

Probability and two-way tables

Math / Problem-Solving and Data Analysis / Probability and conditional probability

Prerequisites: Fractions, proportions and reading row and column totals

Level: Foundational to intermediate instruction

Coverage: 12 original questions: 1 diagnostic, 3 worked examples, 3 guided, 3 independent, 1 exit ticket and 1 extension. Selected skill coverage, not the complete SAT syllabus.

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Teacher answer edition

Use the diagnostic to identify prerequisites. Model examples before guided practice. Treat the exit ticket as a brief check, not a calibrated mastery score.

Question 1

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

- A. $1/6$
- B. $1/3$
- C. $1/2$
- D. $2/3$

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 $2/3$.

Question 2

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. $20/40$

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.

Question 3

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. $12/20$

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.

Question 4

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. $18/40$

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.

Question 5

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

- A. $3/10$
- B. $7/10$
- C. $3/7$
- D. $7/3$

Answer: B

A: $3/10$ 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.

Question 6

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. $18/30$

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.

Question 7

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

- A. $1/4$
- B. $1/2$
- C. $3/4$
- D. 1

Answer: B

A: One favorable outcome misses either HT or TH.

B: HT and TH are two of four equally likely outcomes.

C: $3/4$ is at least one head, including HH.

D: TT and HH do not have exactly one head.

Question 8

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. $1/5$

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.

Question 9

$P(A) = 0.4$, $P(B) = 0.5$ 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

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.

Question 10

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. $20/8$

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.

Question 11

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. $\frac{5}{3}$

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.

Question 12

A table has morning class: pass 15, fail 5; afternoon class: pass 10, fail 10. Among students who passed, what is $P(\text{morning})$?

- A. $15/40$
- B. $15/20$
- C. $15/25$
- D. $20/40$

Answer: C

A: 40 includes failures outside the sample space.

B: 20 is the morning total, reversing the condition.

C: There are 25 passes, of whom 15 are in morning class.

D: $20/40$ is morning overall, not morning given pass.