30. [Probability]

Q. There are 27 marbles in a bag and 18 of them are green. How many marbles do you have to select to make sure you have at least one green marble?

A. *Chances of selecting a green marble = 18*
Chances of selecting a different color marble = 27 − 18 = 9

⇒ **10**

It is possible to select all 9 other coloured marbles before you choose a green marble.

a) There are 6 red, 2 purple and 4 white rulers in a drawer. What is the largest number of rulers you could select from the drawer without taking a white ruler?

red = 6,   purple = 2,   white = 4

6 red + 2 purple   = ☐

b) There are 8 chocolate, 10 milk and 5 cream biscuits in a box. How many biscuits do you have to pick to make sure you have at least one chocolate biscuit?

= ☐

c) Linda has 8 maltesers and 12 coolmints in her bag. How many lollies does she need to take out of her bag to make sure she has at least 3 coolmints?

= ☐

d) There are 7 orange, 9 red and 6 white jellybeans in a jar. Without looking, how many jellybeans do you have to select in order to pick at least one white jellybean?

= ☐

e) There are twenty different pairs of socks in the drawer. Without looking, how many socks need to be picked up in order to have a pair of matching socks?

= ☐

f) Of the 300 songs on an iPod, 185 are pop songs. How many songs do you need to play on a random setting to be sure you will hear a pop song?

= ☐

g) Of the 18 movies on Tom's computer, 6 are comedies. How many movies does Tom have to watch on a random setting to be sure he watches a comedy?

= ☐

h) How many people do you need to gather to be sure that at least two of them were born on the same day of the week?
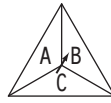
= ☐

Hints: Probability ranges from 0 to 1.
   The closer the probability is to 1, the more likely the event is to happen.
   The closer the probability is to 0, the more unlikely the event is to happen.

Impossible ←	Unlikely —	Equally likely	— Likely →	Certain
0		50/50		1

Q. 'Mary's new baby will be a boy.'

Which expression best represents the probability of this event?

A) very unlikely
B) a 50/50 chance
C) very likely
D) certain

A. *Consider the possibilities.*
The new baby can either be a boy or a girl so there is a 50/50 chance

⇒ **B**

---

a) 'Einstein will be the oldest living person.'

Which expression best represents the probability of this event?

A) impossible
B) very unlikely
C) very likely
D) certain

A

b) 'It will rain in the Sahara desert tomorrow.'

Which expression best represents the probability of this event?

A) impossible
B) very unlikely
C) very likely
D) certain

---

c) 'The football team will win the next game.'

Which expression best represents the probability of this event?

A) very unlikely
B) a 50/50 chance
C) very likely
D) certain

d) 'The whole class will get 100% in the next Maths test.'

Which expression best represents the probability of this event?

A) very likely
B) a 50/50 chance
C) very unlikely
D) impossible

---

e) 'There will be no school holidays next year.'

Which expression best represents the probability of this event?

A) very unlikely
B) a 50/50 chance
C) very likely
D) certain

f) 'Wednesday comes before Thursday.'

Which expression best represents the probability of this event?

A) very unlikely
B) a 50/50 chance
C) very likely
D) certain

---

www.mathsmate.co.nz

Skill 30.3   Finding the possible outcomes (sample spaces) of an event by completing tables.

MM4.2 11 **2** 22 33 44
MM5.1 **1** 1 22 33 44

- Complete the table to reveal all the possible outcomes (PO) (sample space).
- Count the number of possible outcomes (PO) (sample space).

Q. How many different outcomes are possible when a die is thrown and this spinner is spun? [Complete the table.]

A. $PO = 18$

Possible outcomes	Die					
Spinner		1	2	3	4	5	6
	A	A,1	A,2	A,3	A,4	A,5	A,6
	B	B,1	B,2	B,3	B,4	B,5	B,6
	C	C,1	C,2	C,3	C,4	C,5	C,6

Each space represents 1 outcome

Possible outcomes	Die					
Spinner		1	2	3	4	5	6
	A	A,1	A,2				
	B	B,1					
	C	C,1					

---

a) A zoo has both male and female primates. There are gorillas and chimpanzees. Find the size of the sample space. [Complete the table.]

Outcomes (sample space)		
male	gorilla	1
male	chimpanzee	2
female	gorilla	3
female	chimpanzee	4

Each row represents 1 outcome

b) How many different outcomes are possible choosing a primary colour (red, blue and green) and tossing a coin? [Complete the table.]

Possible outcomes	Primary colour		
Coin		R	G	B
	H	R,H		
	T			

---

c) How many different outcomes are possible when rolling a die and flipping a coin? [Complete the table.]

Possible outcomes	Die					
Coin		1	2	3	4	5	6
	H	H,1	H,2				
	T	T,1					

d) How many different outcomes are possible when spinning a spinner labelled 1, 2, 3, 4, 5 and flipping a coin? [Complete the table.]

Possible outcomes	Spinner				
Coin		1	2	3	4	5
	H	1,H				
	T					

---

e) A car comes in silver, red or purple as a convertible or hardtop. Find the size of the sample space. [Complete the table.]

