Year 11 Mathematics Advanced

Topic: Probability and Data (5 of 5)

Review Questions (Worked Solutions): Mixed one-off exam questions

Term 3, 2026

Mixed one-off exam questions

Q1 Girraween 2020 Trial Q13 · **2 marks**

A poker machine has 3 wheels, each showing one of 10 fruit symbols. Wheel 1 has 4 cherries, wheel 2 has 2 cherries and wheel 3 has 5 cherries. (a) Find the number of arrangements which contain 3 cherries. (b) Find the probability of obtaining 3 cherries on the viewing line.

Criteria	**Marks**
(a) 40 arrangements	1
(b) $P(3 \text{ cherries}) = \frac{1}{25}$	1

Solution.

(a) By the multiplication principle, choose one cherry from each wheel. Wheel 1 offers 4 cherries, wheel 2 offers 2, and wheel 3 offers 5, so the number of ways to line up three cherries is

$$4 \times 2 \times 5 = 40.$$

(b) Each wheel shows one of 10 symbols, so the total number of equally likely outcomes is $10 \times 10 \times 10 = 1000$. Hence

$$P(3 \text{ cherries}) = \frac{40}{1000} = \frac{1}{25} = 0.04.$$

Q2 Hurlstone 2024 Trial Q34 · **2 marks**

A six-digit PIN is formed from the digits 0–9 with repetition allowed (and any first digit). A finder guesses by entering six digits. (a) Find $P(\text{the six digits are the correct PIN})$. (b) Find $P(\text{at least one digit is in its correct position})$.

Criteria	Marks
(a) $P(\text{correct PIN}) = \dfrac{1}{10^6}$	1
(b) $P(\geq 1 \text{ correct}) = 1 - \left(\frac{9}{10}\right)^6$	1

Solution.

(a) By the multiplication principle each of the six positions can be any of 10 digits, so there are $10^6 = 1\,000\,000$ equally likely PINs, of which exactly one is correct:

$$P(\text{correct PIN}) = \frac{1}{10^6} = \frac{1}{1\,000\,000}.$$

(b) Work with the complement. For any single position, the guessed digit matches the correct digit with probability $\frac{1}{10}$, so it is *wrong* with probability $\frac{9}{10}$. The six positions are independent, so the probability that *none* is in its correct position is $\left(\frac{9}{10}\right)^6$. Therefore

$$P(\text{at least one correct}) = 1 - \left(\frac{9}{10}\right)^6 = 1 - \frac{531441}{1\,000\,000} = \frac{468559}{1\,000\,000} \approx 0.469.$$

Q3 Sydney Boys 2022 Trial Q5 · **1 mark**

Three towns X, Y, Z are joined by roads: three roads out of X and two roads out of Y. Mr Kent leaves X and Mr Wayne leaves Y, each choosing a road at random. Find the probability that they meet on their way.

Criteria	Marks
Correct option (B)	1

Solution.

Two of Mr Kent's three roads lead to a road that Mr Wayne could also be travelling on, so the probability that Mr Kent picks a road on which a meeting is possible is $\frac{2}{3}$. Given that, Mr Wayne must then choose the one matching road out of his two, with probability $\frac{1}{2}$. By the multiplication rule

$$P(\text{meet}) = \frac{2}{3} \times \frac{1}{2} = \frac{1}{3}.$$

This is option **B**.

Q4 Hunters Hill 2023 Trial Q13 · **3 marks**

Steven picks two notes at random (without replacement) from five \$5, three \$10 and two \$20 notes (ten notes in all). (a) Find $P(\text{total} \geq \$20)$. (b) Given that at least one note is a \$10, find $P(\text{total} \geq \$20)$.

Criteria	**Marks**
(a) recognises dependent draws / a relevant compound probability	1
(a) $P(\text{total} \geq \$20) = \frac{4}{9}$	1
(b) $P(\text{total} \geq \$20 \mid \geq 1 \text{ ten}) = \frac{3}{8}$	1

Solution.

(a) The draws are without replacement, so use the complement: a total below \$20 happens only as \$5+\$5 = \$10 or \$5+\$10 = \$15.

$$P(\$5,\$5) = \frac{5}{10}\times\frac{4}{9} = \frac{20}{90}, \qquad P(\$5,\$10) = 2\times\frac{5}{10}\times\frac{3}{9} = \frac{30}{90},$$

where the factor 2 accounts for the two orders. So $P(\text{total} < \$20) = \frac{20}{90} + \frac{30}{90} = \frac{50}{90} = \frac{5}{9}$, giving

$$P(\text{total} \geq \$20) = 1 - \frac{5}{9} = \frac{4}{9}.$$

(b) Condition on "at least one \$10". Counting unordered pairs (there are $\binom{10}{2} = 45$ in all), the pairs containing a \$10 are:

$$\{\$10,\$10\}: \binom{3}{2} = 3, \quad \{\$10,\$5\}: 3\times 5 = 15, \quad \{\$10,\$20\}: 3\times 2 = 6,$$

so 24 pairs contain a \$10. Of these, the total is $\geq \$20$ only for $\{\$10,\$10\} = \$20$ and $\{\$10,\$20\} = \$30$, i.e. $3 + 6 = 9$ pairs. Hence

$$P(\text{total} \geq \$20 \mid \geq 1 \text{ ten}) = \frac{9}{24} = \frac{3}{8} = 0.375.$$

(The printed trial key gives $\frac{4}{9}$ here, but that simply repeats part (a); the correct conditional probability is $\frac{3}{8}$.)

Q5 Killara 2023 Prelim Q10 · **1 mark**

Two balls are placed independently at random into three different boxes. A participant opens two of the three boxes and wins a prize if both balls are drawn. Find the probability that the participant gets a prize.

Criteria	**Marks**
Correct option (C)	1

Solution.

Opening two of the three boxes leaves exactly one box unopened, so the participant wins precisely when *neither* ball lands in that single unopened box. Each ball, placed independently and uniformly, avoids the unopened box with probability $\frac{2}{3}$, so

$$P(\text{win}) = \frac{2}{3} \times \frac{2}{3} = \frac{4}{9}.$$

(By symmetry this is the same whichever pair of boxes is opened.) This is option **C**.