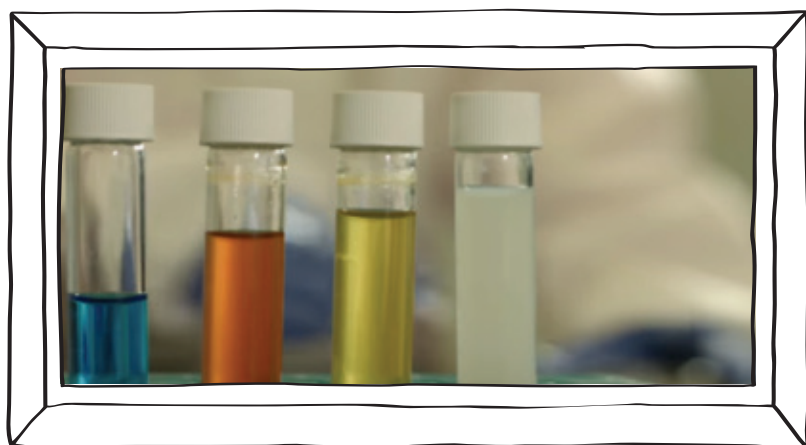


# WORKING IN ADVANCED MANUFACTURING



## What? How? Why?

Advanced Manufacturing is creating important everyday items as part of a team. Designing, testing and building are just some of the areas of manufacturing. Aeroplanes, cars, hospital machines, even shampoo, would not exist without the skills of advanced manufacturing.



**Show this video to  
pupils to set the scene**

**[www.actonstem.co.uk](http://www.actonstem.co.uk)**

## Skills Needed:

- Ability to problem solve
- Understanding why & how things work.
- Ability to explain findings to a team with different skills.
- Strong reading, writing & communication skills.
- Understanding rules & guidelines.
- Understands computers - able to work creatively with technology for design roles.
- Attention to detail.
- Desire to be on the cutting edge of technological developments.
- Minimum of Maths GCSE with further qualifications required for advancement.
- Advanced Apprenticeships and Company Education Programmes for school leavers are strong work-based alternatives to a university degree.

“One in five people in advanced manufacturing are women and they earn very high salaries. Could one of these women be you?”

**Chwarae Teg**



# ADVANCED MANUFACTURING JOB EXAMPLES

## **Manufacturing Engineer | Average Salary: £32,000 (Oct15)**

Manufacturing engineers have a high level of technical expertise and skill, which they use to plan, design, set up, modify, optimise and monitor manufacturing processes.

Manufacturing engineers are designers, as well as analytical and creative thinkers. They can operate on their own initiative but also contribute as a team member working with engineers from various disciplines.

### **Up-to-date full information:**

 [www.careerswales.com/en/career-search/search?jobTitleId=10418](http://www.careerswales.com/en/career-search/search?jobTitleId=10418)

---

## **QA (Quality Assurance) Product Release Officer | Average Salary: £20,000 (Oct15)**

QA Product Release Officers are responsible for ensuring products meet the established standards of quality including reliability, usability and performance.

The testing of products is an important part of the manufacturing process and requires a strong mixture of knowledge, judgement and decision-making.

### **Up-to-date full information:**

 [www.careerswales.com/en/career-search/search?jobTitleId=55799](http://www.careerswales.com/en/career-search/search?jobTitleId=55799)

---

## **Technical Operations Scientist | Average Salary: £35,000 (Oct15)**

Working for the Technical Operations Department, Scientists are involved in improving and resolving issues with product performance.

Design, chemical analysis, leading experiments and team work are all key elements of the job role.

### **Up-to-date full information:**

 [www.careerswales.com/en/career-search/search?jobTitleId=10354](http://www.careerswales.com/en/career-search/search?jobTitleId=10354)

---

## **Check out other jobs in Advanced Manufacturing...**

 [www.careerswales.com/en/tools-and-resources/job-trends/advanced-materials-manufacturing/](http://www.careerswales.com/en/tools-and-resources/job-trends/advanced-materials-manufacturing/)



# CLASSROOM ACTIVITY PAPER DESIGN

TEACHER'S  
GUIDE

In groups- pupils must construct a small table using rolls of newspaper to hold the weight of a single book. The activity could begin with a design phase and a discussion of other paper-based materials to include in construction. The finished table should not only be practical in being weight bearing but colourful too!

## KEY SKILLS (NATIONAL CURRICULUM)

PROBLEM  
SOLVING

WORKING  
WITH OTHERS

DESIGN &  
MAKING

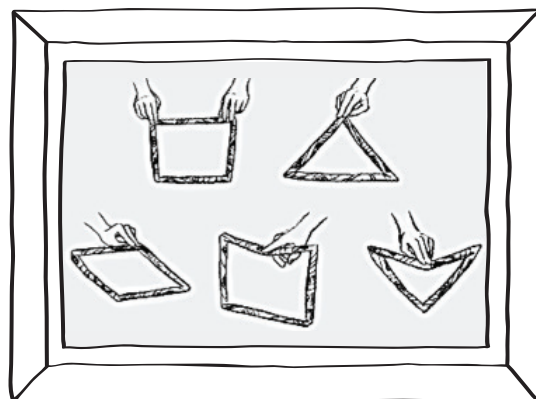
PRESSURES  
& FORCES

## PREPARATIONS & MATERIALS:

- Collection of Newspapers
- Sello-tape or masking tape
- Medium weight book (textbook or storybook)
- Paint

## METHOD

1. Begin by explaining to the pupils the object of the task – constructing a table capable of holding a book that is shown to the classroom.
2. A design phase is recommended so that the pupils in their groups can decide upon the look of the table and familiarise themselves with the materials.
3. The design phase should consider limiting the amount of paper and tape used. There isn't a limitless supply of paper and tape and efficient use of resources is an important design aspect.
4. During the making process it is important to demonstrate to each group the potential properties of paper, emphasising how bundles of rolls are stronger than single ones and the forces and pressure relative to shape (see below). Groups could test a smaller scale model to start with.