Outcomes (sample space)	
silver	convertible
silver	
red	

f) A vendor sells vanilla and chocolate ice cream. Customers can have a waffle or sugar cone and either hot fudge or caramel topping. How many different outcomes are possible when ordering an ice cream in a cone with a single topping? [Complete the table.]

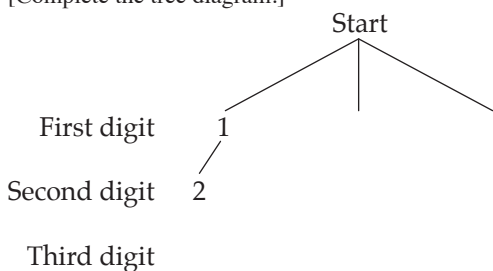| Outcomes (sample space)		
vanilla	waffle	hot fudge
vanilla		caramel
vanilla		

Skill 30.4   Finding the possible outcomes (sample spaces) of an event by completing tree diagrams (1).

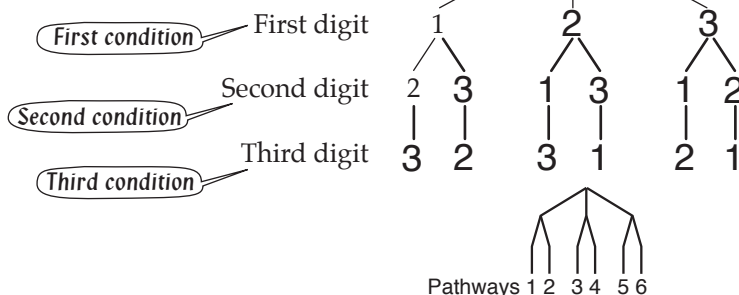MM4.2 1 1 2 **2** 3 3 4 4
MM5.1 1 **1** 2 2 3 3 4 4

- From the start use the first condition to list all the possible outcomes (PO) on the first set of branches.
- From each of the first outcomes create enough branches to list all the possible outcomes of the second condition.
- Continue in this way until the tree diagram is completed.
- Count the number of pathways from the start to the end of each branch line.
  The number of pathways equals the total number of possible outcomes (sample space).

Q. How many different 3-digit numbers can be made using the digits 1, 2 and 3 if the digits can be used only once?
[Complete the tree diagram.]

Start

First digit   1

Second digit   2

Third digit

A. *Possible outcomes (PO)*
= 123, 132, 213, 231, 312, 321
= 6

Start

First condition — First digit   1   2   3

Second condition — Second digit   2 3   1 3   1 2

Third condition — Third digit   3 2   3 1   2 1

Pathways 1 2 3 4 5 6

a) How many different outcomes are possible when flipping a coin and spinning this spinner? [Complete the tree diagram.]

Start

Coin   H   T

Spinner

Spinner: A | B / C | D

Start

Coin   H   T

Spinner A   B C   D A   B C   D
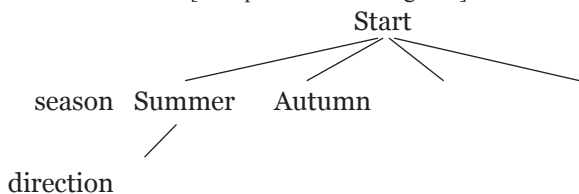
8 pathways = 8 PO

PO = HA, HB, HC, HD, TA, TB, TC, TD = ☐

b) How many different outcomes are possible when flipping a coin and cutting a king from any of the 4 suits in a pack of cards?
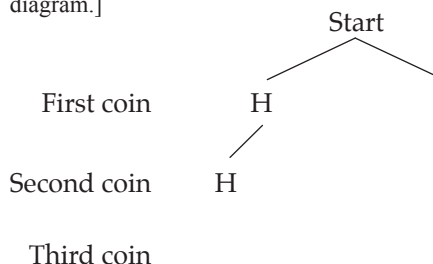[Complete the tree diagram.]

Start

coin
(H,T)   H

King   K♠
(♠,♣,♥,♦)

☐

c) How many different outcomes are possible when choosing a season of the year and one of the 4 point compass directions? [Complete the tree diagram.]

Start

season Summer   Autumn

direction

☐

d) How many different outcomes are possible when flipping 3 coins (assuming order matters)? [Complete the tree diagram.]

Start

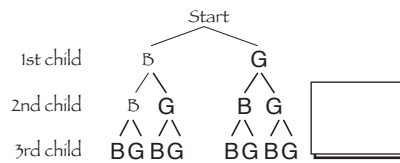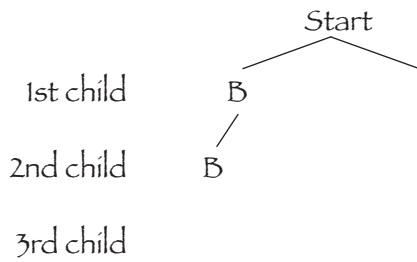First coin   H

Second coin   H

Third coin

☐

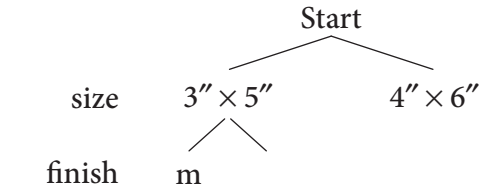**Skill 30**.4 Finding the possible outcomes (sample spaces) of an event by completing tree diagrams (2).

