

Probability Rules, Conditioning and Fair Decisions

Grade 10 – Geometry math · Test Answer Key · Standards: 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

Each solution shows the rule, the numbers substituted and the final probability. The scoring notes show how partial credit is earned for the setup and for choosing the correct denominator.

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Question 1 Two Dice (2 points)

Sums of 10, 11 and 12 occur in $3 + 2 + 1 = 6$ outcomes out of 36: $\frac{6}{36} = \frac{1}{6}$.

Complement: $1 - \frac{1}{6} = \frac{5}{6}$.

1/6 and 5/6

Scoring: 1 point each.

Question 2 Venn Counts (3 points)

(a) $28 + 22 - 9 = 41$, so $\frac{41}{60}$.

(b) $60 - 41 = 19$, so $\frac{19}{60}$.

(c) $\frac{9}{28} \approx 0.321$.

(a) 41/60 (b) 19/60 (c) 9/28

Scoring: 1 point per part.

Question 3 Two-Way Table (3 points)

(a) $\frac{95}{200} = 0.475$.

(b) $\frac{73}{120} \approx 0.608$.

(c) $\frac{58}{105} \approx 0.552$.

(a) 0.475 (b) ≈ 0.608 (c) ≈ 0.552

Scoring: 1 point per part; award the point only if the denominator is the condition total.

Question 4 Independent or Not? (2 points)

$$P(A \cap B) = 0.5 + 0.4 - 0.7 = 0.2.$$

$$0.5 \cdot 0.4 = 0.2, \text{ equal to } P(A \cap B).$$

0.2; independent

Scoring: 1 point for the intersection, 1 point for the independence check.

Question 5 Orders and Groups (2 points)

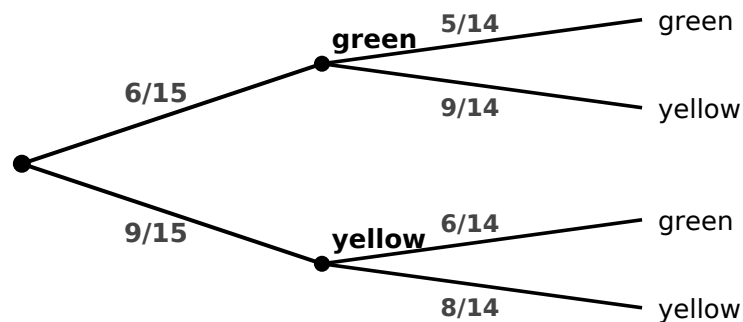
(a) Order matters: $7 \cdot 6 \cdot 5 = 210$.

(b) Order does not matter: ${}^7C_3 = 210 \div 6 = 35$.

(a) 210 (b) 35

Scoring: 1 point each.

Question 6 Marbles Without Replacement (3 points)



Two draws without replacement.

$$(a) \frac{6}{15} \cdot \frac{5}{14} = \frac{30}{210} = \frac{1}{7}.$$

$$(b) \text{ Green then yellow: } \frac{6}{15} \cdot \frac{9}{14} = \frac{54}{210}. \text{ Yellow then green: } \frac{9}{15} \cdot \frac{6}{14} = \frac{54}{210}. \text{ Total } \frac{108}{210} = \frac{18}{35}.$$

(a) 1/7 (b) 18/35

Scoring: 1 point for (a), 2 points for (b).

Question 7 A Positive Test (3 points)

Sick and positive: $0.04 \cdot 0.9 = 0.036$. Healthy and positive: $0.96 \cdot 0.1 = 0.096$.

$P(\text{positive}) = 0.132$. $P(\text{sick} \mid \text{positive}) = \frac{0.036}{0.132} = \frac{3}{11} \approx 0.273$.

3/11 $\approx$ 27.3%

Scoring: 1 point for each of the two paths, 1 point for the conditional probability.

Question 8 Fair Spinner Game (2 points)

First game: each player wins with probability $\frac{2}{4} = \frac{1}{2}$. Fair.

Second game: Ben wins with probability $\frac{1}{4}$ and Anna with $\frac{3}{4}$. Not fair.

First fair; second not fair

Scoring: 1 point for each game.