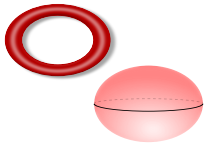
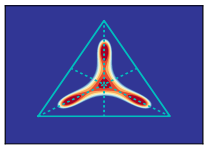
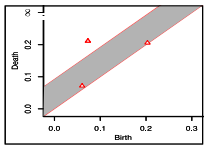
Prof. Brittany Terese Fasy



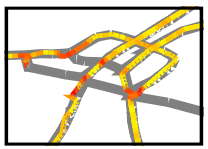
B.S., Mathematics and Computer Science
Saint Joseph's University, Philadelphia, PA



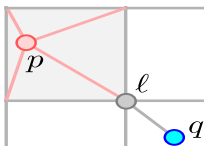
Ph.D., Computer Science, Duke University
Adviser: Herbert Edelsbrunner (IST Austria)



Postdoc: Carnegie Mellon University
CMU TopStat (stat.cmu.edu/topstat)



Postdoc: Tulane University
Applications of TDA



Associate Professor: Montana State University
Searching, Directed Topology, Homotopy Area, ...

Who are you?

1. State your name, major, and expected graduation.
2. Why are you taking this class?
3. Exchange contact info!

Meet another classmate

1. State your name, major, and expected graduation.
2. What is an algorithm?
3. Exchange contact info!

Induction Recap

Hay is for Horses

And, All Horses are the Same Color

Prof. Brittany Terese Fasy

School of Computing & Dept. of Mathematical Sciences

Kyoto, Summer 2014

Kyoto, Summer 2014

But Wait!

All horses (and ponies) are the same color!

Reminder: Proof by Induction

5 Steps

1. **Claim:**
2. **Base Case:**
3. **Inductive Assumption:**
4. **Inductive Step:**
5. **Conclude!**

Reminder: Proof by Induction

5 Steps

1. **Claim:** Property A holds for all $n \geq n_0$.
2. **Base Case:**
3. **Inductive Assumption:**
4. **Inductive Step:**
5. **Conclude!**

Reminder: Proof by Induction

5 Steps

1. **Claim:** Property A holds for all $n \geq n_0$.
2. **Base Case:** Show Property A holds for n_0.
3. **Inductive Assumption:**
4. **Inductive Step:**
5. **Conclude!**

Reminder: Proof by Induction

5 Steps

1. **Claim:** Property A holds for all $n \geq n_0$.
2. **Base Case:** Show Property A holds for n_0.
3. **Inductive Assumption:** Assume Property A holds for some $n = k$.
4. **Inductive Step:**
5. **Conclude!**

Reminder: Proof by Induction

5 Steps

1. **Claim:** Property A holds for all $n \geq n_0$.
2. **Base Case:** Show Property A holds for n_0.
3. **Inductive Assumption:** Assume Property A holds for some $n = k$.
4. **Inductive Step:** Prove that Property A holds for $n = k + 1$.
5. **Conclude!**

Proofs by Induction

Problem I

For all integers $n \geq 0$, $\sum_{i=0}^{n} i = \frac{n(n+1)}{2}$.

Problem II

For all integers $n \geq 2$, $n^2 \geq n + 1$.

Problem III

A tree with n nodes has $n - 1$ edges.

Example of Proof by Induction

Claim: All horses are the same color.

Base Case: One horse is clearly one color.

Inductive Assumption:

Inductive Step:

http://www.telegraph.co.uk/

Example of Proof by Induction

Claim: All horses are the same color.

Base Case: One horse is clearly one color.

Inductive Assumption: Any group of k horses are the same color.

Inductive Step:

http://www.telegraph.co.uk/

http://www.equestrianlifemagazine.co.uk/

Example of Proof by Induction

Claim: All horses are the same color.

Base Case: One horse is clearly one color.