MM4.2 11 2**2** 33 44
MM5.1 1**1** 22 33 44

e) How many different gender combinations are possible if a couple have 3 children and order matters? [Complete the tree diagram.]

Start

1st child   B

2nd child   B

3rd child

Start

1st child   B   G
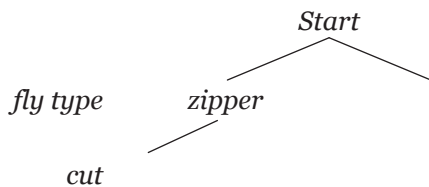
2nd child   B G   B G

3rd child   BG BG   BG BG

f) Photos can be printed in various sizes ($3'' \times 5''$, $4'' \times 6''$) and finishes (matte, gloss) with single or double prints an option. How many choices are possible? [Complete the tree diagram.]
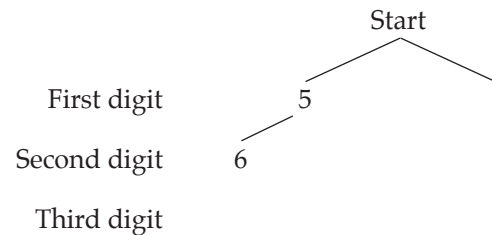
Start

size $3'' \times 5''$ $4'' \times 6''$

finish   m

number

g) Jeans come with 2 fly types (zipper or button fly) and 5 cuts (boot cut, stove pipe, straight leg, skinny, flared). How many choices of jeans are possible? [Complete the tree diagram.]
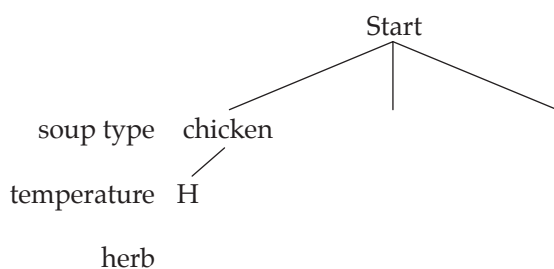
Start

fly type   zipper

cut

h) How many different 3-digit numbers less than 700 can be made using the digits 5, 6, 7 and 8 if the digits can be used only once? [Complete the tree diagram.]
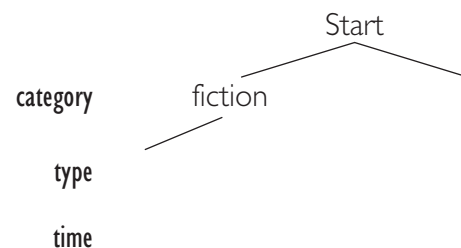
Start

First digit   5

Second digit   6

Third digit

i) There are 3 kinds of soup on the menu: chicken, vegetable and pumpkin. They may be served hot or cold and always with a condiment of parsley or basil. How many choices are possible? [Complete the tree diagram.]

Start

soup type   chicken

temperature H

herb

j) On a library visit Tara must decide whether to loan a fiction or non-fiction item in one of the available formats (book, movie, tape, large print) for 2 weeks or 4 weeks. How many different options does Tara have? [Complete the tree diagram.]
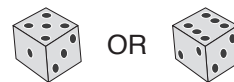
Start

category   fiction

type

time

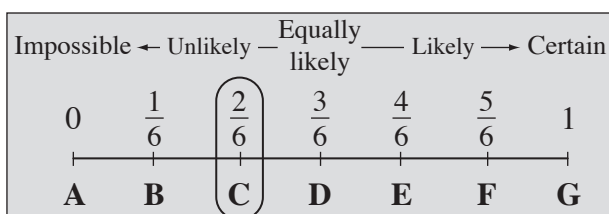**Skill 30.5** Calculating the probability of a simple event (1).

MM4.2 11 22 **33** 4
MM5.1 11 **22** 3 44

- Find the number of favourable outcomes for the event.
- Find the total number of possible outcomes.
- Divide the number of favourable outcomes by the number of possible outcomes:

$$Pr(event) = \frac{\text{number of favourable outcomes}}{\text{number of possible outcomes}} = \frac{FO}{PO}$$

OR

Example: Experiment   throwing a standard die
          Event   throwing a number greater than 4
          Possible outcomes (PO)   6   (throwing a 1, 2, 3, 4, 5 or a 6)
          Favourable outcomes (FO) 2   (throwing a 5 or a 6)
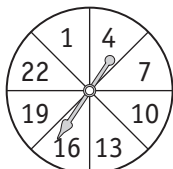   Probability (Pr)   2 out of 6 $= \frac{2}{6}$ (FO out of PO)

Impossible ← Unlikely — Equally likely — Likely → Certain

0	$\frac{1}{6}$	$\frac{2}{6}$	$\frac{3}{6}$	$\frac{4}{6}$	$\frac{5}{6}$	1
A	B	C	D	E	F	G

Hints: Probability ranges from 0 to 1.
The closer the probability is to 1, the more likely the event is to happen.
The closer the probability is to 0, the more unlikely the event is to happen.

Q. When a spinner is spun, what is the probability of spinning a number greater than 10? [Give your answer as a fraction in simplest form.]

