Name _____ Period _____

6.3 Probability of Two Events Exercises:

1. The faces of an unbiased dice are painted so that 2 are *red*, 2 are *blue* and 2 are *yellow*. The dice is rolled twice. Three of the possible outcomes are listed below:

   R R R B R Y

   (a) List all 9 possible outcomes.

   (b) What is the probability that:

   (i) both faces are *red*,

   (ii) both faces are the *same colour*,

   (iii) the faces are of *different colours*?

2. A spinner is marked with the letters A, B, C and D, so that each letter is equally likely to be obtained. The spinner is spun twice.

   (a) List the 16 possible outcomes.

   (b) What is the probability that:

   (i) A is obtained *twice*,

   (ii) A is obtained *at least once*,

   (iii) *both* letters are the *same*,

   (iv) the letter B is *not* obtained at all?

3. Two fair dice are renumbered so that they have the following numbers on their faces:

   1, 1, 2, 3, 4, 6

   The dice are rolled at the same time, and their scores added together.

   (a) Draw a table to show the 36 possible outcomes.

   (b) What is the probability that the total score is:

   (i) 6, (ii) 3,

   (iii) greater than 10, (iv) less than 5 ?

4. A red spinner is marked with the numbers 1 to 4 and a blue spinner is marked with the numbers 1 to 5. On each spinner all the numbers are equally likely to be obtained. The two spinners are spun at the same time and the two scores are added together.

(a) Draw a table to show the 20 possible outcomes.

(b) What is the probability that the total score on the two spinners is:

(i) an *even* number, (ii) the number 7,

(iii) a number greater than 4, (iv) a number less than 7 ?

5. An unbiased dice is rolled and a fair coin is tossed at the same time.

(a) *Either* list all the possible outcomes *or* show them in a table.

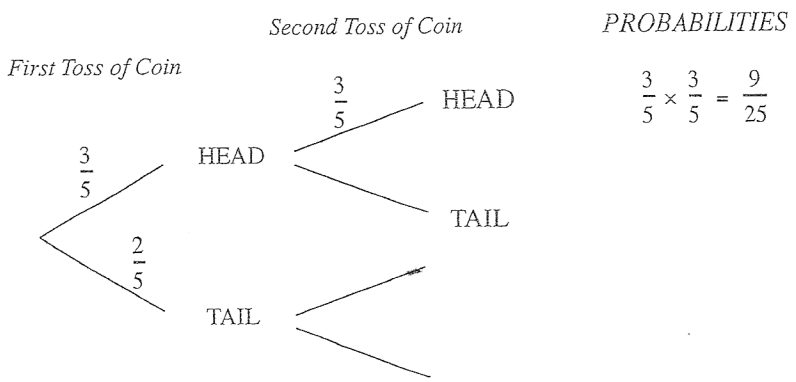
(b) What is the probability of obtaining:

(i) a head and a 6, (ii) a tail and an odd number,

(iii) a tail and a number less than 5 ?

6. A coin is biased so that the probability of obtaining a head is $\frac{3}{5}$ and the probability of obtaining a tail is $\frac{2}{5}$.

(a) Copy and complete the following tree diagram to show the possible outcomes and probabilities if the coin is tossed twice.



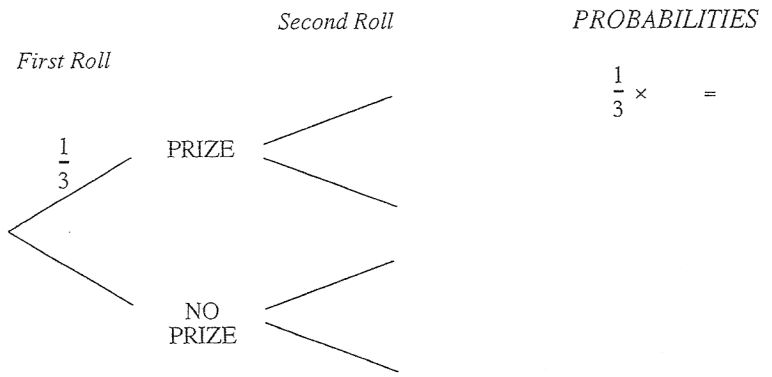
(b) What is the probability of obtaining:

(i) 2 heads, (ii) at least one head,

(iii) 2 tails, (iv) exactly 1 tail ?

