YEAR 4-6 | STUDENT FACT SHEET

LEARNING AREAS: SCIENCE, ENGLISH

Movement, Motion, and Adaptations of Thoroughbred Horses

Primary Industries Education Foundation Australia

Thoroughbred Breeders Australia

Movement, Motion, and Adaptations of Thoroughbred Horses

Adaptations are characteristics, processes, or behaviours that help living things to survive and reproduce in their environment.

Structural adaptations are the physical features of an organism that help it to survive. For example, horses can sleep while standing because of a special feature in their legs called the stay apparatus. This feature allows them to lock their legs in place using tendons and ligaments, so they don't have to use much energy while standing. This adaptation helps horses to stay alert and ready to escape from predators even while they rest.

Behavioural adaptations are actions that an organism does to survive. For example, horses are herd animals. In the wild, they gather and move around in groups to protect themselves from predators and stay close to potential mates. Because of this adaptation, keeping horses close to others in paddocks or stables helps them to feel safe and comfortable.

Physiological adaptations are how an organism's internal systems or functions operate to help it survive in its environment. These adaptations are usually caused by the internal cells of the organism. For example, when horses sweat they produce a foamy substance called latherin which spreads over their coat to cool their bodies down.

How do horses move?

The gait refers to the pattern of steps and the speed at which an animal moves. Horses have four main gaits: **walk**, **trot**, **canter**, and **gallop**. They have a number of structural adaptations that enable them to move in these different ways.

When **walking**, horses move one foot at a time. Their strong legs and flexible joints allow for smooth, controlled movement and support their large bodies.

While **trotting**, horses move their diagonal pairs of legs together. This gait is efficient and less tiring due to the strong muscles and tendons in their upper legs.

During a **canter** or **gallop**, horses move in a three-beat (canter) or four-beat (gallop) pattern. Their long legs and flexible spine allow them to take large strides.

Horses: How Horses Move (1:04)

https://www.pbs.org/video/horses-horse-moves-opzrbl/

Scan the QR code or click on the link to view the Horses: How Horses Move video to observe the different gaits of a horse.

What are thoroughbred horses?

There are many different **breeds** of horses. Breeds of horses with different adaptations are better suited to performing different tasks. **Thoroughbreds** are a breed of horse known for their speed and agility. Their structural, physiological, and behavioural adaptations allow them to run very fast over long distances, making them well-suited for racing. Thoroughbreds have been specially bred over time by selecting **sires** (fathers) and **broodmares** (mothers) with desirable traits (such as speed, temperament, and good health) that are passed on to their offspring.

What adaptations help thoroughbreds to race?

Thoroughbred horses have strong, **muscular bodies** and **short**, **sleek coats**, which lie flat against their skin. The **streamlined** shape of their bodies reduces air resistance while running, helping them to move faster and more efficiently.

Their **long**, **thin legs** help them to take large strides, allowing them to cover more ground quickly. The **strong muscles** in their **upper legs** (especially their hindquarters) help them to take off quickly and maintain high speeds.

Thoroughbreds have **large nostrils** and a **wide jowl (jaw)**, which allows them to take in a lot of oxygen with every breath. Unlike humans, horses cannot breathe through their mouths, so their large nostrils are important for allowing thoroughbreds to breathe in large amounts of air to send oxygen to their muscles as they race.

The **strong hooves** of thoroughbred horses help to absorb pressure and protect their legs and feet from injuries when running on different types of race tracks.

Thoroughbred horses have **larger hearts** than other horse breeds. This helps them rapidly pump blood to their muscles as they run, allowing them to maintain high speeds over long distances without getting tired quickly.

Long, thin legs

Strong hooves

Large nostrils

What makes Australian thoroughbreds so special?

The Australian Thoroughbred industry started with a small number of horses — one stallion, three mares, and three yearlings — that were brought by the first European settlers in 1788. These thoroughbreds had characteristics that made them well-suited to the English landscape where they came from. Over time, Australia's thoroughbred breeders have selected and bred thoroughbreds with adaptations that make them well-suited to the Australian environment and racing conditions.

Australian thoroughbreds are well known for their **lean bodies** and their **speed** on the racetrack. They **develop more slowly** than other thoroughbreds from around the world, reaching their peak performance when they are older. This slow development helps them build strong, resilient bodies that help them to sprint at **high speeds** over **short distances.**

Australian thoroughbreds are known for their ability to perform well on **different types of racetracks** (turf [grass], dirt, and synthetic tracks). The strong muscles and flexible spines of Australian thoroughbreds help them adapt to running on these different surfaces.

