

Student Name: _____

Score: _____

Balls in a container

Work Space

There are 5 white balls, 8 red balls, 7 yellow balls and 4 green balls in a container. A ball is chosen at random.

What is the probability of choosing red?

Answer:

What is the probability of choosing green?

Answer:

What is the probability of choosing either red or white?

Answer:

What is the probability of choosing neither white nor green?

Answer:

What is the probability of choosing other than yellow?

Answer:

What is the probability of choosing black?

Answer:

PROBABILITY PROBLEMS

- 1** A pack of 20 cards is numbered 1 to 20. Determine the probability of each of these events if a card is selected at random from the pack.

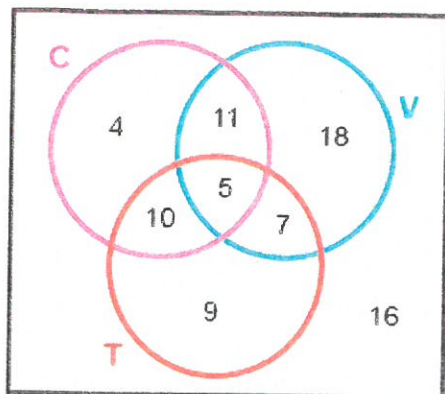
a P(the number 6)	b P(a multiple of 3)
c P(prime number)	d P(not prime)

- 2** A book has pages numbered from 1 to 45. What is the probability of randomly opening the book on a page number containing at least one 3?
- 3** There are three types of marbles in a bag: blue, red and yellow. The probability of drawing out a blue marble without looking is $\frac{1}{2}$ and the probability of selecting a red marble is $\frac{1}{3}$. What is the probability of selecting a yellow marble?
- 4** From a group of red and blue beetles, there is a 75% chance of randomly selecting a red beetle. If there are 24 red beetles, how many beetles are there altogether?
- 5** Arun has a pack of cards numbered 1 to 9. Sally has a die. Arun wins his game if he selects a card that is less than 8. Sally wins her game if she tosses a number less than 6. Who has the greater chance of winning their game? Explain your answer.
- 6** The probability of selecting a dark chocolate from a full box of 25 chocolates is one in five. What is the probability of selecting a dark chocolate after Nick eats one of the dark chocolates?

PROBABILITIES FROM DATA DISPLAYS

TASK 1 Use a Venn diagram to find probabilities

The diagram shows how many members in a travel club visited China, Vietnam or Thailand.



If a person from this club is selected at random, use **fractions** to show the probability that the person:

- did not visit any of the 3 countries
- visited all 3 countries
- visited China
- only visited China
- visited at least 2 of the countries
- visited only one country
- visited Vietnam and Thailand but not China

TASK 2 Create a diagram or table to find probabilities

Fifty students were asked whether they liked snorkelling or cycling. The results showed that 32 liked cycling, 15 liked snorkelling and 12 liked both. Show this data in a Venn diagram ~~or~~ two-way table.
and a

If a student is selected randomly from these 50 students, find the probability that the student likes:

a cycling but not snorkelling	b only one of these sports
c at least one of the sports	d neither of the sports

TASK 3 Use a two-way table to find probabilities

The two-way table shows the numbers of some types of books in Janine's library. Complete the table.

Janine's books

	Fiction	Non-fiction	Totals
Hardcover	13		57
Softcover		7	
Totals			153

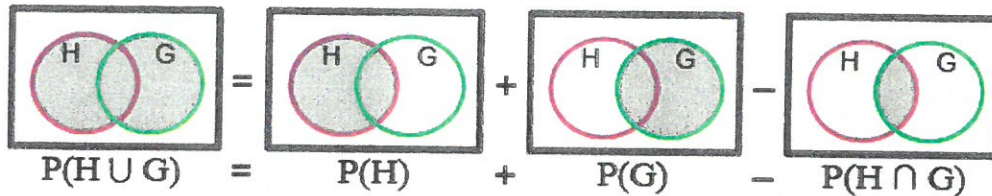
Write each of the following probabilities as a fraction.

