

PROBABILITY

Probability

a) The probability of each outcome of a computer game is shown in the table below.

Outcome	Win	Lose	Draw
Probability	0.3	0.25	0.45

Cynthia plays the game 60 times.

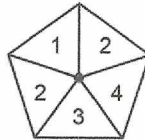
0.55

Calculate the number of times Cynthia should expect to draw.

$$0.45 \times 60 = 27$$

..... 27

b) This is a fair 5-sided spinner.



Ciara spins the spinner twice and records the product of the two squares.

Complete the sample space diagram:

		First spin				
	x	1	2	2	3	4
Second spin	1	1	2	2	3	4
	2	2	4	4	6	8
	2	2	4	4	6	8
	3	3	6	6	9	12
	4	4	8	8	12	16

Find the probability that the product is a multiple of 3.

$$\frac{9}{25}$$

..... $\frac{9}{25}$

Relative Frequency

- a) Dan believes he knows what his brother Ethan is thinking. He carries out an experiment to test this.

Dan and Ethan sit back-to-back.

Ethan rolls an ordinary fair dice.

Ethan then thinks about the number on the dice while Dan tries to predict this number.

The results of the first 15 attempts are shown in the table.

Ethan's number	2	6	5	3	2	1	5	1	3	4	4	6	1	6	5
Dan's prediction	2	4	3	1	2	6	1	6	4	3	2	6	5	2	3
Matching pair	✓				✓							✓			

Estimate the probability of getting a matching pair using the results of

- i) the first five attempts

$$\frac{2}{5}$$

.....

- ii) all 15 attempts

$$\frac{3}{15}$$

$$\frac{1}{5}$$

.....

Which value is the most reliable estimate of the probability of getting a matching pair and why?

$\frac{1}{5}$, as this is based on a larger sample size.

- b) The table shows the relative frequencies of the results for a football team after a number of games.

Result of game	Won	Lost	Drew
Relative frequency	0.2	0.45	0.35

0.35

The team lost 10 more games than they won. How many games did they play altogether?

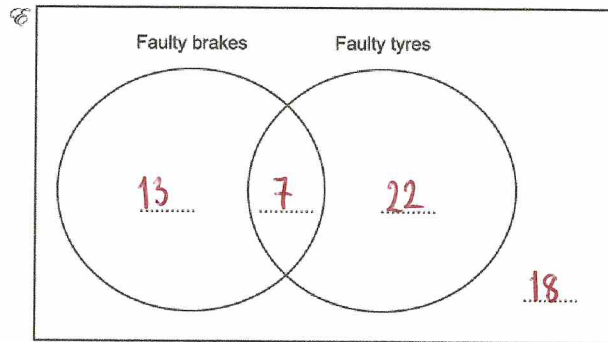
$$\begin{array}{l}
 0.2 \quad 0.45 \\
 \quad \quad \quad \curvearrowright \\
 10 \text{ games} = 0.25 \\
 40 \text{ games} = 1
 \end{array}$$

$$40$$

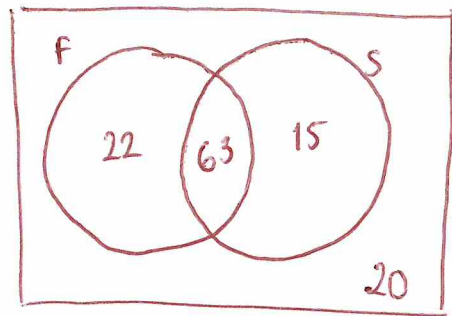
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Venn Diagrams and Sets

- a) A mechanic tests the brakes and tyres of 60 cars. A car passes the test if both the brakes and the tyres are not faulty. 18 cars pass the test, 20 cars have faulty brakes, 29 cars have faulty tyres. Put this information into the Venn diagram below.



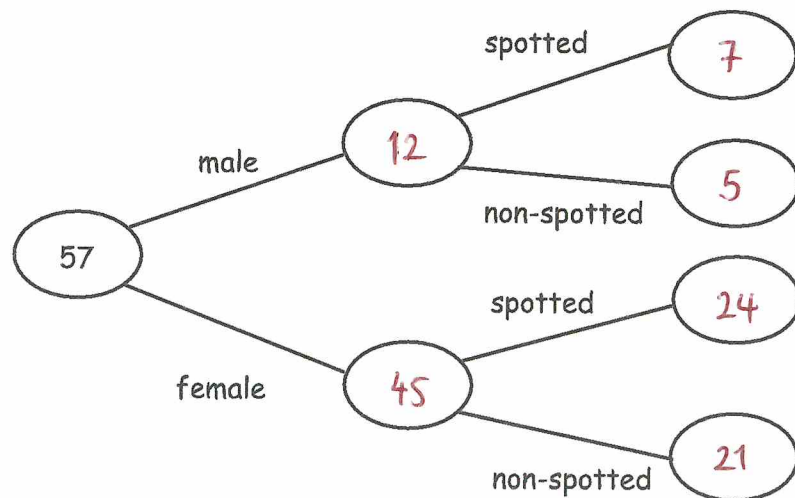
- a) In a group of 120 adults, 85 watch football, 78 play a sport and 20 do neither. Find the probability that an adult chosen at random from those who watch football does not play a sport.



$$\frac{22}{85}$$

Frequency Trees

- A farmer owns 57 pigs. 12 of the pigs are male, 7 of the male pigs are spotted. 26 of the female pigs are non-spotted. Complete the frequency tree.



