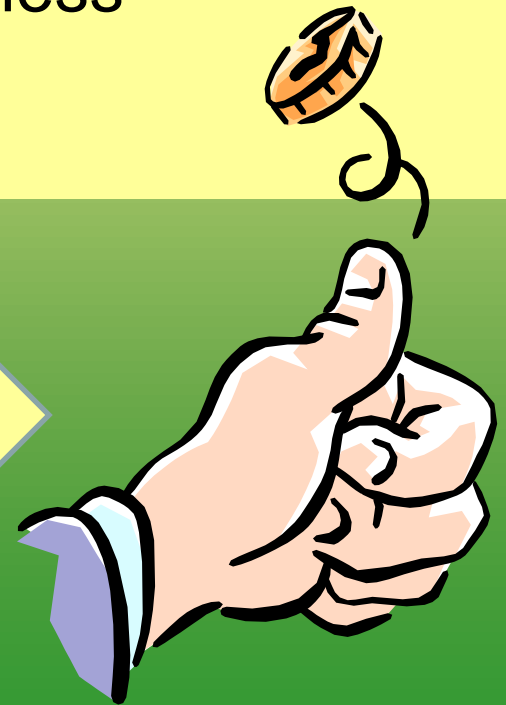
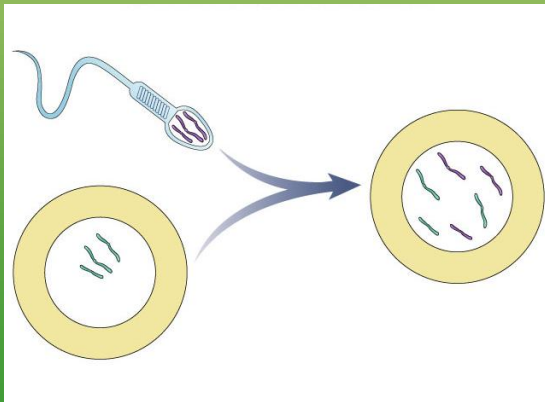


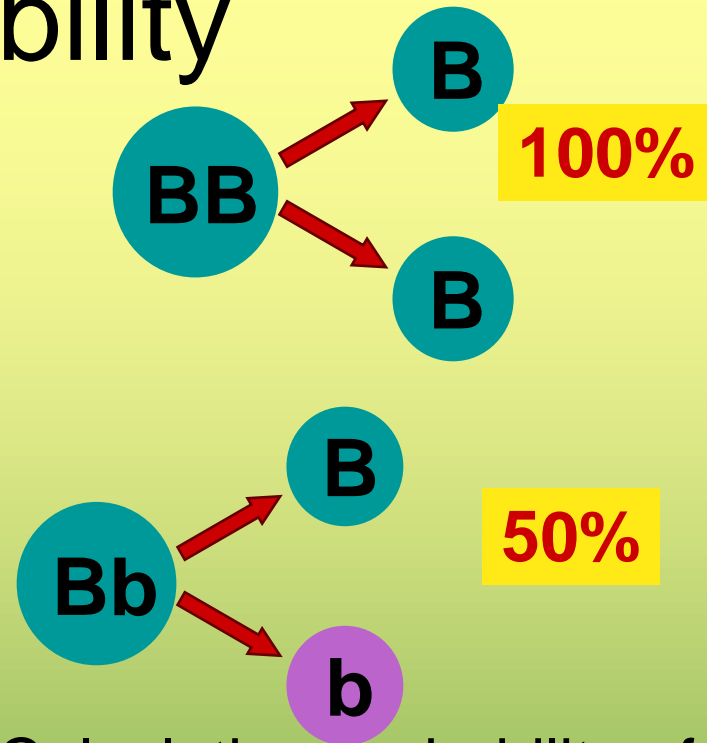
TEORI PELUANG DALAM GENETIKA: The Principles of Probability

- The Principles of probability can be used to **predict** the **outcomes** of genetic crosses
- Alleles segregate by complete randomness
- Similar to a coin flip!



Genetics & Probability

- Mendel's laws:
 - segregation
 - independent assortmentreflect same laws of probability that apply to tossing coins or rolling dice



- Calculating probability of making a specific gamete is just like calculating the probability in flipping a coin
 - probability of tossing heads?
 - probability making a B gamete?

