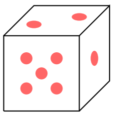
PROBABILITY

A ALGEBRA OF EVENTS

A.1 SAMPLE SPACE

A.1.1 FINDING THE SAMPLE SPACES

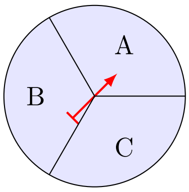
MCQ 1: A fair six-sided die is rolled once.



Find the sample space.

- ☐ $\{1,2,3,4,5\}$
- ☐ $\{1,2,3,4,5,6,7\}$
- ☐ $\{1,2,3,4,5,6\}$

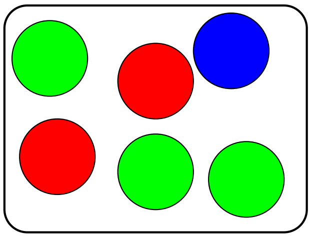
MCQ 2: You spin the arrow on the spinner below.



Find the sample space.

- ☐ $\{A,B,C\}$
- ☐ $\{A,B\}$
- ☐ $\{A,C\}$

MCQ 3: A ball is chosen randomly from a bag containing 2 red balls, 1 blue ball, and 3 green balls.



Find the sample space.

- ☐ {Red, Blue, Green}
- ☐ {2 Red, 1 Blue, 3 Green}
- ☐ {Red, Red, Blue, Green, Green, Green}

MCQ 4: A letter is chosen randomly from the word BANANA. Find all possible outcomes for the chosen letter.

- ☐ {B, N, A}
- ☐ {B, A, N, A, N, A}
- ☐ {A, B, N, A, B, N}

MCQ 5: A couple is expecting a baby. What is the sample space for this random experiment?

- ☐ {boy, girl}
- ☐ {boy}
- ☐ {girl}

A.2 EVENTS

A.2.1 FINDING EVENTS FOR DIE-ROLLING EVENTS

MCQ 6: If you roll a die, what is the set of outcomes for the event "getting a 3"?

- ☐ $\{1,3,5\}$
- ☐ $\{2,3,4\}$
- ☐ $\{1,2,3\}$
- ☐ $\{3\}$

MCQ 7: If you roll a die, what is the set of outcomes for the event "getting a 5 or 6"?

- ☐ $\{5,6\}$
- ☐ $\{4,5,6\}$
- ☐ $\{1,2,3\}$
- ☐ $\{3,4,5\}$

MCQ 8: If you roll a die, what is the set of outcomes for the event "getting a number greater than or equal to 4"?

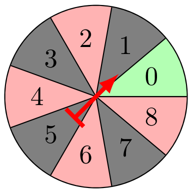
- ☐ $\{1,2,3\}$
- ☐ $\{4,5,6\}$
- ☐ $\{3,4,5\}$
- ☐ $\{2,3,4\}$

MCQ 9: If you roll a die, what is the set of outcomes for the event "even number"?

- ☐ $\{1,3,5\}$
- ☐ $\{2,4,6\}$
- ☐ $\{1,2,3,4,5,6\}$
- ☐ $\{2,3,4,5\}$

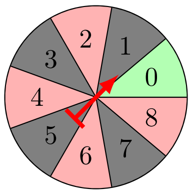
A.2.2 FINDING EVENTS IN A CASINO SPINNER

MCQ 10: If you spin the spinner below, what is the set of outcomes for the event "getting a 2"?



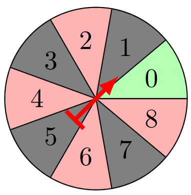
- ☐ $\{2\}$
- ☐ $\{1,2,3\}$
- ☐ $\{2,4,6\}$
- ☐ $\{0,1,2\}$

MCQ 11: If you spin the spinner below, what is the set of outcomes for the event "red"?



- ☐ $\{1,3,5,7\}$
- ☐ $\{0\}$
- ☐ $\{2,4,6,8\}$
- ☐ $\{1,2,3,4\}$

MCQ 12: If you spin the spinner below, what is the set of outcomes for the event "getting an odd number"?



- ☐ $\{0,1,3\}$
- ☐ $\{2,4,6,8\}$
- ☐ $\{1,2,3,4\}$
- ☐ $\{1,3,5,7\}$

A.3 COMPLEMENTARY EVENTS

A.3.1 FINDING THE COMPLEMENTARY EVENTS

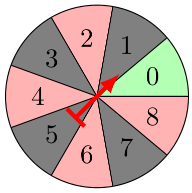
MCQ 13: If you roll a die, what is the set of outcomes for the event "not getting a 6"?

