Utility software

3.2.2 · Computers · revision notes

Utility software is system software that looks after a computer: it maintains it, protects it or makes it run better. The specification names five utilities: file repair, backup, data compression, disk defragmentation and anti-malware. Paper 1 asks what each one is for and how it works, and sometimes includes a short calculation about backups.

Key facts

- Utility software: maintains, protects or improves the performance of the computer
- Backup: copies data so it can be restored. Full = every file; incremental = only files changed since the last backup
- Disk defragmentation: puts each file's fragments back together on a magnetic hard disk, so files load faster
- Grade 8+ only Never defragment an SSD: no speed gain, and extra wear
- File repair: recovers corrupted files
- Data compression: makes files smaller; lossless (exact original restored) or lossy (some data removed)
- Anti-malware: detects, quarantines and removes malware using signatures and behaviour

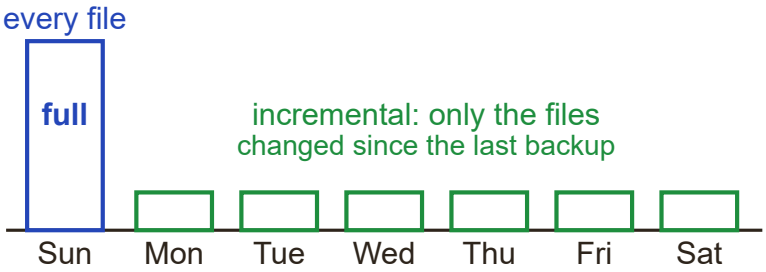
Notes

What utility software is

- **Utility software** is system software that maintains, protects or improves the performance of a computer.
- It is different from **application software**, which lets the user do tasks such as writing documents or editing photos.
- The five utilities in the specification: **file repair**, **backup**, **data compression**, **disk defragmentation** and **anti-malware**.

Backup and file repair

- **Backup** software copies files to another device or location (such as an external drive or the cloud), so they can be restored if the originals are deleted, corrupted, stolen or encrypted by ransomware.
- A **full backup** copies every file. An **incremental backup** copies only the files that have changed since the last backup, so it is quicker and uses less space.



A full backup copies everything; each incremental backup copies only what has changed, so it is smaller and quicker

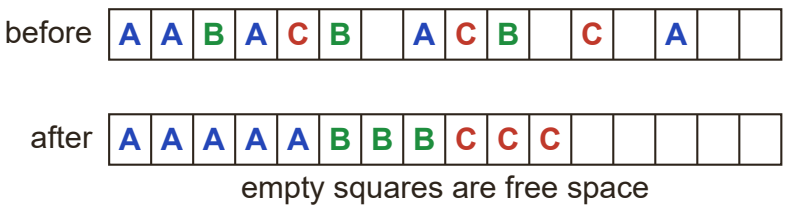
- To restore from incremental backups you need the last full backup and then every incremental backup made since it, in order. This is slower, and a missing backup means lost changes. Grade 7+ only
- A copy should be kept **off site**, so a fire or theft cannot destroy the originals and the backup together.
- **File repair** software tries to fix files that have become corrupted (e.g. by a crash or power cut), recovering as much of the data as possible so the file can be opened again.

Data compression

- Compression software reduces the size of files. **Lossless** compression lets the original be restored exactly; **lossy** compression removes some data permanently.
- Smaller files use less storage space, upload and download faster, and fit within email attachment limits. A compressed file must be decompressed before it can be used.

Disk defragmentation

- On a magnetic hard disk, files are saved, changed and deleted over time, so the free space becomes scattered. New and growing files are split into **fragments** stored in different places.
- Reading a fragmented file makes the read/write head move to many places, which is slow.
- Defragmentation software moves the fragments so that each file is stored in one continuous block, and groups the free space together. The head moves less, so files open faster.



Defragmentation puts the parts of each file (A, B, C) next to each other, so the head moves less

- Do not defragment an SSD: it has no moving parts, so access is equally fast wherever data is stored, and the extra writing shortens its life. Grade 8+ only

Anti-malware

- Scans files, downloads and email attachments as they arrive, and runs scheduled full scans.
- Compares code with a database of known malware **signatures**, and watches for suspicious behaviour to catch new malware.
- Quarantines or deletes infected files. Its database must be updated regularly.

How to answer each type of question

State the purpose of a utility 1 mark each **Grade 3**

1. Say what problem the utility deals with.
2. Keep it to one clear sentence using the key word: corrupted, restore, smaller, fragments, malware.

Example. (a) State the purpose of file repair software. (1)
(b) State the purpose of data compression software. (1)

Model answer.

