Our workshop is very small, not as small as the toy shop in the photo, but not much bigger. We have enough space for most of the basic service and repair work we do. And we have all the tools and basic equipment we need.

Our **workbench** is a lot bigger than the one in the photo, and it is in front of a window. We use it for repairs on small components. There is a vice on top of it and most of the tools are kept in the bench. We also have a sideboard with drawers for tools and small parts next to the workbench. And we have **pneumatic drills** that hold all the drive sockets and bits we need.

The **hydraulic ramp** is the centre of our shop and all the machinery is arranged around the walls for easy access. On the wall opposite the entrance (which you can't see in the photo of the toy shop) we have our **engine tester** and the **tyre set-up**. The heart of the engine tester is a computer specifically developed to read all the engine data, such as rpm and timing, to analyse exhaust gases and many more data.

Today waste disposal is an important part of our professional work. In the left-hand corner we feed a **battery of waste bins**, one each for plastics, cardboard, dirty rags, oil and waste paint. And another row of bins, the one for different scrap metals, brings in good money.

We do our best to keep our environment clean – and we try to be good mechanics.

1 Shop *layout*

Look at the **photo** on the opposite page and read the text below.
Where are the following furnishings and machines located?

The workbench	is	stored in the bench.
The vice		in front of the window.
The tools	are	on top of the bench.
The hydraulic ramp		arranged around the wall.
The machinery		in the middle of the shop.
The engine tester		opposite the door.
The tyre set-up		next to the tyre set-up.
The waste bins		in the left-hand corner.
The computer for balancing wheels		

Compare your results with a partner.

2 A lot *of machines*

Look at the **photo** of the workshop and listen to Alexander and his visitor.

Then mark the equipment and machinery they mention.

Which machines do they use for the following processes?

We use	for cleaning small components.
	for clamping parts.
	for changing a tyre.
	for balancing a wheel.
	for checking engine settings.
	for keeping our hand tools in.
	for reading engine data.
	for changing the engine oil.
	for sorting waste.

I use an engine tester for checking engine settings.

3 Welcome *to my workshop*

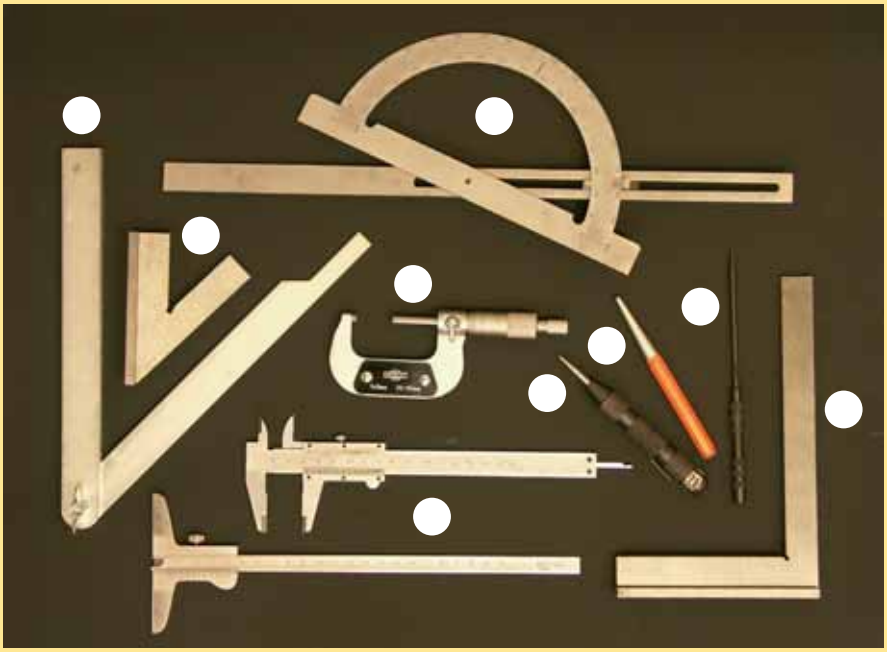
Think of the workshop at your school or college, or at your place of work. Make a sketch in your copybook and mark the machines and furnishings.

