

PART 2. CLASSIFICATION OF CUTTING TOOLS

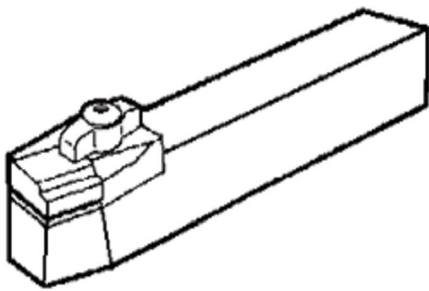
LEAD-IN

1 Answer the following questions.

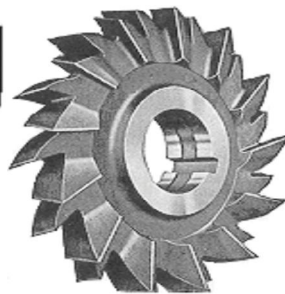
1. What types of cutting tools do you know?
2. Give examples of single-point cutting tools and multiple-cutting tools.
3. What advantages of indexable tools can you name?

2 Which of the following can you see in the pictures? There is one extra cutting tool.

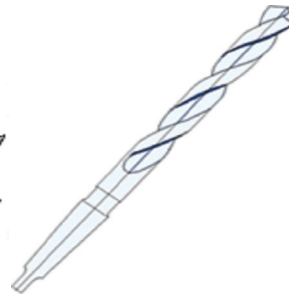
- Grinding wheel
- Broach
- Drill
- File
- Saw
- Milling cutter
- Turning tool



1.



2.



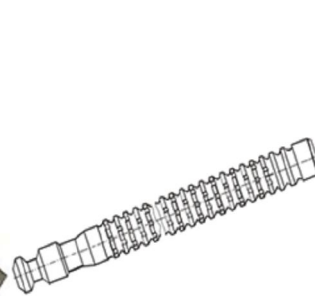
3.



4.



5.



6.

3 *Match the columns to make sentences.*

1. The single-point cutting tool	is known as are known as	a) a tool with a mechanically clamped insert.
2. Multiple-point cutting tools		b) a tool that has one effective cutting edge.
3. A solid tool		c) tools that remove materials on two or more cutting edges simultaneously
4. Indexable tool		d) a tool having the same material throughout

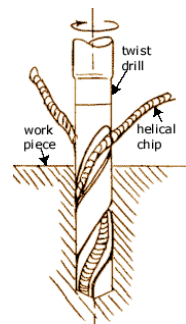
READING

4 *Read the text and fill in the word combinations (A-H) which best fit each paragraph (1-6). There is one extra sentence which you do not need to use.*

- A Regrinding of these tools
- B roughing tools
- C special groups of
- D a solid tool
- E a screw
- F metal-cutting tools
- G turning tools
- H cutting

CUTTING TOOLS CLASSIFICATION

The number and types of cutting tools used is known to be very large. There are turning tools, milling cutters, drills, broaches and etc.; the type of cutter depends on the machine which **employs** it. Tools can also be classified as being (1)_____ or finishing tools according to the task: to take deep cuts or to achieve better accuracy and surface finish.



The cutting tools mention above can further be divided into single-point and multipoint tools. The single-point cutting tool is the most universally used and can be **defined** as a tool that has one effective cutting edge. Ordinary lathe or (2)_____ that do turning, facing, or boring operations are examples of single-point cutting tools. Tools that remove material on two or more cutting edges **simultaneously** are known as multipoint cutting tools.

Another general grouping of cutting tools in common use gives the following types:

- (3) _____ having the same material **throughout**;
- a composite type with the cutting edge in the form of a **tip** which is brazed or soldered on to the **shank**;
- an indexable type where a small piece of the cutting material is held in a **bar** or tool holder by means of (4) _____ or **wedge**.

Indexable **inserts** are made so precisely that after (5) _____ edge has **dulled**, the insert may be unclamped, rotated to the next cutting edge, **reclamped**, and cutting continued without any change in the position of the toolholder. (6) _____ is generally more costly than replacing them. Thus, they are **discarded** after all cutting edges have been dulled.

