

Spring Into Motion



Objective:

In this lesson, students will explore how the horse's musculoskeletal system enables movement and supports athletic performance. They will gain an understanding of the roles played by bones, joints, muscles, tendons, and ligaments in movement, balance, and stability.

Students will:

- **Identify key bones and joints involved in locomotion.**
- **Understand how muscles, tendons, and ligaments work together to create movement.**
- **Recognize how the musculoskeletal system impacts a horse's ability to perform different gaits and movements.**
- **Apply this knowledge to the human body and consider how rider position and joint mobility can influence their aid effectiveness.**
- **Learn best practices for horse care, including warm-ups, cool-downs, and recognizing signs of strain or injury in the musculoskeletal system.**

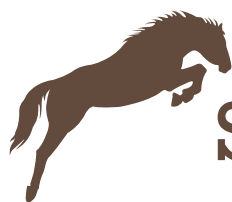
Through hands-on activities, demonstrations, and riding applications, students will develop a deeper appreciation for the mechanics of equine movement and how to support their horse's health and performance.

Supplies:

- A variety of colors of tape
- Polo wrap
- Large exercise ball or trampoline
- Mounting block
- 2 cups and water

Optional:

- Balance board or bosu exercise ball
- Slinky or hula dancer doll



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What to teach:

Here is information on general ideas/concepts to teach. Included below are 5 different activities that can be used to supplement the learning concepts.

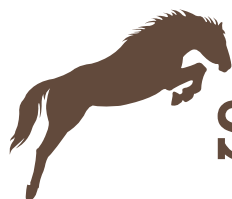
The movement of a horse is the result of a highly coordinated musculoskeletal system. Each part of the system, including bones, joints, muscles, tendons, and ligaments, plays an essential role in creating the power, balance, and flexibility needed for efficient movement. Understanding how these components work together allows riders to improve their horses' performance, promote comfort, and prevent injury. This lesson will help students recognize the role of each component and how to apply this knowledge to their riding and horse care practices.

Bones: The Structural Foundation of Movement

- Bones provide structure and support, allowing the horse's body to stand, move, and bear weight.
- Bones help protect the horse's organs
- Bones act as levers, creating movement when muscles contract.

Joints: Flexibility, Motion, and Shock Absorption

- Joints connect bones, allowing movement and flexibility.
- Synovial Joints – The most mobile joints, featuring a fluid-filled cavity for lubrication.
 - Examples:
 - Hinge (e.g., fetlock) – Movement in one direction.
 - Ball-and-Socket (e.g., shoulder) – Multi-directional movement.
 - Gliding (e.g., 'knee', carpal joints) – Sliding motion.
 - Synovial joints are prone to injury due to their mobility and load-bearing role. Proper nutrition and regular exercise help maintain joint health and performance.



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Muscles: Power, Propulsion, and Coordination

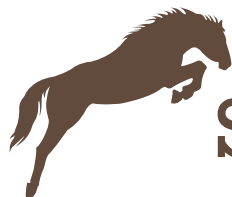
- Muscles generate force by contracting, pulling on bones via tendons to create movement.
- Muscles work in coordination to produce smooth and efficient motion:
 - Agonists (Prime Movers): The primary muscles responsible for generating movement.
 - Antagonists: Muscles that oppose the action of the prime movers, helping to control and balance the movement
 - Have riders flex their bicep muscles and break down what is happening

Tendons: Connecting Muscles and Bones for Movement

- Tendons are strong, flexible connective tissues that attach muscles to bones and transmit force from muscle contractions to produce movement.
- Key tendons in equine locomotion:
 - Superficial and Deep Digital Flexor Tendons (SDFT & DDFT): These tendons absorb impact and assist in flexing the limb.
 - Common Digital Extensor Tendon: Helps extend the lower limb.
 - Suspensory Ligament: Plays a vital role in supporting the fetlock, preventing overextension and absorbing impact during motion.

Ligaments: Stability and Support

- Ligaments connect bones to other bones, providing stability to joints and preventing excessive movement.
- Ligaments help maintain joint integrity, controlling movement to prevent injury during activity.
- Key ligaments in movement:
 - Suspensory Ligament: Essential for maintaining the position of the fetlock and reducing strain.
 - Collateral Ligaments: Located in many of the joints like the coffins, fetlocks and hocks - they help stabilize the joint during movement.



