

Year 9 Term 2 Homework

Student Name: _____	Grade: _____
Date: _____	Score: _____

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7 Year 9 Term 2 Week 7 Homework

7.1 Experimental Probability

We often discuss the likelihood of events occurring using terms such as ‘very likely’, ‘good chance’, and ‘unlikely’. We use probability to make these statements more precise by given a numerical value of the likelihood.

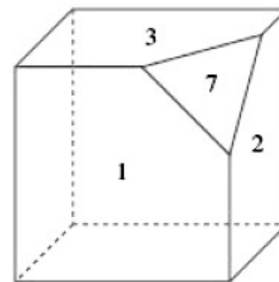
For any particular event A, the probability of A, $P(A)$ is the proportion of the outcomes favourable to A out of the total number of possible outcomes.

$$P(A) = \frac{\text{number of outcomes favourable to } A}{\text{total number of possible outcomes}}$$

- an impossible event has a probability of zero, $P(E) = 0$;
- a certain event has a probability of 1, $P(E) = 1$
- all probabilities are fractions in the range $0 \leq P(E) \leq 1$

Example

An ordinary die with faces labelled 1 to 6 has had one corner sliced off, thus creating a seventh face labelled 7. We want to know the experimental probability for each number being face down when the die is thrown. The results of throwing the die 60 times are shown below:



4	2	5	7	1	4	6	3	5	3	4	6
6	5	5	6	2	3	5	7	5	2	2	4
3	2	7	4	6	3	1	6	4	1	3	1
4	3	5	6	2	3	7	4	2	5	7	6
5	3	6	2	7	6	5	1	5	4	1	4

What are the experimental probabilities for each of the possible outcomes?

Solution

The frequencies of each outcome are:

1—6 times	2—8 times	3—9 times	4—10 times
5—11 times	6—10 times	7—6 times	

The probabilities are:

$$P(1) = \frac{6}{60} \quad P(2) = \frac{8}{60} \quad P(3) = \frac{9}{60} \quad P(4) = \frac{10}{60}$$

$$P(5) = \frac{11}{60} \quad P(6) = \frac{10}{60} \quad P(7) = \frac{6}{60}$$

Remember that these are estimates based on the 60 trials. The results would probably vary a little if we conducted more trials. The more trials we perform, the more accurate our results are likely to be.

If an outcome is impossible (e.g. getting 8 in example 1), then the probability will be 0:

$$P(8) = \frac{0}{60} = 0.$$

Exercise 7.1.1 Seven friends play handball in the school playground. They often argue about which of them is the best player, so they decided to record the results of 100 games. For each game they recorded in a table the player who spent most time at the top position and the player who was eliminated most.

Name	Player with most time at top position	Player with most times eliminated
Varia	HHH HHH IIII 14	HHH HHH 10
Thanh	HHH HHH HHH 15	HHH HHH HHH I 16
Seeza	HHH HHH HHH I 16	HHH HHH HHH HHH 20
Roger	HHH HHH HHH III 18	HHH HHH HHH HHH III 23
Leigh	HHH IIII 9	HHH HHH HHH 15
Lee-Ann	HHH II 7	HHH HHH HHH 15
Greg	HHH HHH HHH HHH I 21	I 1
	Total 100	Total 100

1. For each player find that player's probability in any particular game of spending most of time in top position.

2. For each player find that player's probability in any particular game of being eliminated most.

3. Which player do you consider to be the best at handball? (Give reasons)

4. Which player do you consider to be the worst at handball? (Give reasons)

Exercise 7.1.2 Three students were discussing the possible outcomes when 3 coins are tossed simultaneously. They decided that only 4 different outcomes were possible:

- 3 heads,
- 2 heads and 1 tail,
- 1 head and two tails,
- 3 tails ;

1. They decided that since there were four outcomes the probability for each one would be $\frac{1}{4}$. Do you agree? If you do give reason. If you don't what is the sample space?

2. As a check they decided to perform an experiment tossing one coin each and recording their results. the results of 100 trials are shown in the table below:

3 heads	2 heads and 1 tail	1 head and two tails	3 tails
12	36	38	14

Taking into account the results of their experiment, what are the probabilities of each event? (correct to 2 decimal place)

3. How would you explain this result?

7.2 Theoretical Probability

The probability of an event A is given by:

$$P(A) = \frac{\text{number of outcomes favourable to } A}{\text{total number of possible outcomes}}$$

Example 1

Ten identical pieces of cardboard are numbered 1 to 10. One card is chosen at random. What is the probability that it is:

- a 3? b even? c either 4 or 7? d less than 7? e greater than 12?