A. $FO = 4$ (13, 16, 19, 22)
$PO = 8$ (1, 4, 7, 10, 13, 16, 19, 22)

$$Pr(number > 10) = \frac{FO}{PO}$$
$$= \frac{4 \div 4}{8 \div 4}$$
$$= \frac{1}{2}$$

a) A hookey ring is thrown. What is the probability of hooking an even number? [Give your answer as a fraction.]

$FO = 6$ (2, 4, 6, 8, 10, 12)

$PO = 13$ (1 to 13)

$$Pr(even\ number) = \frac{FO}{PO} = \boxed{}$$

b) A 52 card deck of playing cards is shuffled and one card is dealt from the top of the deck. What is the probability that it will be a black card? [Give your answer as a fraction in simplest form.]

$FO =$

$PO =$

$$Pr(black\ card) = \frac{FO}{PO} = \boxed{}$$

Skill 30.5   Calculating the probability of a simple event (2).

MM4.2 1 1 2 2 **3 3 4** 4
MM5.1 1 1 **2 2** 3 3 4 4

c) When a die is rolled, what is the probability of rolling an even number?
[Give your answer as a fraction in simplest form.]

$FO =$
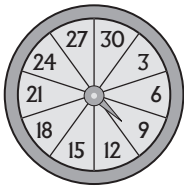...

$PO =$
....

$Pr(even\ number) = \dfrac{FO}{PO} = \qquad = \boxed{}$

d) When a spinner is spun, what is the probability of spinning a G?
[Give your answer as a fraction.]

$FO =$
....

$PO =$
....

$Pr(spinning\ a\ G) = \dfrac{FO}{PO} = \qquad = \boxed{}$

e) A spinner is divided into 10 equal parts. When it is spun once, what is the probability of spinning an odd number?
[Give your answer as a fraction in simplest form.]

$FO =$
....

$PO =$
....

$Pr(odd\ number) = \dfrac{FO}{PO} = \qquad = \boxed{}$

f) If a letter tile is chosen at random, find the probability of choosing letter M.
[Give your answer as a fraction.]

$FO =$
....

$PO =$
....

$Pr(letter\ M) = \dfrac{FO}{PO} = \qquad = \boxed{}$

g) A 52 card deck of playing cards is shuffled and one card is dealt from the top of the deck. What is the probability that it will be a King? [Give your answer as a fraction in simplest form.]
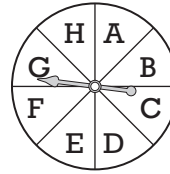
$FO =$
....

$PO =$
....

$Pr(king) = \dfrac{FO}{PO} = \qquad = \boxed{}$

h) A day is randomly selected from the month of November. What is the probability that it will be a holiday?
[Give your answer as a fraction in simplest form.]

SUN	MON	TUE	WED	THU	FRI	SAT
1	2	3	4	5	6	7
8	9	10		12	13	14
15	16	17	18	19	20	21
22	23	24	25		27	28
29	30					

✕ **holiday**

$FO =$
....

$PO =$
....

$Pr(holiday) = \dfrac{FO}{PO} = \qquad = \boxed{}$

Skill 30.5   Calculating the probability of a simple event (3).

MM4.2 1 1 2 2 **3 3** 4
MM5.1 1 1 **2 2** 3 4 4

i) A bag contains 20 keys, one of which opens the door to the prize car. One key is randomly selected from the bag. What is the probability of selecting the winning key? [Give your answer as a fraction.]
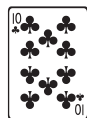
FO =

....

PO =

....

$Pr(winning\ key) = \dfrac{FO}{PO}$ =

....

j) A 52 card deck of playing cards is shuffled and one card is dealt from the top of the deck. What is the probability that it will be a club? [Give your answer as a fraction in simplest form.]

FO =

....

PO =

....

$Pr(club) =$ = =

....

k) A 52 card deck of playing cards is shuffled and one card is dealt from the top of the deck. What is the probability that it will be a red card? [Give your answer as a fraction in simplest form.]
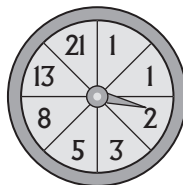
FO =

....

PO =

....

$Pr(red\ card) =$ = =

....

l) A spinner is divided into 8 equal parts. When it is spun once, what is the probability of spinning an even number? [Give your answer as a fraction in simplest form.]
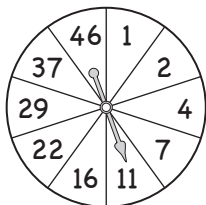
FO =

....

PO =

....

$Pr(even\ number) =$ = =

....

m) When the spinner is spun once, what is the probability of spinning a prime number? [Give your answer as a fraction in simplest form.]

FO =

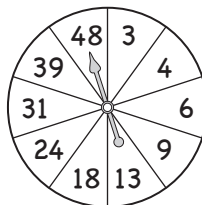...

PO =

....

$Pr(prime\ number) =$ = =

....

n) When the spinner is spun once, what is the probability of spinning a composite number? [Give your answer as a fraction.]

FO =

....

PO =

....

