

# Unit 5

## OUTPUT

### 1.1. Read and translate the following words and word-combinations.

an information-processing application, an output device, capabilities and limitations, graphic animation, strike a ribbon, hard-copy devices, a column of steel pins, multicoloured ribbons, produce text in several colours, draft-quality text, a pen carriage, subtractive primary colours, a quiet operation, mathematical descriptions, a sharper image.

### 1.2. Learn key words and word-combinations.

bitmap – бітове зображення символу  
bold (adj) – жирний  
bubble-jet printer – пристрій струменевого друку  
cyan (adj) – голубувато-зелений  
dot-matrix printer – матричний принтер  
draft quality – чернетковий  
emit (v) – випромінювати; випускати  
hard copy – роздрук  
hue (n) – відтінок  
impact (adj) – контактний  
ink cartridge – касета з чорнилом  
inkjet printer – пристрій струменевого друку  
italic (adj) – курсивний  
LED printer – електрографічний друкарський пристрій зі світлодіодами  
line printer – пристрій друку рядками  
magenta (adj) – червоний  
near-letter quality – середня якість друку  
nonimpact (adj) – безконтактний  
nozzle (n) – сопло

outline (n) – схема, план  
page printer – пристрій друку сторінками  
page-description language – мова опису сторінок  
pin (n) – контактний штир  
plotter (n) – графобудівник  
polygon (n) – багатокутник  
print head – друкувальна головка  
printer (n) – друкарський пристрій, принтер  
scaling – масштабування  
soft copy – зображення на екрані дисплея  
underline (v) – підкреслювати

### 1.1. Read and translate the text.

## Printers

Although the information-processing application itself determines what the content of the output will be, the format of the output depends, in part, on the output device. For example, in the case of generating a simple report, the choices include

- Printing or video display.
- Text and/or graphics.
- Black and white or colour.

Which type of output to use is a decision that depends on the desired use of the information, the cost of producing that information, and whether the required technology is available. When selecting an output device, it is useful to understand the classifications of different output devices along with their capabilities and limitations. Output from a computer system comes in hard copy, soft copy, or machine-readable form.

**Hard copy** refers to the recording of letters, graphics, or pictures on a hard medium, such as paper or film. Examples of hard copy include printing, drawing lines with a plotter, or photographically recording an impression on film or microfilm.

**Soft copy** refers to the use of electronic signals to display a temporary image on a surface such as a video screen.

The most common hard-copy devices are printers. There are some common characteristics that should be examined when matching a printer to an application. They include:

- The ability to print images as well as text.
- The quality or the resolution of the printed image.
- The speed of the printer.
- Whether the printer requires special paper.

Printers are classified into two broad categories: **impact** and **nonimpact**.

The most common type of impact printer is the dot-matrix printer. The essential part of a dot-matrix printer is a **print head**, which contains a column of steel pins. Images are formed by driving various combinations of pins against a ribbon and onto the paper. The two main advantages of dot-matrix printers are their low cost and the flexibility with which they can produce images. A dot-matrix printer can print images as well as text. Because characters or images are produced by a selected pattern of dots, these printers can also change the size and style of characters and add emphasis such as bold, italic, or underlining. With the addition of multicoloured ribbons, the printer can produce text and graphics in several colours.

The speed of dot-matrix printers varies considerably depending on what is being printed and the model of the printer. When printing draft-quality text, some dot-matrix printers can operate in the range of 200 to 400 characters per second. When printing near-letter-quality text or graphics, low-cost dot-matrix printers slow down to a speed of 40 to 80 characters per second.

**Line printers** are another class of impact printers, which are used primarily in large computer installations for high-speed printing of reports and forms. Unlike slower printers that print only one character at a time, these printers set up an entire line of print at once. Although they still print character by character or dot by dot, the process happens so fast that it appears to be printing one line at a time.

A **plotter** is an output device that produces an image on paper by controlling the motion of a pen carriage that draws lines. The plotter sees the output medium of paper as a series of X, Y coordinates. If you plotted similar coordinates on a piece of graph paper and drew lines connecting the points, you would have an approximate visual metaphor for how a plotter draws lines. The computer system sends the plotter a series of numbers representing **coordinates** in the desired pattern. The pen carriage then moves to the different positions while holding the pen on the surface of the paper. Curves are drawn by linking a series of very short straight lines together.

## Printers

### Part 2

Another category of printers is **nonimpact printers**. They operate on the same dot-forming principle as the dot-matrix printer; however, instead of using an impact mechanism, they use nozzles, heat, electricity, magnetism, or optical methods to transfer an image onto paper.