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How They Work Together in Motion

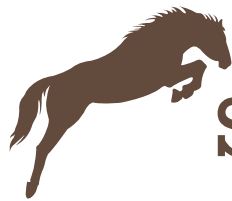
- **Muscle Contraction:** Muscles contract, generating force.
- **Tendon Force Transfer:** Tendons transmit the force from the muscle contraction to the attached bone.
- **Joint Movement:** The bone moves around its joint, which acts as a lever to produce motion.
- **Ligaments Stabilize:** Ligaments keep the joint in place, preventing overextension or abnormal movement.
- **Coordinated Action:** Multiple muscles and tendons work together for efficient, controlled movement.

Application Horse Care

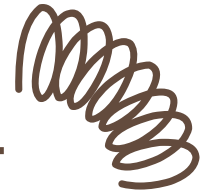
- Discuss how proper hoof trimming can create stress on the joints, tendons and ligaments
- Discuss how soft footing stresses soft tissue while hard footing stresses joints
- Discuss proper warm-ups, appropriate type of work and conditioning to supporting the horse's body
- Can discuss how conformation affects movement and performance
- How nutrition ties in to supporting the musculoskeletal system.

Application To Riding:

- Look at the parallels between humans and horse
- Compare how the fetlocks and pastern absorb the energy of a horse and relate it to how the ankles and knees absorb the movement while riding.
- Discuss the opening and closing of joints and relate it to how the elbows open and close slightly to keep hands steady as the horse's head and the rider's body is in motion.
- Discuss proper warm-ups, appropriate type of work and conditioning supports the human body just as it does the horses.



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Additional Resources:

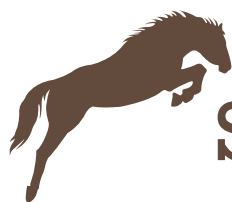
Great short video that highlights the horse's biomechanical movement:

<https://www.youtube.com/watch?v=Y-JTzpaIgys>

Muscle demo craft idea: <https://www.youtube.com/watch?v=pBKBAaW3ydE>

Balance board or bosu exercise ball - This can be used by the equestrians to play with stability and balance. Notice how angles of the joints will open and close with the movement to maintain balance.

Slinky or hula dancer doll - This can be an example of how energy is absorbed such as we do when riding the sitting trot.



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Human-Horse Bone Match-Up Activity: Limbs

Objective:

Equestrians will use colored tape to identify and match key bones and joints in their own lower limbs to those of the horse, improving their understanding of equine anatomy and biomechanics.

Materials Needed:

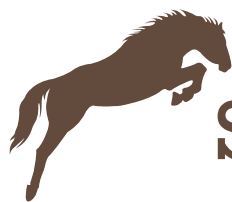
- Several rolls of colored tape (different colors for different bones/joints)
- A horse to serve as the anatomical reference
- A diagram of equine and human skeletal structures (optional reference)
- Polo wrap (optional)

Instructions:

1. **Mark Yourself:** Place a piece of tape on your body at each location.
2. **Mark the Horse:** Place matching colors on the horse's corresponding bones/joints.
3. **Compare & Discuss:**
 - How do human and horse legs differ?
 - Which joints align?
 - How does this affect movement and riding?

Move & Observe (Optional): Have you equestrians move different joints and observe how the position of their bones change. Observe a horse in movement and compare and contrast

Optional- Use a polo wrap to stabilize an equestrian's joint to restrict movement. Have the group observe the "lameness" that becomes visible due to the lack of mobility.



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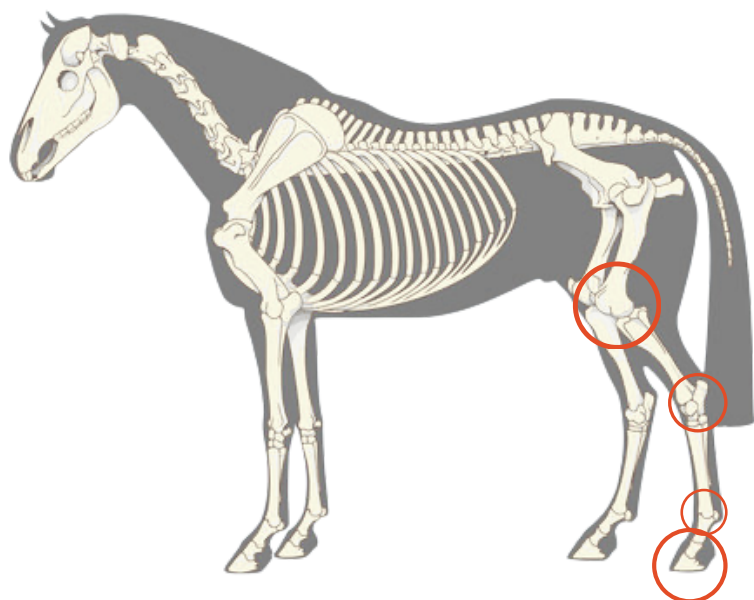


Name: _____

Bones, muscles, tendons, and ligaments work together to help a horse _____

- **Muscle contracts, generating force.**
- **Tendon transfers force to the attached bone.**
- **Bone moves around the joint, acting as a lever.**
- **Tendons and ligaments absorb impact, protecting muscles and bones.**

Draw a line to match the parts of the lower leg between horse and human.