Two Way Tables

In a class of 34 students, 12 study German, 25 study Spanish and 6 do not study either language. One student in the class is selected at random.

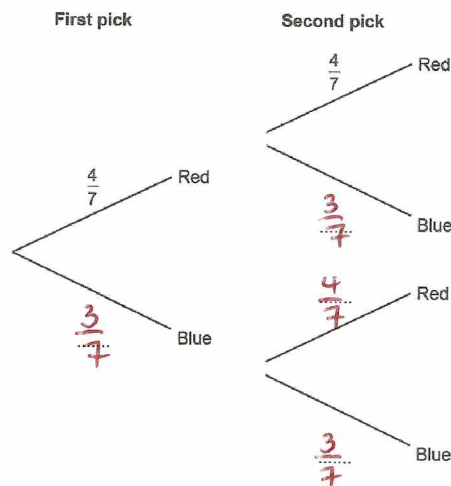
Find the probability that this student studies both languages.

	Studies German	Doesn't study German	Total
Studies Spanish	9	16	25
Doesn't study Spanish	3	6	9
Total	12	22	34

$$\frac{9}{34}$$

Probability Trees (Independent)

- a) A bag contains 4 red counters and 3 blue counters only. Jack picks a counter at random and then replaces it. Jack then picks a second counter at random. Complete the tree diagram.



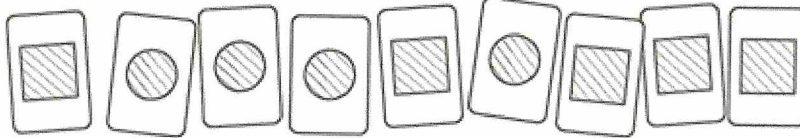
What is the probability that Jack picks out two blue counters.

$$\frac{3}{7} \times \frac{3}{7}$$

$$\frac{9}{49}$$

Probability Trees (Dependent)

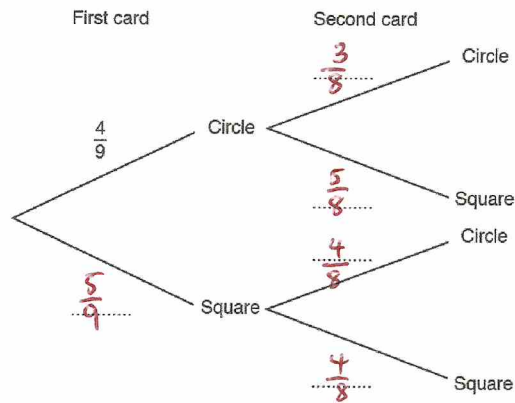
a) Reuben is playing a matching game with these cards.



He turns the cards over and shuffles them.

Reuben takes a card and keeps it. He then takes a second card.

Complete this tree diagram to show the probabilities for each card picked in the game.



If the cards are different, he wins the game.

Calculate the probability that Reuben wins the game.

$$CS = \frac{4}{9} \times \frac{5}{8} = \frac{20}{72}$$

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$$\frac{40}{72} = \frac{5}{9}$$

b) Dani has a pack of 45 cards.

Each card is either red or black.

One-third of the cards in the pack are red. (15)

She picks two cards from the pack, without replacement.

Calculate the probability that Dani picks two black cards.

$$\frac{30}{45} \times \frac{29}{44} = \frac{870}{1980} = \frac{29}{66}$$

$$\frac{29}{66}$$

Successive Events

There are 5 blue sweets, 3 red sweets, 2 green sweets and no other sweets in a box.

Waleed chooses 3 sweets at random from the box and puts them in his pocket.

Show that the probability of Waleed choosing three sweets of the same colour is $\frac{11}{120}$.

$$BBB = \frac{5}{10} \times \frac{4}{9} \times \frac{3}{8} = \frac{60}{720}$$

$$RRR = \frac{3}{10} \times \frac{2}{9} \times \frac{1}{8} = \frac{6}{720}$$

$$GGG = \frac{2}{10} \times \frac{1}{9} \times \frac{0}{8} = 0$$

$$\frac{60}{720} + \frac{6}{720} = \frac{66}{720} = \frac{11}{120}$$