

MIXED PROBLEMS

- The probability of a particular treatment providing a cure is thought to be 0.64. If 2341 people have the treatment, how many would you expect to be cured? (Hint - calculate the expected frequency.)
- The probability of receiving rain on any particular March day in Rockhampton is 0.17. How many dry days would you expect Rockhampton to have in March?
- A person says that he flipped a coin 1000 times and got 814 heads and 186 tails. What is your reaction to this?
- A card is drawn at random from a pack. What is the probability that the card is:
 - black
 - a heart
 - a Queen
 - the 5 of spades
 - a King or a 5
 - a red King
 - a Queen or a spade
 - a heart or a club
 - a red card or a King ?
- In a game of cards you are dealt the Ace of diamonds and the King of hearts. What is the probability that the next card dealt to you is:
 - a King
 - a heart
 - a club
 - a red card ?
- A bag contains discs numbered 1 to 35. If a disc is removed at random from the bag, what is the probability that the disc:
 - is odd
 - is larger than 10
 - is a multiple of 4
 - ends in 0 ?
- A single card is dealt 1000 times from a well shuffled pack of 52 cards. How many times would you expect to get:
 - a red card
 - a spade
 - a Jack
 - a red 7 ?

RED		BLACK	
DIAMONDS	HEARTS	CLUBS	SPADES
Ace ♦	Ace ♥	Ace ♣	Ace ♠
2 ♦	2 ♥	2 ♣	2 ♠
3 ♦	3 ♥	3 ♣	3 ♠
4 ♦	4 ♥	4 ♣	4 ♠
5 ♦	5 ♥	5 ♣	5 ♠
6 ♦	6 ♥	6 ♣	6 ♠
7 ♦	7 ♥	7 ♣	7 ♠
8 ♦	8 ♥	8 ♣	8 ♠
9 ♦	9 ♥	9 ♣	9 ♠
10 ♦	10 ♥	10 ♣	10 ♠
Jack ♦	Jack ♥	Jack ♣	Jack ♠
Queen ♦	Queen ♥	Queen ♣	Queen ♠
King ♦	King ♥	King ♣	King ♠

8. When a biased coin is flipped 2570 times it comes up tails 865 times. If the coin is flipped 80 times, how many tails would you expect?
9. At TAFE, the same examination has been used for the last three years with the following results:

year	1992	1993	1994
total number of students	84	93	77
number of passes	61	74	57

If 102 students sit the examination in 1995, how many would you expect to pass?

10. A bag contains a number of marbles. 30 marbles are taken from the bag, marked with a cross and returned to the bag. The bag is then given a good shake. 50 marbles are then removed at random from the bag and 8 of have a cross on them. Estimate the total number of marbles in the bag.
11. A bag contains 3 red counters, 4 green counters and 5 blue counters. If a counter is selected at random, what is the probability that it is:
 a) blue b) not blue c) red or blue d) yellow?
12. A set of cards is numbered 5 to 25. If a card is chosen at random, what is the probability that the card is:
 a) an even number b) an odd number c) less than 10
 d) prime e) a square number f) a multiple of 7
 g) greater than 30 h) a number whose digits add up to give 8?
13. A roulette wheel has 37 slots. One of the slots is numbered 0 and is coloured green. The other slots are numbered 1 to 36. Half of slots 1 to 36 are red and the rest are black. Find the probability that the ball will land on:
 a) an odd number b) a red number c) the number 10.
14. A letter is selected at random from the alphabet. What is the probability that the letter is:
 a) a "m" b) a vowel c) not a vowel
 d) a letter contained in the word "Maths"
 e) a letter contained in the word "Mathematics"?
15. Comment on the following:
 "A woman has 3 children who are all boys. Therefore the probability of the next child being a boy must be smaller than 0.5."
16. Anne and Robert play a dice game. A red and a green die are thrown. Anne's score is the square of the number on the red die. Robert's score is the product of the two numbers shown on the dice. The higher of the two scores is the winner. What is Anne's probability of winning a game?
 Hint: Draw a 6 x 6 grid.
17. If a coin is flipped four times, what is the probability of getting:
 a) four heads b) at least one head
 c) more than one head d) two heads and two tails in any order?
 Draw a tree diagram to show all the outcomes.

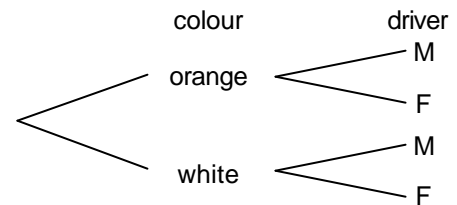
18. A man and woman plan to have 5 children. Estimate the probability that they will have 2 boys and 3 girls.
 Draw a tree diagram to show all possible outcomes.

19. A baby has 4 toys in her playpen - a bear, a rattle, a book and a ball. She chooses a toy at random, play with it for a while and then throws it out of the playpen. She then chooses another toy at random and plays with it before falling asleep. Calculate the probability that she:
 a) plays with the rattle first
 b) plays with the ball second
 c) does not play with the bear.
 Draw a tree diagram to show all 12 equally likely outcomes.

