


MENDELIAN GENETICS

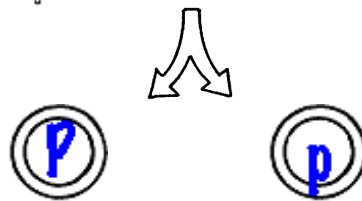
P = purple allele
p = white allele

SINGLE TRAIT CROSS





P₁ Generation PP  Pure purple Pure white  pp Homozygous



F₁ Generation  Pp Heterozygous



F₂ Generation:
75% purple
25% white
25% PP
50% Pp
25% pp

X	P	p
P	 PP	 Pp
p	 Pp	 pp

LAW OF SEGREGATION:

Allele pairs segregate during gamete formation (meiosis)

T = tall
t = short
P = purple
p = white

TWO TRAIT CROSS

Tall & Purple



TTPP

P₁ Generation



Short & white

tppp

TP



TP

tp



tp



Tall & Purple



F₁ Generation

TtPp



TP

Tp

tP

tp

	TP	Tp	tP	tp
TP	TTPP	TTPp	TtPP	TtPp
Tp	TTPp	TTpp	TtPp	Ttpp
tP	TtPP	TtPp	ttPP	ttPp
tp	TtPp	Ttpp	ttPp	ttpp

LAW OF INDEPENDENT ASSORTMENT

Each allele pair segregates independently of other allele pairs during gamete formation

LAWS OF PROBABILITY

RULE OF MULTIPLICATION:

Probability that independent events will occur simultaneously is the product of their individual probabilities

Example #1: You have 2 coins, what is the probability that you will flip two heads?

Coin 1 = 1 in 2 chance heads = $1/2$

Coin 2 = 1 in 2 chance heads = $1/2$

$$1/2 \times 1/2 = 1/4$$

Answer = 1 in 4 chance

Example #2: What is the probability that offspring of an F₁ generation cross will be homozygous recessive? (Pp x Pp → pp)

Mom = 1 in 2 chance for p = $1/2$

Dad = 1 in 2 chance for p = $1/2$

$$1/2 \times 1/2 = 1/4$$

Answer = 1 in 4 chance

RULE OF ADDITION:

The probability of an event that can occur in two or more independent ways is the sum of the separate probabilities of the different ways.

Example #1: You have 2 coins. What is the probability that you will flip a heads and a tails?

Possibility #1

Coin 1 = $1/2$ Heads

Coin 2 = $1/2$ Tails

 $1/2 \times 1/2 = 1/4$

Possibility #2

Coin 1 = $1/2$ Tails

Coin 2 = $1/2$ Heads

 $1/2 \times 1/2 = 1/4$

Answer:

$1/4 + 1/4 = 1/2$

Example #2: What is the probability that two heterozygous parents will produce heterozygous offspring? (Pp x Pp → Pp)

Possibility #1

Mom = $1/2$ P

Dad = $1/2$ p

 $1/2 \times 1/2 = 1/4$

Possibility #1

Mom = $1/2$ p

Dad = $1/2$ P

 $1/2 \times 1/2 = 1/4$

Answer:

$1/4 + 1/4 = 1/2$

Example #3: What is the probability that two parents heterozygous for both height and flower color will produce tall offspring with purple flowers?

Probability of Tt

Mom = $1/2$ T

Dad = $1/2$ t

 $1/2 \times 1/2 = 1/4$

Mom = $1/2$ T

Dad = $1/2$ t

 $1/2 \times 1/2 = 1/4$

$1/4 + 1/4$

$1/2$

Probability of Pp = $1/2$

Answer = $1/2$ (Tt) x $1/2$ (Pp) = $1/4$ chance