

Maths A & I

Probability exam.

Name:

Date:

Remember:

- If nothing else is stated, provide your answers exactly or with 3 sf.
- When answering questions with the calculator you have to state that the answer was provided by the calculator.

1. A cabinet has three drawers, one containing a die of 6 sides, one containing a coin and one containing a kitten. The die may have any of its sides up, so does the coin and the kitten may or may not be asleep, the probability of it being asleep is 0.66.

a) One drawer is opened at random. Show the complete sample space. [1]

b) All three drawers are opened and inspected. What is the probability that the die has the 5 up, the coin shows heads and the kitten is awake?[2]

c) All three drawers are opened and inspected. What is the probability that the die doesn't have the 5 up, the coin shows heads and the kitten is asleep?[2]

d) All three drawers are opened and inspected. What is the probability that the die is showing a number higher than 2 OR the coin shows heads OR the kitten is asleep? [3]

2. In a population of mice, 40% have black fur and the rest have brown fur. 20% have brown tail and the rest have white tail.

a) Show this in a Venn diagram. [1]

b) Use a Venn diagram to represent the mice that have black fur and brown tail. [1]

c) Use a Venn diagram to represent the mice that have black fur or brown tail but not both. [1]

d) Use a Venn diagram to represent the mice that have neither black fur nor brown tail. [1]

e) If one is picked at random, calculate the probability that it has black fur OR brown tail or both. [1]

3. A farmer grows three tricky varieties of pear, all of them seem to take up different colours randomly when they ripen.

The *Flashback* variety is mostly green, but has a probability of $\frac{1}{6}$ of turning red when ripe.

The *Columns* variety is mostly green too, but has a probability of $\frac{1}{4}$ of turning yellow when ripe.

The *R-Type* variety is mostly yellow but has a $\frac{1}{4}$ probability of turning green and a $\frac{1}{8}$ probability of turning red.

The farmer has 330 *Flashback* pear trees, 420 *Columns* pear trees and 250 *R-Type* pear trees.

One pear tree is picked at random and one of its pears inspected.

a) Draw a tree diagram showing the possible outcomes of the experiment. [2]

b) Calculate the probability that the pear is red [2]

c) Calculate the probability that the pear is not yellow [2]

d) Calculate the probability that the pear is *Flashback* or yellow. [3]

e) The pear is green. Calculate the probability that it's *R-Type*. [3]

4. In the Tinto Marshes in Huelva (Spain), the radioactivity due to toxic waste dumping follows a normal distribution with mean 0.7 (millirem per hour) and standard deviation 0.2

a) What is the probability that, if we measure the radioactivity in one spot, it is below 0.35? [2]

b) If we measure the radioactivity in 6 spots, what is the probability that 2 or less show lower level of radioactivity than 0.35? [2]

c) Bonus: If we measure the radioactivity in 9 spots, what is the probability that at least 7 of them show a level of radioactivity above 0.35? [2]

5. A bag contains two dice, the blue one is a regular 6-side die, and the red one has also 6 sides, but because of having been asiduously used by the gods to play, it has developed a distorted probability distribution:

value	1	2	3	4	5	6
probability	x	0.09	0.19	0.05	0.2	0.16

a) Calculate x. [1]

b) One die is picked at random from the bag and cast. What is the probability that it rolls 1 ? [2]

c) Both dice are cast and the numbers added. What is the probability that the sum is 4? [3]