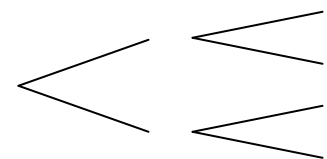
20. A box contains 3 red and 2 white balls. Two balls are removed at the same time. (This is equivalent to removing one ball, not replacing it and then removing a second ball.) What is the probability that:
 a) both balls are red
 b) the balls are different colours?
 Draw a tree diagram to show all 20 equally likely outcomes.

21. A drawer contains 6 loose socks - 2 green, 2 grey and 2 blue. I take two socks from the drawer without looking and put them on. What is the probability that the socks:
 a) are both grey b) form a pair?
 Draw a tree diagram to show all possible outcomes.

22. In a town, 20% of the taxis are orange and 35% of the drivers are men. If I call a taxi at random, calculate the probability that:
 a) it is an orange taxi driven by a man
 b) it is a white taxi driven by a woman.
 Hint: Mark each branch of the tree diagram with a probability.



23. Susan and Dave play golf together. The probability that Susan wins a round of golf against Dave is 0.7. Next weekend, they are going to play 2 rounds. Find the probability that:
 a) Susan wins both games
 b) Dave wins only one game.
 Hint: Mark each branch of the tree diagram with a probability.



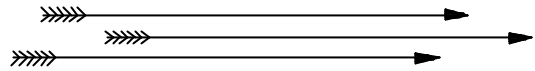
24. When Jane plays squash against Ian, she has a 75% chance of winning each game. What is the probability that Jane wins five games in a row?

25. The probability that Alec will get a cold during a year is 0.3. What is the probability that Alec does not get a cold over the next four years?

26. The last batsman in a team is such a poor player that, every time he faces a ball, the probability of him being out is 0.2. What is the probability that he survives a complete six-ball over?

27. A six-faced die is thrown four times. What is the probability that all the throws are greater than 4?

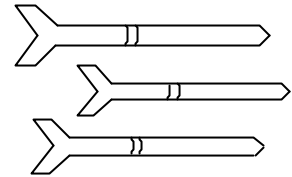
28. The probability of a person hitting a target with an arrow is 0.8. If three arrows are shot at the target, what is the probability of exactly two hits?



29. The probability of a truck breaking down on a trip from Mackay to Melbourne is 0.14. The probability of breaking down on the return trip from Melbourne is also 0.14. What is the probability that the truck makes the trip in both directions without breaking down?

30. A missile has a 0.9 probability of hitting the target. If three missiles are fired at the target, what is the probability that:

- a) all the missiles hit the target
- b) none of the missiles hit the target?



31. A control system in a plane has a 1% chance of failing during a flight. There is a backup system which has a 5% chance of failure if it is brought into operation. If both systems break down then the plane will crash. What is the probability that the plane will crash?

32. A student has a $\frac{3}{5}$ probability of passing a Maths exam and a $\frac{3}{4}$ probability of passing an English exam. Calculate the probability that the student fails both exams.

33. A student has a $\frac{4}{5}$ probability of passing a Maths exam, a $\frac{2}{3}$ probability of passing an English exam and a $\frac{1}{2}$ probability of passing a Science exam. Calculate the probability that the student:

- a) fails all the exams
- b) passes all the exams.

Hint: Mark each branch of the tree diagram with a probability.

34. Gary and Brian play a tennis match that is the best of three sets. The probability that Gary wins each set is 0.6. What is the probability that Gary wins the match?

35. The year 12 in a school contains 84 students. 33 students study Modern History, 28 study Economics and 9 study both.

- a) Draw a Venn diagram to show the information.
- b) If a student is chosen at random, what is the probability that the student studies Modern History but not Economics?
- c) If a student is chosen at random, what is the probability that the student does not study Modern History?
- d) What percentage of the students study neither Modern History nor Economics?

36. A group of 80 people were asked to name their favourite sports. Rugby league was mentioned by 51 people and cricket by 33 people. 10 people did not mention either of these two sports.

- a) Draw a Venn diagram to show the information.
- b) If a person is chosen at random from the 80 people, what is the probability that the person mentioned both sports?
- c) If a person is chosen at random from the 80 people, what is the probability that the person mentioned cricket but not rugby league?

ANSWERS

1. 1498 people
2. 26 days
4. 0.5 0.25 0.077 0.019 0.154 0.038 0.308 0.5 0.538
5. 0.06 0.24 0.26 0.48
6. 0.514 0.714 0.229 0.086
7. 500 250 77 38
8. 27
9. 77
10. 187
11. 0.4167 0.5833 0.5333 0
12. 0.4762 0.5238 0.2381 0.3333 0.1429 0.1429 0 0.0952
13. 0.4865 0.4865 0.0270
14. 0.0385 0.1923 0.8077 0.1923 0.3077
16. 0.4167
17. 0.0625 0.9375 0.6875 0.375
18. 0.3125
19. 0.25 0.25 0.5
20. 0.3 0.6
21. 0.0667 0.2
22. 0.07 0.52
23. 0.49 0.42
24. 0.2373
25. 0.2401
26. 0.2621
27. 0.0123
28. 0.384
29. 0.7396
30. 0.729 0.001
31. 0.0005
32. 0.1
33. 0.0333 0.2667
34. 0.648
35. 0.2857 0.6071 59.26%
36. 0.175 0.2375