7. An unbiased dice is rolled twice in a game. If a 1 or a 6 is obtained, you win a prize.

(a) Copy and complete the following tree diagram:



(b) What is the probability that a player wins:

(i) 2 prizes, (ii) 1 prize, (iii) at least 1 prize ?

8. A card is taken at random from a pack of 52 playing cards. It is replaced and a second card is then taken at random from the pack.
A card is said to be a 'Royal' card if it is a *King*, *Queen* or *Jack*.

Use a tree diagram to calculate the probability that:

(a) *both* cards are Royals, (b) *one* card is a Royal,

(c) *at least one* card is a Royal, (d) *neither* card is a Royal.

9. The probability that a school bus is late on any day is $\frac{1}{10}$. Use a tree diagram to calculate the probability that on two consecutive days, the bus is:

(a) late *twice*, (b) late *once*, (c) *never* late.

10. The probability that a piece of bread burns in a toaster is $\frac{1}{9}$. Two slices of bread are toasted, one after the other.

(a) Use a tree diagram to calculate the probability that at least one of these slices of bread burns in the toaster.

(b) Extend your tree diagram to include toasting 3 slices, one at a time. Calculate the probability of at least one slice burning in the toaster.

11. A coin has two sides, heads and tails.

(a) Chris is going to toss a coin. What is the probability that Chris will get heads? Write your answer as a fraction.

(b) Sion is going to toss 2 coins. Copy and complete the following table to show the different results he could get.

First coin	*Second coin*
heads	heads

(c) Sion is going to toss 2 coins. What is the probability that he will get tails with both his coins? Write your answer as a fraction.

(d) Dianne tossed one coin. She got tails.
Dianne is going to toss another coin.
What is the probability that she will get tails again with her next coin?
Write your answer as a fraction.

12. I have two fair dice. Each of the dice is numbered 1 to 6.

(a) The probability that I will throw *double 6* (both dice showing number 6) is

$$\frac{1}{36}$$

What is the probability that I will *not* throw double 6 ?

(b) I throw both dice and get double 6. Then I throw both dice again.

Which one answer from the list below describes the probability that I will throw *double 6* this time?

less than $\frac{1}{36}$

$\frac{1}{36}$

more than $\frac{1}{36}$

Explain your answer.

I start again and throw both dice.

(c) What is the probability that I will throw *double 3* (both dice showing number 3) ?

(d) What is the probability that I will throw a double? (It could be double 1 or double 2 or any other double.)

13. On a road there are two sets of traffic lights. The traffic lights work independently.

For each set of traffic lights, the probability that a driver will have to *stop* is 0.7.

(a) A woman is going to drive along the road.

(i) What is the probability that she will have to *stop* at *both* sets of traffic lights?

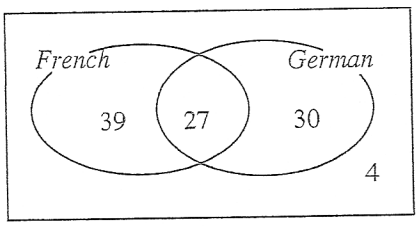
(ii) What is the probability that she will have to *stop* at *only one of the two sets* of traffic lights?

Show your working.

(b) In one year, a man drives 200 times along the road. Calculate an estimate of the number of times he drives through *both sets* of traffic lights *without stopping*. Show your working.

14. 100 students were asked whether they studied French or German.

Results:



27 students studied both French *and* German.

(a) What is the probability that a student chosen at random will study only *one* of the languages?

(b) What is the probability that a student who is studying German is also studying French?

(c) Two of the 100 students are chosen at random.