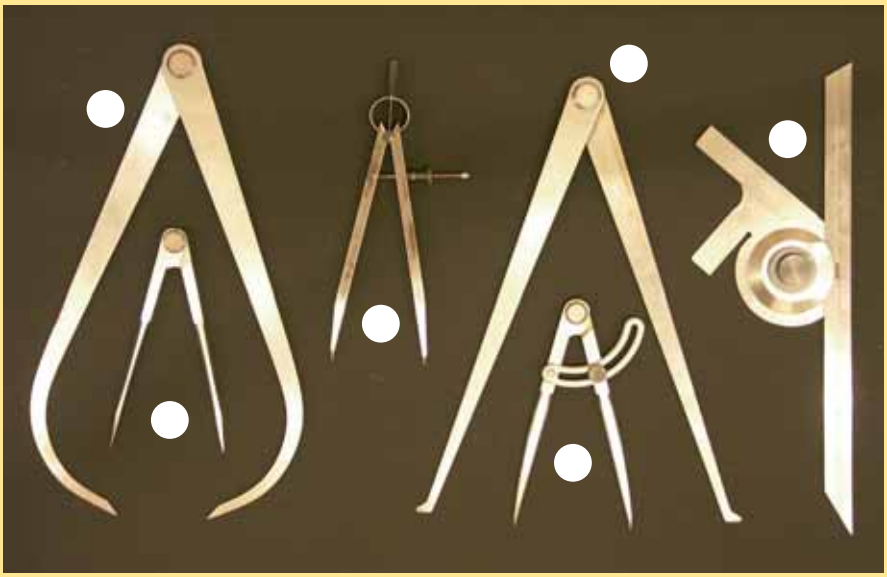
Write a **description** of the workshop you drew (about 50 words).

Show your sketch and discuss the shop in a group of 3 or 4.

Safety tip

Efficient lighting helps to avoid accidents!





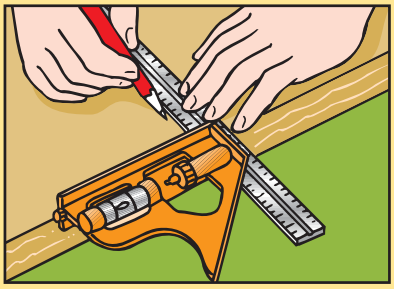
Tools for measuring and marking

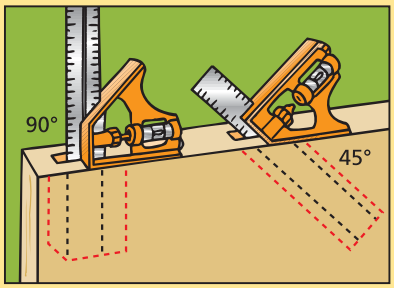
- **A** angle gauge, or protractor
- **B** centre punch
- **C** combination set with protractor square
- **D** combination square with 45/90/135 degree square and spirit level
- **E** compasses, or dividers
- **F** arc dividers
- **G** spring dividers
- **H** drift pin or drift punch
- **I** inside callipers
- **J** micrometer
- **K** outside callipers
- **L** protractor: an angle gauge with a scale
- **M** scriber
- **N** sliding-T bevel
- **O** spirit level
- **P** steel square 45 degrees
- **Q** try square 90 degrees
- **R** Vernier* callipers (2)