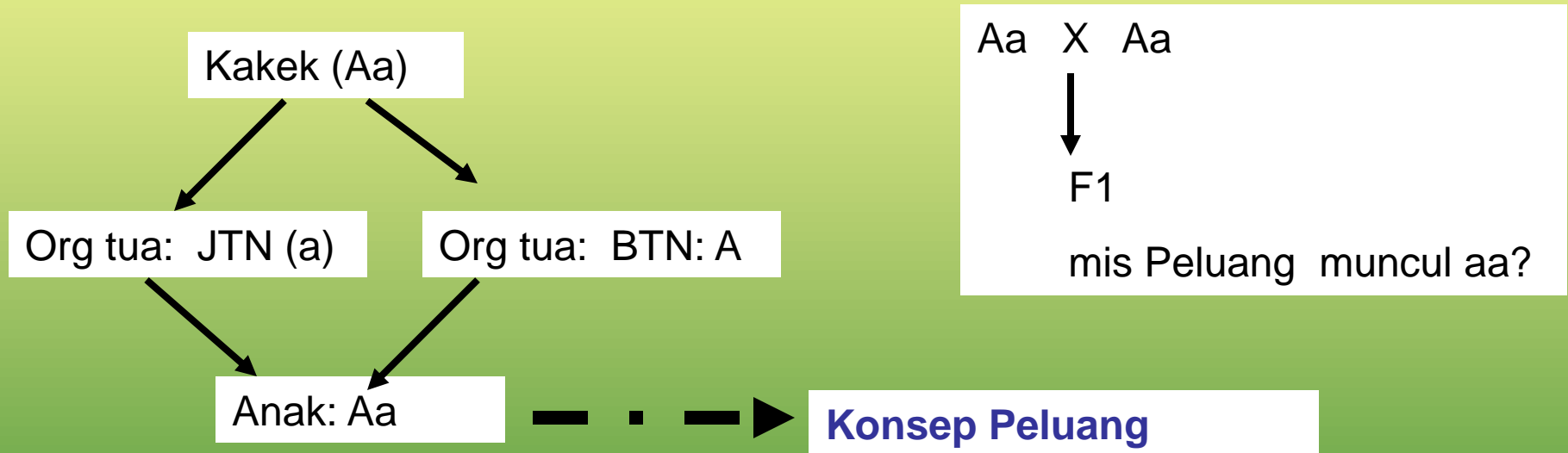
Determining probability

- **Number of times the event is expected**
Number of times it could have happened
- Probabilitas pedet lahir jantan dari 10 kelahiran ?.
Sex ratio 5:5 The probability is **5:10**.
- Or you can express it as a fraction: **5/10**. Since it's a fraction, why not reduce it? The probability that you will pick an odd number is **1/2**.
- Probability can also be expressed as a percent...**1/2=50%** Or as a decimal...**1/2=50%=.5**

GENETIKA: PERAMALAN KETURUNAN DENGAN HUKUM PELUANG

Prinsip dasar: Pemindahan gen dari orang tua kpd keturunannya

Berkumpulnya kembali gen-gen dalam sigot



Analogi pemindahan satu gen (A/a) dari sepasang Gen (Aa) = pelemparan mata uang yang memiliki dua sisi:

-Gambar

-Huruf.

Calculating probability

$$Pp \times Pp$$

	male / sperm	
	P	p
female / eggs	P	Pp
	p	Pp

sperm egg offspring

$$\begin{array}{c} P \\ 1/2 \end{array} \times \begin{array}{c} P \\ 1/2 \end{array} = \begin{array}{c} PP \\ 1/4 \end{array}$$

$$\begin{array}{c} P \\ 1/2 \end{array} \times \begin{array}{c} p \\ 1/2 \end{array} = \begin{array}{c} Pp \\ 1/4 \end{array}$$

$$\begin{array}{c} p \\ 1/2 \end{array} \times \begin{array}{c} P \\ 1/2 \end{array} = \begin{array}{c} Pp \\ 1/4 \end{array} +$$

$$\begin{array}{c} pp \\ 1/4 \end{array}$$

$$\begin{array}{c} p \\ 1/2 \end{array} \times \begin{array}{c} p \\ 1/2 \end{array} = \begin{array}{c} pp \\ 1/4 \end{array}$$

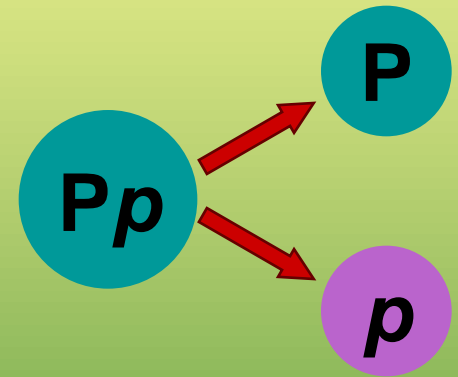
Rule of multiplication

- Chance that 2 or more independent events will occur together
 - probability that 2 coins tossed at the same time will land heads up