Solutions

- a $\frac{1}{10}$ (number of outcomes favourable = 1)
 b $\frac{5}{10} = \frac{1}{2}$ (2, 4, 6, 8, 10 are all favourable outcomes)
 c $\frac{2}{10} = \frac{1}{5}$ (4 and 7 are favourable)
 d $\frac{6}{10} = \frac{3}{5}$ (1, 2, 3, 4, 5, 6 are favourable)
 e 0 (there are no cards greater than 12)

Exercise 7.2.1 A card is drawn at random from a normal deck of 52 cards. What is the probability of it being:

1. the three of spades? _____
2. Ace of club? _____
3. a Jack, Queen or King? _____
4. any of four Aces? _____
5. a black heart? _____

Exercise 7.2.2 A bag contains 3 object of identical size but not all the same colour. A blindfolded person draws one object from the bag, its colour is noted by an assistant, and the object is returned to the bag.

1. How many trials would you require to be confident that you knew the colours of the 3 objects?

2. If the bag contains 10 objects, how many trials would you need to be confident of the colours of the objects?

Exercise 7.2.3

1. Which of these events has the highest probability?

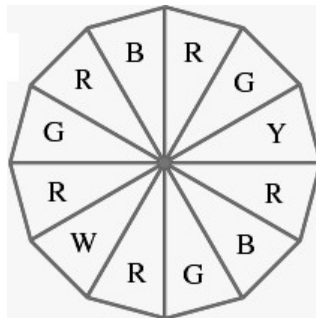
- (a) Tossing a head on a coin.
- (b) Rolling a two on a normal die.
- (c) Choosing Monday at random from the days of the week.
- (d) Randomly choosing an e from the vowels **a, e, i, o** and **u**.

2. The probability of any spelling test being on a Monday is $\frac{1}{5}$. If there were 200 spelling tests, how many of them would you expect to be on a Monday?

3. A bag contains 24 balls. If a ball is drawn at random, we know that:

$P(\text{green}) = \frac{1}{8}$, $P(\text{yellow}) = \frac{1}{4}$, $P(\text{red}) = \frac{5}{8}$, what are the contains of the bag?

4. The spinner is spun. What is the probability of it stopping on:



(a) $P(\text{Green})?$ _____

(b) $P(\text{Red})?$ _____

(c) $P(\text{Yellow})$ _____

(d) $P(\text{White})?$ _____

7.3 Miscellaneous exercises

Exercise 7.3.1

1. As a visitor to a school you visit a class where the students are doing a test. The teacher says “The person who tops the class will probably be a girl.” What can you deduce from this remark?

2. A four digit number is formed using the digit 2, 4, 6, 8. What is the probability that the number is:

(a) Begin with 6 _____

(b) is less than 5000? _____

(c) is greater than 5000? _____

3. A bag contains 24 balls. When a ball is drawn at random we know that:

$P(\text{black}) = \frac{1}{3}$, $P(\text{white}) = \frac{1}{6}$, $P(\text{red}) = \frac{1}{4}$ and $P(\text{blue}) = \frac{1}{4}$. What are the contents of the bag?

4. Two friends each have a pack of 52 cards. They each draw a card at random from the pack. What is the probability that they have both drawn:

(a) the same number? _____

(b) the same suit? _____

(c) the same card? _____

5. A boy rolls two ordinary dice. What is the probability that both dice show the same number?

7.4 Maths challenge

Exercise 7.4.1

1. A circle and a triangle overlap as shown. The area of the circle is three times the area of the triangle. If the common region is removed, the the area of the rest of the circle would be 14 cm^2 more than the area of the rest of the triangle. What is the area of the complete triangle?



2. Ben and Ken compete in more than one event, No one else competes. In each event, the winner gets the number of points W and the loser gets the number of points L . Both W and L are whole numbers. There are no ties. Ben wins the competition by a score of 22 to 13. If Ken wins exactly one event, what is the value of W ?

3. A ship travels from A to B in 5 hours. If it travels from B to A, it will take 7 hours. Suppose the direction and the speed of the the current remain constant. How long does it take for a raft floating along the water to go from A to B?

4. George has some jelly beans in two bags. In one bag he has 4 yellow, 1 black , 4 orange and 3 white jelly beans. In the other bag he has 3 yellow, 4 black, 3 orange and 2 white jelly beans. If George takes one jelly bean out of each bag, what is the likelihood that both of the jelly beans are yellow?