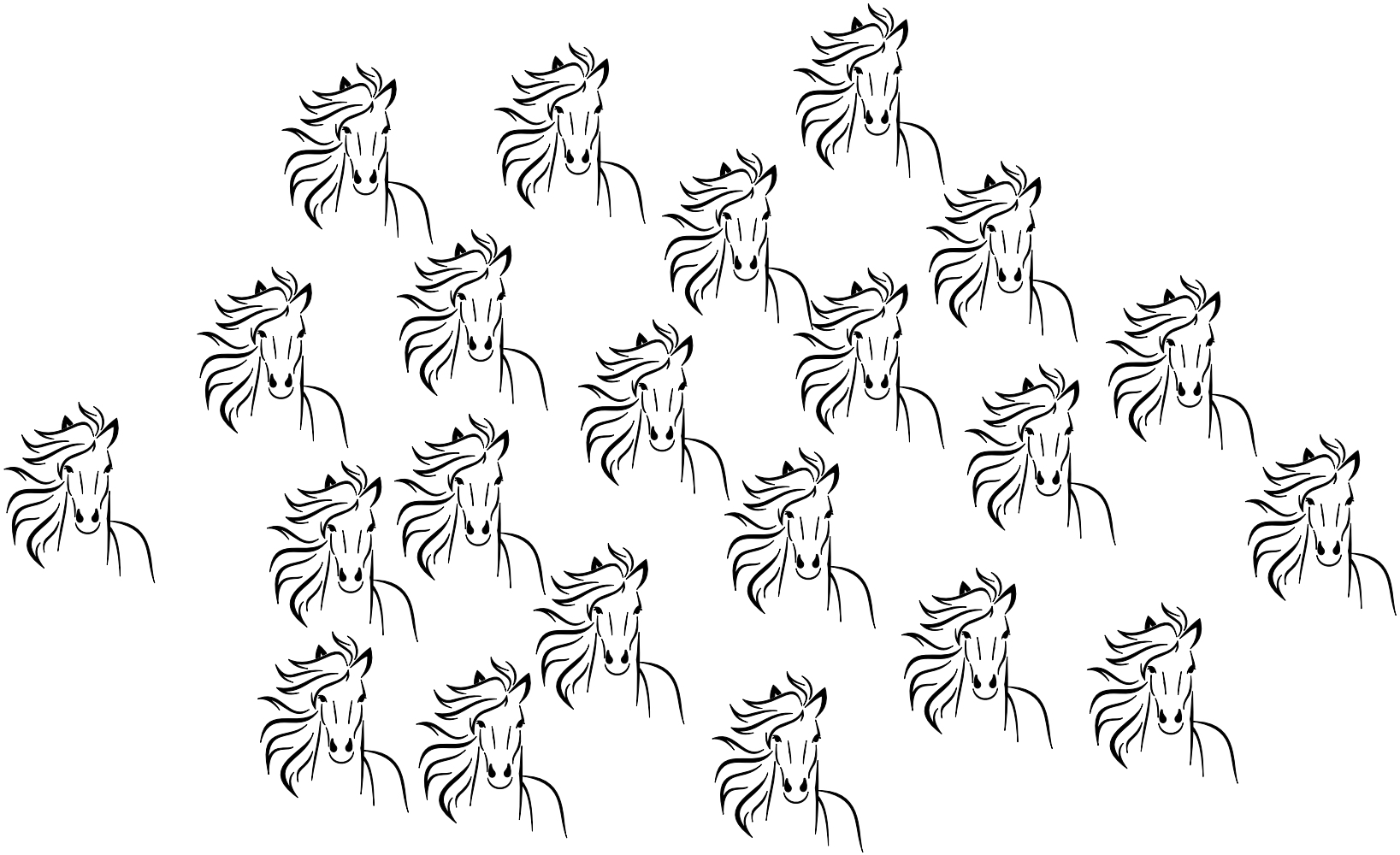
Inductive Assumption: Any group of k horses are the same color.

Inductive Step: Prove statement holds for $k + 1$ horses.

http://www.telegraph.co.uk/

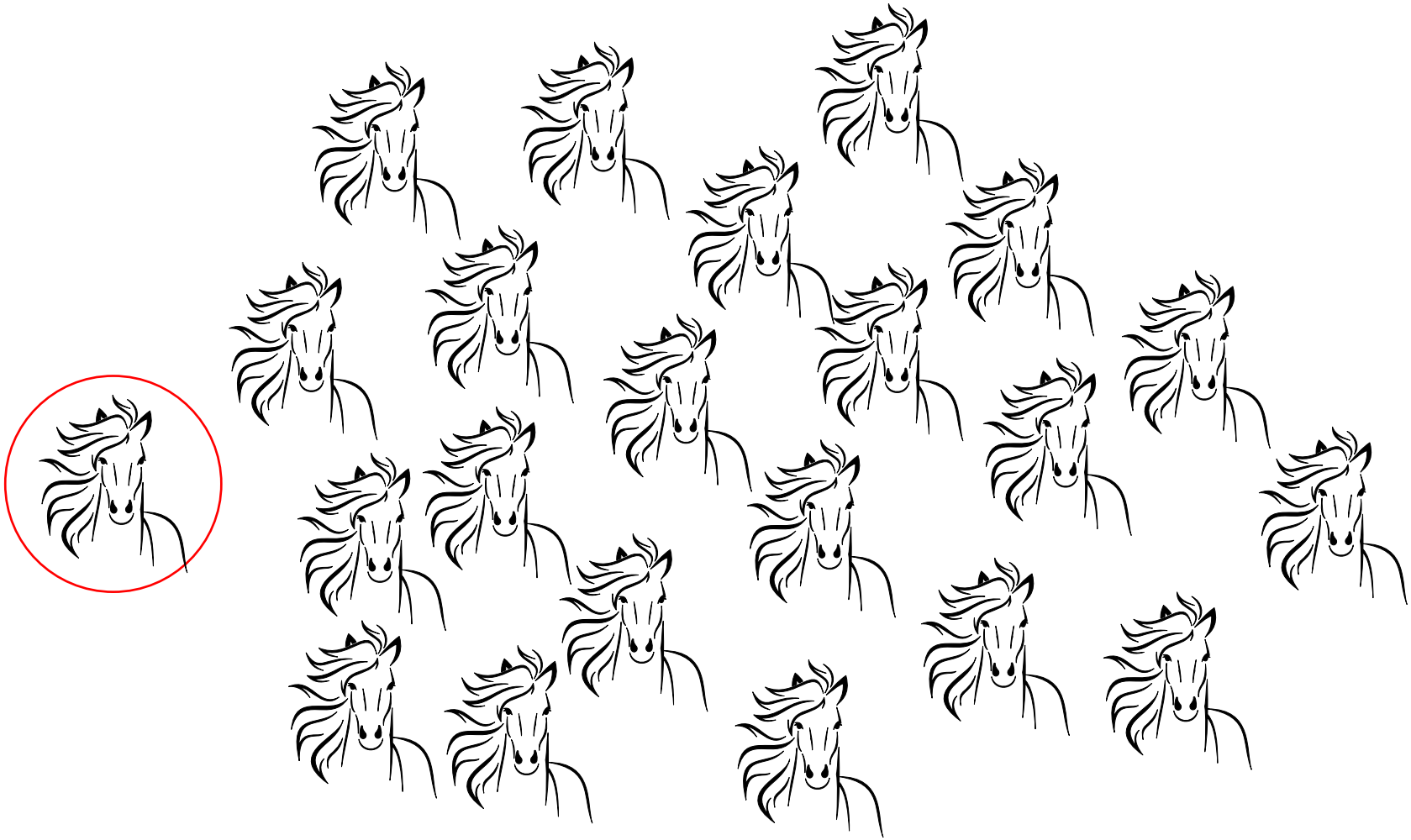
http://www.equestrianlifemagazine.co.uk/