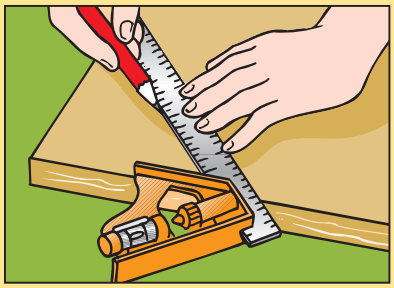
In addition to the standard measuring tools, such as steel rules and squares, there are a number of other useful tools for measuring and marking. One of these is the **combination set** with a precision steel rule that can take a number of different heads: a protractor square (shown above) can be used to mark off angles from 0 to 180 degrees; a 45/90/135 degree square with a spirit level is used to check angles and vertical or horizontal levels, as shown in the illustrations on the right.
Various types of **callipers**, inside and outside callipers, can be used to measure thick stock or irregularly shaped objects.
Vernier* callipers contain a built-in rule and nonius and are used to measure thickness, inside and outside diameters, as well as depths, to a tenth of a millimetre. Similarly, **micrometers** are used to measure thickness or diameters of work-pieces to a hundredth of a millimetre.
Steel **compasses**, or **dividers**, are used to mark distances or circles, or to transfer measurements from one work-piece to another.

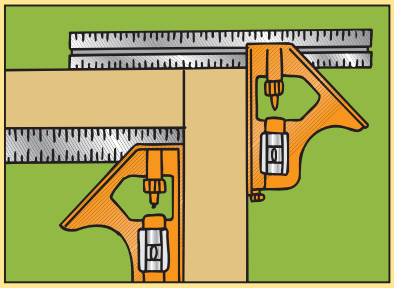
* Pierre Vernier, physicist (1580–1637)

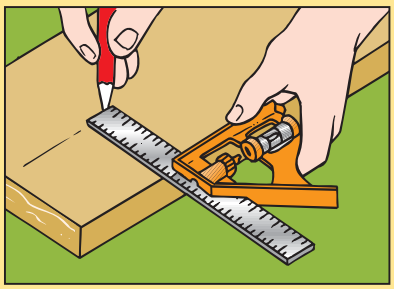
Using a combination square

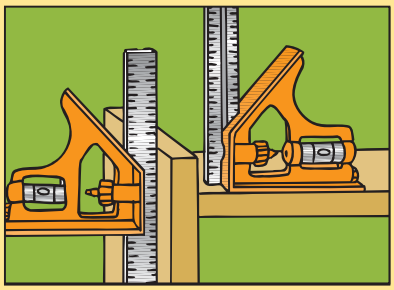












1 Precision *instruments*

Look at the photos and the illustrations on this and the opposite page.
Do you know all the **tools for measuring and marking**?
What are they called in English?
Study the list of tools and write one or two letters next to each of the tools.
Work with a partner.

2 Marking *and measuring*

Look at the instruments and listen to Catherine and Alexander.
Which instruments are they talking about?
And what are the instruments used for? Connect the boxes.

A micrometer ○	is used	○ to measure angles.
A sliding-T bevel ○	can be used	○ to measure thickness.
An angle gauge ○		○ to copy angles.
A protractor ○		○ to mark angles.
A protractor square ○		○ to set the sliding T.
Vernier callipers ○	are used	○ to scribe arcs.
Dividers ○		○ to mark large circles.
Trammel points ○		○ to mark parallel lines.

3 The *all-round tool*

Look at the illustrations on the left.
What is the tool called?
What can you do with it?
Match the illustrations and the following descriptions of tasks.

A Mark angles from 0–180°.
B Mark the centre of a cylindrical shaft.
C Scribe a straight line on metal.
D Check metal corners for correct angles.
E Measure an inside width.
F Mark straight lines, perpendicular to board edges.
G Mark a 45° mitre.
H Measure the depth of a hole.
I Check the vertical and horizontal level.
J Measure fractions of a millimetre.
K Run a 90-degree angle along a board edge.

Which instruments would you need to do the rest of the tasks?

4 Working with *precision tools*

Talk to a partner about the measuring tools you work with.
Which tool do you use for which job?
Take notes in your copybook. Then report to the class.