**Inkjet printers** form characters or graphics with a print head containing tiny nozzles or jets that spray drops of ink onto the paper. The effect is similar to dot-matrix printing.

An inkjet printer is capable of printing colour images. By using a separate nozzle and ink cartridge for each of the three subtractive primary colours – cyan (dark blue), magenta, and yellow – plus a fourth for black, up to six different hues can be printed. The colour inkjet printer is an improvement over the problems of ribbons with multiple colour bands that are required for colour dot-matrix printers. Very expensive inkjet printers produce high-quality colour, which is well suited for low-volume publishing, proof copies and overhead transparencies.

Besides colour, other advantages of inkjet printers include quiet operation and high reliability, thanks mainly to fewer moving parts. A possible disadvantage is the problem of nozzle **clogging**.

A new variation of the inkjet printer is called a **bubble-jet printer**. With bubble-jet technology, the printing element is a computer chip with miniature openings, each with its own heating element. By heating the ink and forcing it through the opening, a small bubble is created. The bubble makes a more precise mark on the paper with less scattering of ink droplets than a conventional inkjet printer. The result is a sharper image.

Laser printers create images with a laser beam scanning across an electrically charged drum. As in a copier, toner or ink with an opposite charge sticks to the drum and is then transferred to paper by pressure and heat to create the finished image. In the past, laser printers were limited to minicomputer and mainframe applications that needed high-volume, high-quality printing.

Laser printers offer near-typeset-quality text, medium-resolution graphics capabilities, and higher speed than conventional impact or nonimpact printers. For example, most of the low-cost laser printers can print eight pages a minute at a resolution of 300 or 600 dots per inch. All can mix type styles and sizes as well as graphic images on the same page.

Laser printers are quite different from conventional printers. They contain their own built-in microprocessor and RAM and ROM memories in

order to produce high print speed and resolution. For example, to print one page of graphic images at a resolution of 300 dots per inch, each square inch requires 90,000 dots. An 8-by-10-inch piece of paper would require 7.2 million dots. If each dot is equivalent to a bit, it would take slightly less than one megabyte of memory to store a single page. Because these printers process and print an entire page at a time, they are often called page printers.

A close cousin of the laser printer uses an array of **light-emitting diodes (LEDs)** instead of the beam of light emitted by a laser. LED printers feature a simpler design than laser printers, which translates into higher reliability and lower costs.

A difference among laser printers is whether characters are produced by using selected patterns of dots, called **bitmaps**, or by using mathematical descriptions, called **outlines**. Printers that feature the latter use a **page-description language** – a language that is used to describe output to a printer or display device.

The language includes commands for describing individual character shapes, drawing lines and polygons, and **scaling** (i.e., making an object appear larger or smaller). When you print on a printer that is equipped with a page description-language, the language takes care of the behind-the-scenes technical details. It constructs a program describing the pages and sends it to the printer. When the printer receives the program, it executes the commands and produces the output. The result is more precise control over the way each page is printed and improved quality of the output.

### 1.2. Give English equivalents.

Ряд контактних штирів, змінювати розмір і стиль літер, швидкісне друкування, принципи формування символів, крихітні сопла, картридж з тонером, основні кольори, різні відтінки, висока надійність, традиційний струменевий принтер, протилежний заряд, переносити на папір, пристрій друку сторінками, роздільна здатність від 300 до 600 точок на дюйм, нагрівальний елемент.

### 1.3. Fill in the blanks with the words from the text.

1. Dot-matrix printers use \_\_\_\_\_ to print the dots required to shape a character.
2. Laser printers scan the image with \_\_\_\_\_ and transfer it to paper with a special link powder.

3. \_\_\_\_\_ are used for engineering drawings and other technical illustrations.
4. Ink-jet printers form characters with \_\_\_\_\_ containing tiny nozzles that spray drops of ink onto paper.
5. The most common type of \_\_\_\_\_ is the dot-matrix printer.
6. Ink-jet printers are quieter than \_\_\_\_\_ printers.