$Pr(composite\ number) =$ =

....

o) There are 8 horses, 10 dogs, 6 chickens and 12 pigs in a yard. If an animal is selected at random, what is the probability that a chicken is chosen? [Give your answer as a fraction in simplest form.]

....

.... ☐

p) Ten balls numbered 1 to 10 are mixed together and then one ball is drawn. Find the probability that a number less than 5 is drawn. [Give your answer as a fraction in simplest form.]

....

.... ☐

q) There are 7 tomato soup cans, 3 chicken soup cans, 5 vegetable soup cans and 3 pumpkin soup cans in the cupboard. If a can is chosen at random, what is the probability that it is a chicken soup can? [Give your answer as a fraction in simplest form.]

....

.... ☐

r) Mia has a bag that contains 7 blue, 5 white, 12 green and 6 yellow marbles. If Mia is randomly selecting a marble, what is the probability that she chooses a green marble? [Give your answer as a fraction in simplest form.]

....

.... ☐

Q. Which event is most unlikely to happen?
- A) choosing a spade from a deck of 52 playing cards
- B) rolling a '4' on a standard die
- C) selecting a white marble from a bag of 8 black and 2 white marbles

A. *Consider each alternative:*   ⟨*Simplify: ÷ 13*⟩

a) 13 spades in 52 cards $= \dfrac{13}{52} = \dfrac{1}{4}$

b) 1 four on a 6 sided die $= \dfrac{1}{6}$ ⟨*Least likely*⟩

c) 2 white marbles out of 10 $= \dfrac{2}{10} = \dfrac{1}{5}$

$\Rightarrow$ **B**   ⟨*Simplify: ÷ 2*⟩

---

s) Which event is most unlikely to happen?
- A) rolling a '6' on a standard die
- B) drawing a diamond from a deck of 52 playing cards
- C) predicting 'boy' for an unborn baby

....

.... = ☐

t) Which event is most likely to happen?
- A) choosing 'false' as the answer
- B) selecting the winner in a 10 horse race
- C) scoring the only touchdown in a game of football

....

.... = ☐

Skill 30.5   Calculating the probability of a simple event (5).

MM4.2 11 22 **33** 4 4
MM5.1 11 **22** 3 4 4

u)   Which event is most likely to happen?

A)   winning the jackpot in a lottery
B)   rolling an odd number on a die
C)   selecting a consonant from
     the word GEOMETRY

....

....

....   = ☐

v)   Which event is most likely to happen?

A)   turning 'heads' on a tossed coin
B)   serving an ace ten times in a row
C)   rolling a number greater
     than 1 on a standard die

....

....   = ☐

w)   Which event is most unlikely to happen?

A)   marking a 'cross' playing
     noughts and crosses
B)   selecting an even number from the
     numbers 1 to 8
C)   throwing a 13 on a hookey board
     marked 1 to 13

....

....   = ☐

x)   Which event does **not** have a 50% chance of success?

A)   drawing a red card from a deck of
     52 playing cards
B)   throwing a bullseye on a dartboard
C)   marking a 'nought' in *noughts and
     crosses*

....

....   = ☐

y)   Which event is most likely to happen?

A)   selecting 'red' from the 7 colours
     of the rainbow
B)   moving a pawn at the start of a
     chess game
C)   randomly hitting a key on a
     keyboard and it being the 'tab' key

....

....   = ☐

z)   Which event is most likely to happen?

A)   choosing a prime number from the
     numbers 2 to 7
B)   winning a car in a raffle
C)   selecting a vowel from
     the word PROBABILITY
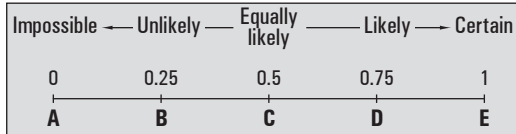
....

....   = ☐

Skill 30.6 Calculating the probability of a simple event using probability scales.

MM4.2 11 22 33 **4** 4
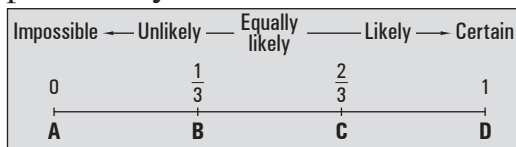MM5.1 11 22 **3** 3 44

- Divide the number of favourable outcomes (FO) by the number of possible outcomes (PO).
  (see skill 30.5, page 316)

Q. 'A coin is tossed and tails comes up.'
Which letter A to E best represents the probability of the event?

Impossible — Unlikely — Equally likely — Likely — Certain

0	0.25	0.5	0.75	1
A	B	C	D	E

A. $FO = 1$ (tails) $PO = 2$ (heads or tails)

$Pr\ (event) = \dfrac{FO}{PO}$ ⟵ possible outcomes

$= \dfrac{1}{2}$

$= 0.5$

The answer is **C**

---

a) 'A blue tile will be drawn from a box containing 8 black tiles and 4 blue tiles.'
Which letter A to D best represents the probability of the event?

Impossible — Unlikely — Equally likely — Likely — Certain

0	$\frac{1}{3}$	$\frac{2}{3}$	1
A	B	C	D

$FO = 4$ $PO = 12$

$\dfrac{FO}{PO} = \dfrac{4}{12} = \dfrac{1}{3}$ (simplify: ÷ 4)   ⟹ ☐

b) 'A die is rolled and a 6 comes up.'
Which letter A to G best represents the probability of the event?

