What Is Probability?

Spot mistakes, reason, and work backward

Name _____ **Date** _____ **Score** _____ / 10

QUICK REVIEW

Probability describes chance from 0 (impossible) to 1 (certain). In bag questions, assume one counter is drawn uniformly at random. For equally likely outcomes, divide the favorable count by the total count. The chance an event does not occur is 1 minus its chance.

Worked example

An equally likely spinner has six sections: one silver and five green. Find the silver and not-silver probabilities.

1. The spinner has 6 equal sections and exactly 1 silver section.
2. Divide favorable by total: $P(\text{silver}) = 1/6$.
3. The complement is $1 - 1/6 = 5/6$; together the probabilities make 1.

Answer: Silver $1/6$; not silver $5/6$.

Practice Problems

Show your thinking.

1. A student says rolling 8 on a fair die has probability $1/6$. Correct the favorable count and classification.

2. A report gives probability 0 for rolling an integer from 1 to 6 on a standard die. Correct it.

3. A bag has 4 red and 6 blue counters. A student divides red count by blue count. Correct red probability and compare with $1/2$.

4. A probability line shows an event halfway between 0 and 1. Find its probability and the complement.

5. A student says the complement of $3/8$ is $5/3$. Correct it using a whole of $8/8$.

6. Can a probability be $-1/4$? State the allowed interval and the distance from this value to the nearest valid endpoint.

7. A student uses $5/15$ as winning probability for a bag with 5 winning and 15 other counters. Correct the denominator and complement.

8. A chance wheel lands on gold with probability $2/7$. Leo says not-gold is $2/5$. Correct the complement and explain why the denominator stays 7.

9. A student uses 2 red and 3 other counters to model red chance $2/3$. Repair the composition for a 12-counter bag.

10. A student reports probability $-1/5$. Correct the allowed range and find the distance to its nearest endpoint.

Answer Key

1. 0; impossible.
2. 1; certain.
3. $2/5 < 1/2$.
4. Both $1/2$.
5. $5/8$.
6. No; allowed $[0, 1]$; distance $1/4$ to 0.
7. Win $1/4$; no win $3/4$.
8. Not gold: $5/7$.
9. 8 red and 4 other.
10. Invalid; distance outside $[0, 1]$ is $\frac{1}{5}$.

Step-by-Step Solutions

Follow each calculation, then check your own work.

Problem 1

1. A die has labels 1 through 6 only.
2. There are 0 favorable outcomes among 6.
3. $P = 0/6 = 0$, not $1/6$.

Problem 2

1. All 6 outcomes meet the condition.
2. $P = 6/6 = 1$.
3. The event is certain, while 0 describes an impossible event.

Problem 3

1. Total $= 4 + 6 = 10$, not 6.
2. $P(R) = 4/10 = 2/5$.
3. $2/5 = 4/10 < 5/10 = 1/2$.

Problem 4

1. Half the distance from 0 to 1 is $1/2$.
2. Complement $= 1 - 1/2 = 1/2$.
3. The two possibilities are equally likely because their probabilities agree.

Problem 5

1. Whole probability $= 1 = 8/8$.
2. Complement $= 8/8 - 3/8 = 5/8$.
3. Check $3/8 + 5/8 = 1$.

Problem 6

1. A favorable-count fraction cannot be negative.
2. The lower allowed endpoint is 0.
3. Distance $= 0 - (-1/4) = 1/4$.

Problem 7

1. Choose one counter at random, so all $5 + 15 = 20$ counters belong in the denominator.
2. Winning probability is $5/20 = 1/4$, not $5/15$.
3. Fifteen nonwinning counters give $15/20 = 3/4$. Check $1/4 + 3/4 = 1$.

Problem 8

1. The whole probability is $1 = 7/7$; it includes gold and not gold.
2. Subtract the gold chance: $7/7 - 2/7 = 5/7$. The total number of equal parts has not changed.
3. Check $2/7 + 5/7 = 1$.

Problem 9

1. Two thirds of the 12 counters must be red: $12(2/3) = 8$.
2. The other count is $12 - 8 = 4$.
3. Check: $8/(8 + 4) = 2/3$. The denominator counts all counters.

Problem 10

1. Valid single-event probabilities satisfy $0 \le P \le 1$.
2. The claim is $-\frac{1}{5}$.
3. Distance to zero $0 - (-\frac{1}{5}) = \frac{1}{5}$.

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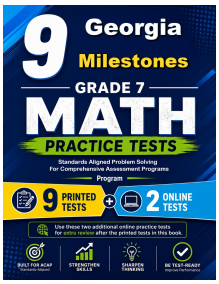

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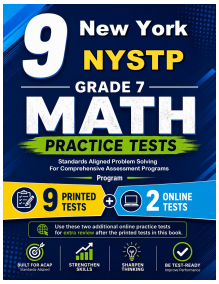

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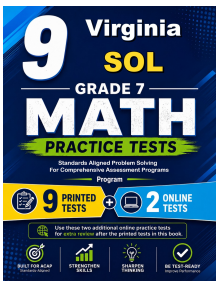

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