I.G.C.S.E. Probability

Index:

Please click on the question number you want

Question 1 **Question 2**

Question 3 **Question 4**

Question 5 **Question 6**

You can access the solutions from the end of each question

Question 1

A fair die is thrown once. Find the probability of obtaining a

a. a one
b. an odd number
c. number less than three
d. a prime number

Click here to read the solution to this question

Click here to return to the index

Solution to question 1

a. The possibility space is $\{1, 2, 3, 4, 5, 6\}$

$$p(\text{a one}) = \frac{1}{6}$$

b. The odd numbers are $\{1, 3, 5\}$

$$p(\text{an odd number}) = \frac{3}{6} = \frac{1}{2}$$

c. The numbers less than three are $\{1, 2\}$

$$p(\text{a number less than three}) = \frac{2}{6} = \frac{1}{3}$$

d. The prime numbers are $\{2, 3, 5\}$. Note: 1 is not a prime number.

$$p(\text{a prime number}) = \frac{3}{6} = \frac{1}{2}$$

Click here to read the question again

Click here to return to the index

Question 2

One letter is selected from the word ‘MATHEMATICS’. Find the probability of selecting

a. an A
b. a M
c. a M or a T
d. a vowel
e. a K

Click here to read the solution to this question

Click here to return to the index

Solution to question 2

Considering the word ‘MATHEMATICS’, there are eleven letters.

a. There are two A’s, therefore $p(\text{an A}) = \frac{2}{11}$

b. There are two M’s, therefore $p(\text{a M}) = \frac{2}{11}$

c. The event picking a M or a T are mutually exclusive, (they cannot happen at the same time). Therefore we must add the corresponding probabilities.

$$p(\text{a M or a T}) = p(\text{a M}) + p(\text{a T})$$
$$= \frac{2}{11} + \frac{2}{11}$$
$$= \frac{4}{11}$$

d. The vowels are $\{\text{a, e, i, o, u}\}$. The word MATHEMATICS contains two A’s, one E, and one I, which makes four in total.

$$p(\text{a vowel}) = \frac{4}{11}$$

e. There are no K’s in the word MATHEMATICS.

$$p(\text{a K}) = 0$$

Click here to read the question again

Click here to return to the index

Question 3

A red die and a blue die are both thrown.
Display all the possible outcomes on a probability space diagram
Find the probability of scoring

a. a total of 7,
b. more than 8,
c. less than 5.

Click here to read the solution to this question

Click here to return to the index

Solution to question 3

Displaying all the possible outcomes on a probability space diagram

blue die	red die 1	2	3	4	5	6
6	**7**	8	9	10	11	12
5	6	**7**	8	9	10	11
4	5	6	**7**	8	9	10
3	4	5	6	**7**	8	9
2	3	4	5	6	**7**	8
1	2	3	4	5	6	**7**

a. From the diagram we can see that there are 36 possible outcomes.
There are six ways that we can get a 7 shown in **red** on the diagram.

$$p(\text{a total of } 7) = \frac{6}{36} = \frac{1}{6}$$

b. The numbers more than 8 are marked in **green** on the diagram.

blue die	red die 1	2	3	4	5	6
6	7	8	**9**	**10**	**11**	**12**
5	6	7	8	**9**	**10**	**11**
4	5	6	7	8	**9**	**10**
3	4	5	6	7	8	**9**
2	3	4	5	6	7	8
1	2	3	4	5	6	7

There are 10 possible outcomes.

$$p(\text{more than } 8) = \frac{10}{36} = \frac{5}{18}$$

c. The numbers less than 5 are marked in **orange** in the diagram.

blue die	red die 1	2	3	4	5	6
6	7	8	9	10	11	12
5	6	7	8	9	10	11
4	5	6	7	8	9	10
3	**4**	5	6	7	8	9
2	**3**	**4**	5	6	7	8
1	**2**	**3**	**4**	5	6	7

There are 10 possible outcomes.

$$p(\text{less than } 5) = \frac{6}{36} = \frac{1}{6}$$

Click here to read the question again

Click here to return to the index

Question 4

A coin and a die are thrown. Write down the probability of obtaining

a. a head and an even number on the die

b. a tail and 3 or 4 on the die.