**1.4. Put the verb into the correct form.**

1. Daisywheel printers \_\_\_\_\_ very common a few years ago. (be)
2. An ink-jet printer \_\_\_\_\_ by projecting small ink droplets onto paper. (operate)
3. Images or characters \_\_\_\_\_ by a selected pattern of dots. (produce)
4. Curves \_\_\_\_\_ by linking a series of very short lines together. (draw)
5. Images \_\_\_\_\_ by driving various combinations of pins against a ribbon and onto paper. (form)

**1.5. Compare impact and nonimpact printers. Talk about their: speed, memory, resolution, service, price, noise. You can use the adjectives from the box.**

fast	slow	high / low	quality	noisy	quiet	cheap
		expensive	reliable	sharp		

**Now write a short text about the pros and cons of a printer or printers you use. Write about these aspects: type, speed, cost, noise, output quality.**

**1.6. Read the passage and choose the best answer to each question.**

The quality of the graphics output on a computer printer is measured in dpi. Simply by changing the density of dots that make up each part of an image, the printer can produce graphics that looks almost photographic. To understand how this works, consider how a black-and-white photograph shows the shades which, in real life, are colours. Each colour is a different shade of grey. For graphics to be produced on the computer printer, a piece of software called a printer driver decides upon a dot of pattern which will

represent each colour shade. These different patterns or textures create an individual effect which your eye translates into grey shade. The closer you look at the image, the less lifelike it looks.

**1. According to the passage, a computer printer can**

- (A) measure dots per inch
- (B) change photographs
- (C) look photographic
- (B) produce pictures

**2. Graphics are like black-and white photographs in that**

- (A) they are produced by computers
- (B) a dot pattern is decided by printer driver
- (C) each colour is seen as a different shade of grey
- (E) they each create an individual effect

**3. According to the passage, the graphics image**

- (A) is an exact reproduction of the photograph
- (B) has the same quality as a photograph
- (C) loses its natural look when viewed close-up
- (E) changes the density of dots

**1.7. Answer the questions.**

1. What categories are printers classified into?
2. What type of copies (soft or hard) do printers produce?
3. What type of printers is the most popular today?
4. What are advantages of dot-matrix printers?
5. How does a dot-matrix printer operate?
6. What type of printers has fewer moving parts?
7. How does a laser printer create images?
8. What is a plotter used for?
9. How do laser printers differ from conventional printers?
10. What is the difference among laser printers?

**2.1. Read and translate the following words and word-combinations.**

Display technologies, liquid-filled display surface, ambient light, back-light, continuous surfaces, the intersection of a row and column, a grid of columns and rows, meet the needs, an electron beam, eyestrain and fatigue,

flicker-free images, lack of clarity, increase, decrease, the inside phosphor-coated surface, overlap, a very narrow range of viewing angles.

### 2.2. Learn key words and word-combinations.

aliasing (n) – ступінчастість

cathode ray tube (CRT) – електронно-променева трубка

display adapter – адаптер дисплея

display screen – екран дисплея

flicker (v) – миготіти

grid (n) – сітка

liquid-crystal display (LCD) – дисплей на рідких кристалах

refresh rate – частота оновлення

resolution (n) – роздільна здатність

supertwist crystal – надвикривлений кристал

VGA (video graphic array) – відеографічний адаптер

video coprocessor – відеоспівпроцесор

### 2.3. Read and translate the text.

## Display Technology

There are a wide variety of display technologies ranging from inexpensive, text-only black-and-white displays to high-end colour stereoscopic displays. There are some common characteristics that should be examined when matching a display to an application. They include

- The ability to display images as well as text.
- Resolution or quality of the image.
- The ability to display colour.
- Portability of the computer.
- The price of the display.

A video display is a subsystem that consists of two components: a **display adapter** and a **display screen**. The display adapter acts as a channel of communication between the computer and the display screen. It contains built-in video memory that stores the images for the display screen. The greater the complexity of the images to be displayed, the more memory required. It also contains its own processor, sometimes called a **video coprocessor**. In some computers the display adapter is included on the system board. If it is not, it must be installed in an expansion slot before connecting it to the display screen.

One common scheme for colour displays uses eight bits to describe each pixel's colour or shade of grey. It is capable of displaying 256 colours or shades of grey simultaneously ( $2^8=256$ ). It does this by referring to a colour with a code number that is eight bits long. Another scheme uses 24 bits to describe each pixel's colour. It is capable of displaying  $2^{24}$  or 16,777,216 colours simultaneously.

A display divides the screen into a grid of rows and columns. The intersection of a row and column on the screen is called a **pixel**, short for **picture element**. It is the smallest unit of display. **Resolution** refers to the number of pixels displayed across and down on the display screen. The more pixels on the screen, the finer the quality and detail of the image. Another measure of resolution is the size of the pixel, called a **dot pitch**. The smaller the pixels, the sharper the quality of the displayed image.