Find the following probabilities for a book that is selected at random from the library.

a $P(\text{fiction})$	b $P(\text{hardcover})$
c $P(\text{non-fiction})$	d $P(\text{softcover})$
e $P(\text{fiction and hardcover})$	f $P(\text{non-fiction and softcover})$
g $P(\text{fiction and softcover})$	h $P(\text{neither fiction nor hardcover})$
i $P(\text{either fiction or softcover})$	j $P(\text{either non-fiction or softcover})$
k If you have a softcover book in your hand, what is the probability that it is fiction?	l If you have a fiction book in your hand, what is the probability that it is softcover?

ADDITION RULE OF PROBABILITY

Addition rule for probability of two events H and G occurring



A jar contains one hundred marbles numbered 1 to 100. One marble is to be drawn at random.

TASK 1 100 marbles and non-mutually exclusive (intersecting) sets

Complete the working to find the probability that the numbered marble drawn will be a multiple of 5 **OR** a multiple of 8.

Using addition rule: $P(\text{multiple of 5 or 8}) = P(\text{multiple of 5}) + P(\text{multiple of 8}) - P(\text{multiple of 5 and 8})$

1 $100 \div 5 = \underline{\hspace{2cm}}$ and so there are $\underline{\hspace{2cm}}$ multiples of 5 in the jar.

$$P(\text{multiple of 5}) = \frac{\boxed{\hspace{2cm}}}{100}$$

2 $100 \div 8 = \underline{\hspace{2cm}}$ and so there are $\underline{\hspace{2cm}}$ multiples of 8 in the jar.

$$P(\text{multiple of 8}) = \frac{\boxed{\hspace{2cm}}}{100}$$

3 The first multiple of 5 and 8 is $\underline{\hspace{2cm}}$.

The next multiple of 5 and 8 is $\underline{\hspace{2cm}}$.

There are $\underline{\hspace{2cm}}$ multiples of 5 and 8 in the jar.

$$P(\text{multiple of 5 and 8}) = \frac{\boxed{\hspace{2cm}}}{100}$$

4 $\therefore P(\text{multiple of 5 or 8}) = P(\text{multiple of 5}) + P(\text{multiple of 8}) - P(\text{multiple of 5 and 8})$

$$= \frac{\boxed{\hspace{2cm}}}{100} + \frac{\boxed{\hspace{2cm}}}{100} - \frac{\boxed{\hspace{2cm}}}{100}$$

=

=

TASK 2 100 marbles and mutually exclusive (non-intersecting) sets

If H and G are **mutually exclusive** sets then there is no intersection between them, and so:

$$P(H \cap G) = 0 \text{ and } P(H \cup G) = P(H) + P(G)$$



Find the probability of drawing a marble that is numbered between 85 and 90 **OR** is a square number.

$9^2 = 81$ and $10^2 = 100$, so there are no square numbers between 85 and 90. That is, these two events are mutually exclusive.

Use the addition rule as it applies to mutually exclusive events to work out the probability.

CHALLENGE

Roll a six



When I use dice in a game, I don't know what numbers I will roll.



Milu is rolling a 6-sided die.

She needs to roll a 6 to be able to begin playing a board game. She keeps rolling until she rolls a 6.

- 1 What is the probability she rolls a 6 on her first attempt?
- 2 What is the probability she doesn't roll a 6 until her second attempt?
- 3 What is the probability she doesn't roll a 6 until her third attempt?
- 4 Can you see a pattern in your last three answers?

Use this pattern (and index notation) to write the probability she doesn't roll a 6 until her:

a 10th roll

b 25th roll

TASK 2 Coin flips

Gemma found a biased coin in her magic kit. It is weighted so that heads is three times more likely than tails.

1 When she flips the coin once, what is the probability of:

a getting a head

b getting a tail



2 Complete the tree diagram, showing all probabilities on the branches and all possible outcomes, when flipping the coin three times.