In general, cutting tools, used for various metal-cutting operations include quite a wide range of shapes and may appear to have nothing in common but all (7) _____ in general **conform** to certain fundamental principles, as follows: the tool is harder than the metal; the tool is so shaped that its edge can be effective in cutting or **shearing off** the metal; and the tool is strong or rigid enough to resist the cutting pressure but keen enough to **sever** the metal.



fig.1

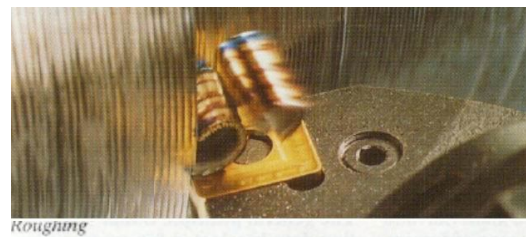


fig.2

5 **Read the text again and underline the main types of cutting tools.** Can you think of any others? What are the main groups of single-point tools according to the text?

VOCABULARY PRACTICE

6 **Fill in: brazed, resist, dulled, shaped, sever, remove.**

1. A composite type is _____ or soldered on the shank.
2. Indexable inserts are discarded after all cutting edges have been _____.
3. The tool is so _____ that its edges can be effective in cutting the metal.
4. Multipoint cutting tools _____ material on two or more cutting edges simultaneously.
5. The tool is rigid enough to _____ the cutting pressure, but keen enough to _____ the metal.

7 **Match the types of cutting tools 1-6 to the definitions a-f, then make sentences.**

1	<i>b</i>	Turning tool
2		Milling cutter
3		Drill

4		Broach
5		File
6		Abrasive wheel

- a) a long tapered multipoint cutting tool used primarily for enlarging holes in one stroke.
- b) a single-point cutting tool used on lathes for creating circular parts
- c) a round, end cutting tool with one or more cutting lips and one or more straight or helical flutes used to create cylindrical holes by rotational action.
- d) a hand tool used to shape material by cutting. It typically takes the form of a flat hardened steel bar covered with a series of sharp edges or teeth.
- e) a rotary cutting tool composed of small grains held together by a bonding material and used to finish parts.
- f) rotary multipoint cutting tool used to produce flat or curved surfaces.

8 Match Russian and English equivalents.

1	solid carbide cutting tool	A	напайная пластина из твердого сплава
2	brazed cemented carbide cutting tip	B	токарный резец с твердосплавной режущей пластиной
3	tool shank	C	отрезной резец
4	clamping by a screw or wedge	D	державка резца
5	general purpose lathe tool	E	расточный подрезной резец
6	internal facing tool	F	износостойкое покрытие
7	lathe tool with cemented carbide cutting insert	G	резец с механически закрепленной пластиной
8	wear resistant coating	H	крепление винтом или клином
9	cutoff tool	I	токарный резец общего назначения
10	cutter with mechanically clamped insert	J	цельный твердосплавный резец

9 Complete the sentences with the words given:

- | | |
|---------------------|--------------------------|
| - aluminum oxide | - next generation |
| - vapour deposition | - thermally conductive |
| - wear-resistant | - continuous improvement |

1. Lifeblood of any profitable metalworking shop is ...
2. The most widely used coating today is ...
3. The TiCN coating can be considered as one of the most ... coating on the market.
4. Some coatings become ... when heated.
5. TiCN coatings are mostly applied by the physical ... process.
6. TiAlN coatings are often supposed to be the ... of Al₂O₃ coatings.

GRAMMAR PRACTICE

The Passive Voice

to be + Participle II

Tense		Active	Passive	Note:
Simple	Present	drill(s)	am is drilled are	It drills / It is drilled
	Past	drilled	was drilled were	
	Future	will drill	will be drilled	
Continuous	Present	am is drilling are	am is being drilled are	It is drilling / It is being drilled
	Past	was drilling were	was being drilled were	
	Future	will be drilling	-	
Perfect	Present	have has asked	have has been asked	It has drilled / It has been drilled
	Past	had drilled	had been drilled	
	Future	will have drilled	will have been drilled	

Modal Verbs

Can/could	}	have been done be done
May/might		
Must/have to		
Should/would		
Needn't		

10 *Read the sentences a-f and write out the passive forms in the table below, then answer the questions 1-4.*

- a) This type of machine tool is being referred to computer numerical control, better known as C.N.C.
- b) The workpiece is mounted on the table that controls the feed against the cutter.
- c) The steel manufacture has been considerably increased recently.

- d) The wheel is composed of many small grains of abrasive.
 e) Concrete units have been brought to the site.
 f) The substance was being heated for three hours.

