

Geometry · Probability: Independence, Conditional Probability and Fair Decisions · Quiz

Common Core S-CP.A.1, S-CP.A.2, S-CP.A.3, S-CP.A.4, S-CP.A.5, S-CP.B.6, S-CP.B.7, S-CP.B.8, S-CP.B.9, S-MD.B.6, S-MD.B.7 · mathovore.fr

Name: _____ Date: ____/____/____ Score: _____

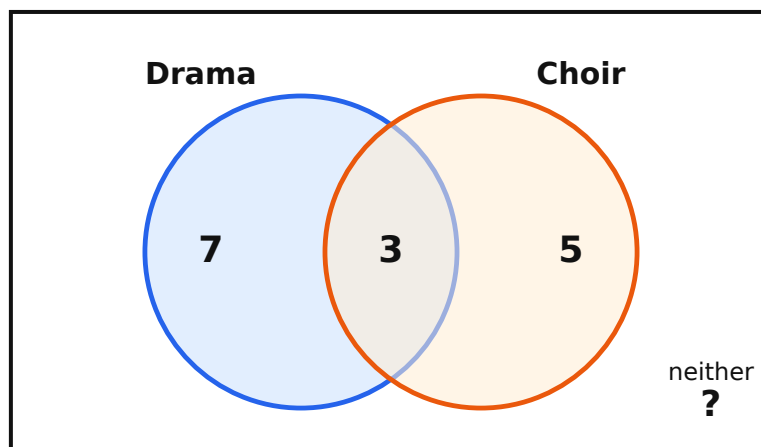
Ten multiple-choice questions check the main probability ideas: Venn diagrams, independence, conditional probability from tables, counting, fair choices and medical-test reasoning. Each question has exactly one correct answer.

GeometryCommon Core: S-CP.A.1 · S-CP.A.2 · S-CP.A.3 · S-CP.A.4 · S-CP.A.5 · S-CP.B.6 · S-CP.B.7 · S-CP.B.8 · S-CP.B.9 · S-MD.B.6 · S-MD.B.7

Questions

Question 1

Of 25 students, 10 are in drama, 8 are in choir and 3 are in both. How many are in neither?



Drama only 7, both 3, choir only 5.

- A. 7
- B. 15
- C. 10
- D. 18

Question 2

A die is rolled. What is the complement of the event “at least 3”?

- A. Rolling a 1 or a 2
- B. Rolling a 1, 2 or 3
- C. Rolling a 4, 5 or 6
- D. Rolling a 3

Question 3

For events A and B, $P(A)=0.5$, $P(B)=0.4$ and $P(A \text{ and } B)=0.2$. Which statement is true?

- A. A and B are not independent because $0.5 + 0.4 \neq 0.2$
- B. A and B are independent because $0.5 \times 0.4 = 0.2$
- C. A and B are mutually exclusive because 0.2 is small
- D. A and B are not independent because $P(A \text{ and } B) \neq 0$

Question 4

A survey of 80 students recorded sports and band participation. Find $P(\text{band given sports})$.

Sports \ Band	Band	No band	Total
Sports	10	30	40
No sports	14	26	40
Total	24	56	80

Sports and band.

- A. $\frac{5}{12}$
- B. $\frac{1}{4}$
- C. $\frac{1}{8}$
- D. $\frac{3}{10}$

Question 5

$P(A)=0.5$, $P(B)=0.35$ and $P(A \text{ or } B)=0.7$. Find $P(A \text{ and } B)$.

- A. 0.15
- B. 0.85
- C. 0.2
- D. 0.175

Question 6

Two marbles are drawn without replacement from a bag of 4 red and 6 blue marbles. Find the probability that both are red.

- A. $\frac{2}{15}$
- B. $\frac{4}{25}$
- C. $\frac{5}{25}$
- D. $\frac{3}{10}$

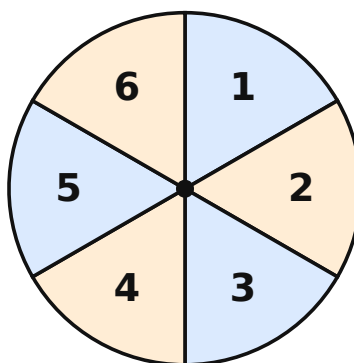
Question 7

A coach picks 3 of 8 players for a relay team, and the order does not matter. How many teams are possible?

- A. 336
- B. 56
- C. 24
- D. 512

Question 8

Two players use the spinner below. Which rule makes the game fair?