(a) To fix or recover files that have become corrupted (1)

(b) To reduce the size of files, so they use less storage space or are quicker to send (1)

Describe how anti-malware protects a computer 3 marks **Grade 5**

1. Say what it scans and when.
2. Say how it recognises malware: signatures and suspicious behaviour.
3. Say what it does with a threat, and why it must be updated.

Example. Describe how anti-malware software protects a computer. (3)

Model answer. Any three from: it scans files, downloads and email attachments for malware (1); it compares them with a database of known malware signatures (1); it looks for suspicious behaviour to detect new malware (1); it quarantines or deletes infected files (1); its signature database is updated regularly so that new malware can be recognised (1).

Explain how defragmentation improves performance

3 to 4 marks | Grade 6

1. Explain how files become fragmented over time.
2. Explain why fragmentation slows a hard disk (the head has to move more).
3. Say what defragmentation does and why files then open faster.

Example. Explain how disk defragmentation software can make files open faster on a magnetic hard disk drive. (3)

Model answer. Any three from: as files are saved, changed and deleted, files become split into fragments stored in different places on the disk (1); defragmentation moves the fragments so that the parts of each file are stored next to each other (1); free space is grouped together too, so new files are less likely to be fragmented (1); the read/write head then moves less to read a file, so it is read more quickly (1).

Calculate and compare backups

2 to 4 marks | Grade 7

1. A full backup copies all the data; each incremental backup copies only what has changed.
2. Add up the full backup and the incremental backups for the period asked.
3. For a disadvantage, think about what is needed to restore everything.

Example. A company has 500 GiB of data. It makes a full backup every Sunday and an incremental backup on each of the other six days. About 20 GiB of data changes each day.
(a) Calculate the storage needed for one week of backups. (2)
(b) Explain **one** disadvantage of incremental backups when the data has to be restored. (2)

Model answer.

(a) 6 × 20 = 120 GiB for the incremental backups (1); 500 + 120 = 620 GiB (1)

(b) The last full backup and then every incremental backup made since it must all be restored, in order (1), so restoring takes longer, and if one incremental backup is missing or damaged some changes cannot be recovered (1).

Explain why an SSD should not be defragmented

2 to 3 marks | Grade 8

1. Say that an SSD has no moving parts.
2. Link it: access is equally fast wherever data is stored, so there is no speed benefit.
3. Add the harm: the extra writing wears out the flash memory cells.

Example. Explain why the solid-state drive in a laptop should not be defragmented. (3)

Model answer. An SSD has no moving parts and no read/write head (1), so data can be accessed equally quickly wherever it is stored, and defragmenting gives no speed benefit (1). Defragmenting rewrites large amounts of data, and each flash memory cell can only be written a limited number of times, so it shortens the life of the SSD (1).

Don’t lose marks

- Saying defragmentation creates more storage space. It rearranges the data; the total free space stays the same.
- Saying defragmentation deletes files or removes viruses.
- Suggesting defragmentation for a solid-state drive.
- Saying anti-malware stops all malware. New malware may not be in its database yet, which is why updates matter.
- Saying compression always loses data. Lossless compression restores the original exactly.
- Confusing utility software with application software, e.g. calling a web browser a utility.

More tips

Memory tricks

- The five utilities as actions: **fix** (file repair), **copy** (backup), **squash** (compression), **tidy** (defragmentation), **guard** (anti-malware).
- Defragmentation is for magnetic hard disks only.
- Incremental = only what has changed since last time.
- Sense check for backups: if the backup is on the same disk as the original, one failure destroys both.

Exam technique

- For defragmentation, explain the problem first (scattered fragments, the head moves more), then the fix, then the benefit.
- For backup questions, say where the copy is kept and how often backups are made.
- If a question names the type of disk, check whether defragmentation actually helps it.
- Show both steps in backup calculations: the incremental total, then the grand total.

What each grade needs

What you need to be able to do, from the first marks up to the top grade.

Grade 3 — **State the purpose of utility software**
It maintains, protects or improves the performance of a computer system.

Grade 3 — **Name the five utilities in the specification**
File repair, backup, data compression, disk defragmentation and anti-malware.

Grade 4 — **Describe what backup software does**
It copies files to another device or place so they can be restored if the originals are lost or damaged.

Grade 5 — **Describe how anti-malware protects a computer**
It scans for known malware signatures and suspicious behaviour, then quarantines or deletes threats.

Grade 5 — **Explain the benefits of data compression**
Smaller files take up less storage space and are quicker to send or upload.

Grade 6 — **Explain how defragmentation speeds up a hard disk**
It puts the fragments of each file back together, so the read/write head moves less.

Grade 7 — **Compare full and incremental backups**

Incremental backups are quicker and smaller, but restoring needs the full backup plus every incremental one since.

Grade 8

Explain why SSDs should not be defragmented

Access time does not depend on where data is stored, and the extra writing wears out the flash memory.

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