Simple	1. 2.
Continuous	1. 2.
Perfect	1. 2.

1. How do we form the Passive?
2. Are there any sentence(s) with an agent?
3. How do we form the passive of modal verbs?
4. When do we use *with* or *by* to introduce the agent?

11 Put the verbs in brackets in the correct Passive form (Simple, Progressive or Perfect).

1. Tools (always be) reliable helpmates in all fields of activities.
2. The twist drill bit (invent) by Steven A. Morse in 1861.
3. New materials and advanced coatings (develop) at present to prolong tool life.
4. Machining with geometrically specified cutting tools (require).
5. The knives (sharpen) in a workshop at the moment.
6. Various cutting tools (use) during the whole history.
7. Yesterday this mill cutter (use) by the apprentice, so there is something wrong with it.
8. It must (produce) of steel; otherwise it wouldn't be so strong and tough.
9. The best performance of cutting tools (achieve) with the help of special computer programs.
10. The heat treatment of a material (finish) by the time a group of foreign engineers entered the workshop.

12 Use the prompts to make complete passive sentences, as in the example.

1. designed\ existing hole\ or\ A broach\ an\ may also\ be designed to pushed or pulled through \be\
A broach may also be designed to be pushed or pulled through an existing hole.
2. as either/ Abrasives/ may be / natural/ classified/ or synthetic/
3. by a chuck / The drill bit/ gripped / / is being / the drill /at one end of

4. used in / are usually/ Drills with a hammer action / hard materials/
5. the cutter/ The chips/ disposed/ are/ behind

13 *Translate into Russian.*

1. All means of production have been recently modernized in this field.
2. Much attention is being given at present to the modern equipment of research laboratories.
3. Every tool, machine and materials used by the engineer to accomplish his purpose stems directly from machine-tools or has been evolved from machines which themselves were produced by machine-tools.
4. Much is being done to improve the conditions for research work.
5. Many old plants and shops are being expanded and reconstructed now.

LISTENING

14 Listen to three monologues. You will hear it twice. As you listen for the first time, answer questions 1-3. As you listen for the second time, answer questions 4-8.

For questions 1-3, choose the correct answer (A,B,C or D). You have 30 seconds to read questions 1-3.

1. How can you name the engineers who focus on dam, flood control, wells and reservoirs?
 - A Environmental engineers
 - B Hydraulic and irrigation engineers
 - C Traffic engineers
 - D Civil engineers
2. What must mechanical engineers know about?
 - A carbide
 - B kitchen
 - C machine
 - D design
3. What is the specific area where materials engineers can be found more often?
 - A education
 - B research
 - C selling or marketing
 - D metals or electronics



fig.1

For questions 4-8, choose the correct answer (A,B,C or D). You have 40 seconds to read questions 4-8.

4. What do civil engineers design?
 - A roads, bridges
 - B geology and hydraulics
 - C recycling plants
 - D commuter railroads
5. When may mechanical engineers be involved in selling the product?
 - A the work can be demanding
 - B an item is highly technical
 - C to make products last longer
 - D the new material is tested repeatedly
6. What are the main objects of environmental engineers?
 - A wells and reservoirs
 - B underground subways
 - C wastewater products, garbage disposal and recycling plants
 - D structure of substances
7. What is the specialization of traffic engineers?
 - A to create physical infrastructure
 - B to deal with wastewater products
 - C to improve roads and highways
 - D to design roads

8. What is the most important requirement to be an engineer?
- A to have basic knowledge of engineering
 - B to have a specialization in specific area
 - C to pass entry exams
 - D a bachelor's degree

16 Gap filling

Fill the gaps in the sentences below with suggested words and word combinations. Listen again if necessary.

materials	recycling	educational	bachelor's
design	materials science	railroads	machine

1. They combine knowledge of _____, engineering, economics, physics, geology and hydraulics to create physical infrastructure essential to modern life.
2. Environmental engineers deal with wastewater products, garbage disposal and _____ plants.
3. Traffic engineers specialize in designing “people-movie systems”, underground subways, commuter _____.
4. A bachelor's degree is the minimum _____ requirement.
5. Some mechanical engineers, for example, do the research needed to create a product itself, while still others _____ the machines to make the product.
6. Mechanical engineers often get to see their designs turned into new products or _____.
7. Often called a _____ person in industry, this inventor plays key role in the manufacture of any product.
8. Entry-level positions require a minimum of a _____ degree from an accredited engineering program.