- ☐ $\{2,3,4\}$
- ☐ $\{1,2,3,4,5,6\}$
- ☐ $\{1,2,3,4,5\}$
- ☐ $\{1,3,5\}$

MCQ 14: If you roll a die, what is the set of outcomes for the event "not getting an odd number"?

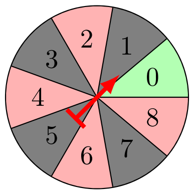
- ☐ $\{2,4,6\}$
- ☐ $\{1,2,3,4,5,6\}$
- ☐ $\{1,2,3\}$
- ☐ $\{1,3,5\}$

MCQ 15: If you spin the spinner below, what is the set of outcomes for the event "not getting a 4"?



- ☐ $\{1,2,3,4\}$
- ☐ $\{0,1,2,3,5,6,7,8\}$
- ☐ $\{2,4,6,8\}$
- ☐ $\{4,5,6\}$

MCQ 16: If you spin the spinner below, what is the set of outcomes for the event "not getting red"?



- ☐ $\{0,1,3,5,7\}$
- ☐ $\{2,4,6,8\}$
- ☐ $\{1,2,3,4,5,6,7,8\}$
- ☐ $\{0\}$

A.4 MULTI-STEP RANDOM EXPERIMENTS

A.4.1 FINDING OUTCOME IN A TABLE

MCQ 17: The table below shows the possible outcomes for the sexes of two children, first and second, where each can be a Boy (B) or a Girl (G).

second child / first child	B	G
B	BB	?
G	GB	GG

Find the missing outcome.

- ☐ BB
- ☐ BG
- ☐ GB

MCQ 18: The table below shows the possible outcomes when selecting two letters at random from the word "MAT" **with replacement** (after choosing a letter, it is put back before the next selection).

letter 1 \ letter 2	M	A	T
M	MM	MA	MT
A	AM	AA	AT
T	TM	?	TT

Find the missing outcome.

- ☐ TT
- ☐ TA
- ☐ AT

MCQ 19: The table below shows the possible outcomes when selecting two letters at random from the word "CODE" **with replacement** (after choosing a letter, it is put back before the next selection).

letter 1 \ letter 2	C	O	D	E
C	CC	CO	CD	CE
O	OC	OO	OD	OE
D	DC	?	DD	DE
E	EC	EO	ED	EE

Find the missing outcome.

- ☐ DO
- ☐ OD
- ☐ DC

MCQ 20: The table below shows the possible outcomes when selecting two letters at random from the word "NODE" **without replacement** (after choosing a letter, it is not put back before the next selection). An "X" means no outcome is possible.

letter 1 \ letter 2	N	O	D	E
N	**X**	?	ND	NE
O	ON	**X**	OD	OE
D	DN	DO	**X**	DE
E	EN	EO	ED	**X**

Find the missing outcome.

- ☐ NN
- ☐ NO
- ☐ ON

MCQ 21: The table below shows the possible outcomes when a coach selects two players at random from four players (A, B, C, D) **without replacement** (after choosing a player, they are not put back before the next selection). An "X" means no outcome is possible.

Player 1 \ Player 2	A	B	C	D
A	**X**	?	AC	AD
B	BA	**X**	BC	BD
C	CA	CB	**X**	CD
D	DA	DB	DC	**X**

Find the missing outcome.

- ☐ AB
- ☐ BA
- ☐ CA

A.4.2 COUNTING THE NUMBER OF POSSIBLE OUTCOMES IN A TABLE

Ex 22: The table below shows the possible outcomes for the sexes of two children, first and second, where each can be a Boy (B) or a Girl (G).

first child \ second child	B	G
B	BB	BG
G	GB	GG

Count the number of possible outcomes.

☐ possible outcomes.

Ex 23: There are four players: A, B, C, and D. For position 1, only players A and B are eligible. For position 2, only players C and D are eligible. The table below shows the possible selections for the two positions.

position 1 \ position 2	C	D
A	AC	AD
B	BC	BD

Count the number of possible outcomes.

☐ possible outcomes.

Ex 24: There are four players: A, B, C, and D. A coach selects two players at random without replacement. The table below shows the possible selections for the two positions. An "X" means no outcome is possible.

Player 1 \ Player 2	A	B	C	D
A	**X**	AB	AC	AD
B	BA	**X**	BC	BD
C	CA	CB	**X**	CD
D	DA	DB	DC	**X**

Count the number of possible outcomes.

☐ possible outcomes.

