

Teacher Notes

Introduction

Pupils can work on this problem individually or with others.

- They can discuss what is being described in the problem, and how they intend to approach it.
- They can share their responses and compare approaches.

This problem deals with a pupil's ability to derive a solution to a problem requiring an understanding of mathematical language and Pythagoras' Theorem.

What I know (think)

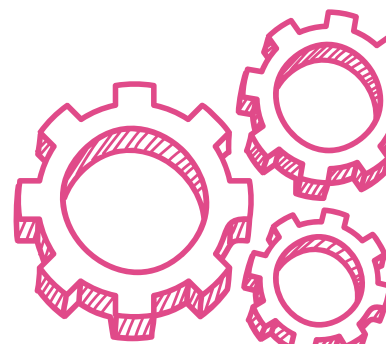
The pupils should know from the given problem:

- Happy Days amusement arcade is adding a children's rollercoaster ride to its park.
- Lengths of steel, which come in two-metre lengths, will be soldered together to produce the finished track.
- The upward incline near the start of the ride will use five lengths of steel.
- For every metre that the steel inclines, the horizontal distance along the ground should not be less than four-fifths of a metre.
- The pupils need to find the maximum height from the bottom of the incline to the top of the incline.

What I need to know (identify)

Pupils need to identify:

- what information they have been given to help them solve the problem;
- how to relate the written communication to their own mathematical understanding;
- whether they can use diagrams or other mathematical tools to help solve the problem;
- what is meant by 'for every metre that the steel inclines, the horizontal distance along the ground should not be less than four-fifths of a metre';
- how long the upward incline will be; and
- how to calculate the height from the bottom of the upward incline to the top of the upward incline.



Rollercoaster (Continued)

What I need to do (employ)

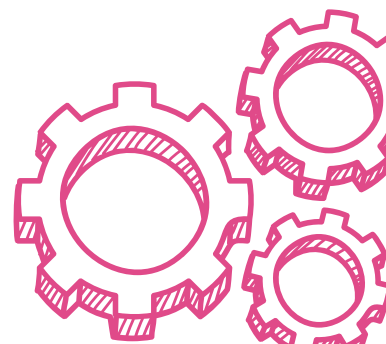
Pupils need to use the written information they have been given and try and use their mathematical understanding to find a solution to the problem. One way to approach the problem is to use diagrams to sketch out the information given:

- The information mentions an upward incline and a horizontal distance – this should give pupils a clue as to what kind of diagram to initially sketch.
- They may also use their understanding of a rollercoaster to draw a rough diagram.
- The pupils' main focus should be on the health and safety requirement.
- By looking at what a one metre incline would look like if the horizontal distance was bigger and smaller than four-fifths of a metre, pupils should be able to recognise what shape is created when looking at the gradient of the incline.
- Pupils should multiply two metres by five to get the length of the incline.
- Pupils can then sketch an incline with ten metres instead of one metre: this should lead them to determine that the maximum horizontal distance would be four-fifths of ten metres, which is eight metres.
- Pupils should recognise that having an incline of ten metres and a horizontal distance of eight metres means that they should use Pythagoras' Theorem to calculate the vertical height from the bottom to the top of the upward incline.

What I did (review)

Pupils will use self-assessment, peer assessment or teacher feedback to decide whether they have approached the problem as intended:

- Did they use diagrams to sketch out what they were told in written communication?
- Did they determine what was meant by 'for every metre that the steel inclines, the horizontal distance along the ground should not be less than four-fifths of a metre'?
- Did they look at what the incline would look like if the horizontal distance was greater than or less than four-fifths of a metre?
- Did they calculate five lengths of two metres for the incline and four-fifths of ten for the horizontal distance?
- Did they sketch a triangle with base eight metres and hypotenuse ten metres?
- Did they use Pythagoras' Theorem to find the perpendicular height of the triangle?
- Did they compare their approach and solution with others?



Rollercoaster (Continued)

Curriculum Objectives

This problem should enable pupils to demonstrate their knowledge, understanding and skills through:

Developing pupils as individuals	<p>Demonstrate an ability and willingness to develop logical arguments</p> <ul style="list-style-type: none"> Pupils will show how they approached the problem and developed an appropriate strategy to calculate the maximum height from the bottom to the top of the upward incline.
Developing pupils as Contributors to the Economy and Environment	<p>Explore how the skills developed through mathematics will be useful to a range of careers</p> <ul style="list-style-type: none"> Pupils will engage in a problem that is similar to those experienced by those working in construction and engineering.

Thinking Skills and Personal Capabilities

This problem can provide an opportunity for pupils to demonstrate a variety of the following Thinking Skills and Personal Capabilities:

Managing Information	<ul style="list-style-type: none"> Ask focused questions Plan and set goals and break a task into sub-tasks
Thinking, Problem-Solving and Decision Making	<ul style="list-style-type: none"> Justify methods, opinions and conclusions Generate possible solutions, try out alternative approaches and evaluate outcomes
Being Creative	<ul style="list-style-type: none"> Experiment with ideas and questions Make ideas real by experimenting with different designs, actions and outcomes Challenge the routine method Take risks for learning
Working with Others	<ul style="list-style-type: none"> Suggest ways of improving their approach to working collaboratively Respect the views and opinions of others and reach agreements using negotiation and compromise
Self-Management	<ul style="list-style-type: none"> Seek advice when necessary Organise and plan how to go about a task Focus, sustain attention and persist with tasks

Cross-Curricular Skills

This problem should enable pupils to demonstrate a variety of the following Cross-Curriculum Skills:



Using Mathematics