The Inductive Step



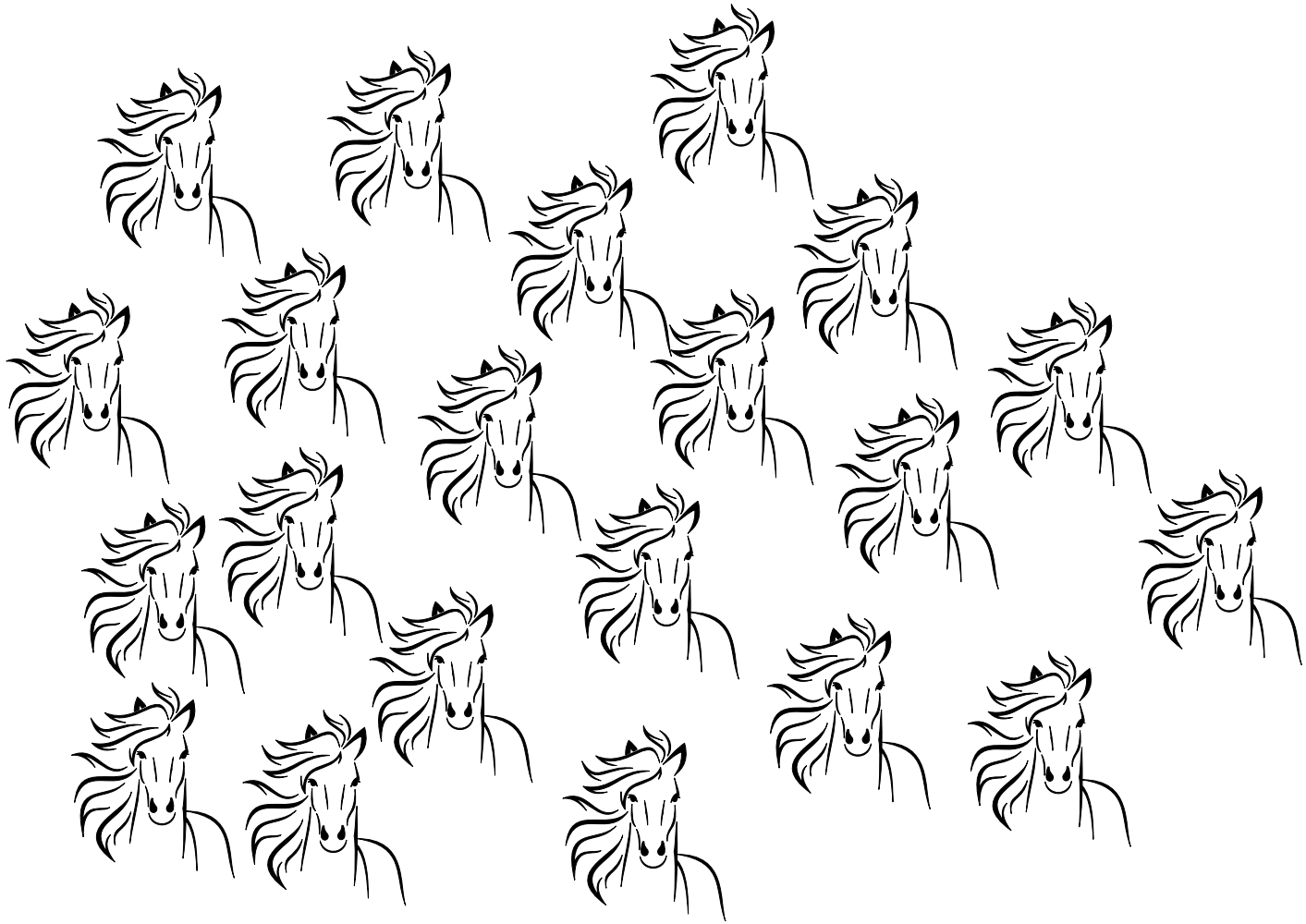
Pferd-weiss by marauder (openclipart)