From the following calculations, write down one which shows the probability that *both* students study French and German.

$\frac{27}{100} \times \frac{26}{100}$ $\quad$ $\frac{27}{100} + \frac{26}{99}$ $\quad$ $\frac{27}{100} + \frac{27}{100}$

$\frac{27}{100} \times \frac{26}{99}$ $\quad$ $\frac{27}{100} \times \frac{27}{100}$

15. A company makes computer disks. It tested a random sample of the disks from a large batch. The company calculated the probability of any disk being defective as 0.025.

Glenda buys 2 disks.

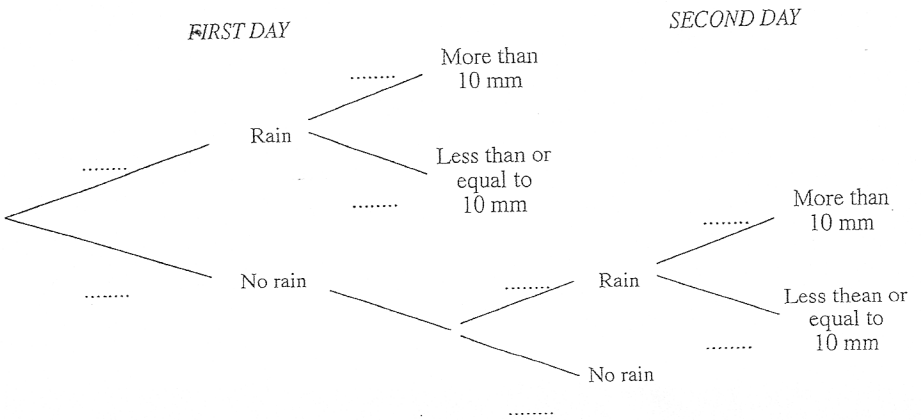
(a) Calculate the probability that *both* disks are defective.

(b) Calculate the probability that *only one* of the disks is defective.

(c) The company found 3 defective disks in the sample they tested. How many disks were likely to have been tested?

16. On a tropical island the probability of it raining on the first day of the rainy season is $\frac{2}{3}$. If it does not rain on the first day, the probability of it raining on the second day is $\frac{7}{10}$. If it rains on the first day, the probability of it raining more than 10 mm on the first day is $\frac{1}{5}$. If it rains on the second day but not on the first day, the probability of it raining more than 10 mm is $\frac{1}{4}$.

You may find it helpful to copy and complete the tree diagram before answering the questions.



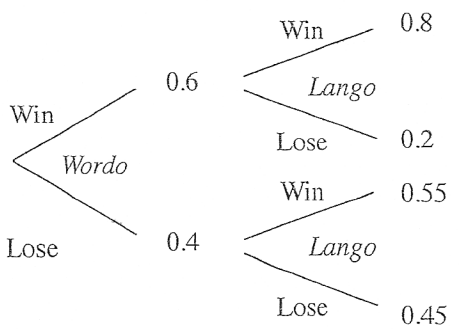
(a) What is the probability that it rains more than 10 mm on the second day, and does not rain on the first? Show your working.

(b) What is the probability that it has rained by the end of the second day of the rainy season? Show your working.

(c) Why is it not possible to work out the probability of rain on both days from the information given?

17. Pupils at a school invented a word game called Wordo. They tried it out with a large sample of people and found that the probability of winning Wordo was 0.6.

The pupils invented another word game, Lango. The same sample who had played Wordo then played Lango. The pupils drew this tree diagram to show the probabilities of winning.



(a) What was the probability of someone from the sample winning Lango?

(b) What was the probability of someone from the sample winning *only* one of the two word games?

(c) The pupils also invented a dice game. They tried it out with the same sample of people who had already played Wordo and Lango.

The probability of winning the dice game was 0.9. This was found to be independent of the probabilities for Wordo and Lango.

Calculate the probability of someone from the sample winning two out of these three games.

(d) Calculate the probability of someone from the sample winning *only* one of these three games.