Discrete Maths (Q 6 & 7, Paper 2)

Lesson No. 4: Simple Probability

2006

6 (a) (i) How many different teams of three people can be chosen can be chosen from a panel of six boys and five girls?

(ii) If the team is chosen at random, find the probability that it consists of girls only?

Solution

6 (a) (i)

You are asked to choose teams of 3 people from 11 people.

6B 5G
↓
3 Places

$$^{11}C_3 = \frac{11\times10\times9}{3\times2\times1} = 165$$

6 (a) (ii)

The number of ways teams of 3 girls can be chosen from 5 girls:

6B ↓ 0 Places
5G ↓ 3 Places

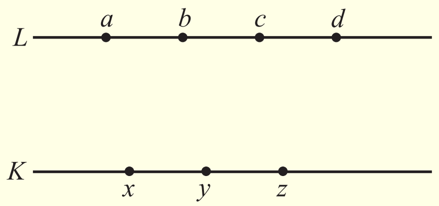
$$^{5}C_3 = \frac{5\times4\times3}{3\times2\times1} = 10$$

p(Choosing a girls team) $= \frac{10}{165} = \frac{2}{33}$

$$p(E) = \frac{\text{Number of desired outcomes}}{\text{Total possible number of outcomes}} = \frac{\#(E)}{\#(S)}$$ …… 12

2003

7 (b)



L and K are distinct parallel lines.

a, b, c and d are points on L such that $|ab| = |bc| = |cd| = 1$ cm.

x, y and z are points on K such that $|xy| = |yz| = 1$ cm.

(i) How many different triangles can be constructed using three of the named points as vertices?

(ii) How many different quadrilaterals can be constructed using four of the named points as vertices?

(iii) How many different parallelograms can be constructed using four of the named points as vertices?

(iv) If one quadrilateral is constructed at random, what is the probability that it is *not* a parallelogram?

SOLUTION

7 (b) (i)

To calculate the number of triangles you need to pick any two points from L $({}^4C_2)$ AND one point from K $({}^3C_1)$ OR one point from L $({}^3C_2)$ AND two points from K $({}^4C_1)$.

No. of triangles = ${}^4C_2 \times {}^3C_1 + {}^3C_2 \times {}^4C_1 = 6\times3+3\times4 = 18+12 = 30$

7 (b) (ii)

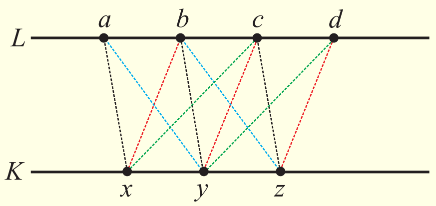
To calculate the number of quadrilaterals you need to pick any two points from L $({}^4C_2)$ AND any two points from K $({}^3C_2)$.

No. of quadrilaterals = ${}^4C_2 \times {}^3C_2 = 6\times3 = 18$

7 (b) (iii)

To calculate the number of parallelograms you need to draw them.

No. of parallelograms = 8



7 (b) (iv)

$$p(E) = \frac{\text{Number of desired outcomes}}{\text{Total possible number of outcomes}} = \frac{\#(E)}{\#(S)} \quad \text{......} \quad \textbf{12}$$

#S: No. of quadrilaterals = 18

#E: No. of quadrilaterals that are *not* parallelograms = 10

p(Quadrilateral that is not a parallelogram) $= \frac{10}{18} = \frac{5}{9}$

2002

7 (a) Two unbiased dice, each with faces numbered 1 to 6, are thrown.

(i) What is the probability of getting a total equal to 8?

(ii) What is the probability of getting a total less than 8?

SOLUTION

7 (a)

	1	2	3	4	5	6
1	(1, 1)	(1, 2)	(1, 3)	(1, 4)	(1, 5)	(1, 6)
2	(2, 1)	(2, 2)	(2, 3)	(2, 4)	(2, 5)	(2, 6)
3	(3, 1)	(3, 2)	(3, 3)	(3, 4)	(3, 5)	(3, 6)
4	(4, 1)	(4, 2)	(4, 3)	(4, 4)	(4, 5)	(4, 6)
5	(5, 1)	(5, 2)	(5, 3)	(5, 4)	(5, 5)	(5, 6)
6	(6, 1)	(6, 2)	(6, 3)	(6, 4)	(6, 5)	(6, 6)

$$p(E) = \frac{\text{Number of desired outcomes}}{\text{Total possible number of outcomes}} = \frac{\#(E)}{\#(S)}$$ 12

The table above is the sample space, S. $\Rightarrow \#(S) = 36$

7 (a) (i)

E = {(6, 2), (5, 3), (4, 4), (3, 5), (2, 6)}

$\Rightarrow \#(E) = 5 \Rightarrow p = \frac{5}{36}$

7 (a) (ii)

$\#(E) = 21 \Rightarrow p = \frac{21}{36} = \frac{7}{12}$

2002

7 (c) A palindromic number is one that reads the same backwards as forwards, such as 727 or 38183.

(i) The year, 2002, is a palindromic year. When is the next palindromic year?

(ii) How many palindromic years are there from 1000 to 9999 inclusive?

(iii) A whole number, greater than 9 and less than 10 000, is selected at random. What is the probability that the number is palindromic?

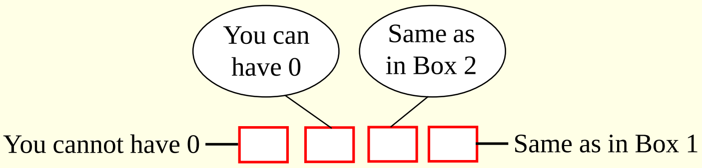
SOLUTION

7 (c) (i)

The next palindromic year is 2112.

7 (c) (ii)

You are being asked how many four digit palindromic numbers there are.

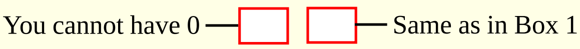


Number of ways = 9 × 10 × 1 × 1 = 90

7 (c) (iii)

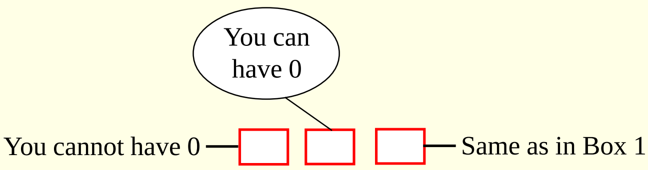
Firstly, you are being asked how many two digit, three digit and four digit palindromic numbers exist?

2 digit palindromic numbers:



Number of ways = 9 × 1 = 9

3 digit palindromic numbers:



Number of ways = 9 × 10 × 1 = 90

No. of palindromic numbers between 9 and 10,000 = 9 + 90 + 90 = 189

No. of numbers between 9 and 10,000 = 9,990

$$p(E) = \frac{\text{Number of desired outcomes}}{\text{Total possible number of outcomes}} = \frac{\#(E)}{\#(S)}$$ 12

p(Picking a palindromic number) $= \frac{189}{9990} = \frac{7}{370}$