Turf (grass) racetrack

Dirt racetrack

Synthetic racetrack

Answer the questions to show what you know about the adaptations of thoroughbred horses.

a) What is a behavioural adaptation that helps horses in the wild?

b) What substance do horses produce when they sweat, and what does it do?

c) Why are large nostrils important for thoroughbred horses during a race?

d) What makes Australian thoroughbreds different from other thoroughbreds around the world?

Forces and surfaces What are forces?

A force is a push or pull exerted by one object on another. There are different types of forces that affect how objects move.

Gravitational forces: This force pulls objects toward the centre of the Earth. It's why things fall when you drop them and why we stay grounded instead of floating away.

Frictional forces: This force occurs when two surfaces move against each other. Friction can slow down or stop motion, like when you try to slide a book across a carpet.

Friction and Gravity | MightyOwl Science | 3rd Grade (5:32)

https://youtu.be/8wXWraHgIVM?

Scan the QR code or click on the link to view the video about friction and gravity.

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How do forces impact racehorses?

When a horse gallops during a race, or practices jumping during training, it needs to push against gravity. The horse's powerful hindquarters and flexible spine help it to move upwards and forwards. Calculating the speed, distance, height, and force involved in jumps can help trainers understand how the horse moves, improving their training techniques to help horses run faster and prevent injuries.

Friction is important for a horse's hooves to grip the racetrack surface. Good grip helps the horse push off the ground effectively. The hooves and leg strength of thoroughbred horses help to grip the racetrack surface and maintain speed during races.

In Australia, racehorses run on tracks made of different materials. Different types of racetracks provide different amounts of friction.

The right amount of friction is important for racehorses because it helps them grip the track and run safely and quickly. If there isn't enough friction, the horse might slip and lose speed, while too much friction can make it harder for the horse to move smoothly. The right amount of friction helps the horse stay stable, move efficiently, and perform its best during the race.

Rougher surfaces such as dirt racetracks can provide greater friction than smoother surfaces, such as turf (grass) racetracks.

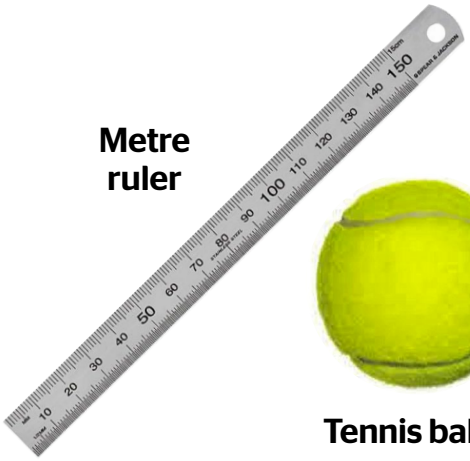
Friction investigation

Aim

To investigate how different surface textures affect the frictional force on a bouncing ball.

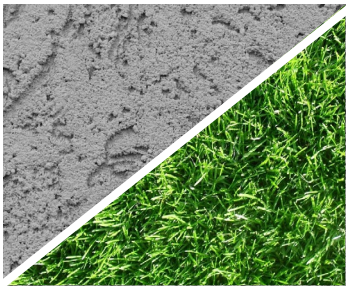
Equipment

Collect these things before you start the experiment:

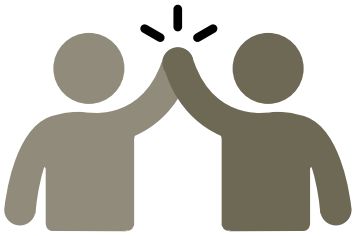


Metre ruler

Tennis ball



Different surfaces (e.g. grass, concrete, tiles)