Impossible — Unlikely — Equally likely — Likely — Certain

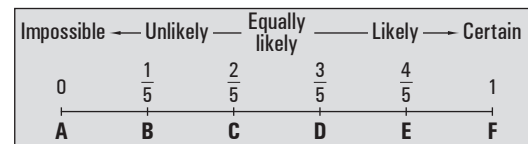| 0	$\frac{1}{6}$	$\frac{2}{6}$	$\frac{3}{6}$	$\frac{4}{6}$	$\frac{5}{6}$	1
A	B	C	D	E	F	G

$FO =$ $PO =$

$\dfrac{FO}{PO} =$ ⟹ ☐

c) 'A caramel chocolate will be drawn from a box containing 12 caramel and 4 spearmint chocolates.'
Which letter A to E best represents the probability of the event?

Impossible — Unlikely — Equally likely — Likely — Certain

0	0.25	0.5	0.75	1
A	B	C	D	E

$FO =$ $PO =$

$=$ ⟹ ☐

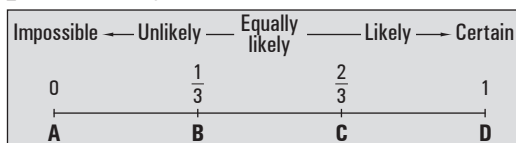**d)** 'A 5-sided pencil is rolled and the logo, printed on 1 side, comes up.'
Which letter A to F best represents the probability of the event?

Impossible — Unlikely — Equally likely — Likely — Certain

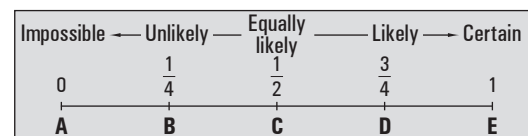| 0	$\frac{1}{5}$	$\frac{2}{5}$	$\frac{3}{5}$	$\frac{4}{5}$	1
A	B	C	D	E	F

$FO =$ $PO =$

$=$ ⟹ ☐

e) 'A red marble will be drawn from a bag containing 3 red and 6 blue marbles.'
Which letter A to D best represents the probability of the event?

Impossible — Unlikely — Equally likely — Likely — Certain

0	$\frac{1}{3}$	$\frac{2}{3}$	1
A	B	C	D

$FO =$ $PO =$

$=$ ⟹ ☐

f) 'A club is drawn from a pack of 52 playing cards.'
Which letter A to E best represents the probability of the event?

Impossible — Unlikely — Equally likely — Likely — Certain

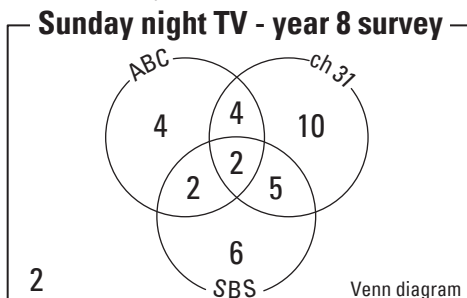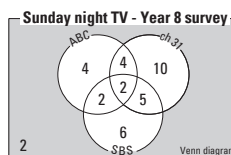| 0	$\frac{1}{4}$	$\frac{1}{2}$	$\frac{3}{4}$	1
A	B	C	D	E

$FO =$ $PO =$

$=$ ⟹ ☐

- Count the total number of possible outcomes.
- Shade the areas inside the Venn diagram that fit the description for favourable outcomes.
- Use the formula for the probability of an event.

Q. What is the probability that a student selected at random from the year 8 class did not watch any Sunday night TV? [Give your answer as a fraction.]
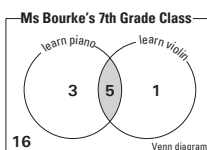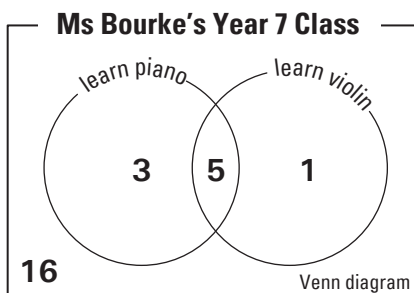
— **Sunday night TV - year 8 survey** —

ABC   ch 31
4   **4**   10
2
2   5
6
2   SBS   Venn diagram

A. $FO = 2$

$PO = 4 + 4 + 2 + 2 + 10 + 5 + 6 + 2$
$= 35$

$Pr(event) = \dfrac{FO}{PO} = \dfrac{2}{35}$

possible outcomes

— Sunday night TV - Year 8 survey —
ABC   ch 31
4   4   10
2
2   5
6
2   SBS   Venn diagram

Students who do not watch TV are shown in the shaded area. Students who do watch TV are shown in the white area.
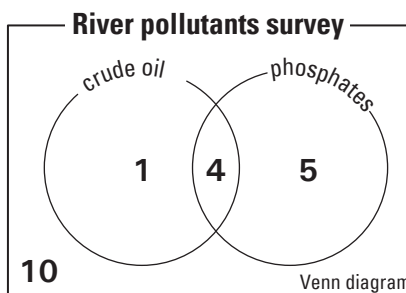
a) What is the probability that a student chosen at random from Ms Bourke's class learns both piano and violin?
[Give your answer as a fraction in simplest form.]