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

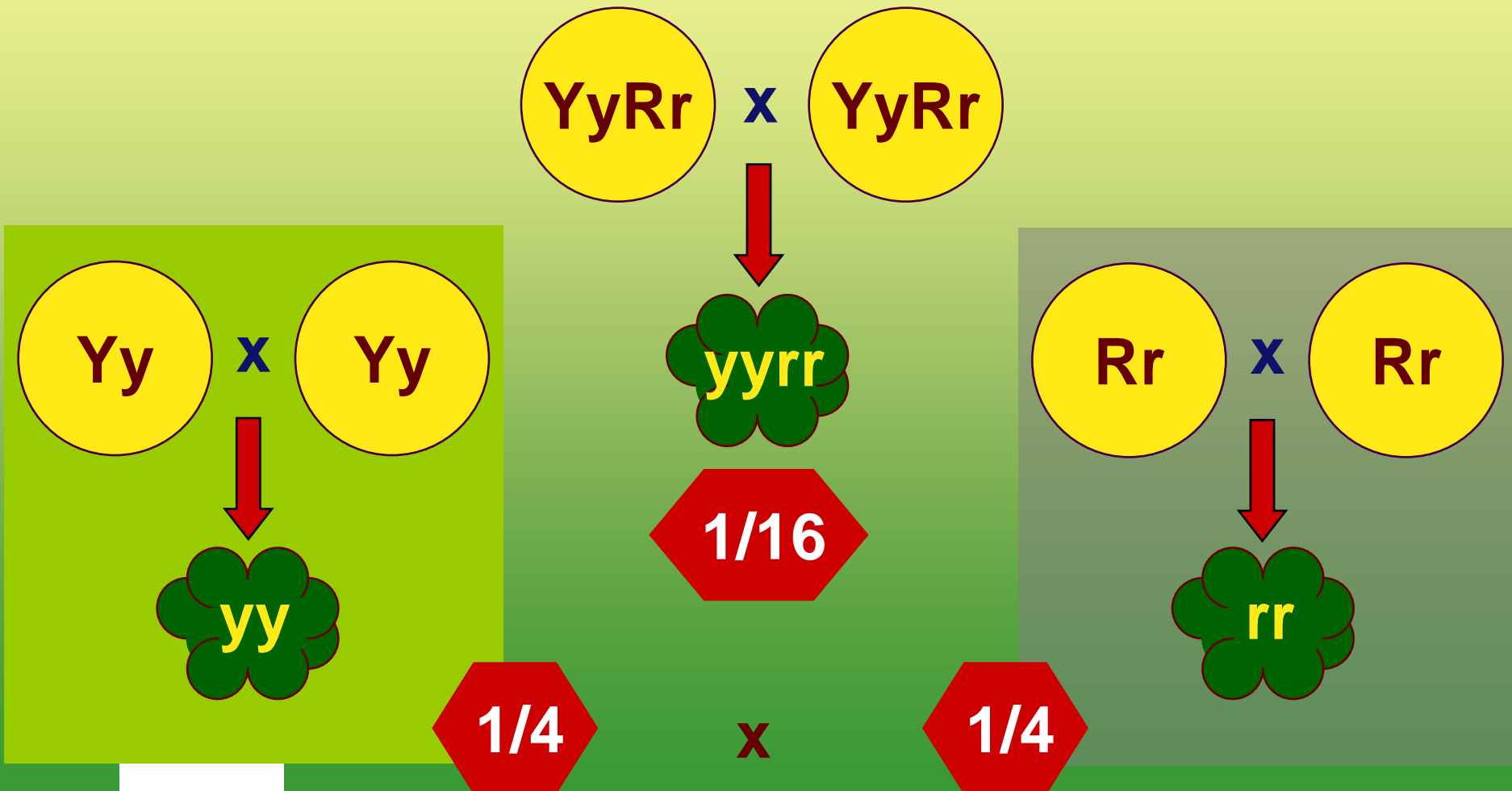
- probability of $Pp \times Pp \rightarrow pp$

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



Calculating probability in crosses

Use rule of multiplication to predict crosses



Apply the Rule of Multiplication

AABbccDdEEFf x **AaBbccDdeeFf**



AabbccDdEeFF

AA x **Aa** → **Aa** **1/2**

Bb x **Bb** → **bb** **1/4**

CC x **cc** → **cc** **1**

Dd x **Dd** → **Dd** **1/2**

EE x **ee** → **Ee** **1**

Ff x **Ff** → **FF** **1/4**

1/64

Got it?
Try this!