Ex 25: There are three students: X, Y, and Z. A teacher selects one student each day, on Monday and Tuesday, to recite a poem. The selection is made without replacement, meaning the same student cannot be chosen both days. The table below shows the possible selections for the two days.

Monday \ Tuesday	X	Y	Z
X	**X**	XY	XZ
Y	YX	**X**	YZ
Z	ZX	ZY	**X**

Count the number of possible outcomes.

☐ possible outcomes.

A.4.3 COUNTING THE NUMBER OF POSSIBLE OUTCOMES FOR AN EVENT

Ex 26: There are four players: A, B, C, and D. A coach selects two players at random without replacement. The table below shows the possible selections for the two positions. An "X" means no outcome is possible.

Player 2 / Player 1	A	B	C	D
A	**X**	AB	AC	AD
B	BA	**X**	BC	BD
C	CA	CB	**X**	CD
D	DA	DB	DC	**X**

Count the number of outcomes for the event that player A is selected.

☐ outcomes.

Ex 27: A pair of colored dice (one red and one blue) is rolled. Each die has faces numbered 1 to 6. The table below shows the possible outcomes for the two dice.

blue die / red die	1	2	3	4	5	6
1	11	12	13	14	15	16
2	21	22	23	24	25	26
3	31	32	33	34	35	36
4	41	42	43	44	45	46
5	51	52	53	54	55	56
6	61	62	63	64	65	66

Count the number of outcomes for the event "double" (both dice show the same number).

☐ outcomes.

Ex 28: A pair of colored dice (one red and one blue) is rolled. Each die has faces numbered 1 to 6. The table below shows the possible outcomes for the two dice.

blue die / red die	1	2	3	4	5	6
1	11	12	13	14	15	16
2	21	22	23	24	25	26
3	31	32	33	34	35	36
4	41	42	43	44	45	46
5	51	52	53	54	55	56
6	61	62	63	64	65	66

Count the number of outcomes for the event "at least one 6" (at least one die shows a 6).

☐ outcomes.

Ex 29: A pair of colored dice (one red and one blue) is rolled. Each die has faces numbered 1 to 6. The table below shows the possible outcomes for the two dice.

blue die / red die	1	2	3	4	5	6
1	11	12	13	14	15	16
2	21	22	23	24	25	26
3	31	32	33	34	35	36
4	41	42	43	44	45	46
5	51	52	53	54	55	56
6	61	62	63	64	65	66

Count the number of outcomes for the event "the sum of the dice is equal to 11."

☐ outcomes.

Ex 30: A pair of colored dice (one red and one blue) is rolled. Each die has faces numbered 1 to 6. The table below shows the possible outcomes for the two dice.

blue die / red die	1	2	3	4	5	6
1	11	12	13	14	15	16
2	21	22	23	24	25	26
3	31	32	33	34	35	36
4	41	42	43	44	45	46
5	51	52	53	54	55	56
6	61	62	63	64	65	66

Count the number of outcomes for the event "the sum of the dice is equal to 7."

☐ outcomes.

Ex 31: A pair of colored dice (one red and one blue) is rolled. Each die has faces numbered 1 to 6. The table below shows the possible outcomes for the two dice.

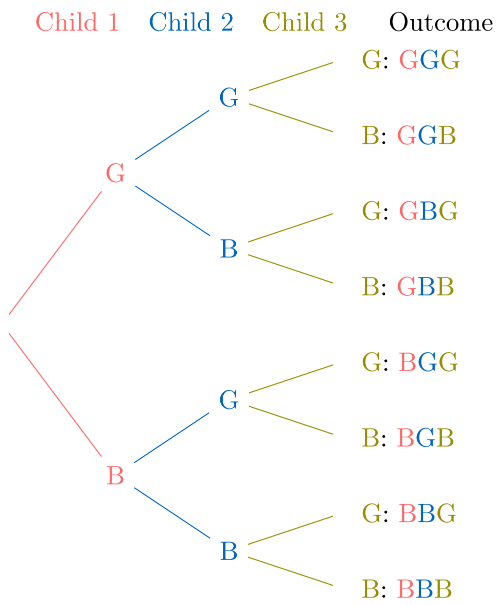
blue die / red die	1	2	3	4	5	6
1	11	12	13	14	15	16
2	21	22	23	24	25	26
3	31	32	33	34	35	36
4	41	42	43	44	45	46
5	51	52	53	54	55	56
6	61	62	63	64	65	66

Count the number of outcomes for the event "the sum of the dice is less than or equal to 3."

☐ outcomes.