Because display images consist of pixels arranged in rows and columns instead of continuous surfaces, the problem of **aliasing** – the jagged or stair step appearance of the edges of diagonal lines or curves – must be resolved. Higher resolution solves part of the problem, but anti-aliasing techniques have been developed that shade or colour neighbouring pixels along an edge to make the transition between light and dark less visible.

Because of advances in display technology, resolution continues to increase. There are several standard resolutions that have evolved to meet the needs of various applications. **Video Graphics Array (VGA)** is a standard developed by IBM. It offers a minimum 640-by-480-pixel resolution with 16 simultaneous colours. With the addition of memory, it can display 256 simultaneous colours.

VGA has been enhanced by a standard called **Super VGA**, which can display images at two resolutions: 800 by 600 pixels, and 1024 by 768 pixels. As in the case of VGA, the addition of memory allows 256 colours to be simultaneously displayed.

Extended Graphics Array (XGA) is an IBM extension of VGA that offers 1280-by-1024-pixel resolution and up to 32,768 simultaneous colours.

One problem with resolution is that images change with size. For example, a 4-inch hand-held portable computer screen with VGA resolution and a 10-foot projection screen with VGA resolution both use the same number of pixels, so the smaller image always looks better.

Video display can be accomplished by a cathode ray tube (CRT), commonly used in television sets. Display on a CRT screen is accomplished by

an electron beam that scans across and down the screen, and then returns to the upper left-hand corner to repeat the process. The technique leaves points of light on the inside phosphor-coated surface of the tube. The beam current is either increased to make a lighter point (pixel) or decreased to make a darker point (pixel) along each of the scan lines.

In many cases, the display creates a complete image 60 times per second (60 Hz). A drawback to this refresh rate is that in many applications, the screen flickers causing eyestrain and fatigue. This problem can be eliminated by increasing the refresh rate (usually to 70 or 80 Hz) to create flicker-free images. Generally, the higher the refresh rate, the higher the cost of the display.

Colour CRTs use three separate electron beams that represent the primary additive colours, red, blue, and green. The beams are focused so that their dot patterns slightly overlap on the screen to create the desired colours.

The most common type of flat panel is the **liquid crystal display (LCD)** – a liquid-filled display surface that, when electrically charged, creates images using ambient light. The historical drawback to LCDs has been their lack of clarity. Because early LCDs produced no light of their own but instead relied on reflected light for viewing, they had a very narrow range of viewing angles and could only be seen clearly if you looked at them straight on. To compensate for this deficiency, manufacturers are dealing with the problem in several ways. The first is to backlight the LCD by adding lights that shine through the LCD screen from behind, thus providing a clearer image. The second is to build LCDs with superiwest crystals, which refract or twist the light to provide much higher contrast (e.g., darker characters against a lighter background). Higher contrast also makes a wider viewing angle possible when looking at the display. The third is to place a transistor at each pixel location on the display. This technique, known as **active-matrix technology**, produces a high-contrast display at the cost of consuming more power.

#### 2.4. Give English equivalents.

Вбудована пам'ять, частота оновлення, щоб компенсувати цей недолік, за рахунок, порівняно з, задовольняти потреби, кольоровий монітор, перетин рядів і стовпців, завдяки досягненням, повне зображення, накладатися один на один, викривлювати, бажаний колір, сумісний, включати в системну плату, розташовувати рядками і стовпцями.

**2.5. Translate into English the following sentences using the... the... (with two comparatives) to say that one thing depends on another thing. Find the sentences with such a structure in the text.**

1. Чим більше пікселів на екрані, тим краща якість зображення.
2. Чим менше розмір екрану, тим чіткіше зображення.
3. Чим вища роздільна здатність, тим більша вартість дисплея.

**2.6. Translate the following sentences into English.**

1. Кількість точок по горизонталі та вертикалі, які монітор здатний відтворити чітко й роздільно, називається його роздільною здатністю.
2. Важливою характеристикою монітора є частота оновлення зображення.
3. Кращі моделі моніторів забезпечують частоту оновлення до 200 Гц.
4. Дисплеї на рідких кристалах застосовуються в основному на переносних комп'ютерах.
5. Чим вища частота оновлення, тим менше буде помітно мерехтіння і менше будуть втомлюватися очі під час роботи з монітором.

**2.7. Fill in the blanks with the words from the text.**

1. The total number of pixels displayed across and down on the display screen is known as \_\_\_\_\_.
2. \_\_\_\_\_ of the monitor is very similar to that of a TV set.
3. The monitor is controlled by a separate circuit board known as the \_\_\_\_\_.
4. Portable computers use a flat \_\_\_\_\_.
5. Three separate electron beams represent the three primary colours: \_\_\_\_\_.