Based on your notes write a short **memo** describing one of the jobs using precision instruments (about 50 words).

Many shapes and sizes

Drilling machines come in many shapes and sizes, from small hand-held power drills to bench and floor-mounted models, pillar drills, CNC-operated machines and multi-purpose drill centres. Most of them can operate with multi-spindle drilling and tapping heads.

They are used to cut holes into or through metal, wood, or other materials, and can also perform operations other than drilling, such as countersinking, counterboring, reaming, honing, spot-facing and tapping.

Drilling machines use drilling tools that are held in the drill press by a chuck or Morse taper and are rotated and fed into the work at variable speeds.

Drill press operators must know how to set up the work, set speed and feed, and provide a sufficient supply of coolant to get an acceptable finished product.

1 Many shapes *and sizes*

Look at the photos and read the text on the opposite page.

What is shown in the photos?

What type of drills are mentioned in the text?

What type of work can be done on a drilling machine?

Drills can be used for		
	○ milling	○ spot-facing
	○ reaming	○ countersinking
	○ boring	○ counterboring
	○ honing	○ grinding
	○ tapping	○ cutting holes into ...

2 Five holes *in one operation*

Look at the photos on this and the opposite page and listen to Elsa and Tariq taking a couple of English-speaking visitors around the machine shop at Wittmann Fitters.

Which machines are they talking about?

What type of work are they discussing?

- ○ Drilling a number of holes in one operation.
- ○ Light repair jobs.
- ○ Small outside jobs.
- ○ Computer numeric control.
- ○ Drilling holes of different depths in one operation.
- ○ Heavy-duty drilling operations.

And what does a drill press operator have to know about?

- ○ How to fix the work piece.
- ○ How to set the right speed.
- ○ How to set the feed.
- ○ How to set the coolant.
- ○ How to organize food and drink.
- ○ Which operations can be done on different drilling machines.

3 A drilling *or tapping job*

Explain to a group of visitors the types of drilling machines used at your place of work or in your workshop.
Tell them what type of work can be done on each of the machines.
Then explain a drilling or tapping job you have done.

Prepare what you want to say in a group of 3 or 4 and take notes in your copybook.

Based on your notes write a **paragraph** about the drilling or tapping job and the machine you used (about 50 words).

How an engine works ▶

A air compressor
B air filter
C air flow meter
D air intake
E alternator
F catalytic converter
G cooling fan
H crankshaft
I cylinder head
K drive belt
L electro-pneumatic valve
M engine block
N exhaust manifold
O ignition cable
P intake manifold
Q oil filler cap
R oil stick
S oxygen sensor
T pulley
U radiator
V spark plug
W thermostat
X turbo charger
Y vacuum unit
Z valve cover

1 The *engine*

Look at the engine on the opposite page.
What are the parts called in English?
Write the appropriate letters into the drawing.

Look at the photos on the left.
Which parts of an engine do they show?
Work with a partner.

2 Four *cylinders*

Listen to Alexander and a customer in the workshop.
They are talking about a customer's car engine.

Look at the engine on the left and tick the **parts** they mention.
Compare your results with a partner.

3 Functions

Listen to the scene at the workshop and complete the following statements.

The		has four ignition cables.
The		are connected to the electronic ignition system.
The		forces air through the radiator.
The		is pumped to the engine.
The		is transported to the combustion chamber.
The		ignite the fuel-air mixture.
The		produces energy.
The		are expelled from the engine via ...

Compare your results with a partner.

