

# Solutions

Nov 20-18:35

1. Three cards are drawn from a deck without replacement. What is the probability that they will be a king, a queen, and a jack, in that order?

$$\text{Total arrangements} = 52P_3$$

$$\text{Arrangement of King} = 4P_1$$

$$\text{Arrangement of Queen} = 4P_1$$

$$\text{Arrangement of Jack} = 4P_1$$

$$P(KQJ) = \frac{4P_1 \times 4P_1 \times 4P_1}{52P_3}$$

$$= \frac{4 \times 4 \times 4}{132600} = \frac{8}{16575}$$

multiply  
because K  
AND Q AND J

Sep 20-22:17

3. Five names are selected at random from a list of 25 names. What is the probability that they will be in alphabetical order?

A  $\frac{1}{25^5 P_5}$

B  $\frac{5!}{25^5 P_5}$

C  $\frac{1}{25^5}$

D  $\frac{5}{25!}$

Total arrangements =  $25 P_5$

Arrangement being alphabetical = 1

$$P(\text{alphabetical}) = \frac{1}{25 P_5}$$

Sep 20-22:17

4. A standard die is rolled four times. What is the probability that it shows a number divisible by three all four times?

A  $\frac{1}{3}$

B  $\frac{1}{6}$

C  $\frac{1}{81}$

D  $\frac{1}{12}$

Independent events

#s divisible by 3 are: 3 and 6

$$P(\text{divisible by 3}) = \frac{2}{6} = \frac{1}{3}$$

$$P(\text{divisible by 3, four times}) = \left(\frac{1}{3}\right)^4$$

$$= \frac{1}{81}$$

Sep 20-22:17

8. What is the probability that a family has all boys, in a family of

- a) 3 children?      b) 4 children?  
c) 5 children?      d)  $n$  children?

Independent events

$$P(\text{Boy}) = \frac{1}{2}$$

$$a) P(3 \text{ boys}) = \left(\frac{1}{2}\right)^3 = \frac{1}{8}$$

$$b) P(4 \text{ boys}) = \left(\frac{1}{2}\right)^4 = \frac{1}{16}$$

$$c) P(5 \text{ boys}) = \left(\frac{1}{2}\right)^5 = \frac{1}{32}$$

$$d) P(n \text{ boys}) = \left(\frac{1}{2}\right)^n = \frac{1}{2^n}$$

Sep 20-22:17

9. A four-letter word jumble is being formed from the letters in the word LOGARITHM.

- a) What is the probability it spells MATH?  
b) What is the probability it includes the letters M, A, T, and H?  
c) What is the probability it includes the letter M?

Dependent events  
letter are not replaced

$$a) P(M) = \frac{1}{9} \quad P(T) = \frac{1}{7}$$

$$P(A) = \frac{1}{8} \quad P(H) = \frac{1}{6}$$

$$\Rightarrow P(\text{MATH}) = \frac{1}{9} \times \frac{1}{8} \times \frac{1}{7} \times \frac{1}{6} = \frac{1}{3024}$$

$$b) = \frac{4}{9} \times \frac{3}{8} \times \frac{2}{7} \times \frac{1}{6} = \frac{24}{3024} = \frac{1}{126}$$

$$c) P(\text{includes M}) = 1 - P(\text{no M})$$

$$= 1 - \left(\frac{8}{9} \times \frac{7}{8} \times \frac{6}{7} \times \frac{5}{6}\right)$$

$$= 1 - \frac{1680}{3024} = 1 - \frac{5}{9} = \frac{4}{9}$$

Sep 20-22:17