— **Ms Bourke's Year 7 Class** —

learn piano   learn violin
3   **5**   **1**
16   Venn diagram

— Ms Bourke's 7th Grade Class —
learn piano   learn violin
3   5   1
16   Venn diagram

$FO = 5$ $PO = 16 + 3 + 5 + 1 = 25$

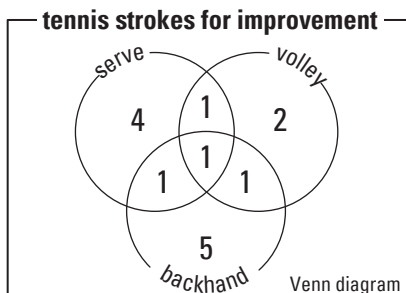$Pr(event) = \dfrac{FO}{PO} = \dfrac{5}{25} \, \substack{\div 5 \\ \div 5} \qquad = \boxed{}$

b) What is the probability that a surveyed river, visited at random, contained only phosphate pollutants?
[Give your answer as a fraction in simplest form.]

— **River pollutants survey** —

crude oil   phosphates
1   **4**   **5**
10   Venn diagram

$FO = \qquad PO =$
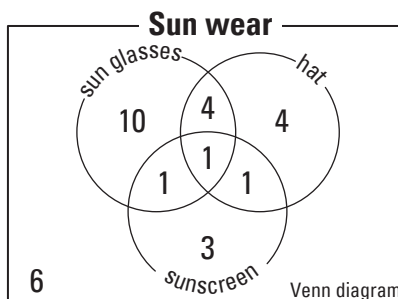
$Pr(event) = \qquad = \qquad = \boxed{}$

c) What is the probability that a tennis player chosen at random named the serve as the stroke that needs improvement? [Give your answer as a fraction.]

— **tennis strokes for improvement** —

serve   volley
4   **1**   2
1
1   1
5
backhand   Venn diagram

$FO = \qquad PO =$

$Pr(event) = \qquad = \boxed{}$

d) What is the probability that a person chosen at random did not wear sunscreen? [Give your answer as a fraction in simplest form.]

— **Sun wear** —

sun glasses   hat
10   **4**   4
1
1   1
3
6   sunscreen   Venn diagram

$FO = \qquad PO =$

$Pr(event) = \qquad = \boxed{}$

- Identify and calculate the probability of the event.

  $$Pr(event) = \frac{\text{number of favourable outcomes}}{\text{number of possible outcomes}} = \frac{FO}{PO}$$

- Identify the complementary events.
- Subtract the probability of the event from 1. $Pr(\text{complementary event}) = 1 - Pr(event)$

Hints: The complement of the event "the plane will be on time" is "the plane will not be on time".
Winning - not winning, voting "yes" - voting "no" are examples of complementary events.

Q. A box contains 10 blue, 2 green and 6 white ribbons. If a ribbon is selected at random, find the probability that it is not a green ribbon. [Give your answer as a fraction in simplest form.]

A. *Event = green*
Complementary event = not a green

$Pr(green) \quad = \dfrac{2}{18}$

$Pr(not\ green) = 1 - \dfrac{2}{18}$

$= \dfrac{18}{18} - \dfrac{2}{18} = \dfrac{16}{18} \begin{smallmatrix} \div 2 \\ \\ \div 2 \end{smallmatrix} = \dfrac{8}{9} = 0.\dot{8}$

a) The probability of an earthquake of 7.5 magnitude occurring in San Francisco in any year is 2%. What is the probability of there being no earthquake in San Francisco next year? [Give your answer as a percentage.]

$Pr(earthquake) = 2\%$

....

$Pr(no\ earthquake) = 100\% - 2\% = \boxed{}$

b) The cookie jar contains 12 cookies of which 4 are burnt. What is the probability of Leah choosing a cookie that is not burnt? [Give your answer as a fraction in simplest form.]

$Pr(burnt) =$

....

$Pr(not\ burnt) = \qquad = \boxed{}$

....

c) A bag contains gold and silver discs. The probability of choosing a gold disc is $\dfrac{2}{5}$. What is the probability of not choosing a gold disc? [Give your answer as a fraction.]

$Pr(gold) =$

....

$Pr(not\ gold) = \qquad = \boxed{}$

....

d) Ten balls numbered 1 to 10 are mixed together and then one ball is drawn. Find the probability that the number drawn is not a perfect square (i.e. 1, 4 or 9). [Give your answer as a fraction.]

$Pr(perfect\ square) =$

....

$Pr(not\ perfect\ square) = \qquad = \boxed{}$

....

e) A ballot box contains 20 liberal, 12 green and 18 labor votes. If one vote is picked at random, what is the probability that it is not labor? [Give your answer as a fraction in simplest form.]

....

$= \boxed{}$

....

f) Of the New Zealand families who have children, 41% have one child and 36% have two children. What is the probability that a New Zealand family with children, when selected at random, has more than two children? [Give your answer as a percentage.]

....

$= \boxed{}$

....

