

1. Probability and two-way tables

SAT Clarity teaching kit

Original supplementary instruction

Teaching notes

Introduce the skill. These materials are independent of College Board.

2. Learning goal

Choose the correct sample space and calculate simple, joint and conditional probabilities.
Before starting: Fractions, proportions and reading row and column totals

Teaching notes

Ask learners to restate the goal. Check the prerequisite before proceeding.

3. Diagnostic

A fair six-sided die has faces 1 through 6. What is the probability of an even result?

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

Teaching notes

Allow quiet thinking before sharing. Record reasoning rather than just the letter.

4. Diagnostic reasoning

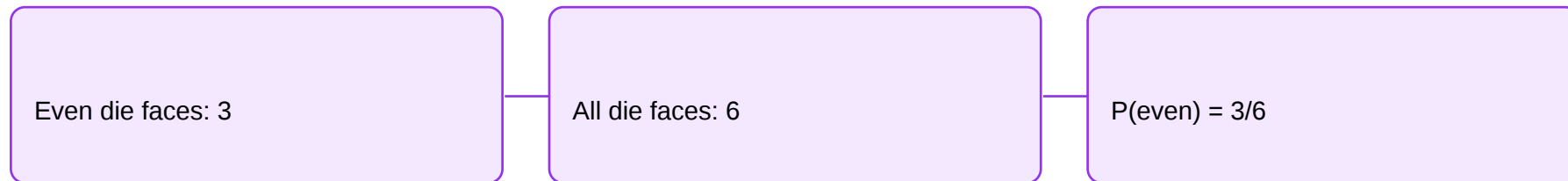
Even faces are 2, 4 and 6: $3/6 = 1/2$.

Teaching notes

Answer: C. A: One favorable face would give $1/6$, but there are three. B: This counts only two of the three even faces. C: Even faces are 2, 4 and 6: $3/6 = 1/2$. D: Four favorable faces would be needed for $2/3$.

5. Sample space

Probability compares favorable outcomes with all equally likely eligible outcomes. The denominator must match the selection rule.



Teaching notes

Ask for an explanation in the learner's own words. Connect this concept to the next worked example.

6. Two-way tables

Rows and columns classify the same people in two ways. Each cell counts an intersection. Totals include each person once.

	Club	No club
Grade 11	12	8
Grade 12	6	14

Joint: 12 / 40

Given club: 12 / 18

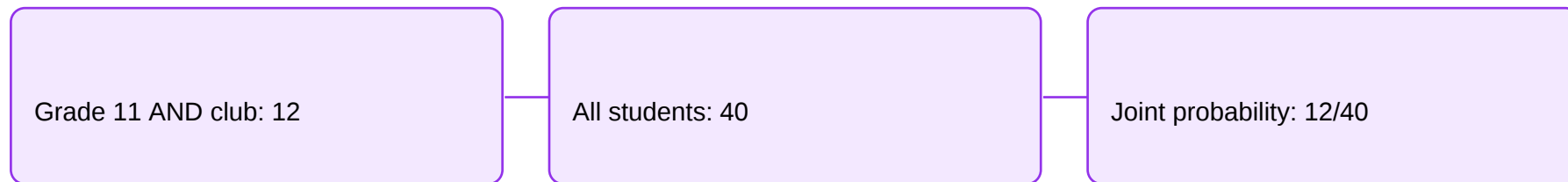
The denominator follows the condition.

Teaching notes

Ask for an explanation in the learner's own words. Connect this concept to the next worked example.

7. Joint probability

For A and B, use the intersection count as numerator and the overall eligible total as denominator.

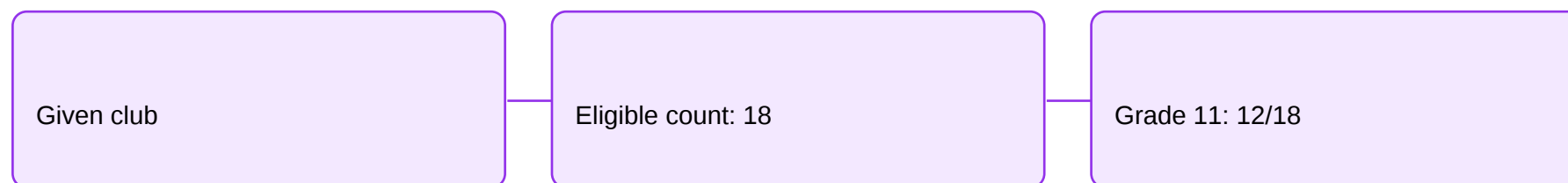


Teaching notes

Ask for an explanation in the learner's own words. Connect this concept to the next worked example.

