Year 10A probability worksheet

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Name: _____ Date: _____

Question 1

A bag contains 5 red, 3 blue and 4 green marbles. One marble is chosen at random. Find:

(a) Pr(blue)

(b) Pr(not green)

Answer: _____

Question 2

Let $\xi = \{1, 2, 3, \ldots, 15\}$, A = {multiples of 3} and B = {odd numbers}.

(a) List the elements of $A \cap B$.

(b) Find $n(A \cup B)$.

(c) List the elements of $A' \cap B$.

Answer: _____

Question 3

For two events A and B, $Pr(A) = 0.45$, $Pr(B) = 0.3$ and $Pr(A \cap B) = 0.12$. Find $Pr(A \cup B)$.

Answer: _____

Question 4

A group of 80 students were surveyed about whether they play sport and whether they have a part-time job. The results are shown below.

	Plays sport	Does not play sport	Total
Has a job	18	12	30
No job	35	15	50
Total	53	27	80

Find the probability that a randomly chosen student plays sport, given that they have a job. Write your answer as a fraction in simplest form.

Answer: _____

Question 5

Two fair six-sided dice are rolled and the numbers are added. Find the probability that the sum is:

(a) 10

(b) less than 5.

Answer: _____

Question 6

At a school, 60% of students study French. Of the students who study French, 40% also study Japanese. Of the students who do not study French, 25% study Japanese. A student is chosen at random and is found to be studying Japanese. Find the probability that this student also studies French. Give your answer as a decimal rounded to two decimal places.

Answer: _____

Question 7

Events A and B are independent, with Pr(A) = 0.6 and Pr(B) = 0.25.

(a) Find Pr(A ∩ B).

(b) Find Pr(A ∪ B).

Answer: _____

Question 8

Evaluate (8!)/(6!).

Answer: _____

Question 9

A school captain team consists of 10 candidates. In how many ways can a President, Vice-President and Treasurer be chosen from the 10 candidates, if no person can hold more than one role?

Answer: _____

Question 10

In how many ways can a group of 3 people be selected from 8 people?

Answer: _____

Year 10A probability: answers and worked solutions

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Question 1

Key idea: Pr(event) = (number of favourable outcomes)/(total number of outcomes), and Pr(not A) = 1 - Pr(A).

(a) 1. Total marbles: 5 + 3 + 4 = 12. 2. Pr(blue) = 3/12 = ¼

(b) 1. Pr(green) = 4/12 = ⅓ 2. Pr(not green) = 1 - ⅓ = ⅔

Answer: (a) ¼ (b) ⅔

Question 2

Key idea: ∩ means "and" (in both sets), ∪ means "or" (in at least one set) and A' means "not in A".

1. A = {3, 6, 9, 12, 15} and B = {1, 3, 5, 7, 9, 11, 13, 15}.

(a) 1. Elements in both: A ∩ B = {3, 9, 15}.

(b) 1. n(A ∪ B) = n(A) + n(B) - n(A ∩ B) = 5 + 8 - 3 = 10. 2. Check by listing: {1, 3, 5, 6, 7, 9, 11, 12, 13, 15} has 10 elements ✓

(c) 1. Odd numbers that are not multiples of 3: A' ∩ B = {1, 5, 7, 11, 13}.

Answer: (a) {3, 9, 15} (b) 10 (c) {1, 5, 7, 11, 13}

Question 3

Key idea: The addition rule is Pr(A ∪ B) = Pr(A) + Pr(B) - Pr(A ∩ B).

1. Pr(A ∪ B) = 0.45 + 0.3 - 0.12 2. = 0.63

Answer: 0.63

Question 4

Key idea: P(A mid B) = (P(A ∩ B))/(P(B)), which in a table means: restrict to the row (or column) that matches the given condition, then find the fraction who also satisfy A.

1. The condition is "has a job", so restrict to the "Has a job" row. There are 30 students with a job. 2. Of those 30, the number who also play sport is 18. 3. P(plays sport mid has a job) = 18/30 = ⅗

Answer: ⅗

Question 5

Key idea: Use a 6 × 6 array of the 36 equally likely outcomes.

1. Sum 10: (4, 6), (5, 5), (6, 4), so 3/36 = 1/12 2. Sum 2, 3 or 4: 1 + 2 + 3 = 6 outcomes, so 6/36 = ⅙

Answer: (a) 1/12 (b) ⅙

Question 6

Key idea: Use a tree diagram and the conditional probability formula P(F mid J) = (P(F ∩ J))/(P(J)).

1. Define events: F = studies French, J = studies Japanese. Set up the known probabilities: P(F) = 0.6, P(F') = 0.4, P(J mid F) = 0.4, P(J mid F') = 0.25. 2. Find the probability of each path that leads to Japanese:\ P(F ∩ J) = 0.6 × 0.4 = 0.24 P(F' ∩ J) = 0.4 × 0.25 = 0.10 3. Find the total probability of studying Japanese:\ P(J) = 0.24 + 0.10 = 0.34 4. Apply the conditional probability formula:\ P(F mid J) = (P(F ∩ J))/(P(J)) = (0.24)/(0.34) = 12/17 ≈ 0.71

Answer: 0.71

Question 7

Key idea: For independent events, Pr(A ∩ B) = Pr(A) × Pr(B).

1. Pr(A ∩ B) = 0.6 × 0.25 = 0.15 2. Pr(A ∪ B) = 0.6 + 0.25 - 0.15 = 0.7

Answer: (a) 0.15 (b) 0.7

Question 8

Key idea: Cancel common factors by expanding just enough of the larger factorial to reach the smaller one.

1. Write 8! as 8 × 7 × 6!:\ (8!)/(6!) = (8 × 7 × 6!)/(6!) 2. Cancel 6! from the numerator and denominator:\ = 8 × 7 3. Evaluate:\ = 56

Answer: 56

Question 9

Key idea: Because the three roles are different, order matters. Use the multiplication principle: count the choices at each stage and multiply.

1. Choose the President: 10 options. 2. Choose the Vice-President from the remaining 9 candidates: 9 options. 3. Choose the Treasurer from the remaining 8 candidates: 8 options. 4. Multiply the choices together:\ 10 × 9 × 8 = 720

This can also be written using factorial notation as:\ (10!)/((10-3)!) = (10!)/(7!) = 720

Answer: 720 ways

Question 10

Key idea: Order does not matter in a selection, so use ${}^{n}C_{r} = (n!)/(r!(n - r)!)$.

1. ${}^{8}C_{3} = (8!)/(3! \times 5!) = (8 \times 7 \times 6)/(3 \times 2 \times 1)$ 2. $= 336/6 = 56$

Answer: 56 ways