Perspective: Dazzle Camouflage

Key Learning Content

This film explains how dazzle camouflage was used during both World Wars to confuse the enemy about the speed and direction of a ship, and hence make it much more difficult to hit it with a missile. This tactic would be particularly effective as the ship would be seen only through the periscope of an attacking submarine. The film leads naturally into the topic of vectors, and the use of scale drawings.

No prior knowledge of vectors and scale is required before watching the film.

Core Outcomes

Learning Points

- Be able to understand the use of perspective to convey distance and depth in a 2D image.
- Be able to use scale drawings to solve problems about distance, speed and direction.
- Be able to understand and use the relationship between average speed, distance and time.

Suggested Activities

- Show all the possible positions of a battleship after one minute if its direction and speed are out by five degrees and by 10%.
- Play a game of battleships and torpedoes where one student has to get their torpedo to hit the other student's battleship.

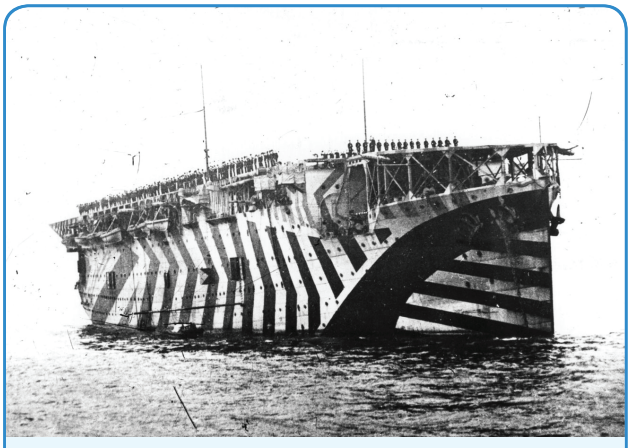
Extension Outcomes

Learning Points

- Be able to understand that a vector has both magnitude and direction.
- Be able to find the resultant of two or more vectors.
- Be able to solve vector equations simultaneously.

Suggested Activities

- Model a battleship and torpedo using vector equations.
- Solve vector equations to find a torpedo's required speed and direction to hit a target.



During two World Wars, warships were painted in camouflage patterns to create an optical illusion and confuse the enemy.

Related Films

To use before the lesson plan:

Escher and the Endless Staircase	This film illustrates the fact that we do not simply see the world as it is, but interpret and make assumptions about what we are seeing.

To use after the lesson plan:

Tank Wars	This film describes the use of a mathematical model to estimate the number of tanks arrayed on a battlefield.
Vectors: Air Traffic Control	This film explains how air traffic controllers keep tabs on airplanes with the use of radar, electronics and mathematics.

Guide Lesson Plan

Introduction

Get two soft balls and select a large open space. Give one of the balls to a student and tell them to roll their ball so that it hits your ball. Then gently roll your ball in a direction away from the student. Let other students try and record successes. Then ask if anyone thinks they could hit the target ball if they weren't able to see its direction and speed?

Show Film

Perspective: Dazzle Camouflage

Main Activity

Foundation

Get students to draw a scale diagram showing the position of a battleship B after one minute if travelling at a speed of three metres per second at an angle of 60 degrees to the vertical. Then show the range of possible positions if the speed could be anything between 2.7 and 3.3 metres per second and the angle anything between 55 and 65 degrees.

Advanced

Explain what a vector is and give examples. Expressing vectors in i, j, form, write down the position vectors for the battleship and torpedo at time t. Let the torpedo's velocity be kv, where v is a given velocity and k is a constant multiplier, value to be determined. By putting the two position vectors equal to each other, solve the equation to find the required velocity of the torpedo.

Extension Activity

Foundation

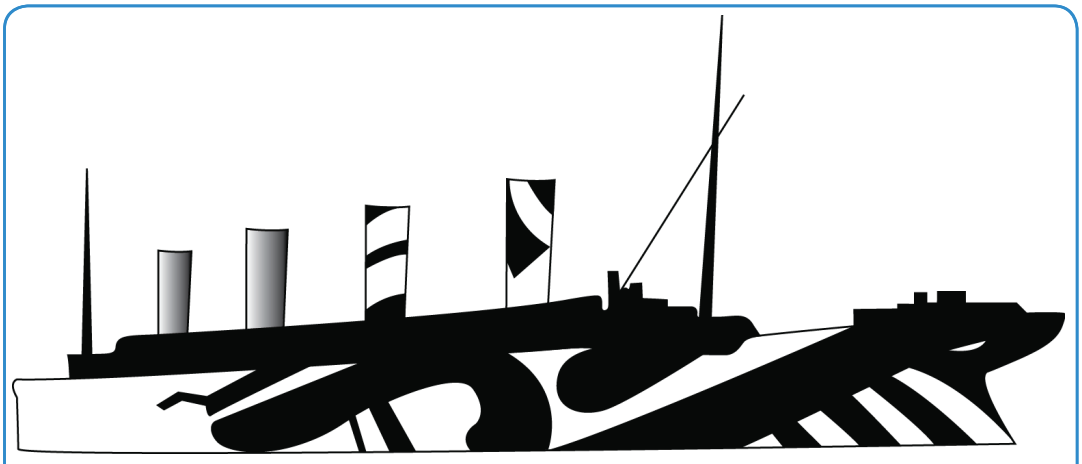
Place students in pairs and get them to play a game of battleships and torpedoes with each other. One student controls a battleship at the top left of the page while the other controls a torpedo at the bottom right. Students take it in turns to move their piece. Students must decide up front on the direction of travel, and on how far their piece moves in one go. Direction and distance must remain the same for all subsequent moves. The battleship goes first in any direction down-and-to-the-right. After the battleship's first move, the torpedo must be launched with a direction and 'speed' designed to hit the battleship as it moves along its course.

Advanced

The captain in the submarine determines that he has the greatest chance of success if he aims to hit the battleship at right angles to its path. Draw an accurate scale diagram to work out the speed and direction of the torpedo if it is to hit the battleship. Can students capture this using vectors?

Optional Extra

Research what a dot product of two vectors is, and how this can be used to show that two vectors are perpendicular. Given the vector path of the battleship, work out an expression for a vector perpendicular to this path.



Dazzle camouflage is a clever use of perspective, as the block colours make it difficult to be certain of which way the ships are facing.