Ways to support joint health:

True / False - Good nutrition

True / False - Keeping the horse overweight

True / False - Getting the horse's feet trimmed every 10 weeks

True / False - Exercising on hard or firm footing

Human-Horse Bone Match-Up Activity - Limbs

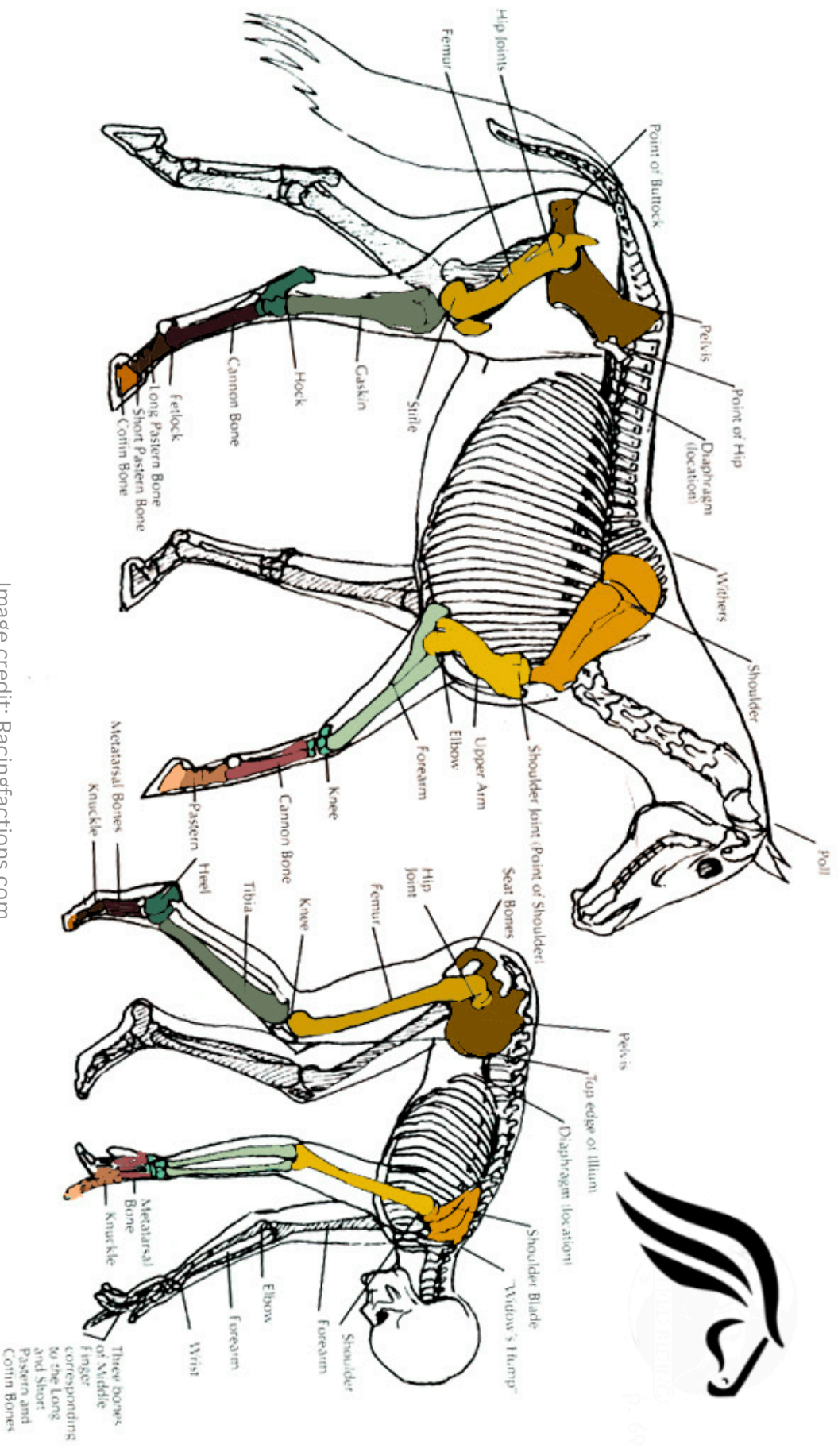


Image credit: Racingfractions.com

Human-Horse Bone Match-Up Activity - Lower Limbs

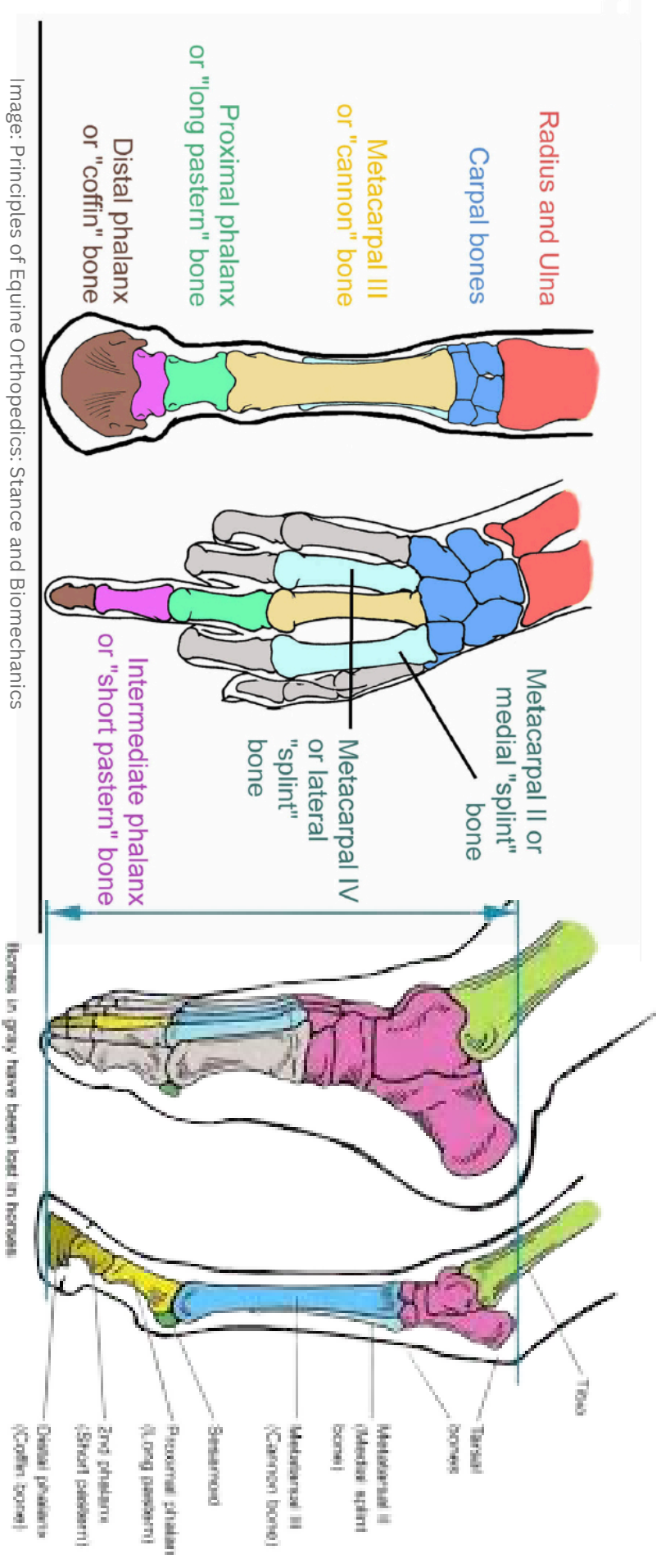