Skill 30.9 Calculating the probability of mutually exclusive events.

MM4.2 11 22 33 44
MM5.1 11 22 33 **4** 4

- Find the probability of each event.

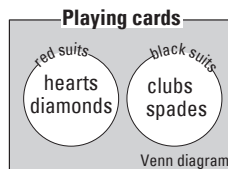$$Pr(event) = \frac{\text{number of favourable outcomes}}{\text{number of possible outcomes}} = \frac{FO}{PO}$$

- Add the probabilities of each event in order to find the probability of both events occurring.

$$Pr(A \text{ and } B) = Pr(A) + Pr(B)$$

- Simplify the fraction where necessary.

  Hint: *Mutually exclusive events cannot occur at the same time.*

  Example: A card selected from a pack of playing cards can either be red or black, but not both.

  Playing cards

  red suits — hearts diamonds

  black suits — clubs spades

  Venn diagram

Q. A stable contains 3 mares, 1 stallion and 8 geldings. If a horse is selected at random, find the probability that it is a mare or a gelding. [Give your answer as a fraction.]

A. $Pr(M) = \dfrac{3}{12}$

$Pr(G) = \dfrac{8}{12}$

$Pr(M \text{ or } G) = Pr(M) + Pr(G)$

$= \dfrac{3}{12} + \dfrac{8}{12}$

$= \dfrac{\mathbf{11}}{\mathbf{12}}$

---

a) What is the probability of drawing a red card or a club from a pack of cards?

[Give your answer as a fraction in simplest form.]

$Pr(red) = \dfrac{26}{52}$ $Pr(club) = \dfrac{13}{52}$

$Pr(red \text{ or } club) = Pr(red) + Pr(club)$

$= \dfrac{26}{52} + \dfrac{13}{52} = \dfrac{39}{52} \begin{smallmatrix} \div 13 \\ \\ \div 13 \end{smallmatrix} \qquad = \boxed{}$

b) When a die is rolled, what is the probability of rolling a 5 or a 6?

[Give your answer as a fraction in simplest form.]

$Pr(5) = \underline{\hspace{2cm}}$ $Pr(6) = \underline{\hspace{2cm}}$

$Pr(5 \text{ or } 6) = Pr(5) + Pr(6)$

$= \underline{\hspace{3cm}} \qquad = \boxed{}$

c) In the lucky dip box there are 5 lolly bags, 4 marble bags and 3 sand bags. If a bag is selected at random, find the probability that it is a lolly or a marble bag. [Give your answer as a fraction in simplest form.]

$Pr(red) = \underline{\hspace{2cm}}$ $Pr(club) = \underline{\hspace{2cm}}$

$= \boxed{}$

d) When a die is rolled, what is the probability of rolling an odd number or an even number? [Give your answer as a fraction in simplest form.]

$= \boxed{}$

Skill 30.10 Finding the possible outcomes of an event by applying the counting principle.

MM4.2 11 22 33 44
MM5.1 11 22 33 4 **4**

- Multiply the number of possibilities in event 1 by the number of possibilities in event 2.
  Hint: The counting principle can be extended to 3 or more events.

Q. Maria chose 1 chemistry class, 1 maths class, 1 history class and 1 English class. According to the schedule she has 2 different chemistry classes, 4 different maths classes, 3 different history classes and 3 different English classes to choose from. If no scheduling conflicts exist, how many different 4-course selections can Maria make?

A. *Number of 4-course selections*
$$= 2 \times 4 \times 3 \times 3$$
$$= 72$$

a) How many different 3-digit numbers can be made from the digits $4, 5, 6, 7$ and 8, if a digit can appear just once?

$N = 5 \times 4 \times 3 \qquad = \boxed{60}$

5 digits in 1st position, 4 digits in 2nd position, 3 digits in 3rd position

b) In how many ways can a family of five stand in a line for a photograph?

$N = \underline{\hspace{3cm}} \qquad = \boxed{}$

c) A coin and a six-sided die are tossed. How many results are possible?

$N = \underline{\hspace{3cm}} \qquad = \boxed{}$

d) How many 4-digit numbers can be formed with the digits $1, 2, 3$ and 4 if no digit can be used more than once?

$N = \underline{\hspace{3cm}} \qquad = \boxed{}$

e) Two coins and one five-sided die are tossed. How many results are possible?

$N = \underline{\hspace{3cm}} \qquad = \boxed{}$

f) In how many ways can six books be arranged on a shelf?

$N = \underline{\hspace{3cm}} \qquad = \boxed{}$

g) How many possible outfits can be created with 3 different dresses, 5 different vests and 2 different pairs of shoes?

$N = \underline{\hspace{3cm}} \qquad = \boxed{}$

h) Using one of each kind of ingredient, how many hamburger combinations can be made with 3 different kinds of bread, 6 different fillings and 2 different sauces?

$N = \underline{\hspace{3cm}} \qquad = \boxed{}$

i) In how many ways can a coach select two emergencies from a total of five players?

$N = \underline{\hspace{3cm}} \qquad = \boxed{}$

j) In how many ways can any 4 of the vowels be grouped assuming they are not repeated?

$N = \underline{\hspace{3cm}} \qquad = \boxed{}$