The Inductive Step



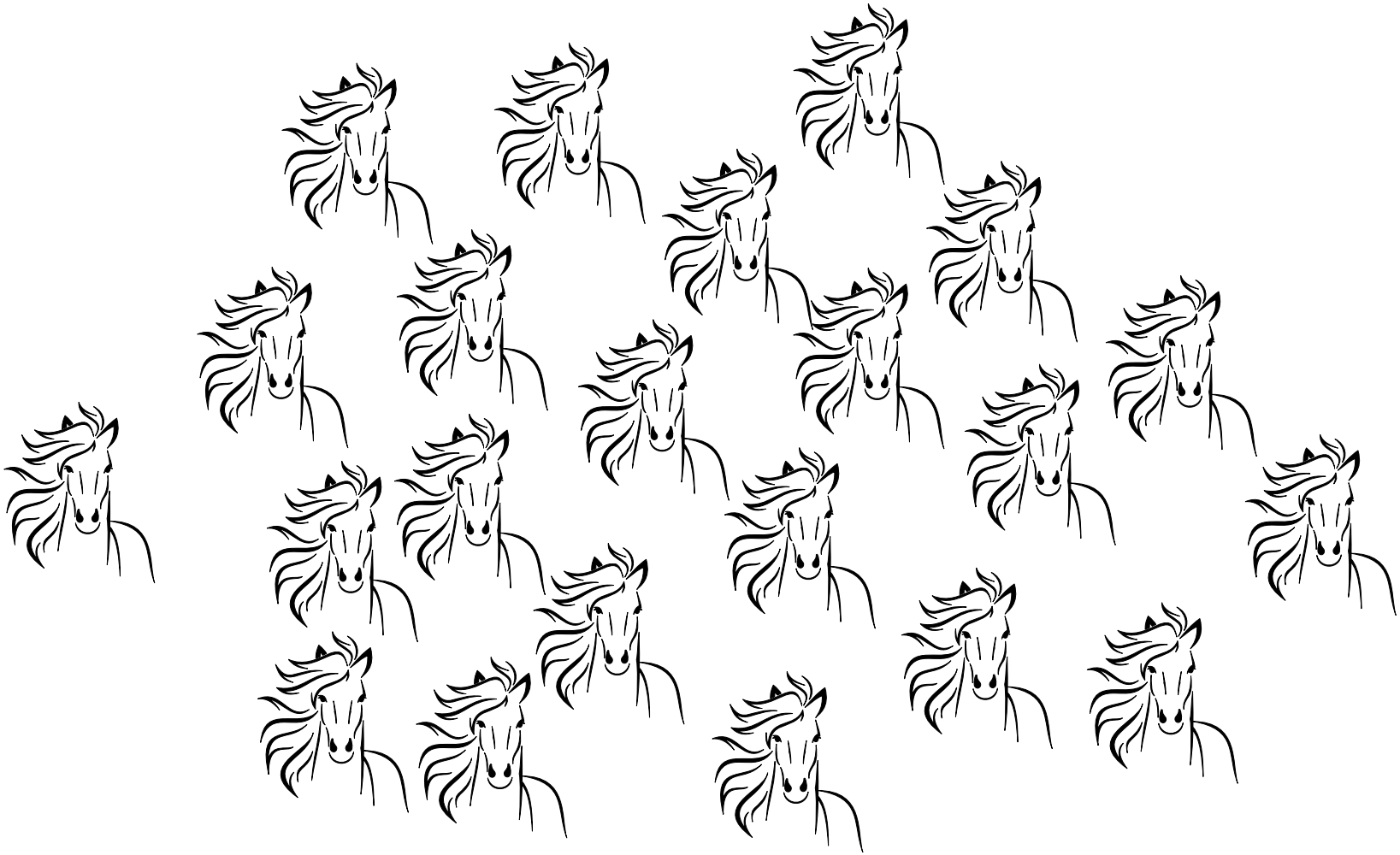
Pferd-weiss by marauder (openclipart)

