

7.1 The Letter Picking Puzzles

Example



One letter is chosen at random from the letter tiles.
It is replaced.
Then a second letter is chosen at random.

Find the probability that the letters picked are;

- (i) T first, *and* then O

HINT : T *and* O
and means *multiply*
 $p(T) \times p(O)$

- (ii) T *and* O

HINT : T *and* O *or* O *and* T
and means *multiply*
or means *add*
 $p(T) \times p(O) + p(O) \times p(T)$

- (iii) T *and* T

HINT : T *and* T
and means *multiply*
 $p(T) \times p(T)$

NOTICE :

- (i) One way of getting T first, and then O
- (ii) Two ways of getting a T and an O
- (iii) One way of getting T and a T



(iv) vowel first, *and* then consonant

(v) vowel *and* consonant

(vi) two consonants

7.2 Vulgar Fractions Vs Decimal Fractions

In our example we are able to easily give *exact* answers by using vulgar fractions. That is, fractions written in the form,

$$\frac{p}{q} \text{ where } p \text{ and } q \text{ are integers, } q \neq 0$$

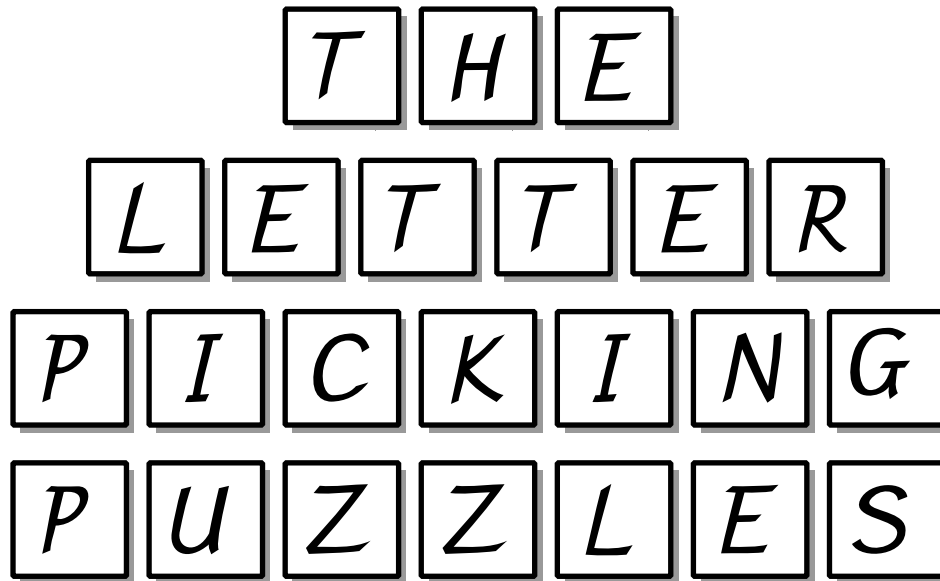
Decimal fractions in our example would necessitated rounding. For example,

$$\frac{6}{49} = 0.122\ 448\ 979\ 6\dots \quad \text{rounds to } 0.122$$

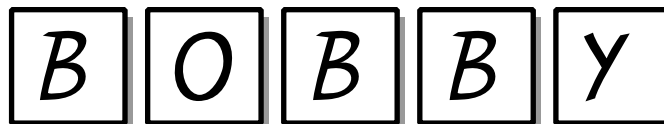
Squaring a vulgar fraction mentally is typically easier than squaring a decimal fraction.

Thus, in probability, it's often preferable to use vulgar fractions rather than decimal fractions. However, some GCSE questions will use terminating decimals to make a question more accessible to candidates who are not confident with manipulating vulgar fractions.

7.3 Exercise



Question 1



One letter is chosen at random from the letter tiles.

It is replaced.

Then a second letter is chosen at random.

Find the probability that the letters picked are;

(i) **B** first, *and* then **Y**

HINT : *B and Y*
and means *multiply*
 $p(B) \times p(Y)$

(ii) **B and Y**

HINT : *B and Y or Y and B*
and means *multiply*
or means *add*
 $p(B) \times p(Y) + p(Y) \times p(B)$

(iii) **B and B**

HINT : *B and B*
and means *multiply*
 $p(B) \times p(B)$

Question 2



One letter is chosen at random from the letter tiles.

It is replaced.

Then a second letter is chosen at random.

Find the probability that the letters picked are;

(i) **A** first, *and* then **T**

(ii) **A** *and* **T**

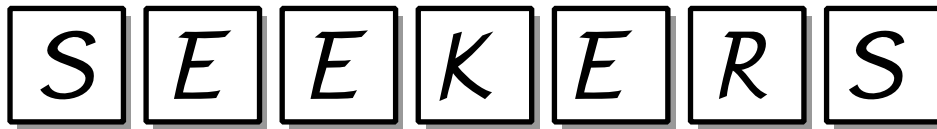
(iii) **T** *and* **T**

(iv) vowel first, *and* then consonant

(v) vowel *and* consonant

(vi) two vowels

Question 3



One letter is chosen at random from the letter tiles.