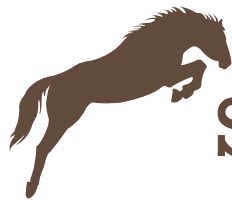
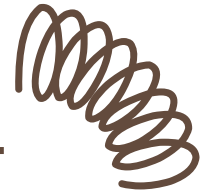


Image: Principles of Equine Orthopedics: Stance and Biomechanics



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Rider Movement Absorption

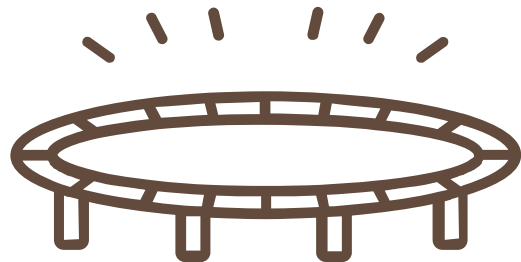
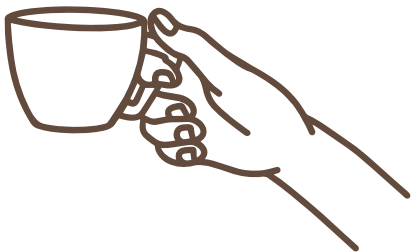
Look at the motion of joints in a rider. Examine the way the energy is absorbed through the movement.