Rule of addition

- Chance that an event can occur 2 or more different ways
 - sum of the separate probabilities
 - probability of **Bb** x **Bb** → **Bb**

sperm		egg		offspring	
B		b		Bb	
1/2	x	1/2	=	1/4	
b		B		Bb	
1/2	x	1/2	=	1/4	



1/4
+
1/4
<hr/>
1/2

DASAR TEORI PELUANG

I. **Terjadinya sesuatu yang diinginkan = sesuatu yang diinginkan**

keseluruhan kejadian

$$P(X) = X/(X+Y)$$

$$\text{Contoh : } P(\text{gambar}) = 1/1+1 = \frac{1}{2} = 50\%$$

$$P(\text{lahir anak jantan}) = \text{lahir jantan} / (\text{lahir JTN} + \text{BTN}) \\ = \frac{1}{2} = 50\%.$$

II. Peluang terjadinya 2 peristiwa /lebih yang masing-masing berdiri sendiri

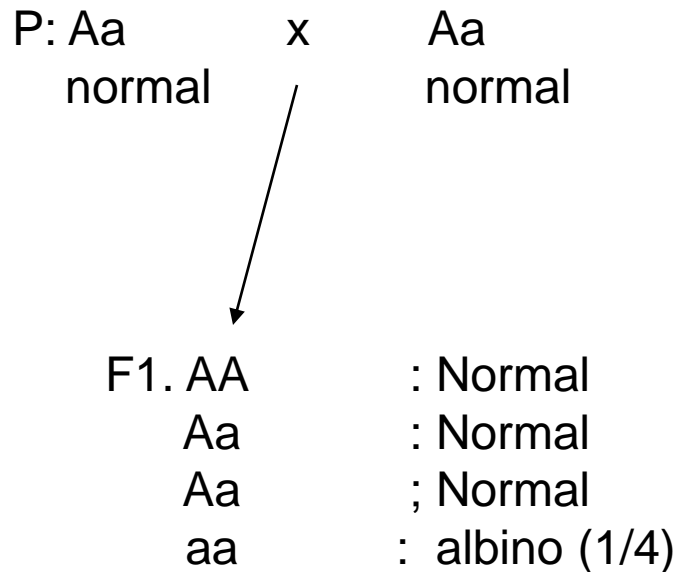
$$P(X, Y) = P(X) \times P(Y)$$

contoh: Peluang dua anak pertama laki-laki

$$P(KI, LK) = (1/2) \times (1/2) = \frac{1}{4}.$$

Aplikasi dalam pewarisan sifat

Contoh: Gen resesif a (Albino)



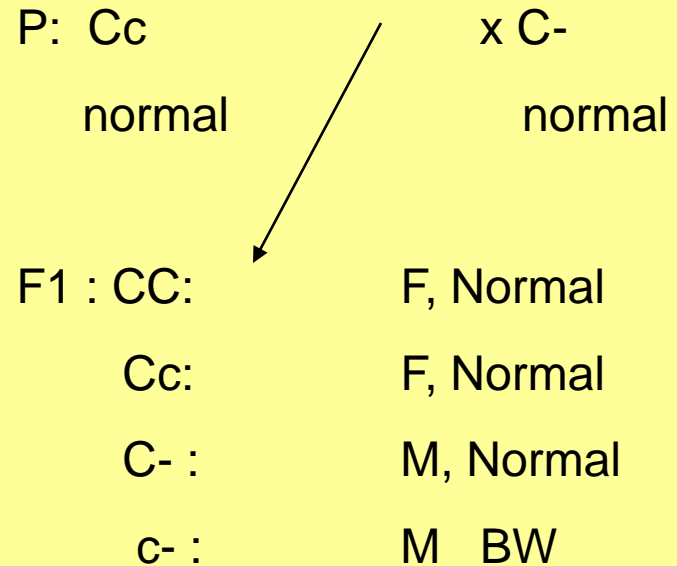
Peluang anak laki-laki albino ???

P (lk, albino) = $\frac{1}{4} \times \frac{1}{2} = \frac{1}{8}$

P (normal lk) = $\frac{3}{4} \times \frac{1}{2} = \frac{3}{8}$

Butawarna : gen resesif c

X-linked.