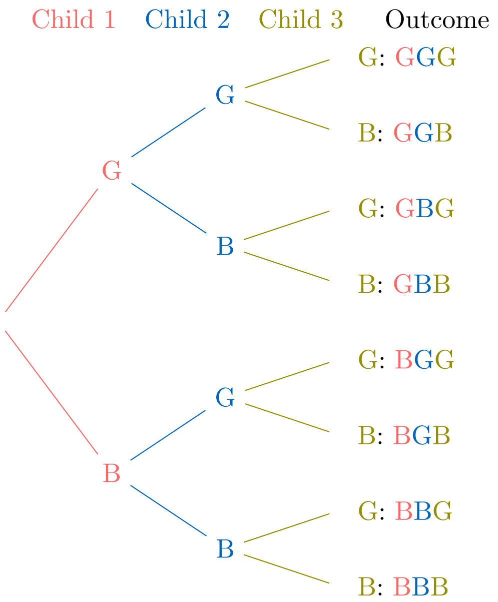
A.4.4 COUNTING THE NUMBER OF POSSIBLE OUTCOMES IN A TREE DIAGRAM

Ex 32: Parents have three children, each either a boy (B) or a girl (G). The tree diagram below illustrates all 8 possible sex outcomes for the three children.



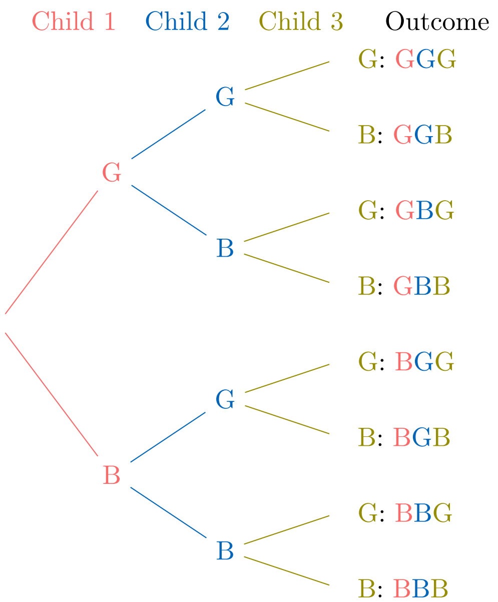
Count the number of possible outcomes for the event where the first child is a boy.

Ex 33: Parents have three children, each either a boy (B) or a girl (G). The tree diagram below illustrates all 8 possible sex outcomes for the three children.



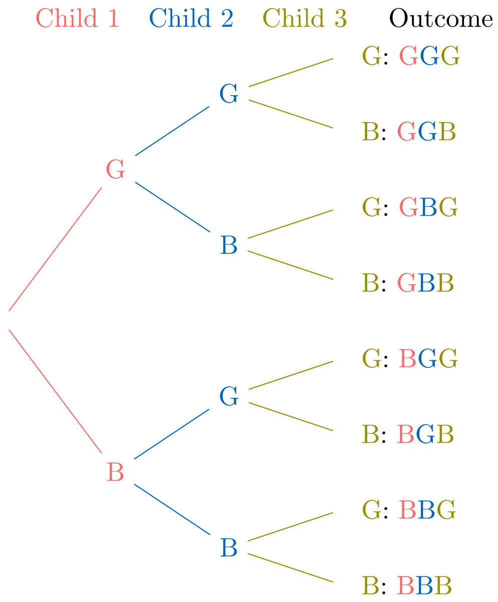
Count the number of possible outcomes for the event where there are exactly two girls.

Ex 34: Parents have three children, each either a boy (B) or a girl (G). The tree diagram below shows all 8 possible sex outcomes for the three children.



Count the number of possible outcomes for the event where there are at least two girls.

Ex 35: Parents have three children, each either a boy (B) or a girl (G). The tree diagram below illustrates all 8 possible sex outcomes for the three children.



Count the number of possible outcomes for the event where the family has mixed-sex children (at least one boy and one girl).

B PROBABILITY

B.1 DEFINITION

B.1.1 DESCRIBING PROBABILITIES WITH WORDS

MCQ 36: The probability of winning a game is $\frac{1}{10}$. Find the word to describe this probability.

☐ Impossible

☐ Less Likely

☐ Even Chance

☐ Most Likely

☐ Certain

MCQ 37: The probability of winning a game is $\frac{4}{5}$. Find the word to describe this probability.

☐ Impossible

☐ Less Likely

☐ Even Chance

☐ Most Likely

☐ Certain

MCQ 38: The probability of winning a game is $\frac{1}{2}$. Find the word to describe this probability.