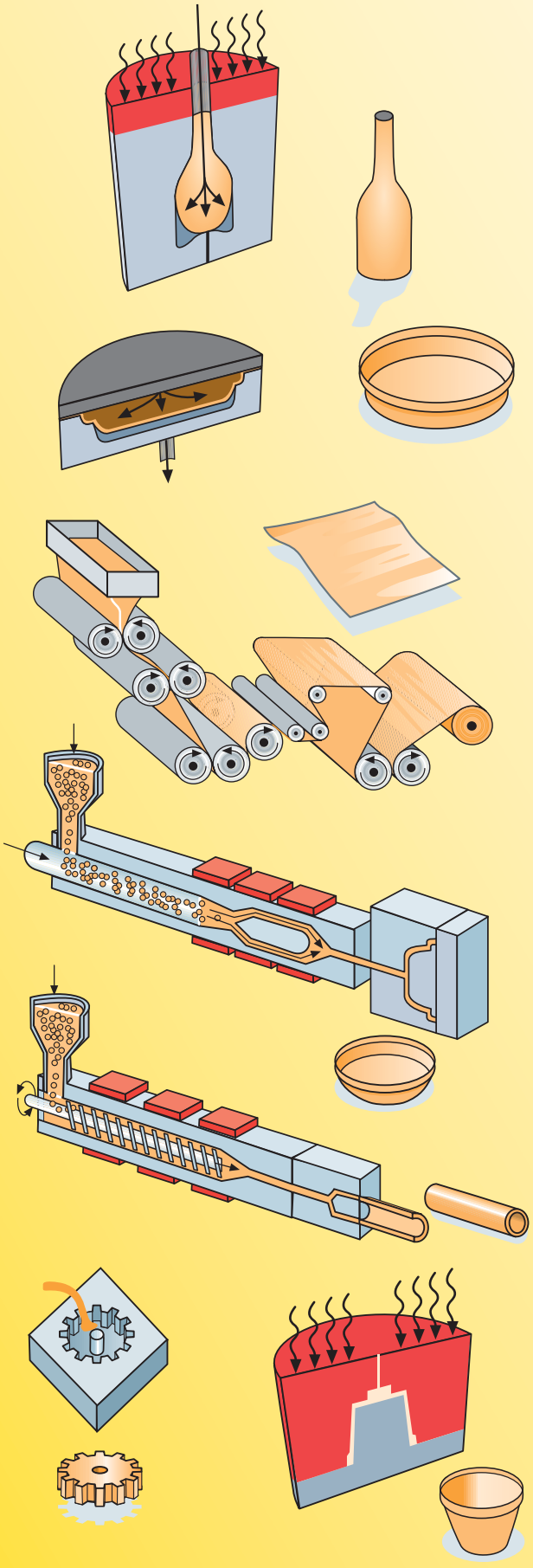
4 The ignition *does not work*

In a group of 3 or 4 explain to an English speaking costumer what is wrong with the engine of his or her car and explain how the engine works.

Write a short **memo** (50-100 words) describing the engine problems of the customer's car.
Then practise the scene in your group.

Present your scene to the class.
Listen to the other presentations and take notes of what is wrong with their car.

All shapes *and forms* ▸



Thermoplastics that can be hardened and melted more than once. Typical thermoplastics are acrylics, polystyrenes (PS), polyethylenes (PET, LDPE, HDPE), polypropylene (PP), vinyls (PVC) and nylons.

Calendering results in continuous plastic sheets; hot plastic is forced between successive sets of heated rollers.

Injection moulding uses a screw to push plastic through a heated tube into a mould.

Extrusion is a continuous process that heats plastic pellets in a long barrel. A screw pushes the heated plastic through a die opening to form objects such as garden hoses and piping.

Thermoforming: a vacuum draws a heated plastic sheet down into a mould.

Blow moulding forms containers (bottles) from soft, hollow plastic tubes placed into a mould. Air is injected into the heated tube and expands the plastic against the walls of the mould.

Both types of plastic, **thermoplastics** and **thermosetting** plastics, can be formed through casting and expansion processes.

Casting forms plastic objects in a mould. After the plastic is poured in the mould, additives mixed into the plastic cause the resin to harden.

Expansion processes inject gases into the plastic melt, creating a plastic foam from the tiny bubbles trapped inside.