Click here to read the solution to this question

Click here to return to the index

Solution to question 4

A coin and a die are thrown. Write down the probability of obtaining

a. The events a head and an even number on the die are independent i.e one event does not affect the other.

Either

$$p(\text{a head on a coin}) = \frac{1}{2} \text{ and the } p(\text{an even number on a die}) = \frac{3}{6} = \frac{1}{2}$$

$$p(\text{a head and an even number}) = p(\text{a head}) \times p(\text{an even number})$$

$$= \frac{1}{2} \times \frac{1}{2}$$

$$= \frac{1}{4}$$

or drawing a possibility space diagram we can see that the possibility space is 12. There are three possible outcomes of getting a head and a even number.

coin

H	H,1	**H,2**	H,3	**H,4**	H,5	**H,6**
T	T,1	T,2	T,3	T,4	T,5	T,6
	1	**2**	**3**	**4**	**5**	**6**

die

$$p(\text{a head and an even number}) = \frac{3}{12} = \frac{1}{4}$$

b. The events of getting a tail and 3 or 4 on the die are mutually exclusive ie cannot happen at the same time. The two outcomes are marked on the possibility space in **green**.

coin

H	H,1	H,2	H,3	H,4	H,5	H,6
T	T,1	T,2	**T,3**	**T,4**	T,5	T,6
	1	**2**	**3**	**4**	**5**	**6**

die

$$p(\text{a tail and 3 or 4 on the die}) = \frac{2}{12} = \frac{1}{6}$$

Click here to read the question again

Click here to return to the index

Question 5

A bag contains 5 green balls and 3 blue balls. A ball is drawn and is **not** replaced. A second ball is drawn. Draw a tree diagram to show all the possible outcomes.
Find the probability of drawing,

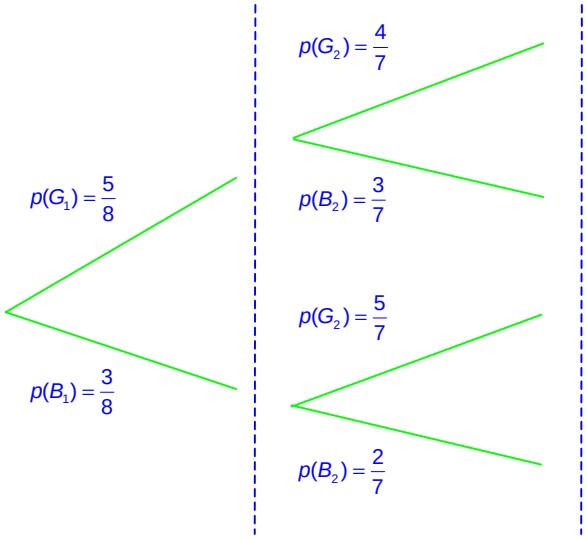
a. two green balls,
b. one green ball and one blue ball.
c. at least one blue ball.

Click here to read the solution to this question

Click here to return to the index

Solution to question 5

Drawing a tree diagram to show all the possible outcomes.



$$p(G_1 \text{ and } G_2)=\left(\frac{5}{8}\right)\left(\frac{4}{7}\right)=\frac{20}{56}$$

$$p(G_1 \text{ and } B_2)=\left(\frac{5}{8}\right)\left(\frac{3}{7}\right)=\frac{15}{56}$$

$$p(B_1 \text{ and } G_2)=\left(\frac{3}{8}\right)\left(\frac{5}{7}\right)=\frac{15}{56}$$

$$p(B_1 \text{ and } B_2)=\left(\frac{3}{8}\right)\left(\frac{2}{7}\right)=\frac{6}{56}$$