☐ Impossible

☐ Less Likely

☐ Even Chance

☐ Most Likely

☐ Certain

MCQ 39: The probability of winning a game is 0. Find the word to describe this probability.

☐ Impossible

☐ Less Likely

☐ Even Chance

☐ Most Likely

☐ Certain

MCQ 40: The probability of winning a game is 1. Find the word to describe this probability.

☐ Impossible

☐ Less Likely

☐ Even Chance

☐ Most Likely

☐ Certain

B.1.2 MAKING DECISIONS USING PROBABILITIES

MCQ 41: Louis advises you to play because the probability of winning this game is $\frac{3}{4}$. Do you follow his advice?

☐ Yes

☐ No

MCQ 42: Louis advises you to play because the probability of winning this game is $\frac{1}{4}$. Do you follow his advice?

☐ Yes

☐ No

MCQ 43: The probability of succeeding a penalty is $\frac{1}{2}$ for Louis and $\frac{3}{4}$ for Hugo. Which player do you choose to take the penalty?

☐ Louis

☐ Hugo

MCQ 44: The probability of succeeding a penalty is $\frac{1}{4}$ for Louis and $\frac{3}{5}$ for Hugo. Which player do you choose to take the penalty?

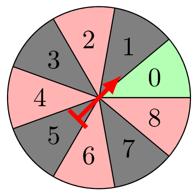
☐ Louis

☐ Hugo

B.2 EQUALLY LIKELY

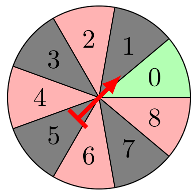
B.2.1 FINDING PROBABILITIES IN A CASINO SPINNER

Ex 45: You spin the casino spinner shown below. Calculate the probability of the event "getting a 2".



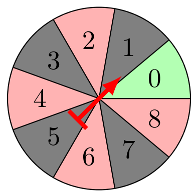
$P(\text{"getting a 2"}) = \square$

Ex 46: You spin the casino spinner shown below. Calculate the probability of the event "not getting a 4".



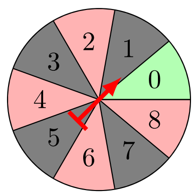
$P(\text{"not getting a 4"}) = \square$

Ex 47: You spin the casino spinner shown below. Calculate the probability of the event "red".



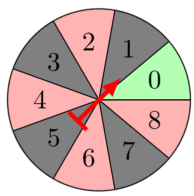
$P(\text{"red"}) = \square$

Ex 48: You spin the casino spinner shown below. Calculate the probability of the event "getting an odd number".



$P(\text{"getting an odd number"}) = \square$

Ex 49: You spin the casino spinner shown below. Calculate the probability of the event "not getting red".



$P(\text{"not getting red"}) = \square$

B.2.2 FINDING PROBABILITIES IN A DICE EXPERIMENT

Ex 50: If you roll a die, what is the probability of the event "getting a 3"?

$$P(\text{"getting a 3"}) = \square$$

Ex 51: If you roll a die, what is the probability of the event "getting a 5 or 6"?

$$P(\text{"getting a 5 or 6"}) = \square$$

Ex 52: If you roll a die, what is the probability of the event "getting a number greater than or equal to 4"?

$$P(\text{"number} \geq 4\text{"}) = \square$$

Ex 53: If you roll a die, what is the probability of the event "even number"?

$$P(\text{"even number"}) = \square$$

Ex 54: If you roll a die, what is the probability of the event "not getting a 6"?

$$P(\text{"not getting a 6"}) = \square$$

Ex 55: If you roll a die, what is the probability of the event "not getting an odd number"?

$$P(\text{"not getting an odd number"}) = \square$$

B.2.3 CALCULATING THE PROBABILITY IN MULTI-STEP RANDOM EXPERIMENTS

Ex 56: A coach selects two players at random from a group of four players, labeled A, B, C, and D, without replacement (once a player is chosen, they are not available for the next selection). The table below shows all possible outcomes for selecting Player 1 and Player 2, where an "X" indicates an impossible outcome due to the same player being selected twice.