Styrofoam contains a chemical that produces gas when heated. As the material cools and hardens, the gas creates a plastic foam.

Thermosetting plastics are more rigid and resistant to higher temperatures than thermoplastics. Once set, thermosetting plastics cannot be re-moulded; they must be broken or ground down. The most common thermosetting plastics are most polyesters, epoxies and phenolics.

www.science.howstuffworks.com > plastics > videos
Or google **types of plastics**.

Recycling plastics turned out to be problematic everywhere. Plastics are very durable, they degrade very, very slowly, and burning results in toxic fumes. In addition to all that, manufacturing plastics creates large quantities of chemical pollutants, and depletes the Earth's supply of fossil fuels.
To assist recycling of disposable items, the plastics industry devised a scheme to mark plastic bottles by plastic type.
A recyclable plastic container is marked with a number in a symbol giving the plastic type:

The biggest problem with plastics recycling is that it is difficult to automate the sorting of plastic waste, and so it is labour-intensive. As the value of the material is low, recycling plastics is unprofitable. For this reason, the percentage of plastics recycled is very small, around 5%.

1 Thermoplastics

Look at the **illustrations** on the opposite page and read the text next to them.
How do the paragraphs refer to the illustrations?

2 Thermosetting *plastics*

Look at the grouping of plastics on the opposite page and listen to this expert on the Technology Today show.
Which of the (types of) plastics does she mention?

Listen again and underline the words.
Then read the words to a partner.
They are difficult to pronounce, aren't they?
Listen once more if you want to.

3 Calendering

Which products are made in each of the forming processes described?
Go through the paragraphs and underline the products referred to.
Then make notes in the frame.

Calendering Injection moulding Extrusion Thermoforming Blow moulding Casting Expansion	is used to make	

4 Recycling *plastics*

Look at the photo on the left and read the text below.
Answer the following questions with a partner.
What does the text say about plastics?
And about manufacturing them?
Why is recycling so difficult?
What does the industry do to assist recycling?
Are you familiar with the recycling symbols?
What do they stand for? – Listen to the expert on the CD.

5 Plastics *everywhere*

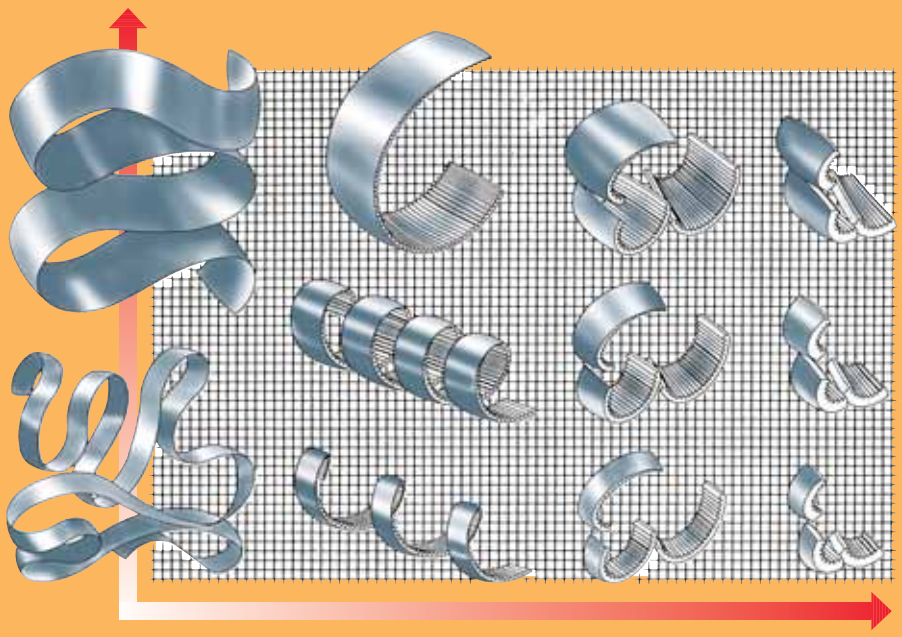
Collect some plastic objects in your classroom.
Try to find out what type of plastics they are made of.
What types of plastics are you dealing with?
In your technical subjects? At work?
Discuss the questions in a small group.

