

Exercise walk-through

5.1.1

Utility software

A-Level Computer Science

You must be able to

- state what utility software is, and why an operating system provides it
- describe the purpose of a **disk formatter**, a **virus checker**, **defragmentation software**, **disk contents analysis** and **disk repair** software, **file compression** and **back-up software**
- match each utility to a situation, and say whether it improves performance or protects data
- explain how defragmentation improves performance, and why back-up software is needed

1

The method

Method — What utility software is

- A **utility program** is system software that carries out **one specific maintenance task** to keep the computer working well, safely or efficiently. It is not an application: it does no job for the user's work.
- Most operating systems **bundle** utilities, so the user does not have to find and install each one.

utility programs



Common utility programs: antivirus, backup, file compression and disk defragmenter

Method — The six utilities the syllabus names

- The syllabus names six. Learn what each one does, and when it is needed: | utility | what it does | when it is needed | |—|—|—| | **disk formatter** | prepares a disk for use: sets up its file system and partitions, deleting any data | a new disk, or a disk to be wiped | | **virus checker** (**antivirus** 杀毒软件) | scans files and memory for known virus **signatures** 签名; quarantines or deletes what it finds | every download, on a schedule; needs updating | | **defragmentation software** | moves the scattered blocks of each file so they are together on the disk | a hard disk that has become slow | | **disk contents analysis** / **disk repair** | shows what is using the space (large, duplicate, temporary files); finds and repairs bad sectors and file-system errors | a disk that is full, or gives errors | | **file compression** | shrinks a file so it needs less storage and transfers faster | attaching, uploading or archiving files | | **back-up software** (**backup** 备份) | copies files to another medium on a schedule, so they can be restored | always: the only recovery from loss |

Method — Defragmentation, for three marks

- 1 A hard disk stores a file in whatever free blocks it finds, so after many saves and deletes a file is **fragmented** 碎片化: its blocks are scattered across the disk.
- 2 Reading a fragmented file needs many movements of the read/write head, which is slow.
- 3 The **defragmenter** moves the blocks so each file is stored **contiguously**, and gathers the free space into one region.
- 4 Files are then read with fewer head movements, so they load faster, and new files are written into one continuous space.

It is not needed on an SSD: an SSD has no moving head, so scattered blocks cost nothing.

Method — “Explain the need for back-up software”, for two marks

- It makes a **copy** of the data on a separate medium (external disk, network, cloud), on a **schedule**, without the user remembering.
- So the data can be **restored** after a disk failure, accidental deletion, corruption or a ransomware attack.
- A **full backup** copies everything; an **incremental backup** 增量备份 copies only what changed since the last one, so it is quicker.

Method — Performance, or protection?

- An exam question often asks for utilities that “improve the performance” or that “keep data safe”. Know which is which:

Method — Performance, or protection?

improves performance	protects data or the system
defragmentation (files read with fewer head movements)	virus checker (malware removed before it runs)
disk repair (a disk with errors is slow, or fails)	backup (data restored after loss, corruption or ransomware)
disk contents analysis (free space by removing junk)	disk formatter (a wiped disk holds no old data)
compression (more fits on the disk; faster transfer)	

2

Practice

Practice 2.1 ■ 6 marks

Write the letter of the correct description next to each utility.

Practice 2.1 ■ 6 marks

letter	description
A	scans files for known malware and removes it
B	copies files to another medium so they can be restored
C	prepares a new disk for use by setting up its file system
D	moves the blocks of each file so they are stored together
E	reduces the size of a file so it takes less space
F	finds and repairs errors and bad sectors on a disk

Practice 2.1 ■ 6 marks

utility	letter
back-up software	_____
defragmentation software	_____
disk formatter	_____
disk repair software	_____
file compression	_____
virus checker	_____

Solution 2.1

Method: The six utilities the syllabus names — p.5

Worked steps

- back-up software: **B** **B1**
- defragmentation software: **D** **B1**
- disk formatter: **C** **B1**
- disk repair software: **F** **B1**
- file compression: **E** **B1**
- virus checker: **A** **B1**

Practice 2.2 ■ 4 marks

State the utility program that each person should use.

Practice 2.2 (a)

A video file is too large to send as an email attachment.

Solution 2.2 (a)

Method: The six utilities the syllabus names — p.5

Worked steps

file compression **B1**

Practice 2.2 (b)

A computer says the disk is full, but the user does not know what is taking the space.

Solution 2.2 (b)

Worked steps

disk contents analysis **B1**

Practice 2.2 (c)

A second-hand hard disk still holds the previous owner's files and must be made ready for use.

Solution 2.2 (c)

Worked steps

disk formatter **B1**

Practice 2.2 (d)

A USB memory stick has been used on many other computers.

Solution 2.2 (d)

Worked steps

virus checker **B1**

Practice 2.3 ■ 2 marks

State **two** utility programs that can improve the performance of a computer.

Solution 2.3

Method: What utility software is — p.4

Worked steps

any **two** of:

- defragmentation software **B1**
- disk repair software **B1**
- disk contents analysis (frees space) **B1**

Practice 2.4 ■ 1 mark

State what is meant by a **fragmented** file.

Solution 2.4

Method: Defragmentation, for three marks — p.6

Worked steps

- a file whose blocks are stored in separate places on the disk, not next to each other **B1**

Practice 2.5 ■ 1 mark

State what is meant by an **incremental** backup.