Peluang:

BW laki-laki : $\frac{1}{4} \times \frac{1}{2} = \frac{1}{8}$

Perempuan normal = $\frac{1}{2} \times \frac{1}{2} = \frac{1}{4}$

Laki-laki Normal = $\frac{1}{2} \times \frac{1}{4} =$

III. Peluang Terjadinya dua peristiwa /lebih yang saling mempengaruhi

$$P (X \text{ atau } Y) = P (x) + P (Y)$$

Contoh Pelemparan dua mata uang bersama

Peluang muncul dua gambar atau 2 huruf = $\frac{1}{4} + \frac{1}{4} = \frac{1}{2}$.

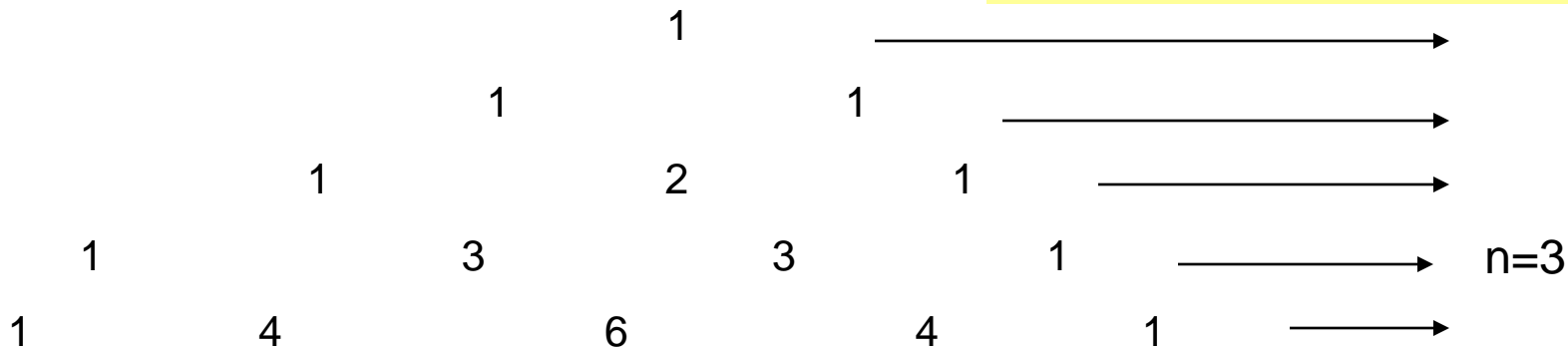
PENGGUNAAN RUMUS BINOMIUM: $(a+b)^2$

$$'(2G, 2 H)= ? \quad N = 2 \quad \longrightarrow \quad (a^2+2ab+b^2)$$

$$2 ab = 2 (1/2) (1/2) = 1/2$$

a, b = DUA KEJADIAN YANG TERPISAH

n = banyaknya kejadian



Pelemparan 3 mata uang (n= 3) ; $(a+b)^3 = a^3 + 3 a^2b + 3 ab^2 + b^3$

$$\begin{aligned} \text{Peluang } 1 G , 2 H &= 3 ab^2 = 3 ((1/2)(1/2)^2) \\ &= 3/8. \end{aligned}$$

Penggunaan Rumus Binomium: Peluang pewarisan sifat Albino

JTN : Aa x BTN Aa



$\frac{3}{4}$ Normal

$\frac{1}{4}$ Albino

Jika suatu perkawinan mempunyai 4 anak ($n = 4$)

Maka

Peluang semua anak normal ?

Rumus $(a+b)^4 = a^4 + 4ab^3 + 6a^2b^2 + 4ab^3 + b^4$

Peluang 4 anak normal $(a^4) = (3/4)^4 = 81/256$

Aplikasi lain teori peluang dalam genetika

Pada suatu perkawinan:

Genotip diketahui, mis : Aa Bb Cc X Aa Bb Cc



aabbCc \longrightarrow aa = 1/4
bb = 1/4
Cc = 1/2

Peluang (aabbCc) = $1/4 \times 1/4 \times 1/2 = 1/32$

AaBbCcDdEe X AaBbCcDdEe



AABbccDdEE ? = $1/2 \times 1/2 \times 1/4 \times 1/2 \times 1/4 = 1/256$

Contoh Pada dua sifat : GEN: Dominan dan Resesif
 -mata Merah Dominan thd Putih (M)
 -Kuliut Albino Resesif (a)

Genotip
 Fenotip

Mm Aa X mm Aa



F1 ???

Aa X Aa
 A A
 a a
 AA
 Aa
 Aa
 aa = 1/4

Bagaimana Peluang Gen Sifat tsb diwariskan pada anak anaknya?

Mm x mm
 M m
 m m



M = 1/2
 a = 1/4 =

1/8

Mm
 Mm
 mm
 mm