The Inductive Step



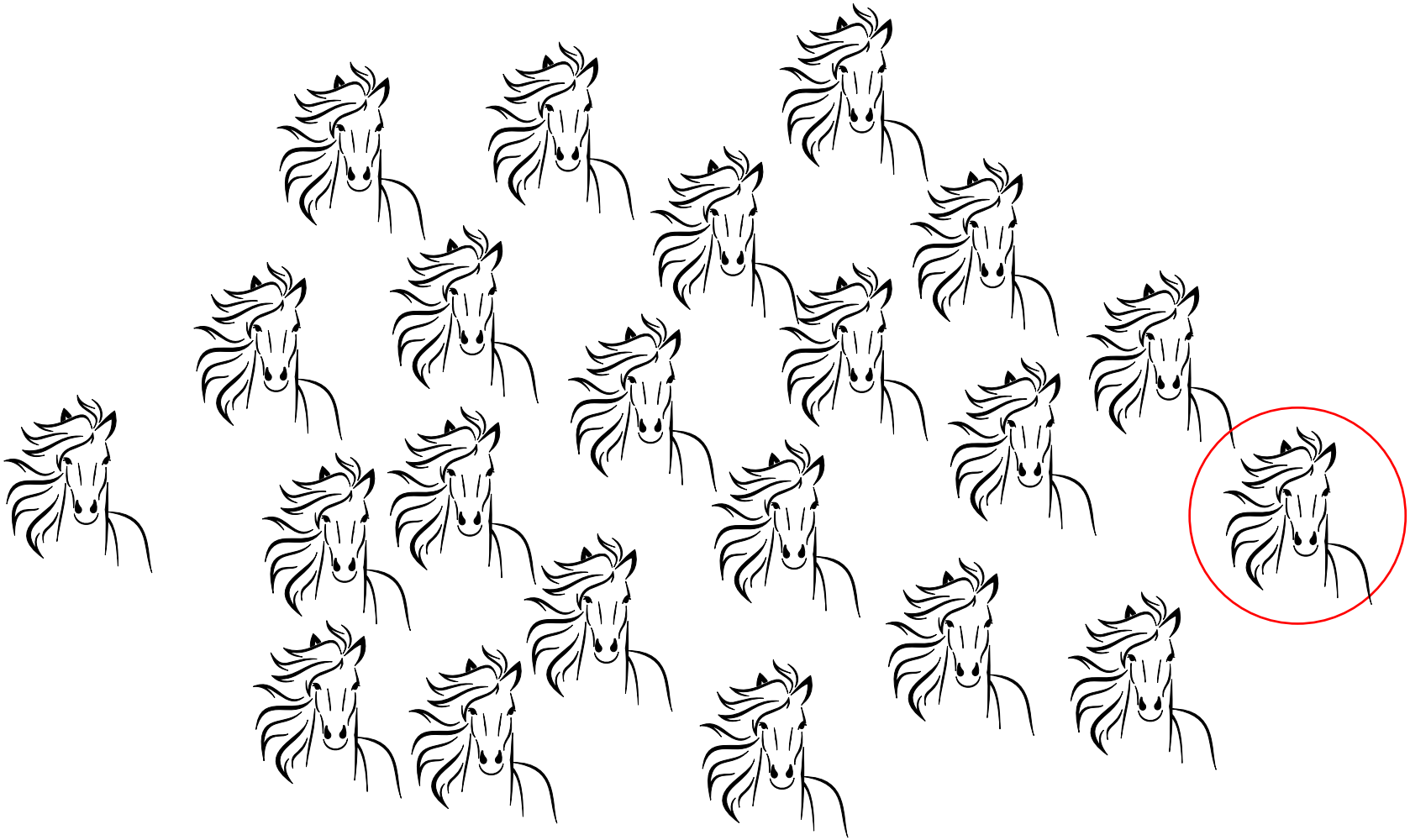
Pferd-weiss by marauder (openclipart)

