

**Phase:** 5/6

**Subject:** Design and Technology

**Focus:** Pulleys or gears

**Term:** Summer

## Prior Learning

- Experience of axles, axle holders and wheels that are fixed or free moving.
- Basic understanding of electrical circuits, simple switches and components.
- Experience of cutting and joining techniques with a range of materials including card, plastic and wood.
- An understanding of how to strengthen and stiffen structures

## Vocabulary

|                    |  |
|--------------------|--|
| Pulley             | A grooved wheel over which a drive belt can run  |
| Gear               | A wheel with teeth around its circumference  |
| Drive Belt         | The belt which connects and transfers movement between pulleys   |
| Gearing up or down | Changing the rotational speed of a product by the use of pulleys or gears. When a small pulley or gear is used to drive a larger one the rotational speed is reduced and the product has been geared down. |
| Mechanical system  | A set of related parts or components used to create movement   |
| Driver             | The gear or pulley that provides the input movement to the system  |
| Follower           | The gear or pulley that provides the output movement to the system   |
| Mesh               | The point where two gears join together and transfer movement  |
| Motor Spindle      | The rod on the end of the motor onto which a gear or pulley is attached.   |

## Knowledge

- Understand that mechanical and electrical systems have an input, process and an output.
- Understand how gears and pulleys can be used to speed up, slow down or change the direction of movement.

### THOUGHT

What type of toy vehicle shall I make?  
What will be its purpose?  
Who will use it?

What electrical and mechanical components shall I use?

Which materials will I use to make it?  
How will I make fit for purpose?

How will I make the body shell for my toy vehicle?

What tools and materials will I need?  
What order will I work in?  
What constraints am I working to?

Do I need to change anything?

Will my product meet the needs, wants and interests of the user group?

### ACTION

Discussing ideas, drawing annotated sketches or exploded diagrams  
Generating a simple design specification

Discussing, modelling and evaluating different systems using mechanical and electrical components

Investigating and trialling possible materials and components

Discussing, exploring and evaluating prototypes

Negotiating, developing and agreeing a step-by-step plan

Discussing, testing and modifying the design

Evaluating the product with the intended user group and against the original design specification

## By the end of the unit I should...

### Designing

- Generate innovative ideas by carrying out research using surveys, interviews, questionnaires and web-based resources.
- Develop a simple design specification to guide my thinking.
- Develop and communicate ideas through discussion, annotated drawings, exploded drawings and drawings from different views.

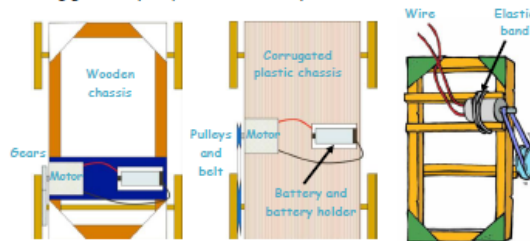
### Making

- Produce detailed lists of tools, equipment and materials. Formulate step-by-step plans and, if appropriate, allocate tasks within a team.
- Select from and use a range of tools and equipment to make products that are accurately assembled and well finished. Work within the constraints of time, resources and cost.

### Evaluating

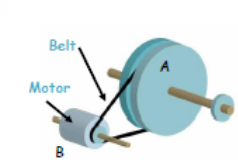
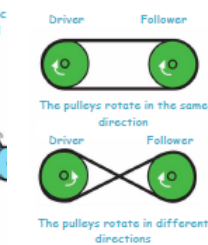
- Compare the final product to the original design specification.
- Test products with intended user and critically evaluate the quality of the design, manufacture, functionality and fitness for purpose.
- Consider the views of others to improve my work.
- Investigate famous manufacturing and engineering companies relevant to the project.

### Building gears or pulleys into children's products



An example of a handmade reversing switch

### Developing understanding of gears and pulleys



The small pulley (B) rotates much more quickly than the large pulley (A)

Using construction kits, ask children to explore gear ratio using combinations of two gears e.g.

| No. teeth | Ratio |
|-----------|-------|
| 8, 16     | 2:1   |
| 8, 40     | 5:1   |
| 8, 24     | 3:1   |
| 40, 40    | 1:1   |

