


# PRACTICE 7.1 – Experimental vs. Theoretical Probability

\* Full, worked solutions can be found in the folder linked on the Course Website ☺

## Exercise 7A

- A letter is picked at random from the letters of RANDOM. Calculate the probability that it is a letter from MATHS.
- A dartboard has 20 sectors of equal area.
 

If a dart lands in a numbered sector at random, find the probability that the number is:

  - at least 4
  - more than 6
  - less than 30
  - no more than 14
  - prime
  - square
  - a solution to the equation  $x^2 = 3$ .
- Ann and Ruth are designing a game for a CAS project. The numbers 1, 2, 3, ..., 11 are written on identical tickets and one ticket is drawn at random from an envelope. Find the probability that the number on the ticket drawn is:
  - odd
  - square
  - prime
  - square and odd
  - square and prime
  - prime and odd
  - a prime and even.
- A personal identification number (PIN) consists of four digits. Consider the PIN 0005 equal to the number 5 etc. Find the probability that a PIN is:
  - equal to 0000
  - less than 8000 and more than 7900
  - divisible by 10
  - at least 13.

## Exercise 7B



- A survey was carried out in a small city centre street one Saturday afternoon. Shoppers were asked about how they travelled that day. The results are shown in the table below.
 

Mode of transport	Car	Bus	Foot
Male	40	59	37
Female	33	41	29

One shopper was randomly selected.

  - Find the probability that this shopper travelled by car.

One male shopper was randomly selected.

  - Find the probability that this male shopper travelled on foot.
  - 1300 shoppers visit the town in one week. Estimate the number of shoppers who travelled by bus.
- In an experiment, a number  $a$  is chosen at random from the set  $\{2, 3, 4, 5\}$  and a number  $b$  is chosen at random from the set  $\{3, 4, 5, 6\}$ .
  - Find the probability that  $\frac{b}{a}$  is a natural number.
  - The experiment is repeated 320 times. Find the expected number of times that  $a - b$  will be positive.
- A fair dodecahedral die has faces numbered 1, 2, 3, ..., 12. The die is thrown 154 times. Find the expected number of times that the die will show:
  - a factor of 12
  - a prime number
  - a prime factor of 12.
- The probabilities of each outcome of a biased die are modelled with the following theoretical probabilities:
 

Outcome	1	2	3	4	5	6
Probability	0.15	0.2	0.25	0.2	0.12	0.08

The die is thrown 207 times. Find the expected number of odd outcomes.
- A large jar contains 347 marbles, 125 of which are red. A marble is chosen at random and replaced. Find the expected number of times a non-red marble is chosen in 531 trials.
- A letter is chosen at random from the word "ICOSAHEDRAL". Find the expected number of times a vowel is chosen in 79 trials.

- 7 Each day in June, Maged records types of cars passing a point on a road popular with tourists. The percentages of each type of car are given in the table below:

Type of car	Classic	Luxury	Compact	Family saloon	Estate	SUV	Other
Percentage	0.5%	1.2%	23.1%	30.9%	15.4%	19.8%	9.1%

- a Use this information to predict the number of classic or luxury cars Maged would expect to observe in July given that he observes 573 cars in July.
- b State the assumption made in your answer.
- 8 Quality control is being carried out in a clothing factory. 1.37% of garments produced by machine A have defects and 0.41% of garments produced by machine B have defects. A quality control manager inspects 67 garments from machine A and 313 garments from machine B. Find the expected number of defects.
- 9 An artist chooses an area of her neighbourhood to photograph by throwing a dart each morning at a large map pinned to her studio wall.



Key:

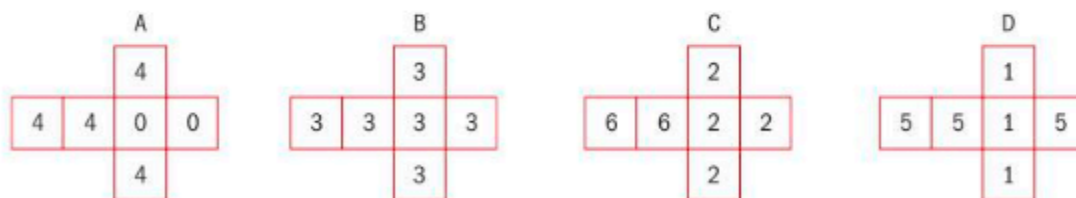
Red = central business district    Blue = government buildings

Green = park

Grey = housing

Find the expected number of times the artist will not photograph government buildings given that she takes photographs each day during August.

- 10 These dice compete in the "Dice world cup". The semifinals are A vs B and C vs D. The winners of each semifinal go in to the world cup final.



Write down your subjective judgment of which die you feel will be most likely to win the "Dice world cup".