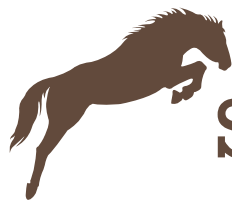
Option 1 - Exercise Ball or Trampoline

1. Have the riders do a slow bounce on the ball or trampoline to replicate movement of the horses back.
2. Hand them two cups full of water or you can have them again create the movement with the ball or trampoline

Option 2 - Trampoline

- Have the riders jump from a mounting block down onto exercise trampoline and observe if they absorb the energy through their knees, ankles and hip or if they bounce.
- Repeat the exercise asking them not to bounce rather and highlight the change that took place in the joints.





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Grid Drawing Activity

The grid method is an art technique that uses a grid to divide an image into smaller sections. Artists use this technique to accurately copy an image or scene.

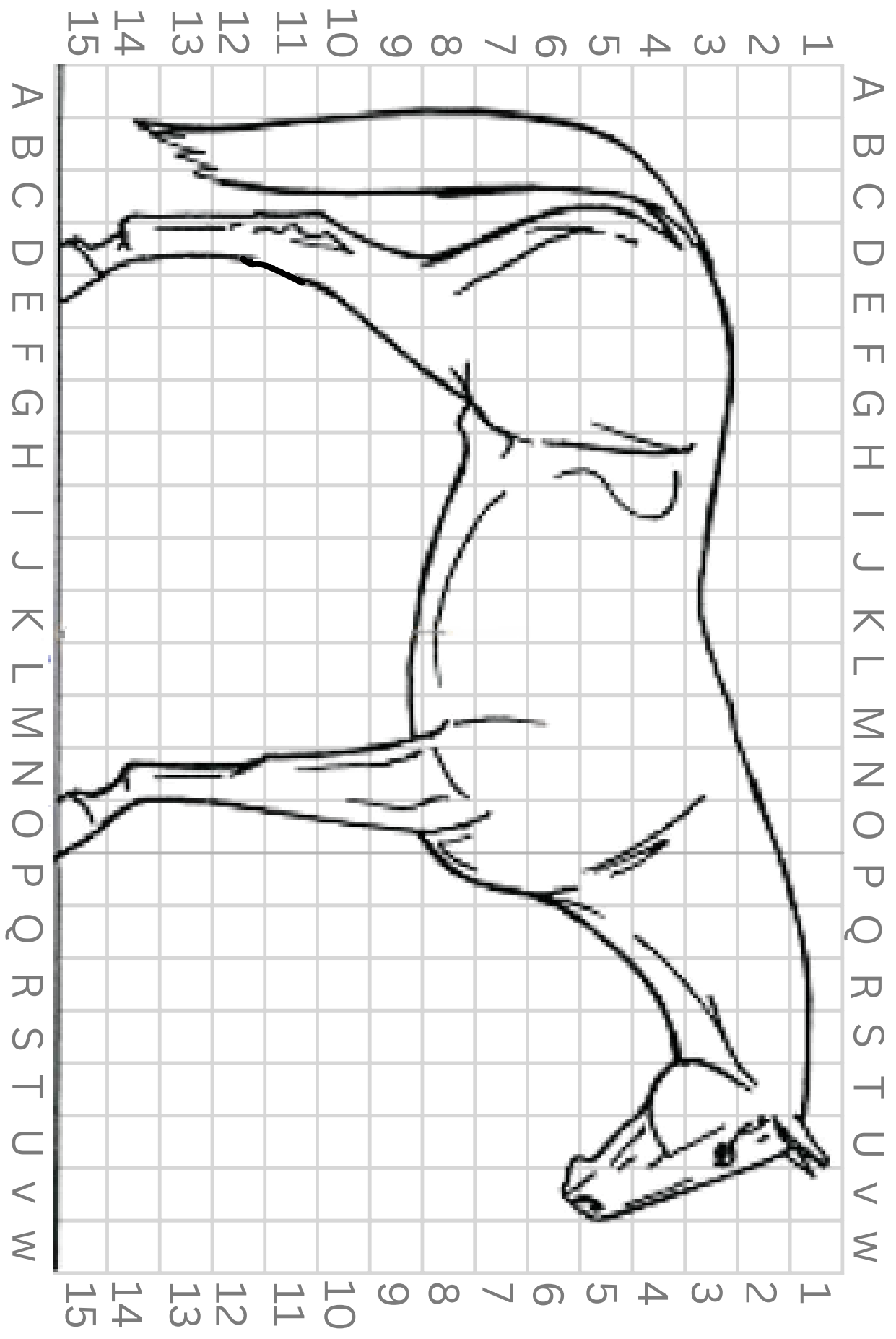
Option 1 - Artistic Study

Allow the equestrians to draw a horse with attention to each section of the horse individually.