Player 2 / Player 1	A	B	C	D
A	**X**	AB	AC	AD
B	BA	**X**	BC	BD
C	CA	CB	**X**	CD
D	DA	DB	DC	**X**

Calculate the probability that player C is selected as either Player 1 or Player 2.

$$P(\text{"selecting player C"}) = \square$$

Ex 57: Parents have three children, each either a boy (B) or a girl (G). The tree diagram below illustrates all 8 possible gender outcomes for the three children.Calculate the probability that the family has at least two girls.

$$P(\text{"at least two girls"}) = \square$$

Ex 58: A pair of colored dice (one red and one blue) is rolled. Each die has faces numbered 1 to 6. The table below shows the possible outcomes for the two dice.

dé bleu / dé rouge	1	2	3	4	5	6
1	11	12	13	14	15	16
2	21	22	23	24	25	26
3	31	32	33	34	35	36
4	41	42	43	44	45	46
5	51	52	53	54	55	56
6	61	62	63	64	65	66

Calculate the probability that the sum of the two dice is exactly 7.

$$P(\text{"sum is 7"}) = \square$$

Ex 59: A pair of colored dice (one red and one blue) is rolled. Each die has faces numbered 1 to 6. The table below shows the possible outcomes for the two dice.

dé bleu / dé rouge	1	2	3	4	5	6
1	11	12	13	14	15	16
2	21	22	23	24	25	26
3	31	32	33	34	35	36
4	41	42	43	44	45	46
5	51	52	53	54	55	56
6	61	62	63	64	65	66

Calculate the probability that the sum of the two dice is greater than or equal to 11.

$$P(\text{"sum } \geq 11\text{"}) = \square$$

Ex 60: A pair of colored dice (one red and one blue) is rolled. Each die has faces numbered 1 to 6. The table below shows the possible outcomes for the two dice.

dé bleu / dé rouge	1	2	3	4	5	6
1	11	12	13	14	15	16
2	21	22	23	24	25	26
3	31	32	33	34	35	36
4	41	42	43	44	45	46
5	51	52	53	54	55	56
6	61	62	63	64	65	66

Calculate the probability that the sum of the two dice is exactly 6 or 8.

$$P(\text{"sum is 6 or 8"}) = \square$$

B.3 COMPLEMENT RULE

B.3.1 APPLYING THE COMPLEMENT RULE

Ex 61: I toss a fair coin. The probability of getting heads is $\frac{1}{2}$. Find the probability of getting tails.

$$P(\text{"Getting tails"}) = \square$$

Ex 62: A teacher told a joke in class: "Why was the math book sad? Because it had too many problems!" The probability that a student laughs at the joke is 70%.
Find the probability that a student does not laugh at the joke.

$$P(\text{"Not laughing"}) = \square\%$$

Ex 63: I randomly select a student in the class. The probability that a girl is selected is $\frac{9}{10}$.
Find the probability that a boy is selected.

$$P(\text{"Selecting a boy"}) = \square$$

Ex 64: The weather forecast predicts that there is a 70% chance of rain tomorrow.
Find the probability that it will not rain tomorrow.

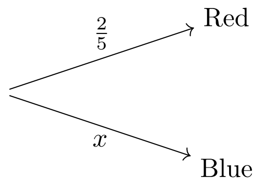
$$P(\text{"No rain"}) = \square\%$$

Ex 65: In a loto game, the probability of winning is $\frac{1}{100}$.
Find the probability of losing.

$$P(\text{"Losing"}) = \square$$

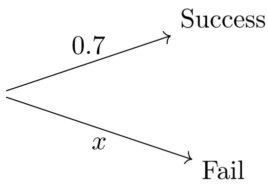
B.3.2 COMPLETING A PROBABILITY TREE DIAGRAM

Ex 66: From a bag containing red balls and blue balls, the probability of choosing a red ball is $\frac{2}{5}$. Find the probability x of choosing a blue ball.



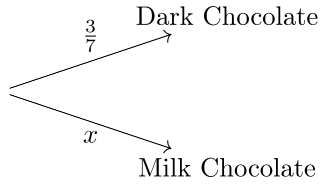
$$x = \frac{\square}{\square}$$

Ex 67: Jasper is playing basketball. The probability that he makes his first shot is 0.7. Find the probability x that he misses his first shot.



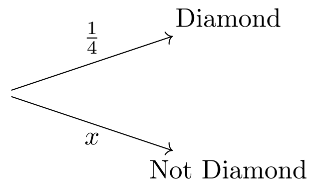
$$x = \square$$

Ex 68: In a box of assorted chocolates, the probability of picking a dark chocolate is $\frac{3}{7}$. Find the probability x of picking a milk chocolate.