8. Conditional probability

Given B, restrict the sample space to B. $P(A \text{ given } B) = \text{count}(A \text{ and } B) / \text{count}(B)$, when $\text{count}(B)$ is positive.

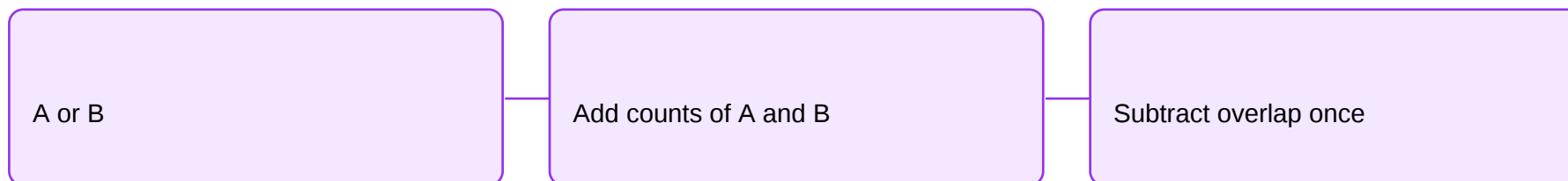


Teaching notes

Ask for an explanation in the learner's own words. Connect this concept to the next worked example.

9. Complement and union

$P(\text{not } A) = 1 - P(A)$. For A or B, include either event and subtract their overlap once.



Teaching notes

Ask for an explanation in the learner's own words. Connect this concept to the next worked example.

10. Worked example 1

A table has Grade 11: club 12, no club 8; Grade 12: club 6, no club 14. One student is selected randomly from all 40. What is $P(\text{Grade 11 and club})$?

- A. $12/20$
- B. $12/18$
- C. $12/40$
- D. $20/40$

Teaching notes

Model reading the prompt and identifying the requested quantity or relationship before solving.

11. Example 1 reasoning

The joint cell is 12 and the overall total is 40.

Teaching notes

Answer: C. A: 12/20 conditions on Grade 11. B: 12/18 conditions on club membership. C: The joint cell is 12 and the overall total is 40. D: 20/40 includes every Grade 11 student.

12. Worked example 2

Using that table, a club member is selected randomly. What is $P(\text{Grade 11 given club})$?

- A. $12/40$
- B. $12/18$
- C. $18/40$
- D. $12/20$

Teaching notes

Model reading the prompt and identifying the requested quantity or relationship before solving.

13. Example 2 reasoning

There are 18 club members, 12 in Grade 11. Probability is $12/18$.

Teaching notes

Answer: B. A: 40 includes students outside the conditioned group. B: There are 18 club members, 12 in Grade 11. Probability is $12/18$. C: $18/40$ is the probability of club membership overall. D: $12/20$ reverses the conditioning group.

14. Worked example 3

Using that table, what is $P(\text{Grade 11 or club})$ for a random student from all 40?

- A. $38/40$
- B. $26/40$
- C. $12/40$
- D. $18/40$

Teaching notes

Model reading the prompt and identifying the requested quantity or relationship before solving.

15. Example 3 reasoning

Union count = $20 + 18 - 12 = 26$. Divide by 40.

Teaching notes

Answer: B. A: $20 + 18$ counts the 12 overlapping students twice. B: Union count = $20 + 18 - 12 = 26$. Divide by 40. C: $12/40$ counts the intersection only. D: $18/40$ counts club members only.

16. Wrong denominator

Among club members means the denominator is club members, not all students.

Teaching notes

Ask students to explain how the error changes the result. Use a counterexample if needed.

17. Reversed condition

$P(A \text{ given } B)$ and $P(B \text{ given } A)$ generally have different denominators.

Teaching notes

Ask students to explain how the error changes the result. Use a counterexample if needed.

18. Double counting

When adding row and column totals, an overlapping cell can be counted twice.

Teaching notes

Ask students to explain how the error changes the result. Use a counterexample if needed.

19. Independence assumption

Table classifications alone do not establish independence. Use the given counts.

Teaching notes

Ask students to explain how the error changes the result. Use a counterexample if needed.