5. Once each group is satisfied with their table, it is then time to go around the class and test whether the table can support the weight of the book.

6. The majority of the tables won't work on the first try, so it is now a process of classroom discussion to see how the table could be improved e.g. more tape for unrolling tubes, adding trusses to create added support (see below).



7. Once the table is able to fully support the book, it's time to add colour to the creation.

8. **Remember: Be Creative! A table doesn't need four legs to be considered a table.**

## LEARNING OUTCOMES

- Design & manufacturing task that requires problem solving, experimentation and quality testing – skills required in the advanced manufacturing sector.
- Understanding and integration of creativity combined with STEM.
- Ability to bring together pupils of varying age and ability across KS2 – ideal for smaller classroom numbers.
- Provides pupils with an insight into the journey of product development and the greater possibilities of advanced manufacturing.

## FURTHER INVESTIGATION & RESOURCES

 [nwef.infobasecymru.net/IAS/launch](http://nwef.infobasecymru.net/IAS/launch)

### Paper table demo:

 [www.youtube.com/watch?v=z0Tuaqcxa0I](http://www.youtube.com/watch?v=z0Tuaqcxa0I)

### Advanced Manufacturing – the paper battery:

 [whatis.techtarget.com/definition/paper-battery](http://whatis.techtarget.com/definition/paper-battery)

### Siemens:

 [www.siemens.co.uk](http://www.siemens.co.uk)

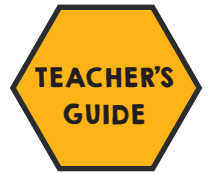
### How It's Made:

 [science.howstuffworks.com](http://science.howstuffworks.com)

Produced in association with thanks to: **SIEMENS**



# CLASSROOM ACTIVITY OPTICAL ILLUSIONS



## WHAT ARE OPTICS?

You rely on optics every day. Your digital camera, wireless mouse, and even your Blu-ray disc of your favourite film are all technologies enabled by the science of optics.

Optics is the science of light and includes the study of sight and what we see through our eyes. Optics is used by the medical profession, scientists and engineers.

## WHAT IS AN OPTICAL ILLUSION?

It's not magic, it's science!

Optical illusions can use colour, light and patterns to create images that can be deceptive or misleading to our brains. The information gathered by the eye is processed by the brain, creating a perception that in reality, does not match the true image. Perception refers to the interpretation of what we take in through our eyes. Optical illusions occur because our brain is trying to interpret what we see and make sense of the world around us. Optical illusions simply trick our brains into seeing things which may or may not be real.

Pupils should work in pairs or 3's to look at these optical illusions and discuss what they see and see how the brain can trick them into seeing different things. There is no right and wrong answer!

Try out some of these illusions and discover just how tricky it can be for your brain to accurately interpret the images from your eyes.

### 1. WHICH END OF THIS BAR LOOKS DARKER?

Cover everything except for the bar with a piece of paper above and below the bar shape.



The bar is all the same shade of green. But when it is next to the lighter green, it looks darker, and when it is next to a darker green, it looks lighter.

Your brain judges the colour of the bar depending on what is next to it.

## 2. WHAT CAN YOU SEE?

### A vase... or two faces?

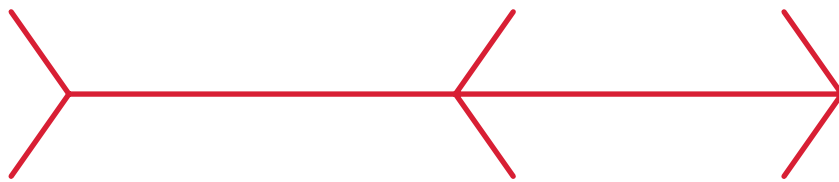
Both answers are correct! You can see both at the same time, but your eyes can only focus on one at once.

When you see the two white faces, facing each other, you can't properly see the vase; when you see the vase, the faces just become a white background.



## 3. WHICH IS LONGER?

Look at these two sections of line. There are 6 stems and one line running through the middle. There are two sections, left and right. Which line seems longer, on the left or right? Now, measure each section with a ruler. Which line is longer?



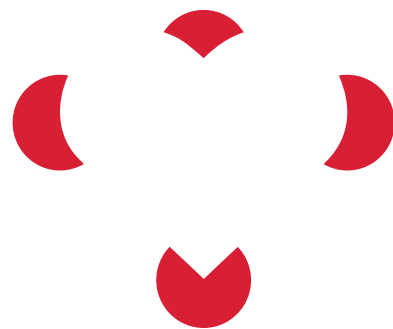
Both sections are exactly the same length, but the section with the lines sloping outwards on the far left hand side looks longer. The lines sloping inwards makes the line look shorter. Your brain judges things by what is around them and is tricked by the extra lines sloping in different directions.

## 4. MISSING SHAPES

Look at this picture. Can you see a triangle?



Look at this picture. Can you see a heart?



There are no triangle or heart shapes in these pictures!  
Your brain sees the edges of where the shapes could go and imagines the rest!

Take a look at some more optical illusions on line [faculty.washington.edu](http://faculty.washington.edu)

- Are you interested and curious about why and how the brain and eyes work this way?
- Would you like to find out more about optics? Optics is used in science, for solving crimes, building things and engineering, health and medicine, film and media.

