THE STRIVING

MUSLIM ACADEMY

Islamic and Academic Education

YEARS 7 TO 9 · COMPUTING

How a computer works

Hardware against software, the memory hierarchy, the fetch decode execute cycle, and binary.

WHAT IS INSIDE

- Hardware, software and how they fit together
- How instructions and data are stored
- How each one is worked

The Striving Muslim Academy

2 sets · a hint on every question

Written for a parent teaching at home. No training assumed, and nothing else to buy.

strivingmuslimacademy.com

Hardware, software and how they fit together

Work it out on paper before checking the back.



1. **Sort these into hardware and software: keyboard, operating system, processor, web browser, screen, printer driver.**
   Hardware is what you could drop. Software is instructions.

2. **Put these in order, from fastest and smallest to slowest and largest: hard disk, registers, main memory, cache.**
   The closer to the processor, the faster and the less of it there is.

3. **Why does a computer have both main memory and a hard disk, rather than only the faster one?**
   One of them keeps its contents when the power goes off.

4. **Write out the fetch, decode, execute cycle in your own words, in order.**
   Three steps, repeated for every single instruction.

The Striving Muslim Academy

How each one is worked

Every trace printed in full, so it can be marked step by step.



HARDWARE, SOFTWARE AND HOW THEY FIT TOGETHER

1. Sort these into hardware and software: keyboard, operating system, processor, web browser, screen, printer driver.

1. Hardware: keyboard, processor, screen.
2. Software: operating system, web browser, printer driver.
3. A printer driver is the awkward one: it is software, even though it exists to work a piece of hardware.

Answer: **hardware: keyboard, processor, screen; software: operating system, web browser, printer driver**

2. Put these in order, from fastest and smallest to slowest and largest: hard disk, registers, main memory, cache.

1. Registers sit inside the processor, so they are fastest and there are only a few.
2. Cache is next, then main memory.
3. A hard disk is slowest and largest.
4. So: registers, cache, main memory, hard disk.

Answer: **registers, cache, main memory, hard disk**

3. Why does a computer have both main memory and a hard disk, rather than only the faster one?

1. Main memory is fast but loses everything when the power goes.
2. A disk is slower but keeps its contents.
3. So the disk holds what must survive and memory holds what is being worked on now. Using only memory would mean losing your work; using only disk would make everything slow.

Answer: **memory is fast but forgets when the power goes, and the disk is slow but remembers, so each does the job the other cannot**

4. Write out the fetch, decode, execute cycle in your own words, in order.

1. Fetch: the processor collects the next instruction from memory, using the address it is holding.
2. Decode: it works out which operation that instruction means and what it needs.
3. Execute: it carries it out, then moves on to the next address and begins again.

Answer: **fetch the instruction from memory, decode what it means, execute it, then repeat**

The Striving Muslim Academy

How each one is worked, continued

HOW INSTRUCTIONS AND DATA ARE STORED



1. Write 218 as an 8-bit binary number.

1. Work down the columns, writing 1 where the value fits.
2. 218 = 11011010.

Answer: **11011010**

2. Write 62 as an 8-bit binary number.

1. Work down the columns, writing 1 where the value fits.
2. 62 = 00111110.

Answer: **00111110**

3. Write 51 as an 8-bit binary number.

1. Work down the columns, writing 1 where the value fits.
2. 51 = 00110011.

Answer: **00110011**

4. Write 50 as an 8-bit binary number.

1. Work down the columns, writing 1 where the value fits.
2. 50 = 00110010.

Answer: **00110010**

5. What number is the binary 01011010?

1. The columns with a 1 in them are added together.
2. That gives 90.

Answer: **90**

6. What number is the binary 11010000?

1. The columns with a 1 in them are added together.
2. That gives 208.

Answer: **208**

7. What number is the binary 11001010?

1. The columns with a 1 in them are added together.
2. That gives 202.

Answer: **202**

8. What number is the binary 10111001?

1. The columns with a 1 in them are added together.
2. That gives 185.

Answer: **185**

The Striving Muslim Academy

SAMPLE PAGES

You have read a few pages. The pack is longer.

What you are holding is a short sample, taken from different parts of the pack so that you can see how a week is planned and what a child is actually asked to do, before you decide.

The complete pack, and the rest of the academic materials, are on our website: schemes of work for a parent teaching at home, and practice packs for the skills children get stuck on.

The Striving Muslim Academy

strivingmuslimacademy.com

Islamic and Academic Education

Members of the homeschool community do not buy these. If you have joined the community, the pack for the term you are working on is given to you at no cost.

Our Islamic Education classes are free. These packs are part of what pays the teachers who teach them.