20. Guided practice 1

A bag contains 3 red and 7 blue marbles. One is selected randomly. What is $P(\text{not red})$?

- A. $\frac{3}{10}$
- B. $\frac{7}{10}$
- C. $\frac{3}{7}$
- D. $\frac{7}{3}$

Teaching notes

Learners solve first. Ask partners to justify a choice and reject an alternative.

21. Guided practice 1 reasoning

The 7 blue marbles are all non-red marbles out of 10.

Teaching notes

Answer: B. A: $\frac{3}{10}$ is red, the event being excluded. B: The 7 blue marbles are all non-red marbles out of 10. C: 7 is not the total sample space. D: This exceeds 1 and cannot be a probability.

22. Guided practice 2

A table records walkers: helmet 9, no helmet 3; cyclists: helmet 16, no helmet 2. Among cyclists, what is $P(\text{helmet})$?

- A. $16/30$
- B. $16/25$
- C. $16/18$
- D. $18/30$

Teaching notes

Learners solve first. Ask partners to justify a choice and reject an alternative.

23. Guided practice 2 reasoning

There are 18 cyclists and 16 wear helmets.

Teaching notes

Answer: C. A: 30 uses everyone rather than cyclists. B: 25 uses helmet wearers rather than cyclists. C: There are 18 cyclists and 16 wear helmets. D: 18/30 is the probability of being a cyclist overall.

24. Guided practice 3

A fair coin is tossed twice. What is $P(\text{exactly one head})$?

- A. $\frac{1}{4}$
- B. $\frac{1}{2}$
- C. $\frac{3}{4}$
- D. 1

Teaching notes

Learners solve first. Ask partners to justify a choice and reject an alternative.

25. Guided practice 3 reasoning

HT and TH are two of four equally likely outcomes.

Teaching notes

Answer: B. A: One favorable outcome misses either HT or TH. B: HT and TH are two of four equally likely outcomes. C: $\frac{3}{4}$ is at least one head, including HH. D: TT and HH do not have exactly one head.

26. Independent practice 1

A bag has 2 red and 3 blue marbles. Two are selected without replacement. What is $P(\text{both red})$?

A. $4/25$

B. $1/10$

C. $2/5$

D. $1/5$

Teaching notes

Answer: B. A: $4/25$ incorrectly uses replacement. B: $P = (2/5)(1/4) = 1/10$. Only one red remains after the first. C: $2/5$ accounts only for the first draw. D: $1/5$ is not the product of the two conditional probabilities.

27. Independent practice 2

$P(A) = 0.4$, $P(B) = 0.5$ and $P(A \text{ and } B) = 0.2$. What is $P(A \text{ or } B)$?

- A. 0.2
- B. 0.7
- C. 0.9
- D. 1.1

Teaching notes

Answer: B. A: 0.2 is the intersection. B: $0.4 + 0.5 - 0.2 = 0.7$. C: 0.9 double counts the overlap. D: 1.1 adds overlap rather than subtracting and exceeds 1.

28. Independent practice 3

In a group of 50, 20 play chess. Of the chess players, 8 also play music. What is $P(\text{music given chess})$?

- A. $8/50$
- B. $20/50$
- C. $8/20$
- D. $20/8$

Teaching notes

Answer: C. A: 50 is the overall total, not the conditioned group. B: $20/50$ is chess overall. C: Restrict to the 20 chess players. $8/20 = 0.4$. D: This reverses numerator and denominator and exceeds 1.

29. Exit ticket

A spinner has 8 equally likely sections, 3 purple. What is $P(\text{not purple})$?

- A. $\frac{3}{8}$
- B. $\frac{5}{8}$
- C. $\frac{3}{5}$
- D. $\frac{5}{3}$

Teaching notes

Answer: B. A: $\frac{3}{8}$ is purple. B: $8 - 3 = 5$ sections are not purple, so probability is $\frac{5}{8}$. C: 5 is favorable count rather than total count. D: This exceeds 1. Ask the learner to name one remaining uncertainty.

30. Review and next practice

Independent answers: 1: B, 2: B, 3: C

Return to the concept behind each missed item.

Use the extension question in the worksheet.

Version 1.0, editorial review 2026-09-17

Teaching notes

Review the separate teacher edition for all distractor explanations. Domain mapping source: <https://satsuite.collegeboard.org/higher-ed-professionals/sat-validity/content-domains> . Difficulty estimates are instructional, not empirically calibrated.