

# CPU cores

## Teacher's Notes



## Lesson Plan

| Length             | 60 mins   | Specification Link  | 212/c |  |
|--------------------|---|---|-------|--|
| Learning objective | Candidates should be able to:<br>(c) explain how the number of CPU cores affect their performance   |   |       |  |
| Time (min)         | Activity  | Further Notes   |       |  |
| 10                 | <p>Explain that over the years processors have become faster as clock speeds have increased but engineers are finding it difficult to produce faster ones for a variety of reasons.</p> <ul style="list-style-type: none"> <li>Ask students to suggest reasons.</li> </ul> <p>Explain that engineers have had to think of other solutions to increase the speed of computer processing. Using a projector, display the <b>Interactive Starter Activity</b>.</p> <p>Explain that the engineers worked out that it was more efficient to pull heavier loads along railways by using several engines working together rather than trying to design and build a 'super-engine'.</p> | <p>Too much heat generated. System is limited by the rate of data transfer within the processor and from memory to the processor.</p> <p>The video is shown in a new window and shows locomotives working together to pull large freight trains.</p> <p>It is not necessary to show all of the train video, just enough to demonstrate the use of multiple power sources.</p> |       |  |
| 15                 | Watch the set of videos, pausing to discuss the content.  |   |       |  |
| 5                  | <p>Discuss the videos to assess learning. Ask questions such as:</p> <ul style="list-style-type: none"> <li>What is meant by a multi core processor?</li> <li>How do multi core processors speed up computer processing?</li> <li>Why is a dual core processor not always twice as fast as a single core one?</li> </ul>  | <p>A processor having several CPUs.</p> <p>The cores can work together on the same problem. Each core can be working on a different program at the same time.</p> <p>It might not be possible to run different parts of a program at the same time. One might be waiting to receive data from a process being carried out by the other core.</p>                              |       |  |
| 10                 | <p><b>Worksheet 1</b></p> <p>Pupils to complete <b>Worksheet 1</b> either on paper or on computer.</p> <p>Ask individual students for their answers and discuss with the class so that all students have the correct answers.</p>   | <p>Answers provided.</p> <p>Ask students with the correct responses to explain to the class how they arrived at their answers.</p>  |       |  |
| 10                 | The students use the <b>Interactive Activity 1</b> .  |   |       |  |



| Time (min)      | Activity   | Further Notes   |              |   |             |   |           |   |                       |   |           |   |            |   |           |   |            |   |                      |   |           |    |           |  |
|-----------------|--|-----------------|--------------|---|-------------|---|-----------|---|-----------------------|---|-----------|---|------------|---|-----------|---|------------|---|----------------------|---|-----------|----|-----------|--|
|                 | <p><b>Extension Challenge/Homework</b></p> <p>Students to complete and submit any remaining sections of Worksheet 1 and Worksheet 2 for homework.</p>  |                 |              |   |             |   |           |   |                       |   |           |   |            |   |           |   |            |   |                      |   |           |    |           |  |
| 5               | <p><b>Plenary</b></p> <p><b>Core terminology</b></p> <p>Ask the students for the names of processors with different numbers of cores e.g.</p> <table border="1" data-bbox="421 931 892 1373"> <thead> <tr> <th>Number of cores</th> <th>Common names</th> </tr> </thead> <tbody> <tr><td>1</td><td>single-core</td></tr> <tr><td>2</td><td>dual-core</td></tr> <tr><td>3</td><td>tri-core, triple-core</td></tr> <tr><td>4</td><td>quad-core</td></tr> <tr><td>5</td><td>penta-core</td></tr> <tr><td>6</td><td>hexa-core</td></tr> <tr><td>7</td><td>hepta-core</td></tr> <tr><td>8</td><td>octa-core, octo-core</td></tr> <tr><td>9</td><td>nona-core</td></tr> <tr><td>10</td><td>deca-core</td></tr> </tbody> </table> | Number of cores | Common names | 1 | single-core | 2 | dual-core | 3 | tri-core, triple-core | 4 | quad-core | 5 | penta-core | 6 | hexa-core | 7 | hepta-core | 8 | octa-core, octo-core | 9 | nona-core | 10 | deca-core |  |
| Number of cores | Common names   |                 |              |   |             |   |           |   |                       |   |           |   |            |   |           |   |            |   |                      |   |           |    |           |  |
| 1               | single-core  |                 |              |   |             |   |           |   |                       |   |           |   |            |   |           |   |            |   |                      |   |           |    |           |  |
| 2               | dual-core  |                 |              |   |             |   |           |   |                       |   |           |   |            |   |           |   |            |   |                      |   |           |    |           |  |
| 3               | tri-core, triple-core  |                 |              |   |             |   |           |   |                       |   |           |   |            |   |           |   |            |   |                      |   |           |    |           |  |
| 4               | quad-core  |                 |              |   |             |   |           |   |                       |   |           |   |            |   |           |   |            |   |                      |   |           |    |           |  |
| 5               | penta-core   |                 |              |   |             |   |           |   |                       |   |           |   |            |   |           |   |            |   |                      |   |           |    |           |  |
| 6               | hexa-core  |                 |              |   |             |   |           |   |                       |   |           |   |            |   |           |   |            |   |                      |   |           |    |           |  |
| 7               | hepta-core   |                 |              |   |             |   |           |   |                       |   |           |   |            |   |           |   |            |   |                      |   |           |    |           |  |
| 8               | octa-core, octo-core   |                 |              |   |             |   |           |   |                       |   |           |   |            |   |           |   |            |   |                      |   |           |    |           |  |
| 9               | nona-core  |                 |              |   |             |   |           |   |                       |   |           |   |            |   |           |   |            |   |                      |   |           |    |           |  |
| 10              | deca-core  |                 |              |   |             |   |           |   |                       |   |           |   |            |   |           |   |            |   |                      |   |           |    |           |  |



## WORKSHEET 1 ANSWERS

- 1 Suggest a reason why manufacturers are finding it difficult to produce processors with clock speeds over 5GHz.

Too much heat is generated which cannot be dissipated fast enough.  
Transmission delays on the chip itself and between the memory and the CPU.

- 2 What is the difference between a multi processor system and a multi core system?

A multi processor system has several microprocessors each with a single CPU and a multi core system has a single microprocessor with several CPUs.

- 3 List two advantages of a multi core processor over a single core one.

In a multi core system each of the CPUs can:

Work together on the same program.

Work on different programs at the same time.

- 4 Find the common names used by manufacturers for processors having the following number of cores.

| Number of cores | Common names         |
|-----------------|----------------------|
| 1               | single-core          |
| 2               | dual-core            |
| 4               | quad-core            |
| 5               | penta-core           |
| 8               | octa-core, octo-core |
| 10              | deca-core            |

- 5 Explain why all programs cannot be run twice as fast with a dual core processor than with a single core one.

The tasks required to be done may not be able to be carried out in **parallel**.

They may be **sequential** so that one task requires output from a previous task.

Manufacturers are now optimising software to take advantage of parallel processing.

## WORKSHEET 2 ANSWERS

**1** (a) State what is meant by the initials CPU. (1)  
Central Processing Unit

(b) List *three* components of a CPU. (3)

Control unit

Arithmetic and Logic Unit or ALU

Registers

(c) State the common names for the following multi core processors. (3)

**Two cores:** dual core

**Four cores:** quad core

**Six cores:** hexa core

(d) (i) Explain why a dual core processor can usually execute a single program faster than a single core one. (2)

Each CPU can process different parts of the same program simultaneously.

(ii) What is this type of processing called? (1)

Parallel processing