The Inductive Step



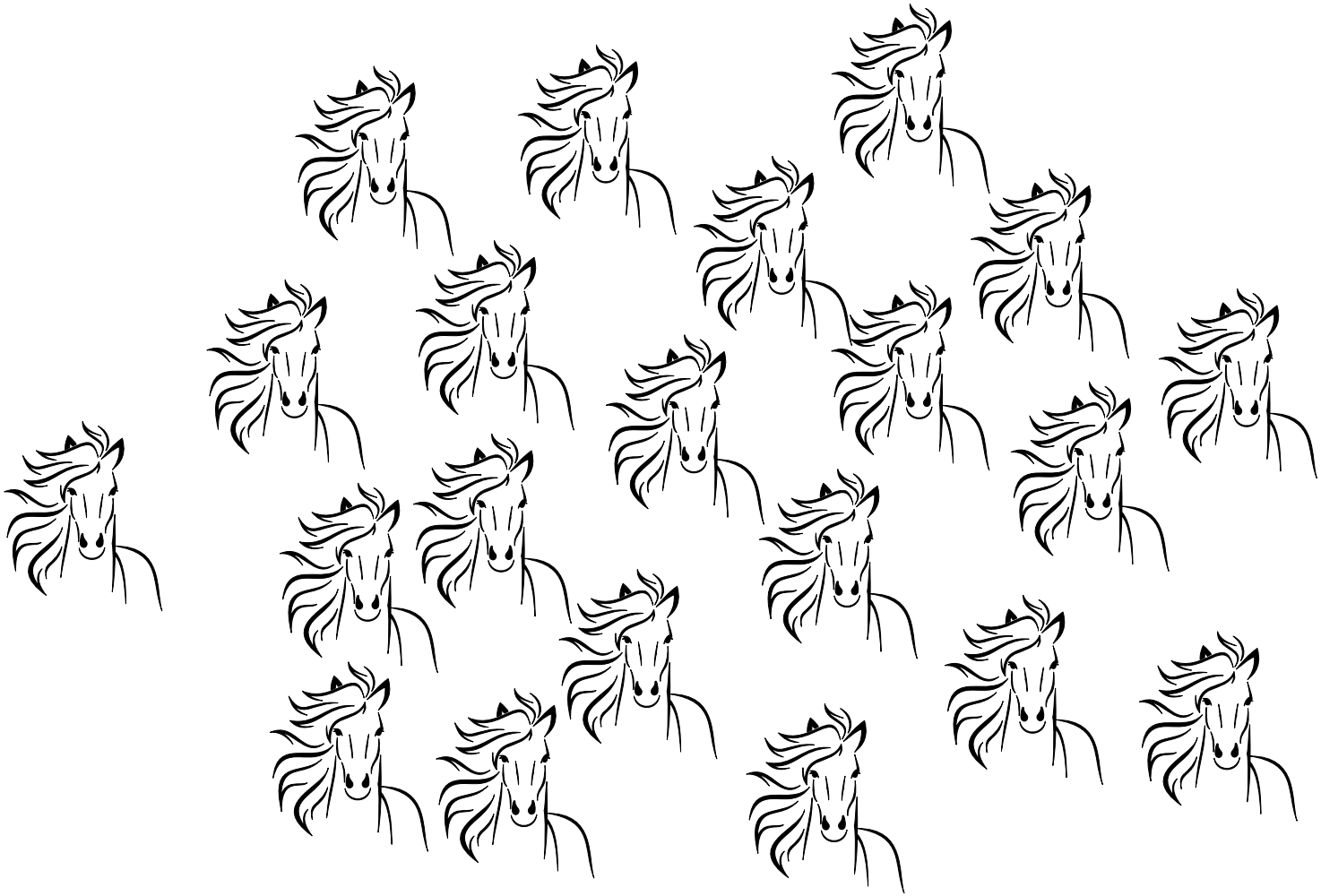
Pferd-weiss by marauder (openclipart)

The Inductive Step



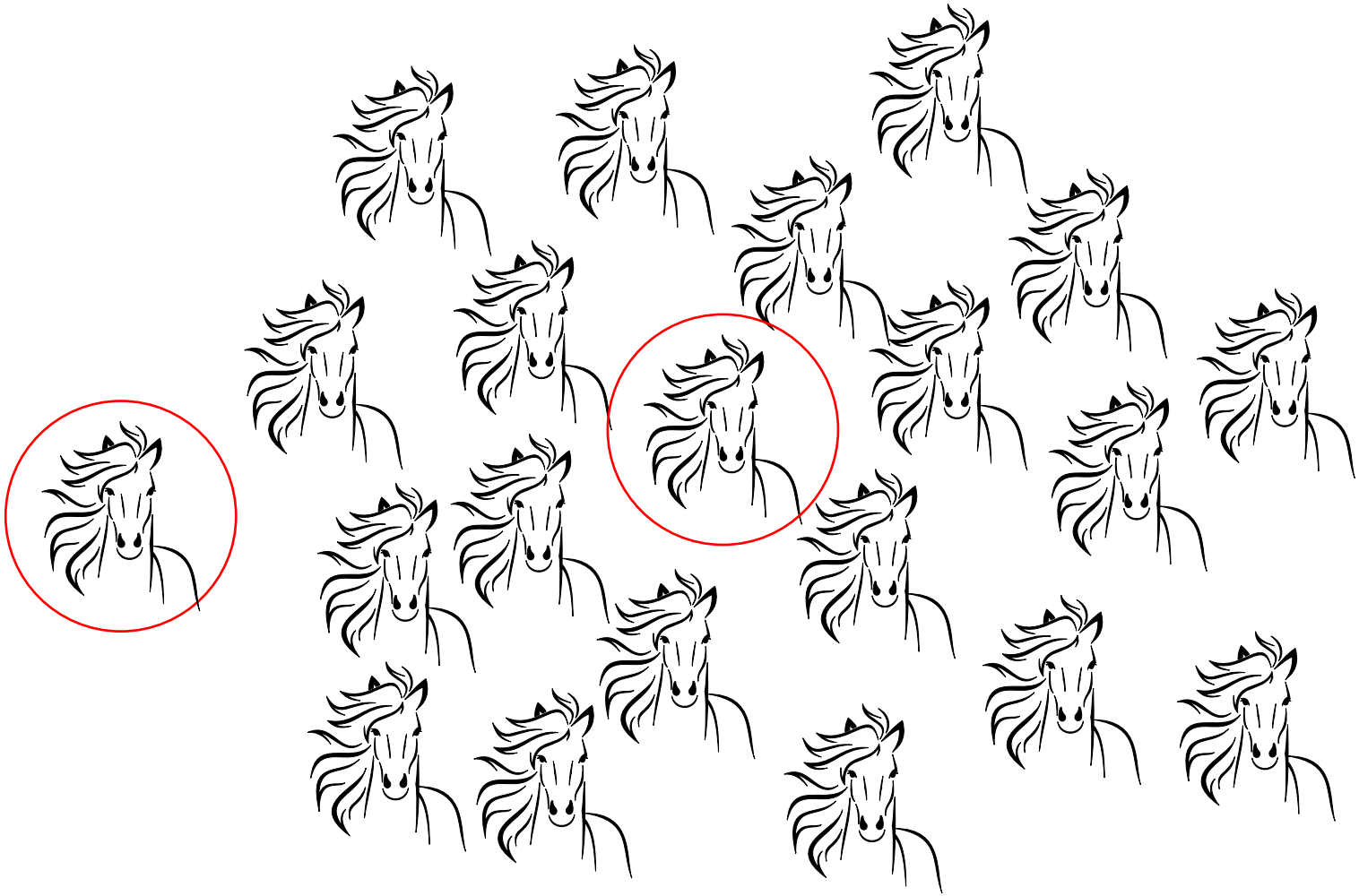
Pferd-weiss by marauder (openclipart)

