

5. Probability

Starter Quiz ·

1. Find the probability of two red from 3 red and 2 blue without replacement.
- _____
2. Find $P(A \text{ given } B)$ if $P(A \cap B)=0.12$ and $P(B)=0.3$.
- _____
3. Find red relative frequency for 18 red results in 60 trials.
- _____
4. Use $p=0.3$ to estimate red count in 200 trials.
- _____
5. How many ordered outcomes do two fair dice have?
- _____
6. All possible totals of two fair dice are equally likely.
- ☐ True ☐ False
7. The union count is the sum of the two set counts without adjustment.
- ☐ True ☐ False
8. With 18 cycling, 12 swimming and 7 doing both, why is "at least one" 23 rather than 30?
- ☐ The overlap must be added twice: $18+12+7=37$ do at least one
- ☐ Adding 18+12 counts the 7 twice; subtracting the overlap gives $18+12-7=23$
- ☐ All 30 students do a sport, since $18+12=30$
9. $P(A \text{ given } B)$ equals $P(B \text{ given } A)$.
- ☐ True ☐ False
10. Mutually exclusive events with positive probabilities are dependent.
- ☐ True ☐ False

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Answers ·

1. **0.3**
- Without replacement, $P(RR)=3/5 \times 2/4=0.3$.
2. **0.4**
- $P(A|B)=P(A \cap B)/P(B)=0.12/0.3=0.4$.
3. **0.3**
- $18/60=0.3$.
4. **60.0**
- Expected count= $np=200 \times 0.3=60$.
5. **36.0**
- 6 choices for the first and 6 for the second: 36.
6. **False**
- A total of 7 has six ways, but 2 has only one, so the totals are not equally likely.
7. **False**
- Elements in both sets are counted twice, so subtract the intersection: $n(A \cup B)=n(A)+n(B)-n(A \cap B)$.
8. **Adding 18+12 counts the 7 twice; subtracting the overlap gives 18+12-7=23**
- The inclusion-exclusion count removes the double-counted overlap once: $18+12-7=23$. Filling the Venn overlap FIRST, then the only-regions, prevents the error.
9. **False**
- The two conditional probabilities have different denominators, so they are usually different.
10. **True**
- True. Mutually exclusive events with positive probabilities are dependent: if one happens, the other cannot, so $P(A \text{ and } B)=0 \neq P(A)P(B)$.