

# AP Statistics - Probability Rules and Simulation - Test Answer Key

Common Core AP STAT 4.1, AP STAT 4.2, AP STAT 4.3, AP STAT 4.4, HSS-CP.A.1, HSS-CP.B.7 · [maths-pdf.fr/en/](https://maths-pdf.fr/en/)

Each solution includes a scoring guide. Give credit for choosing the correct rule, for correct arithmetic, and for answers that use the context of the problem.

**AP Statistics** · Common Core State Standards: **AP STAT 4.1, AP STAT 4.2, AP STAT 4.3, AP STAT 4.4, HSS-CP.A.1, HSS-CP.B.7**

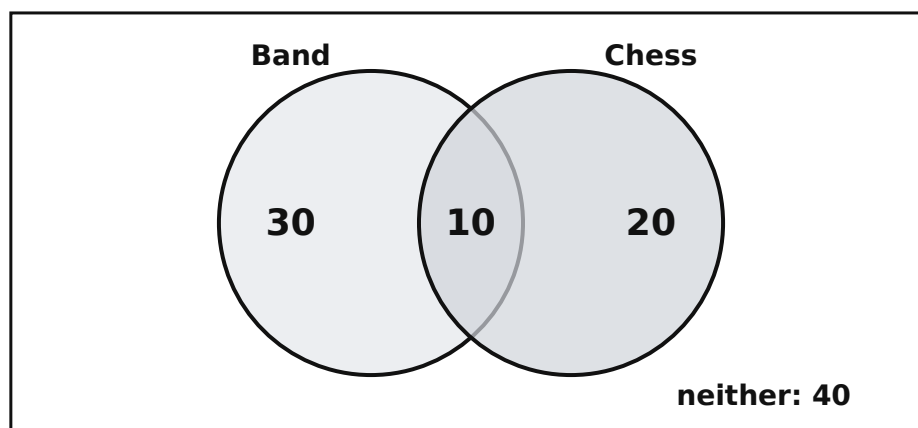
## Question 1 - Interpret a probability [2 pts]

In the long run, about 15% of plays are wins. In 100 plays the count of wins will vary around 15.

**Long-run proportion; not exactly 15 wins in every 100 plays.**

*Scoring: 1 point for long-run relative frequency, 1 point for noting the variation.*

## Question 2 - Venn diagram [4 pts]



Students in band and chess.

(a) 0.40. (b) 0.10. (c)  $0.40 + 0.30 - 0.10 = 0.60$ . (d) No, because 10 students are in both.

**0.40, 0.10, 0.60, not mutually exclusive.**

*Scoring: 1 point per part.*

**Question 3 - Two dice [3 pts]**

| + | 1 | 2 | 3 | 4  | 5  | 6  |
|---|---|---|---|----|----|----|
| 1 | 2 | 3 | 4 | 5  | 6  | 7  |
| 2 | 3 | 4 | 5 | 6  | 7  | 8  |
| 3 | 4 | 5 | 6 | 7  | 8  | 9  |
| 4 | 5 | 6 | 7 | 8  | 9  | 10 |
| 5 | 6 | 7 | 8 | 9  | 10 | 11 |
| 6 | 7 | 8 | 9 | 10 | 11 | 12 |

Sample space for two dice: 36 equally likely outcomes.

(a)  $\frac{5}{36}$ . (b) Sums 2 (1 way) and 3 (2 ways):  $\frac{3}{36} = \frac{1}{12}$ . (c)  $1 - \frac{5}{36} = \frac{31}{36}$ .

**5/36; 1/12; 31/36.**

Scoring: 1 point per part.

**Question 4 - Addition rule [2 pts]**

$$0.62 + 0.35 - 0.18 = 0.79.$$

**0.79.**

Scoring: 1 point for the rule, 1 point for 0.79.

**Question 5 - Simulation [3 pts]**

| Random digits                                               |
|-------------------------------------------------------------|
| 4 8 1 9 6 2 3 7 5 0 2 4 9 1 8 6 3 5 2 7 0 4 1 9 6 3 8 5 2 7 |

Digits for the simulation.

4 8 1 -> 1; 9 6 2 -> 1; 3 7 5 -> 1; 0 2 4 -> 2; 9 1 8 -> 1; 6 3 5 -> 1; 2 7 0 -> 2; 4 1 9 -> 1; 6 3 8 -> 1; 5 2 7 -> 1 wins.

Trials with at least one win: 10 of 10.

**Estimate 1.0 (exact value 0.784).**

Scoring: 1 point for the digit assignment and grouping, 1 point for counting the wins, 1 point for the estimate.

### Question 6 - Complement [2 pts]

Both delayed:  $0.27 \times 0.27 = 0.0729$ . At least one not delayed:  $1 - 0.0729 = 0.9271$ .

**0.9271.**

Scoring: 1 point for the both-delayed probability, 1 point for the complement.

### Question 7 - Name the complement [1 pt]

The complement is the event that the condition fails.

**No heads: all three flips are tails.**

Scoring: 1 point for 'all tails' or 'no heads'.

### Question 8 - Law of large numbers [3 pts]

The law of large numbers applies to many trials. With only 6 shots the proportion varies a lot:  $5/6 = 83\%$  could easily happen by chance for a 60% shooter.

**Six shots are too few to reflect her true long-run percent.**

Scoring: 1 point for referencing large numbers, 1 point for noting 6 is small, 1 point for the conclusion.

|                  |
|------------------|
| <b>Total</b>     |
| <b>20 points</b> |