Write a **paragraph** about plastics you are familiar with, and the challenges which come with them. Combine the questions and your answers and link the sentences (50-100 words).
www.ider.herts.ac.uk/school/courseware/materials/plastics

Cutting *chips?* ▸

Computer chips, okay,
metal chips maybe;
we know
casino chips,
potato chips
and fish and chips ...

But who knows
cutting chips?

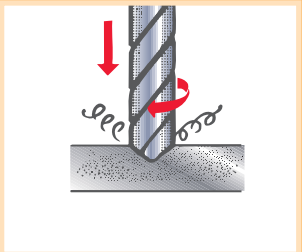


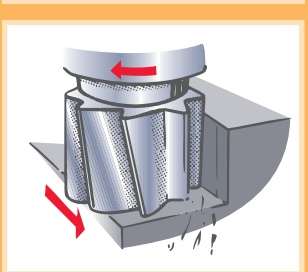
On this machining centre we produce all kinds of shapes, such as this little turbine. The work-pieces are slowly moved back and forth below a rotating tool with several cutting edges.

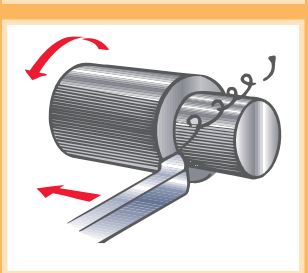
Here we produce mainly cylindrical pieces, such as bars at different diameters. The work-pieces are rotating and chips are cut with a tool.

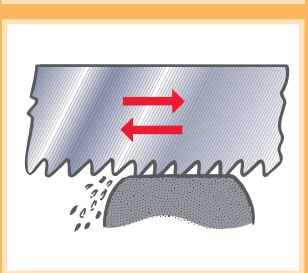
Here we smooth surfaces: the work-pieces are moved across the path of an abrasive wheel which is rotating at high speed, removing very small chips, or sparks.

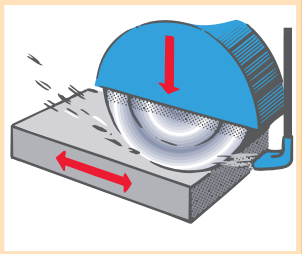
www.suhner.com

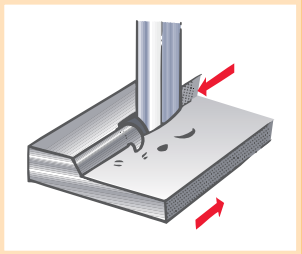












1 What kind of *chips?*

Look at the **drawing** at the top of the opposite page.
What kind of chips do you get from the following processes?

Filing, sawing, drilling, turning, shaping, milling and grinding

Which of the **processes** can you identify in any of the photos and drawings on this and the opposite page?
Take notes next to the photos or drawings.

2 A machine *tool operator*

Look at the photos and drawings and listen to this **interview**.

What is the man doing at the moment?

Which machine is he working on?

What does a machine tool operator do?
He/She can work on the following machines:

- milling machine
- pin-ball machine
- centre-lathe
- machining centre
- surface grinder
- washing machine
- drilling presses
- electric saw

3 Machines *and processes*

Look at the photos and read the paragraphs on the opposite page.
Which text belongs to which photo?
What are the machines called?
Which processes are described in the paragraphs?

Which machines would you use for the following processes?

I would use a milling machine	to cut special shapes.
I'd use _____	to produce flat surfaces.
We use _____	to produce a cylindrical work-piece.
For turning	I'd use a centre lathe.
For drilling holes	I'd use _____
For grinding	

4 Which processes *can you handle?*

In a group of 3 or 4 discuss the processes you can handle and the machines you can work on.
Write a short **report** in your copybook (50-100 words).
Then present your results to your class.

