Finding Probabilities of Compound Events

Spot mistakes, reason, and work backward

Name _____ **Date** _____ **Score** _____ / 8

QUICK REVIEW

Multiply independent stage chances for an AND event: $(1/4)(1/5) = 1/20$. Add disjoint winning paths, or subtract the losing chance from 1. Without replacement, update the remaining counts.

Worked example

Flip a fair coin and independently spin five equal sectors A, B, C, D, E. Find the chance of tails and either A or E.

1. Tails has chance $1/2$.
2. A or E takes 2 of 5 sectors, so its chance is $2/5$.
3. Both are needed and the stages are independent: $(1/2)(2/5) = 1/5$.
Answer: $1/5$.

Practice Problems

Show your thinking.

1. In two independent fair coin flips a student adds $1/2 + 1/2$ and calls exactly one head certain. List the winning and losing outcomes and correct the chance.

2. On two independent fair six-sided dice, a student adds $1/6 + 1/6$ for at least one six. Which outcome was counted twice? Correct the probability.

3. A student lists only pairs with first roll no larger than second and reports $6/21$ for doubles on two independent fair six-sided dice. Correct the denominator and probability.

4. One spinner has equal sectors A, A, A, B and a second independent spinner has equal sectors X, Y. A student uses $1/2$ for A. Correct the chance of A and Y.

5. Draw twice at random without replacement from 2 yellow and 4 purple counters. A student uses $(2/6)(4/6)$ for yellow then purple. Correct it and compare with purple then yellow.

6. Two independent fair spinners are each labeled $1, 2, 3, 4$. A student says an even product requires both spins even. Give a counterexample and correct the chance.

7. Draw twice at random with replacement from 2 red and 3 blue counters. A student uses $(2/5)(1/4)$ for two reds. Repair the second probability and the result.

8. A fair six-sided die and an independent four-equal-sector spinner H, H, H, T are used. A student adds $1/2 + 1/4$ for odd and T. Correct the chance.

Answer Key

1. Win HT, TH; lose HH, TT. Chance $1/2$.
2. $(6,6)$ was counted twice; chance $11/36$.
3. Denominator 36; doubles have probability $1/6$.
4. $3/8$.
5. Both orders have chance $4/15$.
6. Example: $(1,2)$ gives an even product. Correct chance $3/4$.
7. Second red chance $2/5$; two reds $4/25$.
8. $1/8$.

Step-by-Step Solutions

Follow each calculation, then check your own work.

Problem 1

1. There are $2(2) = 4$ equally likely ordered outcomes.

2. Exactly one head includes HT and TH, a count of 2. HH and TT do not win.

3. The correct chance is $2/4 = 1/2$, not 1.

Problem 2

1. Among 36 ordered outcomes, 6 have a first-roll six and 6 have a second-roll six.

2. $(6,6)$ is in both groups, so count it once: $6 + 6 - 1 = 11$.

3. The correct chance is $11/36$.

Problem 3

1. $(1,2)$ and $(2,1)$ are different outcomes. Keep all $6(6) = 36$ equally likely ordered pairs.

2. Doubles include one pair per face, from $(1,1)$ to $(6,6)$, so count 6.

3. Divide by the ordered count: $6/36 = 1/6$.

Problem 4

1. A covers 3 of 4 sectors, so $P(A) = 3/4$.

2. Y covers 1 of 2 sectors, so $P(Y) = 1/2$.

3. Both are needed: $(3/4)(1/2) = 3/8$.

Problem 5

1. After yellow, 4 purple remain among 5 counters: $(2/6)(4/5) = 4/15$.

2. After purple, 2 yellow remain among 5: $(4/6)(2/5) = 4/15$.

3. The denominator on the second draw is 5 in each order; the two products are equal.

Problem 6

1. $(1,2)$ gives $1(2) = 2$, which is even despite an odd first spin.

2. The product is odd only when both are odd: $(2/4)(2/4) = 1/4$.

3. All other pairs give even products, with chance $1 - 1/4 = 3/4$.

Problem 7

1. First red has chance $2/5$.

2. Return the first counter; all 5 counters are available again, including 2 red.

3. The red-red path has probability $(2/5)(2/5) = 4/25$.

Problem 8

1. Odd is $3/6 = 1/2$; T is $1/4$.

2. The event requires both, so multiply: $(1/2)(1/4) = 1/8$.

3. Check: the 3 odd faces each pair with one T sector, giving $3/24 = 1/8$.

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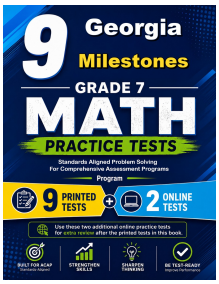

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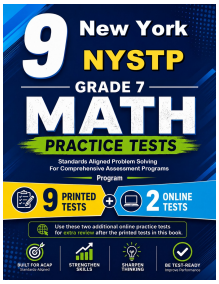

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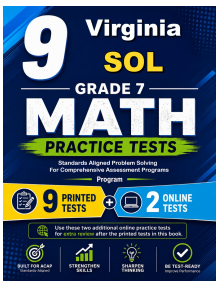

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