The Inductive Step



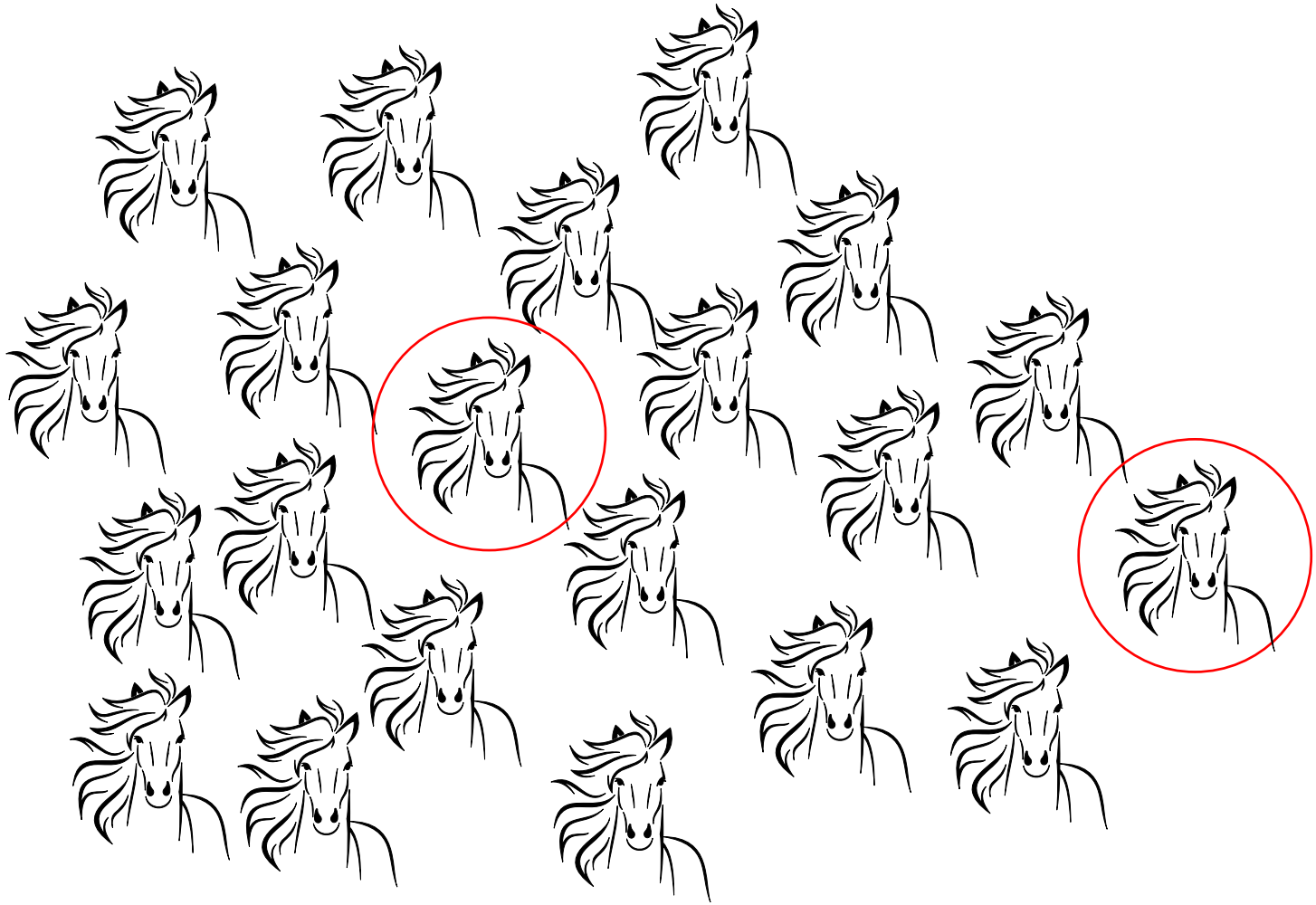
Pferd-weiss by marauder (openclipart)