Solution 2.5

Method: “Explain the need for back-up software”, for two marks — p.7

Worked steps

- a backup that copies only the files that have changed since the previous backup **B1**

Practice 2.6 ■ 2 marks

Explain why a virus checker must be updated regularly.

Solution 2.6

Worked steps

- new viruses appear all the time **B1**
- the checker can only recognise the viruses whose signatures are in its database, so the database must be updated to catch new ones **B1**

3

Exam-style

Exam-style 3.1 ■ 6 marks

A laptop that is three years old has become slow to open files. It has a magnetic hard disk.

Exam-style 3.1 (a) ■ 4 marks

Identify the utility program that could improve its performance, and **explain** how it does so.

Solution 3.1 (a)

Method: The six utilities the syllabus names — p.5

Worked steps

defragmentation software B1

- after many saves and deletes, each file's blocks are scattered across the disk, so the read/write head must move many times to read one file B1
- the defragmenter moves the blocks so that each file is stored contiguously, and gathers the free space together B1
- files are then read with fewer head movements, so they open faster B1

Exam-style 3.1 (b) ■ 2 marks

The owner replaces the hard disk with a solid state drive. **Explain** why this utility is no longer useful.

Solution 3.1 (b)

Worked steps

an SSD has no moving read/write head, so it reads scattered blocks as fast as contiguous ones **B1**

- defragmenting only adds unnecessary writes, which wear the SSD **B1**

Exam-style 3.2 ■ 6 marks

A small business keeps its accounts on one office computer.

Exam-style 3.2 (a) ■ 2 marks

Explain the need for back-up software on this computer.

Solution 3.2 (a)

Method: “Explain the need for back-up software”, for two marks — p.7

Worked steps

the accounts could be lost through disk failure, accidental deletion, corruption or a ransomware attack **B1**

- back-up software copies the files to another medium on a schedule, so a copy exists and the data can be restored **B1**

Exam-style 3.2 (b) ■ 2 marks

The software makes a full backup every Sunday and an incremental backup on the other days. **Explain** why it does not make a full backup every day.

Solution 3.2 (b)

Worked steps

a full backup copies every file, which takes a long time and a lot of storage **B1**

- an incremental backup copies only the files that changed that day, so it is quick and small; a full copy once a week keeps the restore simple **B1**

Exam-style 3.2 (c) ■ 2 marks

State where the backup copies should be kept, and give a reason.

Solution 3.2 (c)

Worked steps

on a separate medium away from the computer, for example an external disk kept elsewhere or cloud storage **B1**

- so that a fire, theft or a virus on the computer does not destroy the backup as well **B1**

Exam-style 3.3 ■ 4 marks

An operating system includes a virus checker.

Exam-style 3.3 (a) ■ 2 marks

Describe the purpose of a virus checker.

Solution 3.3 (a)

Method: The six utilities the syllabus names — p.5

Worked steps

it scans files (and memory) to detect malware **B1**

- and removes, quarantines or blocks any virus it finds before it can run and cause damage **B1**

Exam-style 3.3 (b) ■ 2 marks

Describe how the virus checker recognises a virus in a downloaded file.

Solution 3.3 (b)

Worked steps

it compares the code in the file with a database of known virus **signatures** (patterns)

B1

- a match means the file contains that virus; it also watches for suspicious behaviour B1

Exam-style 3.4 ■ 5 marks

A student's computer reports errors when saving files, and some files can no longer be opened.

Exam-style 3.4 (a) ■ 3 marks

Identify the utility program the student should run first, and **state** what it does.

Solution 3.4 (a)

Worked steps

disk repair software **B1**

- it checks the disk for bad sectors and file-system errors **B1**
- and repairs them, marking bad sectors so they are not used again **B1**

Exam-style 3.4 (b) ■ 2 marks

The student then wants to send a folder of 40 photographs to a friend. **Explain** the benefits of compressing the folder before sending it.

Solution 3.4 (b)

Worked steps

the folder takes less storage and uploads and downloads faster **B1**

- 40 files are bundled into one archive, which is easier to send and to receive

B1

Exam-style 3.5 ■ 5 marks

A technician installs a new hard disk in a computer.

Exam-style 3.5 (a) ■ 3 marks

Identify the utility program that must be run before the disk can store files, and **describe** what it does.

Solution 3.5 (a)

Method: The six utilities the syllabus names — p.5

Worked steps

a **disk formatter** **B1**

- it prepares the disk for use by creating the file system (and partitions) **B1**
- so that the OS can store and find files on it; any existing data is deleted **B1**

Exam-style 3.5 (b) ■ 2 marks

The technician says that a **disk contents analysis** program should also be run on the computer's old disk. **Explain** how this program helps the user.

Solution 3.5 (b)

Worked steps

it shows the user what is using the disk space: large files, duplicates and temporary files **B1**

- so the user can delete what is not needed and free space, which also keeps the computer fast **B1**

Exam-style 3.6 ■ 2 marks

Explain why utility programs are supplied with the operating system rather than being built into the operating system itself.

Solution 3.6

Method: What utility software is — p.4

Worked steps

- a utility does one occasional maintenance task, so it is not needed all the time **B1**
- keeping it as a separate program keeps the operating system smaller and simpler, and the utility can be updated or replaced on its own **B1**