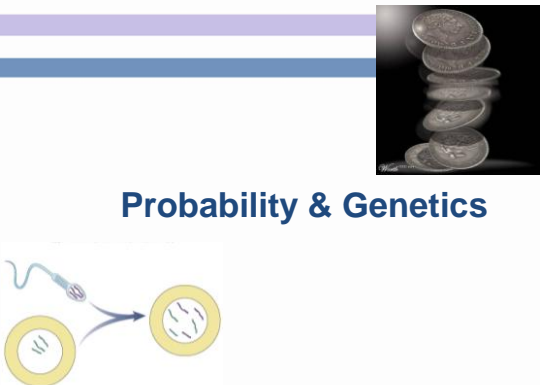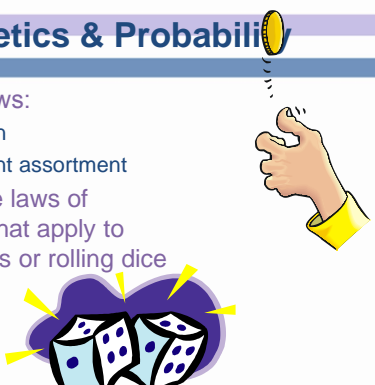## Probability & Genetics

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Genetics & Probability

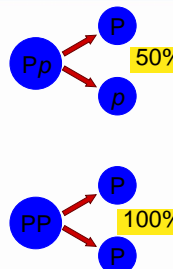- Mendel's laws:
  - segregation
  - independent assortment
  reflect same laws of probability that apply to tossing coins or rolling dice
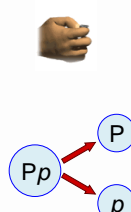

Probability & genetics

- Calculating probability of making a specific gamete is just like calculating the probability in flipping a coin
  - probability of tossing heads? 50%
  - probability making a P gamete…

P*p* → P / *p*   50%

PP → P / P   100%

Probability & genetics

- Outcome of 1 toss has no impact on the outcome of the next toss
  - probability of tossing heads each time?   50%
  - probability making a P gamete each time?   50%

P*p* → P / *p*

Calculating probability

Pp x Pp

male / sperm

	P	p
P	PP	Pp
p	Pp	pp

female / eggs

sperm	egg	offspring
P	P	PP
1/2 x	1/2 =	1/4
P	*p*	P*p*
1/2 x	1/2 =	1/4
p	P	1/4
1/2 x	1/2 =	1/2
p	*p*	*pp*
1/2 x	1/2 =	1/4

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 x 1/2 = 1/4

  - probability of Pp x Pp → pp

    1/2 x 1/2 = 1/4

1

Calculating dihybrid probability

- Rule of multiplication also applies to dihybrid crosses
  - heterozygous parents — YyRr
  - probability of producing yyrr?
    - probability of producing y gamete = 1/2
    - probability of producing r gamete = 1/2
    - probability of producing yr gamete = 1/2 x 1/2 = 1/4
    - probability of producing a yyrr offspring = 1/4 x 1/4 = 1/16

Rule of addition

- Chance that an event can occur 2 or more different ways
  - sum of the separate probabilities
  - probability of Pp x Pp $\rightarrow$ Pp

sperm	egg	offspring		
P	p	Pp		1/4
1/2 x	1/2 =	1/4		+ 1/4
p	P	Pp		———
1/2 x	1/2 =	1/4		1/2