

PROBABILITY

- 1) A box contains 23 red, 12 blue and 17 yellow juggling balls. If I choose one ball from the box at random, what is the probability that it will be red?
- 2) There are 50 tickets sold in a raffle. If Jane buys 5 tickets, what is the probability that she will win first prize in the raffle?
- 3) "I threw a coin 10 times and it came up heads each time. So it is more likely to come up tails on the next throw." Is this statement true? Write a sentence or two to support your answer.
- 4) "There are 12 football teams in a competition. So my favourite team, the Tasmanian Tigers, has a probability of $\frac{1}{12}$ of winning the competition."
Comment on the truth of this statement in a sentence or two.
- 5) In a survey it was found that $\frac{2}{3}$ of the people in Littletown want a statue of the mayor in the park. If I choose one person from Littletown at random, find the probability that the person does not want a statue of the mayor in the park.
- 6) A bag contains red and green marbles. The probability of choosing a red marble at random is $\frac{2}{5}$.
 - (a) What is the probability of choosing a green marble at random?
 - (b) If I add another 7 red marbles to the bag, the probability of choosing a red marble changes to $\frac{1}{2}$. How many marbles are there in the bag now?
- 7) If I throw a die, find the probability of throwing
 - (a) a 6
 - (b) an odd number
 - (c) a number less than 3
 - (d) an odd number or a number less than 3.
- 8) In a class of 30 students, 12 study Physics, 14 study Chemistry and 9 study neither. If one student is surveyed at random, find the probability that he/she studies
 - (a) both Physics and Chemistry
 - (b) Chemistry only.
- 9) Sarah throws two dice. Find the probability of getting
 - (a) a pair of 3s
 - (b) any pair
 - (c) at least one 4
 - (d) a total of 9
 - (e) a total greater than 8
- 10) There is a 12% probability of a particular television breaking down at any one time. What is the probability that two of these televisions will both be broken down?

- 11) If there are 100 tickets sold in a raffle and Lee buys 3 tickets, find the probability of Lee winning
- (a) first prize
 - (b) both first and second prize.
- 12) The probability of certain plant growing taller than 4 metres is $\frac{1}{3}$. If I plant 2 of these plants, find the probability that
- (a) one
 - (b) both
- of them will grow more than 4 metres tall.
- 13) A bag contains 5 white, 3 red and 6 yellow balls. If two balls are chosen at random, find the probability that there will be a red and a yellow ball
- (a) if the first ball is replaced before choosing the second
 - (b) if there is no replacement.
- 14) A certain type of bird has a probability of $\frac{1}{12}$ of hatching a bird with white feathers. If a bird lays three eggs, find the probability of hatching
- (a) exactly one bird with white feathers
 - (b) at least one bird with white feathers.
- 15) A class has 12 males and 15 females. There are 7 males and 9 females in the class who play tennis. If a student is chosen from the class at random, find the probability that the student is
- (a) a female who doesn't play tennis
 - (b) a male tennis player.
- 16) (a) If 20 coins are tossed, find the probability that they will all come up tails.
(b) If n coins are tossed, find the probability that they will all come up tails.
- 17) A factory makes televisions and video machines. By checking for faults regularly, it is found that on average, 5 out of every 300 televisions are faulty and 8 out of every 200 video machines are faulty.
- (a) If I check 2 televisions and 1 video machine at random, what is the probability that exactly one of them is faulty?
 - (b) How many televisions must be checked so that the probability of at least one being faulty is greater than 0.95?
- 18) One hundred and fifty four blue Smarties were mixed into a batch of Smarties that did not contain any blue ones previously. Later, a sample of 300 Smarties was taken from the batch at random. There were 55 blue Smarties in this sample. Estimate how many Smarties there were in the original batch before the extra blue ones were added.
- 19) A menu has 5 entrees, 8 main courses and 4 desserts from which to choose.
- (a) How many different combinations are possible for a meal containing an entree, a main course and a dessert?
 - (b) In how many different ways can a meal of a main course and dessert be chosen?
- 20) (a) How many possible phone numbers are there with 7 digits, if the first digit cannot be 0?