Progress *review* ▶

I can	Listening	I need more practice	Unit	Level
	follow a guided tour in a mechanic's workshop and pick out words and phrases relating to tools and equipment.		7B	A2
	understand words and simple phrases from a dialogue about measuring and marking and the instruments used.		8B	A2
	follow a guided tour in a machine shop and pick out words and phrases relating to drilling jobs and machinery.		9B	A2
	follow a simple description of a car engine, identify the main parts and their function.		10B	A2
	understand words and simple phrases from an interview about basic types of plastics, forming processes and products.		11B	A2
	understand words and simple phrases from an interview about basic metalworking machines and operations.		12B	A2

I can	Reading	I need more practice	Unit	Level
	pick out the information I need in an illustrated text about a mechanic's shop and identify basic tools and equipment.		7B	A2
	pick out the information I need in an illustrated text about measuring and marking instruments and their uses.		8B	A2
	pick out the information I need in an illustrated text about drilling machines and basic drilling operations.		9B	A2
	pick out familiar words and phrases, e.g. engine parts, in an illustration of a car engine.		10B	A1-A2
	pick out the information I need in an illustrated text about basic types of plastics, forming processes and products.		11B	A2
	pick out the information I need in an illustrated text about basic metalworking operations.		12B	A1-A2

I can	Speaking	I need more practice	Unit	Level
	ask and answer simple questions about a mechanic's workshop and point out the tools and equipment in a sketch.		7B	A2
	ask and answer simple questions about work I can do using measuring and marking instruments.		8B	A2
	give a short rehearsed presentation of drilling machines at my place of work and the type of work I can do.		9B	A2
	give simple practical information about the engine of a car, its main parts and their functions.		10B	A2
	ask and answer simple questions about products made of basic types of plastics and the forming processes used.		11B	A2
	give a short rehearsed presentation about basic metalworking machines and the operations I can handle.		12B	A2

I can	Writing	I need more practice	Unit	Level
	draw a plan of a basic mechanic's workshop and describe in writing the tools and equipment and their location.		7B	A2
	write a short memo describing work I can do using instruments for measuring and marking.		8B	A2
	describe in writing work I can do using drilling or tapping machines.		9B	A2
	write a short memo describing the main engine parts of a car, their function and what can go wrong.		10B	A2
	make notes about products made of basic types of plastics and forming processes used.		11B	A2
	write a short report of basic metalworking machines and the operations I can handle.		12B	A2

Self assessment

Unit 7B (CD) **A lot *of machines***

Here is my workbench where I work on small _____ .
The vice is for _____ parts.
Next to the bench that's the _____ equipment.
On the PC I can look up all the _____ _____ of the cars we repair and the spare parts we might need.
I usually keep my tools in a _____ and _____ I need within reach I keep on the pegboard.
The hydraulic ramp is in the _____ _____ .
Next, I'll be changing the _____ .
And then I'll tune _____ with _____ .

Go through the text on the left.

Listen to the interview as often as you need to, then fill in the gaps.

Compare your results with a partner, taking turns reading the sentences to each other.

If your results don't match consult a pair near you and/or check your results with the texts in Unit 7B.

How many of the answers did you get right at first? _____

And in the end? _____

How would you grade your performance? _____

Teacher's grade & signature: _____

Portfolio ideas

You could keep the map of a **workshop** you drew and **revise** the text describing it (Unit 7B); revise the memo about **tools** for measuring and marking (Unit 8B); add the paragraph about **drilling** and **tapping** (Unit 9B) and other various **machinery** (Unit 12B).
You could also go over your memo about **car engine** problems (Unit 10B) and the paragraph about **plastics** (Unit 11B). Combine the questions and your answers and link the sentences.

Date your text(s) and keep them in your **Portfolio**!