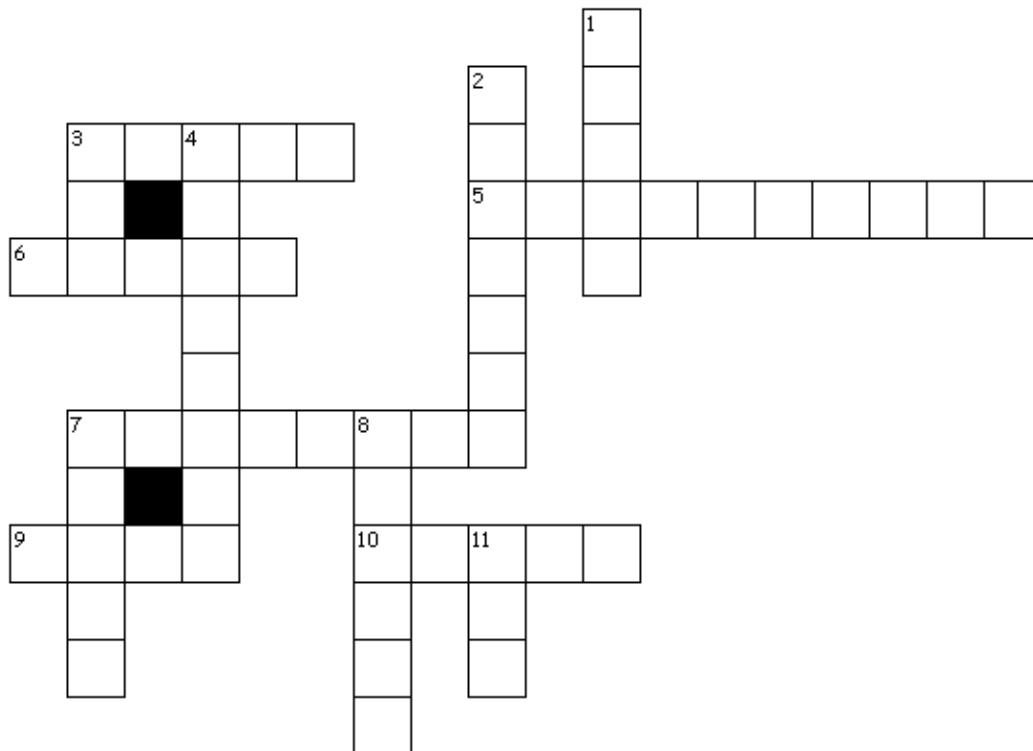
17 Detailed Comprehension

Listen again and read these sentences, then decide which are true or false .

1. Becoming a civil engineer is a lot of work.
2. Mechanical engineers also design everyday items like kitchen appliances and power tools.
3. Some mechanical engineers, for example, don't do the research needed to create a product itself, while still others design the machines to make the product.
4. Being a mechanical engineer, you'll need excellent math and science skills, plus the ability to think analytically and to deal with abstract ideas.
5. This job of materials engineer is multi-faceted – part inventor, part scientist.

REVISION TASK

CUTTING TOOLS



Across

3. It is a tool designed primarily for the purpose of digging or removing earth.
5. Process of sharpening of a tool with an abrasive tool.
6. It is a long-edged piece of metal, used as a cutting and thrusting weapon in many civilizations throughout the world.
7. A holmaking operation.
9. A hand tool used to shape material by cutting. It typically takes the form of a flat hardened steel bar covered with a series of sharp edges or teeth.
10. Part of a tool by which it is held in the machine and rotated.

Down

1. A block of solid material that is shaped like a narrow V in cross section and can be pushed or driven between two objects or parts of an object in order to split or secure them.
2. Machining process used to produce circular parts with single point cutters.
3. A tool that uses a hard blade or wire with an abrasive edge to cut through softer material.
4. A hard material, often a mineral, that is used in grinding wheels.
7. A round, end cutting tool with one or more cutting lips and one or more straight or helical flutes used to create cylindrical holes by rotational action.
8. A replaceable tool bit with several cutting points.
11. It is an implement that has been used for millennia to shape, split and cut wood, harvest timber, as a weapon and a ceremonial or heraldic symbol.