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- (b) Phone numbers now have 8 digits, and the first cannot be 0. How many more phone numbers are possible now than with 7 digits?
- 21) Evaluate 8P_5
- 22) Evaluate 7P_2
- 23) How many arrangements of 3 digit numbers can be made from the numbers 1, 2, 3, 4 and 5 if
- (a) all digits may be repeated
 - (b) no digit can be repeated
 - (c) no digit can be repeated and the number is even
 - (d) all digits may be repeated and the number is more than 400?
- 24) (a) How many combinations can be made from the word MATHEMATICS?
(b) How many arrangements are possible if the letters I and C are together?
(c) If I choose one letter at random from the word MATHEMATICS, what is the probability that it is the letter M?
- 25) A table has 7 chairs around it.
- (a) In how many ways can 7 people be arranged around the table?
 - (b) Find the probability that two friends will sit together if seating is at random.
 - (c) In how many ways can the seating be arranged if two people do not want to sit together?
- 26) A queue has 5 men and 4 women in it. In how many ways can the queue be arranged if
- (a) the men and women alternate
 - (b) all the women stand together
 - (c) the men and women can stand anywhere in the queue?
- 27) A necklace has 10 beads around it.
- (a) How many different arrangements are possible?
 - (b) If half the beads are pink and the other half grey, in how many ways can they be arranged so that the colours alternate?
- 28) (a) In a class of 30 students, 5 are randomly chosen to form a study group. In how many ways can the group be formed?
(b) If the class has 14 males and 16 females, and the group is to have 2 males and 3 females, in how many ways can the group be chosen?
- 29) There are 10 sales positions available and 35 people apply.
- (a) How many combinations are possible in the 10 positions if the selection is random?
 - (b) Four of these positions are in the country and only 12 of the people who applied are interested in these positions. In how many ways can these positions be filled?
 - (c) Seven of the 10 positions are filled from the 35 applicants. How many combinations are possible for the remaining positions?
- 30) A coin is tossed 12 times. Find the probability of tossing
- (a) 5 tails
 - (b) 2 or 3 heads
 - (c) at least 10 tails.

- 31) The probability of a certain brand of stereo being faulty is $\frac{1}{12}$. If a store buys 8 of these stereos, find the probability that 3 are faulty (leave your answer in index form).
- 32) A certain strain of tomato plants has a $\frac{2}{5}$ chance of producing a miniature tomato. If 4 of these plants are grown, find the probability that
- (a) all have miniature tomatoes
 - (b) 2 have miniature tomatoes
 - (c) at least one plant has miniature tomatoes.
- 33) A department store has 6 different entrances. Five people arrive at the store at a certain time. Find the probability that
- (a) all 5 people use the same entrance
 - (b) 4 people use the same entrance and the other person uses a different entrance
 - (c) all 5 use a different entrance from each other.

ANSWERS

- 1) $\frac{23}{52}$
- 2) $\frac{1}{10}$
- 3) False - each throw is independent of the one before it. The probability is $\frac{1}{2}$.
- 4) False - probability of winning is not random. Different skills and other factors need to be taken into account, so the probability of any team winning is not equally likely.
- 5) $\frac{1}{3}$
- 6) (a) $\frac{3}{5}$ (b) 42
- 7) (a) $\frac{1}{6}$ (b) $\frac{1}{2}$ (c) $\frac{1}{3}$ (d) $\frac{2}{3}$
- 8) (a) $\frac{1}{6}$ (b) $\frac{3}{10}$
- 9) (a) $\frac{1}{36}$ (b) $\frac{1}{6}$ (c) $\frac{11}{36}$ (d) $\frac{1}{9}$ (e) $\frac{5}{18}$
- 10) 1.44%
- 11) (a) $\frac{3}{100}$ (b) $\frac{1}{1650}$
- 12) (a) $\frac{4}{9}$ (b) $\frac{1}{9}$
- 13) (a) $\frac{9}{49}$ (b) $\frac{18}{91}$
- 14) (a) $\frac{121}{576}$ (b) $\frac{397}{1728}$
- 15) (a) $\frac{2}{9}$ (b) $\frac{7}{27}$
- 16) (a) $\frac{1}{2^{20}} = \frac{1}{1048576}$ (b) $\frac{1}{2^n}$
- 17) (a) $\frac{6313}{90000}$ (b) 179
- 18) 686
- 19) (a) 160 (b) 32
- 20) (a) 9 000 000 (b) 81 000 000
- 21) 6720
- 22) 42
- 23) (a) 125 (b) 60 (c) 24 (d) 50

24) (a) 4 989 600 (b) 907 200 (c) $\frac{1}{2494800}$

25) (a) 720 (b) $\frac{1}{3}$ (c) 480

26) (a) 2880 (b) 17 280 (c) 362 880

27) (a) 181 440 (b) 1440

28) (a) 142 506 (b) 50 960

29) (a) 183 579 396 (b) 495 (c) 3276

30) (a) $\frac{99}{512}$ (b) $\frac{143}{2048}$ (c) $\frac{79}{4096}$

31) $\binom{8}{3} \frac{11^5}{12^8}$

32) (a) $\frac{16}{625}$ (b) $\frac{216}{625}$ (c) $\frac{544}{625}$

33) (a) $\frac{1}{1296}$ (b) $\frac{5}{1296}$ (c) $\frac{5}{54}$