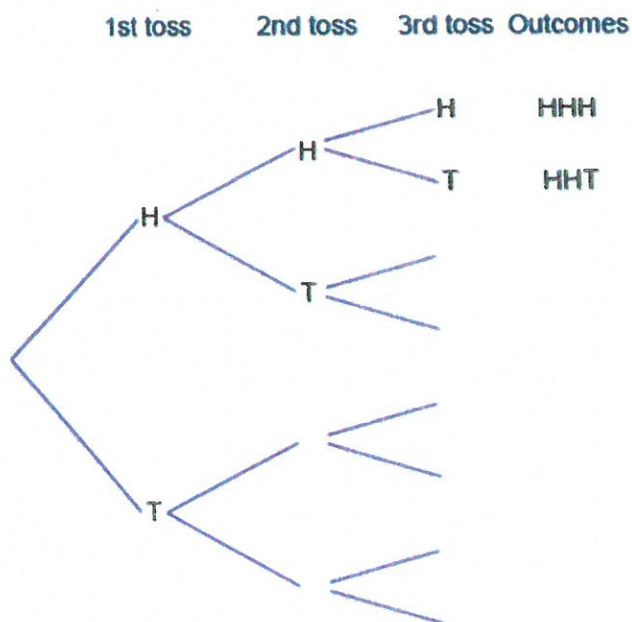
3 Use your tree diagram to calculate:

a $P(\text{HHH})$

b $P(\text{TTT})$

c $P(\text{HHT})$

d $P(\text{2 heads and 1 tail in any order})$

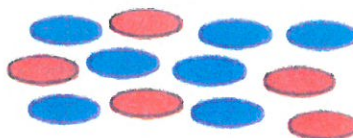


PROBABILITY TREES WITHOUT REPLACEMENT

TASK 1 Counter counting

A bag contains 5 red counters and 7 blue counters.

You are asked to take two counters from the bag.



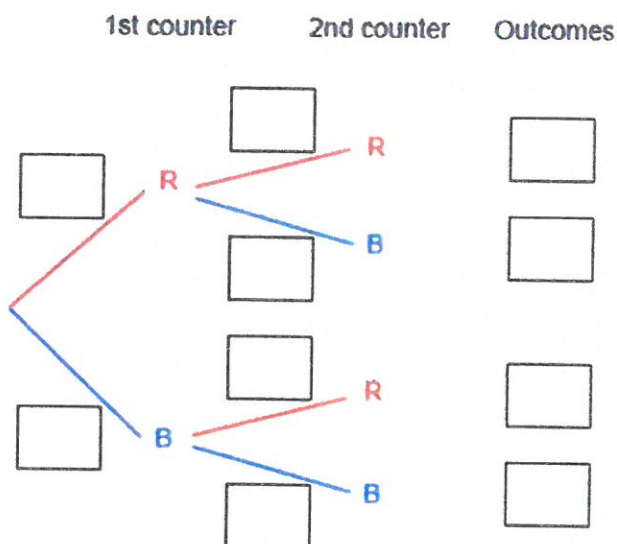
- 1 Complete the probability tree diagram representing this information.

- 2 Find the probability that the counters chosen:

a are both blue

b are both the same colour

c are different colours



TASK 2 Flavour challenge

Ahmed is eating fruit jubes in the dark at the movies. The packet contains 20 jubes, half of which are orange flavoured, $\frac{2}{5}$ are lemon and the remainder are mandarin.

1 What is the probability that the first jube Ahmed eats is mandarin flavour?

2 Complete the tree diagram representing this information. Write all probabilities on the branches and list the outcomes.

Note that the events of eating jubes are dependent events, so take care with the probabilities on the branches.

3 What is the probability that the first two jubes he eats are lemon and mandarin (in that order)?

4 What is the probability that the first two jubes he eats are lemon and mandarin (in any order)?

5 What is the probability that all three jubes he eats are mandarin?

6 What is the probability that all three jubes he eats are the same flavour?