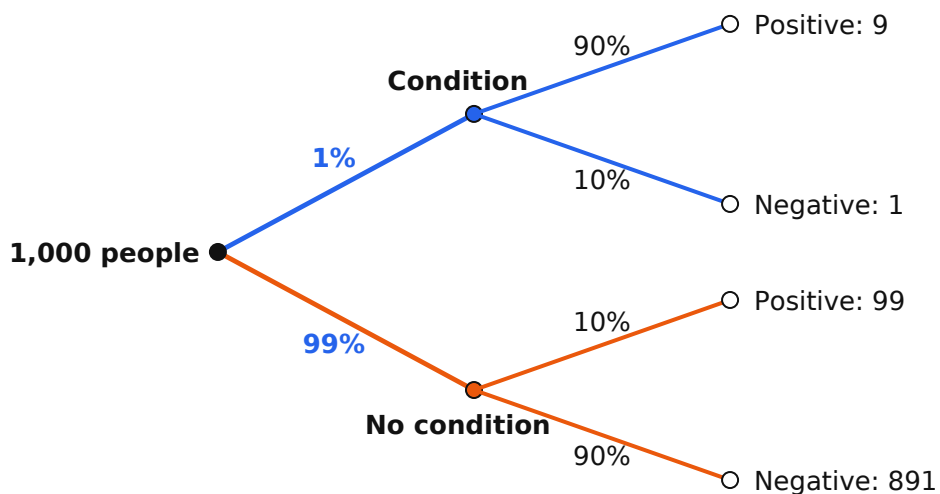
Six equal sectors.

- A. Player A wins on 1 or 2; Player B wins on 3, 4, 5 or 6

- B. Player A wins on 1, 2, 3 or 4; Player B wins on 5 or 6
- C. Player A wins on 6 only; Player B wins on 1, 2, 3, 4 or 5
- D. Player A wins on 1, 2 or 3; Player B wins on 4, 5 or 6

Question 9

The tree shows 1,000 people tested for a condition. Find the probability that a person with a positive test has the condition.



Frequency tree.

- A. $\frac{9}{10}$
- B. $\frac{1}{10}$
- C. $\frac{1}{12}$
- D. $\frac{1}{100}$

Question 10

A contestant picks one of three doors; the host, who knows where the car is, opens a different door with a goat. What is the probability of winning the car by switching?

- A. $\frac{1}{3}$
- B. $\frac{1}{2}$
- C. $\frac{2}{3}$
- D. $\frac{1}{6}$

Answer key

1. **C** - Students in at least one group: $7 + 3 + 5 = 15$, so $25 - 15 = 10$. Choosing 7 comes from subtracting 18 without the overlap.
2. **A** - At least 3 means 3, 4, 5 or 6. Everything else, 1 or 2, is the complement. The outcome 3 belongs to the event.
3. **B** - Independence means $P(A \text{ and } B) = P(A)P(B)$, and $0.5 \times 0.4 = 0.2$. Adding the probabilities is the wrong test, and mutually exclusive events would have $P(A \text{ and } B) = 0$.
4. **B** - Restrict to the 40 sports students; 10 of them are in band, so $10/40 = 1/4$. Using 24 as the total gives $P(\text{sports given band}) = 5/12$ instead.
5. **A** - The addition rule gives $0.7 = 0.5 + 0.35 - P(A \text{ and } B)$, so $P(A \text{ and } B) = 0.15$. The value 0.85 forgets to subtract the overlap, and 0.175 multiplies as if independent.
6. **A** - $P(\text{red, then red}) = (4/10)(3/9) = 12/90 = 2/15$. Using 4/10 twice treats the draws as with replacement and gives 4/25.
7. **B** - Order does not matter, so use combinations: $8 \cdot 7 \cdot 6 / 3! = 56$. The number 336 counts ordered arrangements (permutations).
8. **D** - A fair game gives each player the same probability: 3/6 each. The other rules give probabilities 2/6 vs 4/6, 4/6 vs 2/6 and 1/6 vs 5/6.
9. **C** - There are $9 + 99 = 108$ positive tests and 9 are true: $9/108 = 1/12$. The value 9/10 is the detection rate, which answers a different question.
10. **D** - The first pick wins with probability 1/3, so the other unopened door wins with probability 2/3. Many people say 1/2, but the host's choice is not random.

Remember:

- Addition rule: $P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$; complement: $P(\text{not } A) = 1 - P(A)$.
- Independent events satisfy $P(A \text{ and } B) = P(A)P(B)$, which is the same as $P(A \text{ given } B) = P(A)$.
- Conditional probability: $P(A \text{ given } B) = P(A \text{ and } B) / P(B)$; general multiplication rule: $P(A \text{ and } B) = P(B)P(A \text{ given } B)$.
- Permutations count ordered selections, $nPr = n!/(n-r)!$; combinations count unordered ones, $nCr = n!/(r!(n-r)!)$.
- A random decision is fair when every choice has the same probability; natural frequencies make medical-test probabilities clear.