It is replaced.

Then a second letter is chosen at random.

Find the probability that the letters picked are;

(i) **S** first, *and* then **K**

(ii) **S** *and* **K**

(iii) **S** *and* **S**

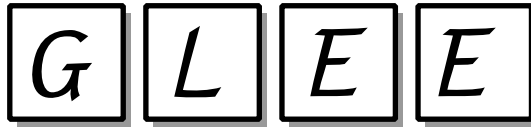
(iv) consonant first, *and* then vowel

(v) consonant *and* vowel

(vi) two consonants

Question 4

In this question, don't cancel down any fractions.



One letter is chosen at random from the letter tiles.

It is replaced.

Then a second letter is chosen at random.

Find the probability that the letters picked are;

(i) **G and G**

(ii) **L and L**

(iii) **E and E**

(iv) **The same letter is picked twice.**

Question 5



One letter is chosen at random from the letter tiles.

It is replaced.

Then a second letter is chosen at random.

Find the probability that the letters picked are;

(i) C first, *and* then U

(ii) C *and* U

(iii) U *and* U

(iv) consonant first, *and* then vowel

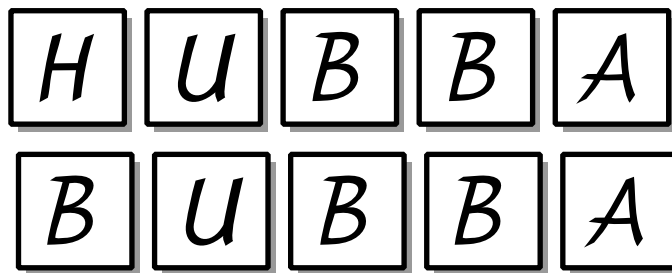
(v) consonant *and* vowel

(vi) two consonants



Question 6.

In this question, don't cancel down any fractions.



One letter is chosen at random from the letter tiles.

It is replaced.

Then a second letter is chosen at random.

Find the probability that the letters picked are;

(i) **B** first, *and* then **U**

(ii) **H** *and* **A**

(iii) vowel *and* consonant

Question 7

A multipack bag of crisps contains

- * 3 *ready salted*
- * 4 *salt & vinegar*
- * 2 *cheese & onion*
- * 2 *prawn cocktail*

A bag is chosen at random then replaced.

A second bag is then chosen at random.

What is the probability that the following are chosen:

- (i) First *salt & vinegar*, then *prawn cocktail*.

- (ii) First *prawn cocktail*, then *salt & vinegar*.

- (iii) *Prawn cocktail* and *salt & vinegar*.

- (iv) *Ready salted* and *cheese & onion*.

Question 8

An iPod holds five tunes.

- * *American π* .
- * *Do the Fraction Frolic NOW !*
- * *I kissed Pythagoras (and I liked it)*.
- * *She were number crazy*.
- * *The Spinner Takes It All*.

Two tracks are played at random.

What is the probability that the following are the first two tunes played:

- (i) First *American π* , then *She were number crazy*.

- (ii) *American π* and *She were number crazy*.

Question 9

I've decided to use a coin to walk randomly along a corridor.

If I spin Heads I walk ten steps forward.

If I spin Tails I walk ten steps back.

What is the probability that after four spins that I've walked from my starting position:

- (i) Forty steps forward.
- (ii) Thirty steps forward.
- (iii) Twenty steps forward.

Question 10

One letter is chosen at random from the word;

I L L U M I N A T I O N

It is replaced, and then a second letter is chosen, again at random.

Find the probability that;

(So that answers may be easily compared, do not cancel down your answers)

- (i) the M is chosen first and the M is chosen second
- (ii) an N is chosen first and an N is chosen second
- (iii) the U is chosen first and the O is chosen second
- (iv) the U and the O are chosen
- (v) an I is chosen first and an L is chosen second
- (vi) a vowel is chosen each time
- (vii) a vowel is chosen once
- (viii) no vowel is chosen

Question 11

A number is chosen at random from the following list;

3, 5, 6, 8, 14.

It is replaced and a second number is chosen from the list.

Find the probability that;

- (i) The 5 is chosen first and the 14 is chosen second.

- (ii) The 5 and 14 are chosen.

- (iii) No numbers other than the 5 and the 14 are involved.

Question 12

First one and then a second letter is chosen at random from this sentence.

What is the probability that it is an "e" both times ?

Question 13

The PIN numbers used in the "chip & pin" system are four digit numbers.

In trying to access an account, three attempts are permitted.

What is the probability of a thief, entering one four digit number at random, gets in ?