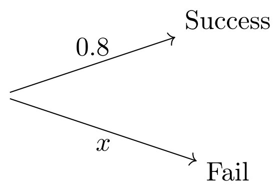
$$x = \frac{\square}{\square}$$

Ex 69: In a deck of cards, the probability of drawing a card from the suit of diamonds is $\frac{1}{4}$. Find the probability x of drawing a card that is not a diamond.



$$x = \frac{\square}{\square}$$

Ex 70: Emma is playing a video game. The probability that she completes a level is 0.8. Find the probability x that she fails to complete the level.



$$x = \square$$

B.4 PROBABILITY OF INDEPENDENT EVENTS

B.4.1 DRAW A PROBABILITY TREE FOR TWO INDEPENDENT EVENTS

Ex 71: Let E be the event “drawing a red marble” from a bag of 10 marbles with 6 red marbles. Let F be the event “spinning a 1” on a spinner numbered 1 to 10.
Suppose the two events are independent.
Draw the probability tree diagram.

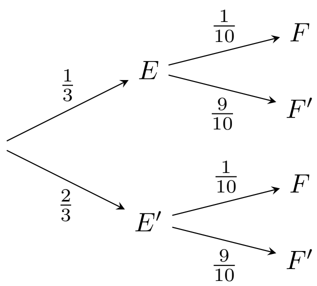
Ex 72: Let A be the event “drawing an ace” from a standard deck of 52 cards. Let B be the event “rolling a 6” on a regular six-sided die.
Suppose the two events are independent.
Draw the probability tree diagram.

Ex 73: Let E be the event "player A succeeds his basketball shot" ($P(E) = 60\%$).
Let F be the event "player B succeeds his basketball shot" ($P(F) = 70\%$).
Assume the two shots are independent.
Draw the probability tree diagram.

Ex 74: Let E be the event "Julia passes her computer test" ($P(E) = 80\%$).
Let F be the event "Julia passes her English test" ($P(F) = 90\%$).
Assume the two tests are independent.
Draw the probability tree diagram.

B.4.2 CALCULATING PROBABILITIES FROM A TREE DIAGRAM

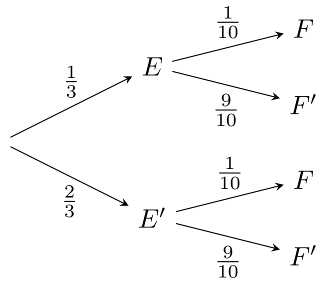
Ex 75: Consider the following probability tree diagram. The two events E and F are independent.



Calculate the probability that both E and F occur

$$P(E \text{ and } F) = \square$$

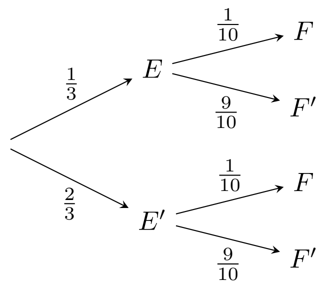
Ex 76: Consider the following probability tree diagram. The two events E and F are independent.



Calculate the probability that neither E nor F occur (i.e., both the complement events E' and F' happen):

$$P(E' \text{ and } F') = \square$$

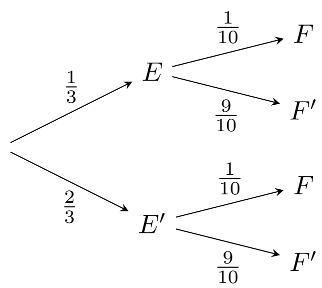
Ex 77: Consider the following probability tree diagram. The two events E and F are independent.



Calculate the probability that E occurs and F does not occur:

$$P(E \text{ and } F') = \square$$

Ex 78: Consider the following probability tree diagram. The two events E and F are independent.

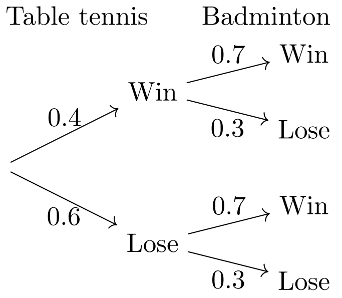


Calculate the probability that E' occurs and F occurs:

$$P(E' \text{ and } F) = \square$$

B.4.3 CALCULATING PROBABILITIES FROM A TREE DIAGRAM

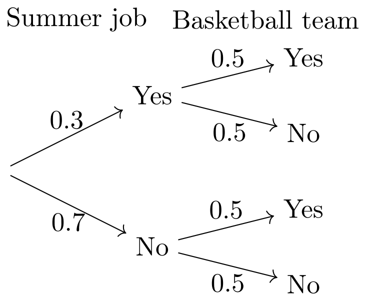
Ex 79: Niamh plays a game of table tennis on Saturday and a game of badminton on Sunday. The probability of winning table tennis is 0.4 and the probability of winning badminton is 0.7. The two events are independent. The probability tree is shown below:



Calculate the probability that Niamh wins both games.

