impossible and 1 represents certain; all probabilities lie between them.
7. Example: rolling an odd number, probability $\frac{3}{6} = \frac{1}{2}$.

Answer Key 2 — Experimental vs Theoretical Probability

1. $108/200 = 0.54$.
2. It is close to 0.5; random variation can cause a difference.
3. $56/300 = 14/75$, approximately 0.187.
4. $1/6$.
5. B.
6. Experimental results are affected by random variation and the number of trials.
7. With more trials, the experimental probability would generally tend to get closer to the theoretical probability.

Answer Key 3 — Complementary Probability & Combined Events

1. 0.65.
2. 0.82.
3. 1.
4. Multiples of 5 from 1 to 30 = 6, so not a multiple = $24/30 = 4/5$.
5. 0.78.
6. Together, an event and its complement make the whole sample space, so their probabilities add to 1.
7. 0.65.

Answer Key 4 — Two-Step Probability & Tree Diagrams

1. HH, HT, TH, TT; $P(\text{two heads})=1/4$.

2. $2/4 = 1/2$.

3. $(3/5)(3/5)=9/25$.

4. $(3/5)(2/5)+(2/5)(3/5)=12/25$.

5. 12 equally likely outcomes.

6. $(3/6)(1/2)=1/4$.

7. $(2/5)(2/5)=4/25$.

Answer Key 5 — Probability from Diagrams & Real Life

1. $P(A)=1/4$; $P(A \text{ or } C)=1/2$; $P(\text{not } B)=3/4$.
2. $4/500 = 1/125$.
3. 30%.
4. 15%.
5. $8/10 = 4/5$.
6. A probability refers to the likelihood of rain for the stated forecast period, not the fraction of the day it must rain.
7. Probability cannot exceed 1.

Answer Key 6 — Probability Reasoning Challenge

1. Six ordered pairs sum to 7, so $6/36 = 1/6$.
2. $3/6 \times 3/6 = 1/4$.
3. $6/10 = 3/5$.
4. Multiples of 4: 10; multiples of 5: 8; common multiples: 20 and 40, so total = $10+8-2 = 16$; probability = $16/40 = 2/5$.
5. 0.92.
6. Mutually exclusive events cannot happen together; independent events have outcomes that do not affect each other's probabilities.
7. Example: roll a fair die; win if the result is 1 or 2. $P(\text{win})=2/6=1/3$.