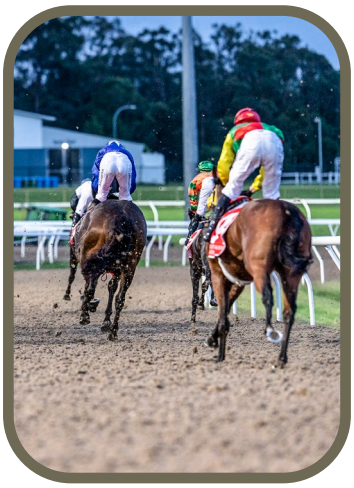


A partner

Instructions

1. Record your prediction about which surface will allow the ball to bounce the highest (have the least friction) and which will result in the lowest bounce (have the most friction) on your worksheet.
2. Hold the metre ruler upright on the first surface. Drop (without pushing or throwing it down at all!) the tennis ball from the top of the ruler.
3. Using the markers on the ruler, allow your partner to observe how high the ball bounces on the surface.
4. Repeat the drop at least 5 times on each surface (and calculate an average) recording the result in the table on your worksheet.
5. Move to the remaining surfaces and repeat the steps, recording the height of each bounce in centimetres (cm) on your worksheet.
6. Complete the remaining questions on the worksheet.

e) Make a prediction about which surface will allow the ball to bounce the highest (provide the least friction).



f) Make a prediction about which surface will cause the ball to bounce the lowest (provide the most friction).

g) Record the results of the experiment in the table below.

Type of surface (e.g. concrete, grass, tiles)	Description of texture (e.g. smooth, bumpy, soft, hard)	Average height of bounce (cm)

h) Complete the sentences by describing the investigation.

During this investigation we asked the question...

When we changed the variable _____

what will be the effect on _____

"I" control the INDEPENDENT variable, therefore the independent variable was...

I cannot control the dependent variable, therefore the dependent variable was...

i) What were 3 scientific words that you needed to use in this experiment?

j) Was your prediction correct? Why/why not?

k) Which of the surfaces provided the most friction?

l) Which of the surfaces provided the least friction?

m) Did anything go wrong in the experiment or were there any unusual results?

n) Did you answer the question you set out to answer?

YES ☐ **NO** ☐

o) The conclusion to this investigation is that...

Learning Areas | Australian Curriculum Content:

Science
Identify how forces can be exerted by one object on another and investigate the effect of frictional, gravitational and magnetic forces on the motion of objects (AC9S4U03)

Examine how particular structural features and behaviours of living things enable their survival in specific habitats (AC9S5U01)

Pose questions to explore observed patterns and relationships and make predictions based on observations (AC9S4I01)

Pose investigable questions to identify patterns and test relationships and make reasoned predictions (AC9S5I01, AC9S6I01)

Use provided scaffolds to plan and conduct investigations to answer questions or test predictions, including identifying the elements of fair tests, and considering the safe use of materials and equipment (AC9S4I02)

Plan and conduct repeatable investigations to answer questions, including, as appropriate, deciding the variables to be changed, measured and controlled in fair tests; describing potential risks; planning for the safe use of equipment and materials; and identifying required permissions to conduct investigations on Country/Place (AC9S5I02, AC9S6I02)

Follow procedures to make and record observations, including making formal measurements using familiar scaled instruments and using digital tools as appropriate (AC9S4I03)

Use equipment to observe, measure and record data with reasonable precision, using digital tools as appropriate (AC9S5I03, AC9S6I03)

Construct and use representations, including tables, simple column graphs and visual or physical models, to organise data and information, show simple relationships and identify patterns (AC9S4I04)

Construct and use appropriate representations, including tables, graphs and visual or physical models, to organise and process data and information and describe patterns, trends and relationships (AC9S5I04, AC9S6I04)

Compare findings with those of others, consider if investigations were fair, identify questions for further investigation and draw conclusions (AC9S4I05)

Compare methods and findings with those of others, recognise possible sources of error, pose questions for further investigation and select evidence to draw reasoned conclusions (AC9S5I05, AC9S6I05)

English
Use comprehension strategies such as visualising, predicting, connecting, summarising, monitoring and questioning to build literal and inferred meaning, to expand topic knowledge and ideas, and evaluate texts (AC9E4LY05)

Use comprehension strategies such as visualising, predicting, connecting, summarising, monitoring and questioning to build literal and inferred meaning to evaluate information and ideas (AC9E5LY05, AC9E6LY05)

ATTRIBUTION, CREDIT & SHARING

This resource was produced by Primary Industries Education Foundation Australia (PIEFA) in collaboration with Thoroughbred Breeders Australia. Primary Industries Education Foundation Australia's resources support and facilitate effective teaching and learning about Australia's food and fibre industries. We are grateful for the support of our industry and member organisations for assisting in our research efforts and providing industry-specific information and imagery to benefit the development and accuracy of this educational resource.

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