$P(\text{"Win both"}) =$ ☐

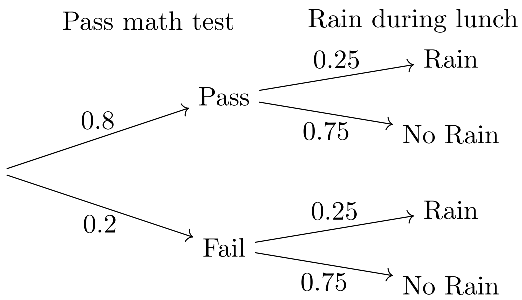
Ex 80: Noah is applying for a summer job and also trying out for a basketball team. The probability that Noah gets the job is 0.3, and the probability that Noah is selected for the basketball team is 0.5. The two events are independent. The probability tree is shown below:



Calculate the probability that Noah does **not** get the job **and** is **not** selected for the basketball team.

$P(\text{"No job and not selected for team"}) =$ ☐

Ex 81: Maria has a math test and there is a chance of rain during lunch. The probability that Maria passes her math test is 0.8, and the probability that it rains during lunch is 0.25. The two events are independent. The probability tree is shown below:



Calculate the probability that Maria passes her math test **and** it rains during lunch.

$P(\text{"Pass and Rain"}) =$ ☐

B.4.4 CALCULATING THE PROBABILITY OF TWO INDEPENDENT EVENTS

Ex 82: Let A be the event "drawing an ace" from a standard deck of 52 cards. Let B be the event "rolling a 6" on a regular six-sided die.
Suppose the two events are independent.

1. Draw the probability tree diagram.
2. Calculate the probability of "drawing an ace" and "rolling a 6".

Ex 83: Let E be the event "player A succeeds in their basketball shot" ($P(E) = 40\%$). Let F be the event "player B succeeds in their basketball shot" ($P(F) = 40\%$).
Suppose the two events are independent.

1. Draw the probability tree diagram.
2. Calculate the probability that both players fail their shot.

Ex 84: Let E be the event "drawing a red marble" from a bag of 10 marbles with 6 red marbles. Let F be the event "spinning a 1" on a spinner numbered 1 to 10.
Suppose the two events are independent.

1. Draw the probability tree diagram.
2. Calculate the probability of "drawing a red marble" and "spinning a 1".

Ex 85: Let E be the event "the machine produces a defective item" ($P(E) = 15\%$). Let F be the event "the item is selected for quality control" ($P(F) = 20\%$).
Suppose the two events are independent.

1. Draw the probability tree diagram.
2. Calculate the probability that the machine produces a non-defective item and the item is not selected for quality control.

B.5 EXPERIMENTAL PROBABILITY

B.5.1 CALCULATING EXPERIMENTAL PROBABILITIES IN PERCENTAGE FORM

Ex 86: During a classroom experiment, Ethan flips a coin 50 times and records that it lands on heads 30 times. Calculate the experimental probability that the coin lands on heads, and express the result in percentage form.

$$P(\text{"landing on heads"}) \approx \boxed{}\ \%$$

Ex 87: During a week of basketball practice, Mia made 45 out of 60 free-throw attempts. Estimate the experimental probability that Mia will make her next free-throw attempt, and express the result in percentage form.

$$P(\text{"making the next attempt"}) \approx \boxed{}\%$$

Ex 88: During a week, the school cafeteria recorded that out of 150 students, 120 chose a vegetarian meal. Estimate the experimental probability that the next student will choose a vegetarian meal, and express the result in percentage form.

$$P(\text{choosing a vegetarian meal}) \approx \boxed{}\%$$

Ex 89: Over the course of a year, it rained on 146 days out of 365 recorded days. Estimate the experimental probability that it will rain, and express the result in percentage form.

$$P(\text{"raining"}) \approx \boxed{}\%$$

B.5.2 CONDUCTING EXPERIMENTS TO ESTIMATE PROBABILITIES

Ex 90: In a experiment, you are asked to toss a fair coin at least 30. Follow these steps:

1. Note the number of times the coin lands on heads.
2. Note the total number of trials (tosses).
3. Calculate the experimental probability that the coin lands on heads, and express the result in decimal form.

Ex 91: In a classroom experiment, you are asked of your friends at least 10 to choose randomly a single number from 1, 2, 3, 4, or 5. Follow these steps:

1. Note the number of times the answer is 5.
2. Note the total number of trials (friends asked).
3. Calculate the experimental probability that a friend chooses the number 5, and express the result in decimal form.