a. $p(\text{two green balls}) = p(G_1 \text{ and } G_2)=\left(\frac{5}{8}\right)\left(\frac{4}{7}\right)=\frac{20}{56}=\frac{5}{14}$

b. Considering the tree diagram

$$\begin{aligned} p(\text{one green ball and one blue ball}) &= p(G_1 \text{ and } B_2)+p(B_1 \text{ and } G_2) \\ &=\left(\frac{5}{8}\right)\left(\frac{3}{7}\right)+\left(\frac{3}{8}\right)\left(\frac{5}{7}\right) \\ &=\frac{15}{56}+\frac{15}{56} \\ &=\frac{30}{56} \\ &=\frac{15}{28} \end{aligned}$$

c. $p(\text{at least one blue ball}) = 1-p(\text{two green balls})$

$$\begin{aligned} &=1-\frac{5}{14} \\ &=\frac{9}{14} \end{aligned}$$

Click here to read the question again

Click here to return to the index

Question 6

A study is made of a group of students. In the group there are 14 boys and 16 girls. Of the boys it is found 8 of them like Mathematics and of the girls 10 like Mathematics. Draw a tree diagram and find the probability that a student chosen at random

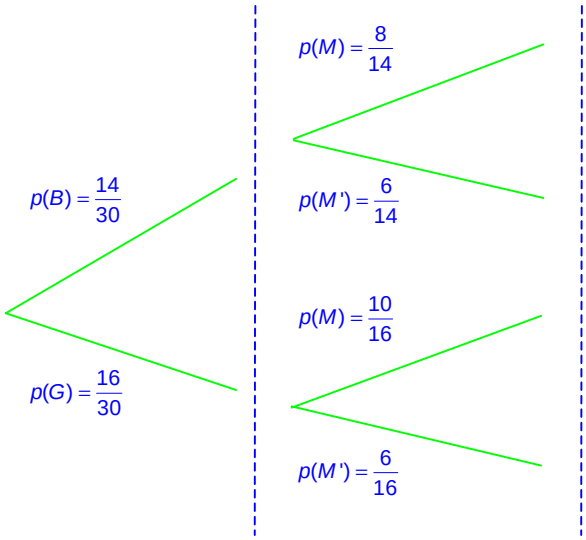
a. is a boy and likes Mathematics.
b. is a girl and does not like Mathematics
c. likes Mathematics.

Click here to read the solution to this question

Click here to return to the index

Solution to question 6

Drawing the tree diagram



$$p(B \text{ and } M) = \left(\frac{14}{30}\right)\left(\frac{8}{14}\right) = \frac{8}{30}$$

$$p(B \text{ and } M') = \left(\frac{14}{30}\right)\left(\frac{6}{14}\right) = \frac{6}{30}$$

$$p(G \text{ and } M) = \left(\frac{16}{30}\right)\left(\frac{10}{16}\right) = \frac{10}{30}$$

$$p(G \text{ and } M') = \left(\frac{16}{30}\right)\left(\frac{6}{16}\right) = \frac{6}{30}$$

a. $p(\text{a boy and likes Mathematics}) = p(B \text{ and } M) = \left(\frac{14}{30}\right)\left(\frac{8}{14}\right) = \frac{8}{30} = \frac{4}{15}$

b. $p(\text{a girl and does not like Mathematics})$

$$= p(G \text{ and } M') = \left(\frac{16}{30}\right)\left(\frac{6}{16}\right) = \frac{6}{30} = \frac{1}{5}$$

c. $p(\text{likes Mathematics}) = p(B \text{ and } M) + p(G \text{ and } M)$

$$= \left(\frac{14}{30}\right)\left(\frac{8}{14}\right) + \left(\frac{16}{30}\right)\left(\frac{10}{16}\right)$$

$$= \frac{10}{30} + \frac{8}{30}$$

$$= \frac{18}{30}$$

$$= \frac{3}{5}$$

Click here to read the question again

Click here to return to the index