**NZQA**

**Approved**

Achievement standard: 91169 Version 2

Standard title: Demonstrate understanding of physics relevant to a selected context

Level: 2

Credits: 3

Resource title: Jumping cats

Resource reference: Physics VP-2.2 v2

Vocational pathway: Social and Community Services

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| Quality assurance status | These materials have been quality assured by NZQA. NZQA Approved number A-A-02-2015-91169-02-8213 |
| Authenticity of evidence | Assessors/educators must manage authenticity for any assessment from a public source, because learners may have access to the assessment schedule or exemplar material.Using this assessment resource without modification may mean that learners’ work is not authentic. Assessors/ educators may need to change figures, measurements or data sources or set a different context or topic to be investigated or a different text to read or perform. |

Vocational Pathway Assessment Resource

Achievement standard: 91169

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Learner instructions

# Introduction

This assessment activity requires you to demonstrate your understanding of how physics relates to cats jumping, so that, as a veterinary nurse, you can give advice to clients whose pets are injured by falls.

You are going to be assessed on how you demonstrate comprehensive understanding of physics relevant to the context of cats jumping.

The following instructions provide you with a way to structure your work so you can demonstrate what you have learnt and achieve success in this standard.

Assessor/educator note: It is expected that the assessor/educator will read the learner instructions and modify them if necessary to suit their learners.

# Task

Veterinarian nurses are often required to help take care of animals that have been injured by falls. As part of this they sometimes provide advice to owners about how to help small animals recover from injury and how to reduce the risk of further injury. Understanding the physics of how an animal such as a cat jumps and how it lands is very important to understanding how to care for injured animals.

Cats have the ability to jump to great heights. Their natural ability is due to how their muscles and bones work together to provide an upward force. The force of each muscle pulling on the bone acts as a lever that results in an upward force on the cat. The amount of force required depends on how high the cat needs to jump.

Similarly, when a cat falls from a height, there are large forces involved as the cat lands. Young or injured cats can be at particular risk if they fall or jump from too great a height before their muscles and bones are ready for the impact.

Working independently, research the forces and motion involved when cats jump to and from high objects. You will use your research information to prepare a report in two sections.

In the first section, you will explain the forces and motion involved to explain how cats can jump so high and how they land when they fall from a high object.

In the second section, you will prepare a poster or pamphlet that a veterinary nurse may give to a pet owner to help them understand the importance of how to care for a small or injured cat. The poster or pamphlet should make them aware of the dangers of falling from high objects before the animal is strong enough.

Your report could include these ideas:

* forces involved when a cat jumps upwards
* how a cat lands when falling from a height
* how muscles and joints act as levers to optimise the jump
* ideas about energy changes, momentum, forces, and impulse when a cat falls and lands from a height
* calculating the changes in gravitational potential energy and speed as a cat jumps to and from a high object
* estimating the time it takes for a cat to land after falling from a higher object from the time its feet touch the ground until it stops moving downwards
* using equations of motion to draw a graph that shows how forces and speed change as a cat falls and lands from a high object
* explaining how the height of the jump and the time of the impact affect the forces involved
* comparing the forces acting for a healthy cat when falling from a certain height with that of an injured cat with a reduced range of muscle motion.

All sources of information, images, diagrams, and data must be acknowledged and referenced in a format that allows them to be easily traced.

Submit each section of your report in a format agreed with your assessor/educator. This could be:

* a written report (with illustrations, diagrams, and graphs, if appropriate)
* a poster (with annotations or supporting notes)
* an oral presentation (with written references)
* a project booklet
* multimedia (for example a video or web page with embedded video, graphics, and text).

You will be assessed on how well you describe the relevant physics and integrate it into the context of cats jumping. In your report you should aim to elaborate, justify, evaluate, compare and contrast, or analyse the physics underpinning how cats jump.

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Assessor/Educator guidelines

# Introduction

The following guidelines are supplied to enable assessors/educators to carry out valid and consistent assessment using this internal assessment resource.

As with all assessment resources, education providers will need to follow their own quality control processes. Assessors/educators must manage authenticity for any assessment from a public source, because learners may have access to the assessment schedule or exemplar material. Using this assessment resource without modification may mean that learners' work is not authentic. The assessor/educator may need to change figures, measurements or data sources or set a different context or topic. Assessors/educators need to consider the local context in which learning is taking place and its relevance for learners.

Assessors/educators need to be very familiar with the outcome being assessed by the achievement standard. The achievement criteria and the explanatory notes contain information, definitions, and requirements that are crucial when interpreting the standard and assessing learners against it.

# Context/setting

This activity requires learners to undertake research and prepare a report demonstrating comprehensive understanding of the physics relevant to how cats jump.

# Conditions

Confirm the format of the report with learners, for example:

* a written report (with illustrations, diagrams, and graphs, if appropriate)
* a poster (with annotations or supporting notes)
* an oral presentation (with written references)
* a project booklet
* multimedia (for example a video or web page with embedded video, graphics, and text).

# Resource requirements

Learners will require access to the internet.

# Additional information

None.

# Assessment schedule: Physics 91169 – Jumping cats

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| Evidence/Judgements for Achievement | Evidence/Judgements for Achievement with Merit | Evidence/Judgements for Achievement with Excellence |
| The learner demonstrates understanding of physics relevant to a selected context by:* providing characteristics of, or an account of, the physics related to how cats are able to jump to and from high objects

For example the learner:* + draws a diagram to help describe how the leg muscles are connected to the bones
	+ describes how the muscles and bones work together to act as a lever
	+ draws a diagram to determine the individual and resultant forces acting on a cat as it jumps upwards
	+ calculates the acceleration of the cat upwards for a given resultant force and mass
	+ calculates the change in gravitational potential energy for a cat as it jumps to a higher object
	+ describes the relationship between the force applied and the height reached
	+ explains to a pet owner why an injured cat may be more likely to sustain injury if falling from too great a height.

*The above expected learner responses are indicative only and relate to just part of what is required.* | The learner demonstrates in-depth understanding of physics relevant to a selected context by:* providing the characteristics of, or an account of, the physics related to how cats are able to jump to and from high objects
* providing reasons as to how and/or why the physics applies to how cats are able to jump to and from high objects

For example the learner:* + uses the gravitational potential energy when a cat is on a high object to determine the kinetic energy and speed of the cat as it lands after falling from this object
	+ estimates the time taken for a cat to land from the time its feet hit the ground to the time it stops moving downwards
	+ uses the time of impact for landing and the momentum of the cat as it lands to calculate the forces acting upwards
	+ explains to a pet owner why falling from too great a height may exert too great a force on the muscles and joints of an injured or small cat.

*The above expected learner responses are indicative only and relate to just part of what is required.* | The learner demonstrates comprehensive understanding of physics relevant to a selected context by:* providing the characteristics of, or an account of, the physics related to how cats are able to jump to and from high objects and linking ideas to integrate physics related to this context
* elaborating on how and/or why the physics applies to this context
* justifying and evaluating why the particular physics is well suited to this context, and/or comparing alternatives

For example the learner:* + compares the forces acting on the muscles and joints for a cat falling from a certain height with that of an injured cat with a more limited range of muscle movement in terms of the differing time of impact
	+ uses equations of motion to draw a graph of velocity versus time and resultant force versus time for a cat as it falls and lands
	+ explains why restricting the height that a small or injured cat is able to jump from is important in terms of preventing further injury.

*The above expected learner responses are indicative only and relate to just part of what is required.* |

Final grades will be decided using professional judgement based on an examination of the evidence provided against the criteria in the Achievement Standard. Judgements should be holistic, rather than based on a checklist approach.