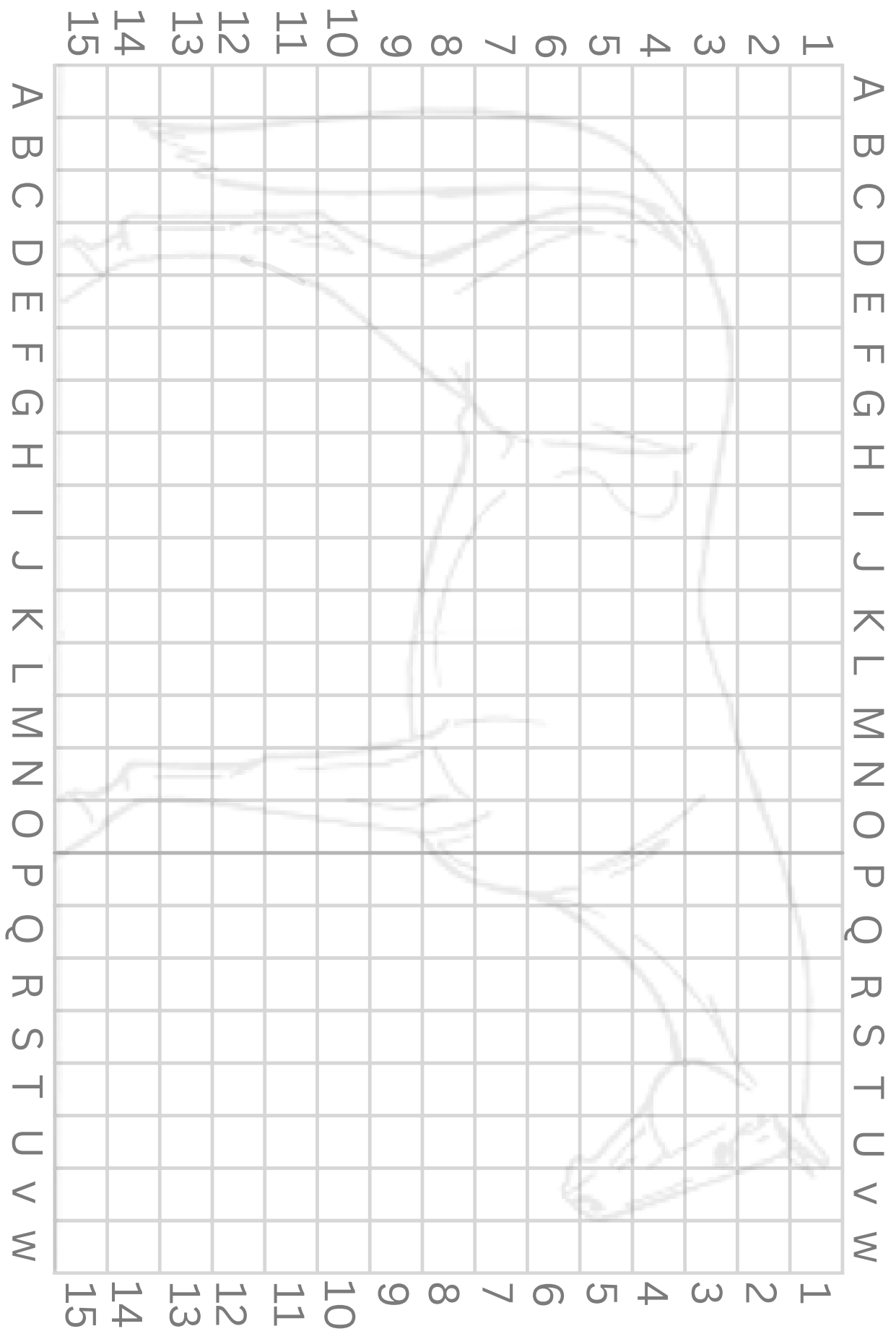
1. Focus on one square at a time
2. Copy the image from that square into the corresponding square on the blank grid paper
3. Continue until the entire image has been transferred

