

Technical drawing, CAD, CAM – worksheet (<https://www.liveworksheets.com/io1387315nd>)

Read the text, then drag suitable words into the sentences:

hand-drawn

recycle symmetrical

images

accurate

consistent

architect

viewer



A In the past, technical drawings for industry and architecture were drawn by hand, i.e. people worked at drawing boards with drawing equipment. These **hand-drawn** diagrams provided clear technical information but were slow and expensive to make. Nowadays, working drawings are done on computers, which is much quicker.

B Computers can also:

- 1. save, change, and **recycle** the drawings
- 2. make 3D images
- 3. make drawings bigger or smaller
- 4. keep an electronic library of standard parts
- 5. make **symmetrical** **images** of components
- 6. make **accurate** and **consistent** drawings

C A good way to explain the advantages is to think about architectural drawing. Features such as windows and doors can be moved until the **architect** likes the building. Images of the rooms are created in 3D so the **viewer** can 'walk' through the rooms. Designers can also experiment with different arrangements of furniture and colours.

1. _____ means having two halves the same shape and size.

2. _____ means made by a person.

3. _____ means to use something again.

4. A _____ is a person looking at something.

5. _____ means correct in every detail, with no mistakes.

6. _____ are pictures and drawings.

7. An _____ is a person who designs buildings.

8. _____ means always the same.

Match the benefits of CAD with the explanations (some benefits can be used more than once):

With the CAD system you can:

1. save, change and **recycle** the draw
2. make 3D images
3. keep an electronic library of standard parts
4. make drawings bigger or smaller
5. make **symmetrical** **images** of components
 - a) You can draw 50%, then make a mirror image
 - b) You don't waste time drawing things again and again
 - c) You make fewer mistakes
 - d) You can see the finished shape in 3D
6. make **accurate** and **consistent** drawings

Read the text, drag the terms to the pictures and choose the correct answers:

compass

pencils

protractor

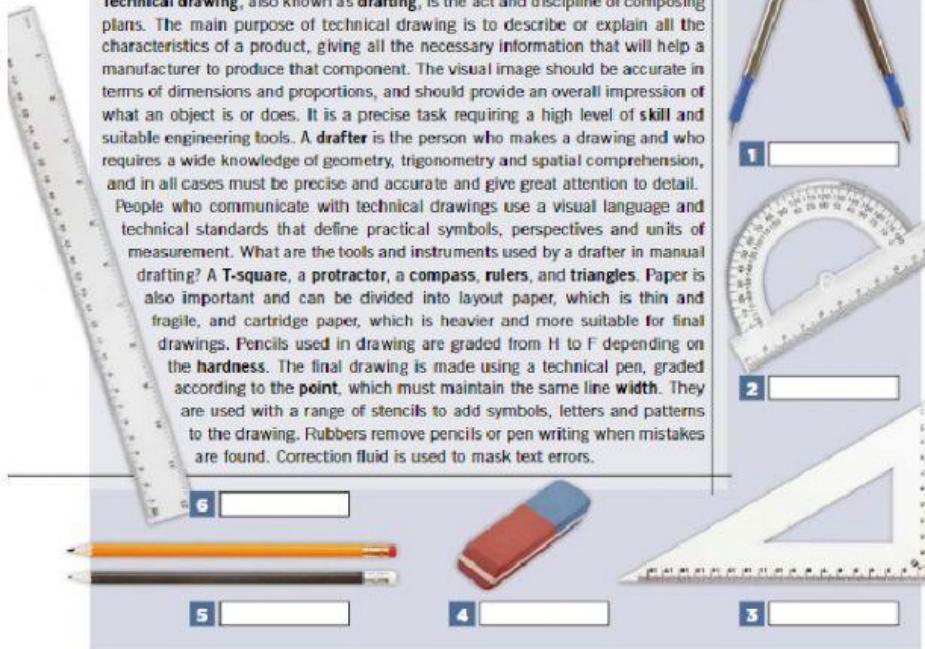
rubber

ruler

T-square

1 Read the text about technical drawing and label the pictures.

Technical drawing, also known as **drafting**, is the act and discipline of composing plans. The main purpose of technical drawing is to describe or explain all the characteristics of a product, giving all the necessary information that will help a manufacturer to produce that component. The visual image should be accurate in terms of dimensions and proportions, and should provide an overall impression of what an object is or does. It is a precise task requiring a high level of skill and suitable engineering tools. A **drafter** is the person who makes a drawing and who requires a wide knowledge of geometry, trigonometry and spatial comprehension, and in all cases must be precise and accurate and give great attention to detail. People who communicate with technical drawings use a visual language and technical standards that define practical symbols, perspectives and units of measurement. What are the tools and instruments used by a drafter in manual drafting? A **T-square**, a **protractor**, a **compass**, **rulers**, and **triangles**. Paper is also important and can be divided into layout paper, which is thin and fragile, and cartridge paper, which is heavier and more suitable for final drawings. Pencils used in drawing are graded from H to F depending on the **hardness**. The final drawing is made using a technical pen, graded according to the **point**, which **must** maintain the same line **width**. They are used with a range of stencils to add symbols, letters and patterns to the drawing. Rubbers remove pencils or pen writing when mistakes are found. Correction fluid is used to mask text errors.