**2.8. Put the verb into the correct form.**

1. The VGA card \_\_\_\_\_ a standard for colour monitors. (become)
2. A tilt-and-swivel stand \_\_\_\_\_ to move the monitor up, down and around so that the angle can be adjusted for each user. (use)
3. Different boards \_\_\_\_\_ different types of display. (drive)
4. The intersection of grid and columns on the screen \_\_\_\_\_ a pixel. (call)

**2.9. Answer the questions.**

1. What is the importance of pixel resolution?
2. What unit of frequency is used to measure the refresh rate of a monitor?
3. What is the most common display?
4. What types of computers use LCD displays?
5. What are the advantages and disadvantages of LCD and CRT displays?
6. What is the main drawback of LCDs? What are the ways of its elimination?
7. In what way is the problem of aliasing solved?

**Test Yourself****Match the following key terms to the appropriate definition:****A.**

1. Output device
  2. Hard copy
  3. Soft copy
  4. Impact printer
  5. Dot-matrix printer
  6. Line printer
- a. A printer that uses a combination of a striking mechanism and a ribbon to transfer images onto paper.
  - b. A device that decodes coded symbols into a form of information that is easy for people to use or understand.
  - c. The recording of an image on a medium such as paper or film.
  - d. A printer that sets up an entire line of print at once.
  - e. The recording of an image on a medium such as a display screen.
  - f. A printer that uses a selected pattern of dots transferred by impact.

**B.**

7. Nonimpact printer
  8. Ink-jet printer
  9. Laser printer
  10. Page-description language
  11. Plotter
- a. A printer that uses a laser to record an impression on a drum.
  - b. A device that produces an image by controlling the motion of a pen carriage.

- c. A printer that uses nozzles, heat, electricity, magnetism, or optical methods to transfer images onto paper.
- d. A language that is used to describe output to a printer or display device.
- e. A printer that uses a selected pattern of dots transferred by spraying droplets of ink.

12. Pixel

13. Resolution

14. Aliasing

15. Liquid crystal display (LCD)

16. Electroluminescent display (ELD)

- a. A display that relies on reflected light for viewing.
- b. A device that produces light through the application of an electric current on a sensitive surface.
- c. The number of pixels displayed across and down on the display screen.
- d. The jagged or stair step appearance of the edges of diagonal lines or curves.
- e. A technique that uses prerecorded human speech as the source of voice output.

**True/False:**

- 22. The information-processing application determines the format of the output.
- 23. The advantages of hard copy stem from our familiarity with paper.
- 24. The most common form of printer is the dot-matrix printer.
- 25. Nonimpact printers operate on the same dot-forming principle as dot-matrix printers.
- 26. Because of more moving parts, inkjet printers are noisier and less reliable than dot-matrix printers.
- 27. High-speed dot-matrix printers are an alternative to line printers.
- 28. To achieve higher print speeds, magnetic or optical technology is used to replace mechanical technology.
- 29. Laser printers are quite different from conventional printers.
- 30. Cathode ray tubes (CRTs) are the most common form of video display.
- 31. A video display consists of an adapter and a screen.
- 32. A display divides the screen into a grid of rows and columns.
- 33. A 10-foot projection screen has more pixels than a 10-inch screen.

**Multiple Choice:**

37. Which of the following is not a major type of computer output?
  - a. Voice.
  - b. Text.
  - c. Images.
  - d. Content.
38. An impact printer's name is derived from
  - a. Having the same print quality as an electric typewriter.
  - b. Transferring a pattern of dots to the paper.
  - c. Transferring a whole or partial character by striking a ribbon.
  - d. Using heat to transfer an image onto paper.
39. The intersection of a row and column on a display screen is called
  - a. Pixel.
  - b. Cell.
  - c. Resolution.
  - d. Dot pitch.
40. Standard VGA resolution is
  - a. 320 by 200 pixels.
  - b. 640 by 480 pixels.
  - c. 800 by 600 pixels.
  - d. 1280 by 1024 pixels.
44. Nonimpact printing is an important technology because it
  - a. Is primarily a high-speed method of printing.
  - b. Is a lower-cost technology.
  - c. Is the simplest way of colour printing.
  - d. Can produce output on microfiche.
45. Laser printing derives its flexibility from
  - a. Transferring images onto specially treated paper.
  - b. Its use of sophisticated me-chanical technology.
  - c. An embedded microprocessor in the printer.
  - d. Its lack of moving parts.