Option 2 - Anatomy Game

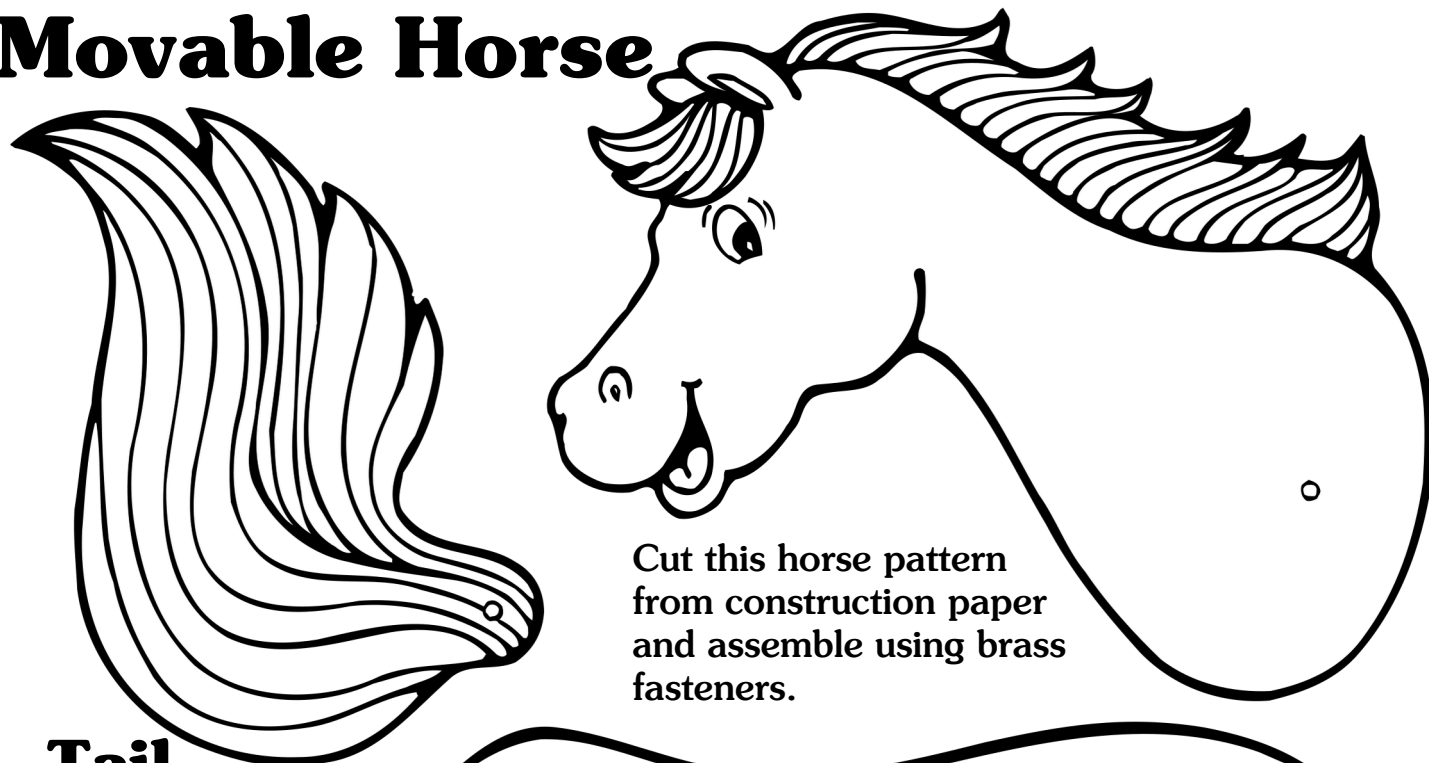
- Use the grid lines as identification markers
 - Have the equestrians identify the body part of the letter/number you call out
 - Have the equestrians call out the letter/number that represents the a part of the horse that you call out



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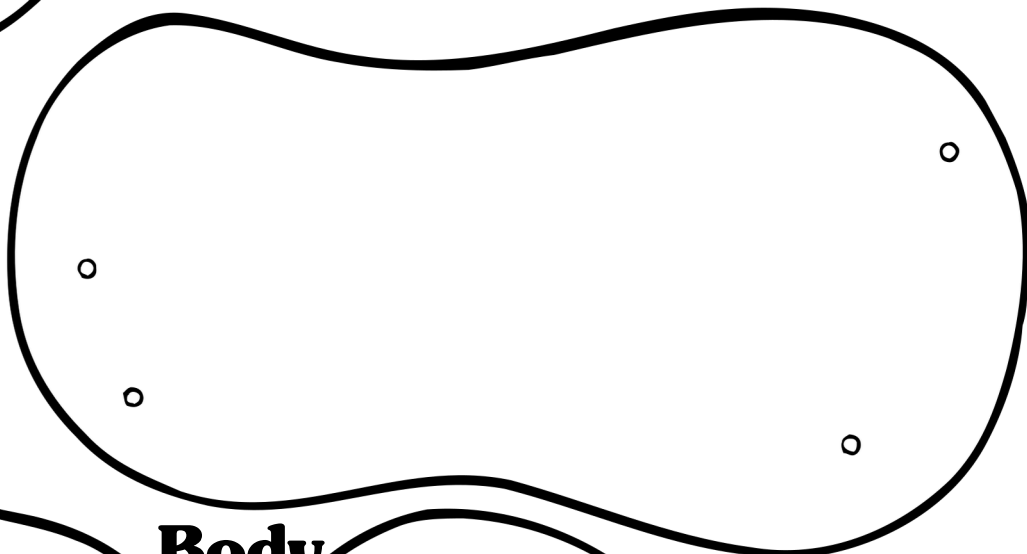