2 Read the text again and choose the correct answer.

1 Technical drawing is needed to...

- A make a scale of the product.
- B practise pens, rulers and stencils.
- C let the manufacturer understand the requirements.

2 The drafter needs...

- A some paper and a pencil.
- B a wide range of technical instruments.
- C the final product.

3 Paper is chosen considering...

- A what sort of drawing the drafter is going to make.
- B the pencils he/she is going to use.
- C the drafter's preference.

4 Pencils are graded according to...

- A hardness.
- B hardness and colour.
- C hardness and point.

5 A technical pen...

- A makes regular lines.
- B maintains the same line width.
- C draws lines of the same length.

6 When mistakes are found...

- A we can't correct them.
- B they're removed with correction fluid.
- C stencil can cover them.

Listen and complete suitable words in the gaps:

3  Listen and complete the text with the words in the box.

creation advantages boards drawings software defects faster
Instructions traditional reduce modification electronically

CAD/CAM systems

Drawing (1) _____ and manual drawing are not always precise and rapid: (2) _____ design is usually slow, especially in its revision and (3) _____. For this reason manufacturing firms have replaced manual drawing with computer-aided design (CAD) to carry out functions related to design and production. This computer technology assists the designer in the (4) _____, modification and analysis of a physical object. Nowadays computer (5) _____ can easily provide a three-dimensional drawing, which allows engineering designers to see how mechanical components may fit together without making models thus saving a lot of time. CAD is much (6) _____ and more accurate than manual drawing; designs can be quickly modified, reproduced and transmitted (7) _____. Computer simulated analysis of the model helps experts find problems and (8) _____ without building prototypes, in this way saving a lot of money and time. When the design is ready, the CAD system can generate the detailed (9) _____ needed to start product manufacturing. When CAD systems are linked to manufacturing equipment controlled by computers, they form an integrated CAD/CAM system. Computer-aided manufacturing (CAM) offers significant (10) _____ over traditional approaches by controlling manufacturing equipment with computers instead of human labour. CAM converts the design of a component into computer language and it gives (11) _____ to the computer regarding machine operations. Thanks to CAD/CAM systems it is possible to eliminate operator errors and (12) _____ manufacturing costs.



4 Read the text again and match each sentence with its ending.

1 CAD helps designers	a <input type="checkbox"/> seen from any angle and are easily manipulated.
2 By using a CAD technology	b <input type="checkbox"/> to draw, modify and correct designs.
3 Unlike manual drawing, CAD	c <input type="checkbox"/> the design into computer language.
4 CAD allows us to save	d <input type="checkbox"/> defects can be easily found.
5 CAD designs can be	e <input type="checkbox"/> provides three-dimensional drawings.
6 CAM is the use of computer software	f <input type="checkbox"/> time and money.
7 The CAM system turns	g <input type="checkbox"/> minimise errors and manufacturing costs.
8 CAD/CAM systems	h <input type="checkbox"/> to control machine tools in the manufacturing process.

Read the text below. Then drag the ends of the sentences to the right places:

Machining and CNC

Machining is the use of machines to cut pieces of material (called workpieces) and shape them into components. The tools used in machining, to make holes, grooves, threads, etc., are called **machine tools**. Metal is often **machined**. As it is cut, waste is produced, called **swarf or chips**. During machining, a liquid called **cutting fluid** may be pumped onto the workpiece to act as a **coolant**, keeping the workpiece cool.

In manufacturing, machining is usually guided by computers called **computer numerical control (CNC)** systems. Often, design information (on shapes and sizes of components) is fed directly into CNC systems from **computer aided design / computer aided manufacturing (CAD/CAM)** software.

Note: CAD/CAM is said as two words: /'kæd ,kæm/.

1. Material being machined is called _____.
2. The waste metal produced during machining is called _____.
3. Metal gets hot during cutting, so cutting fluid can be used as _____.
4. A computer that guides a machining proces is called _____.
5. Drawings can be produced and transferred to the machinig proces using _____.

CAD/CAM software

a coolant

a workpiece

a CNC system

swarf or chips