The Inductive Step



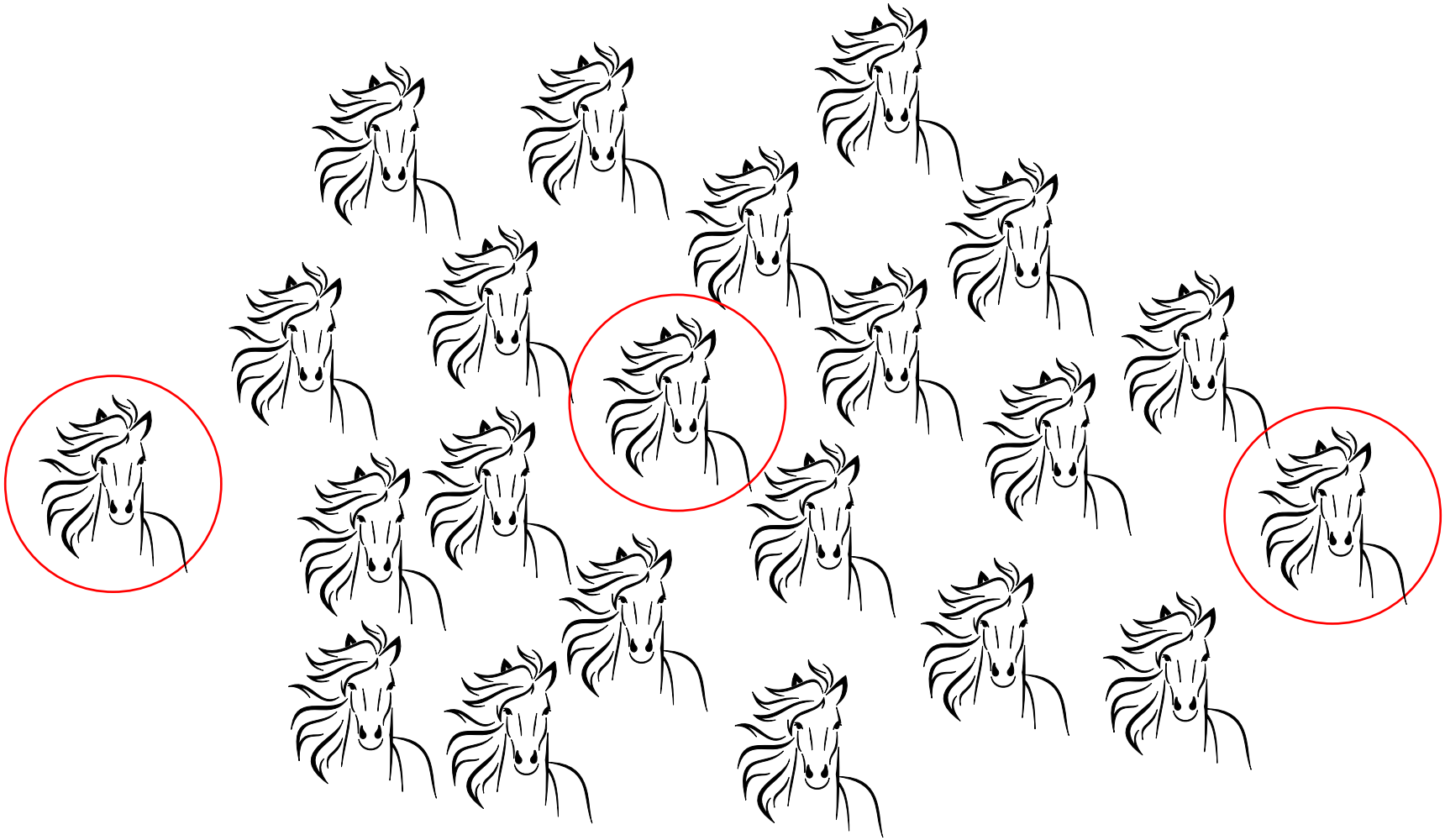
Pferd-weiss by marauder (openclipart)

The Inductive Step



Pferd-weiss by marauder (openclipart)

The Inductive Step



Pferd-weiss by marauder (openclipart)

Example of Proof by Induction

Claim: All horses are the same color.

Base Case: One horse is clearly one color.

Inductive Assumption: Any group of k horses are the same color.

Inductive Step: Prove statement holds for $k + 1$ horses.

http://www.telegraph.co.uk/

http://www.equestrianlifemagazine.co.uk/

Thank You!

Email me: brittany@fasy.us

Welcome to CSCI 432!

Horse Humor

Suppose we define a horse's tail to be a leg.
How many legs does a horse have?"

Welcome to CSCI 432!

Horse Humor

Suppose we define a horse's tail to be a leg.
How many legs does a horse have?"

- The mathematician answers "5";

Welcome to CSCI 432!

Horse Humor

Suppose we define a horse's tail to be a leg.
How many legs does a horse have?"

- The mathematician answers "5";
- the computer scientist "1";

Welcome to CSCI 432!

Horse Humor

Suppose we define a horse's tail to be a leg.
How many legs does a horse have?"

- The mathematician answers "5";
- the computer scientist "1";
- and the engineer says "But you can't do that!"