Movable Horse

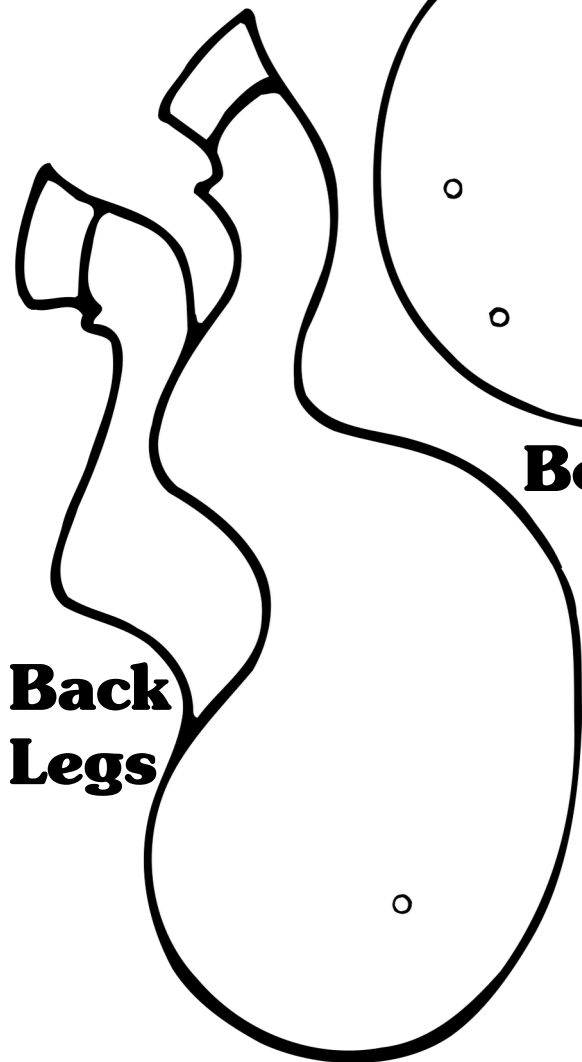


Cut this horse pattern from construction paper and assemble using brass fasteners.

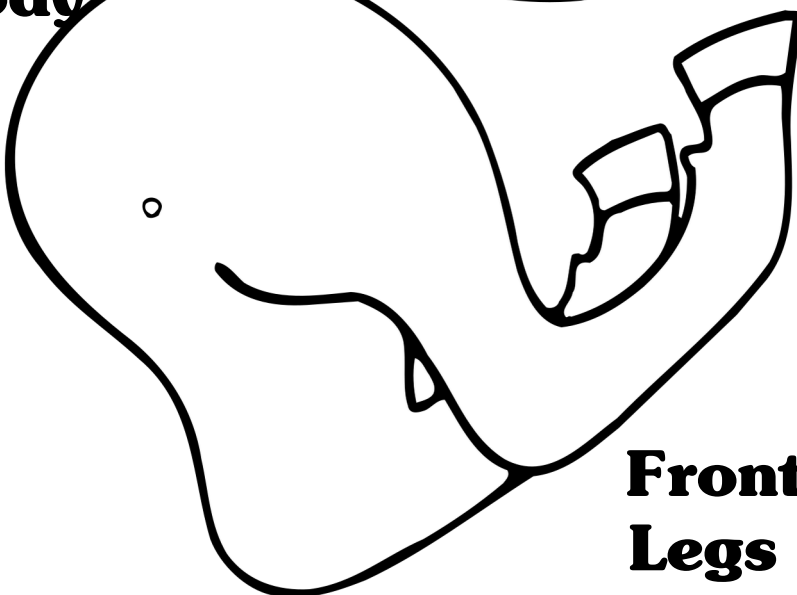
Tail



Body



**Back
Legs**



**Front
Legs**