1. Flash at 0x0000_0000 and SRAM at 0x2000_0000 can overlap if the flash is large enough.

   ☐ True ☐ False

2. Why must a pointer to a hardware status register be volatile?

   ☐ The hardware can change the value, so every access must really read it

   ☐ It makes the code run faster

   ☐ Registers cannot be read without it

   ☐ It stops the register changing

3. With memory-mapped I/O, the CPU uses ordinary load and store instructions to talk to a peripheral.

   ☐ True ☐ False

4. A timer runs from 84 MHz with divider factors P = 84 (PSC = 83) and R = 1000 (ARR = 999). What is the interrupt rate in Hz?

   _____ Hz

5. At 115 200 baud, 8N1, one byte takes

   ☐ 1 ms

   ☐ 86.8 µs (10 bit times)

   ☐ 8.68 µs

   ☐ 69.4 µs (8 bit times)

6. An 8-bit ADC uses a 3.3 V reference. What is one LSB, in mV? Give 1 decimal place.

   _____ mV

7. Bisection searches 512 suspect instructions. How many probes does it need at most?

   _____

8. 8 KB of SRAM needs how many address lines?

   ☐ 8192

   ☐ 13

   ☐ 8

   ☐ 16

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☐ True ☐ False

10. A pin stays an input no matter what you write to its data register. The likely cause is

    ☐ Its direction-register bit was never set to output

    ☐ The clock is too slow

    ☐ volatile is missing

    ☐ The data register is broken

1. **False**

   The regions differ in their top address bits, so no address can belong to both; the decoder separates them by those bits.

2. **The hardware can change the value, so every access must really read it**

   Without ‘volatile‘ the compiler may read once and reuse the value, so a loop waiting for a status bit can spin for ever.

3. **True**

   The peripheral’s registers sit at addresses, so a read or write to that address reaches the hardware instead of RAM.

4. **1000 Hz**

   $84 \times 10^6/(84 \times 1000) = 1000$ Hz: a 1 ms tick, and the stored values 83 and 999 both fit 16 bits.

5. **86.8 µs (10 bit times)**

   8N1 is 10 bits per byte, and $10/115\,200 = 86.8$ µs. The start and stop bits are part of the cost.

6. **12.9 mV**

   $3.3/2^8 = 3.3/256 = 12.9$ mV. Each extra bit halves the step.

7. **9**

   Each probe halves the range: $\log_2 512 = 9$.

8. **13**

   $8\,\text{KB} = 8192 = 2^{13}$ bytes, so 13 lines; it spans ‘0x2000_0000‘ to ‘0x2000_1FFF‘.

9. **True**

   That is what makes assembly useful for checking compiler output; one C line often becomes several instructions.

10. **Its direction-register bit was never set to output**

    The direction register decides which way the pin works; the data register only carries the level. Set the direction first.

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