

Q P.1

$$293 / 16 = 18 \dots 5$$

Decimal : 293

$$18 / 16 = 1 \dots 2$$

Hex : 0x125

$$1 / 16 = 0 \dots 1$$

Q P.2

Because each number in the array is stored in a 16-bit integer, but many of the initial prime numbers are small enough to fit within 8 bits.

Q 2.1

Q 2.2

Based on the formula : $\text{Band Rate} = \frac{f_{\text{osc}}}{16 \times (\text{UBRR0} + 1)}$

$$\text{UBRR0} = \frac{f_{\text{osc}}}{(\text{Band Rate}) \times 16} - 1 = \frac{2 \times 10^6}{9600 \times 16} = 12.02083$$

0.02083 does not matter for this project, so I took 12

Decimal \rightarrow Binary

12 1100

Therefore UBRR should be : $\underbrace{0000}_{\text{UBRR0}[11:8]} \underbrace{00001100}_{\text{UBRR0}[7:0]}$

Q 3.3

binary

decimal

8 bit can represent up to 255

8 bits \rightarrow 255

Q 3.4

H: 72, E: 69, L: 76, O: 79

Q 3.5

	Decimal	ASCII
$63 \% 10 = 3$	$3 + 48 \rightarrow$	51
$63 / 10 = 6$	$6 + 48 \rightarrow$	54

Q 4.1

Given that the baud rate is 9600 bit per second

Total bit in one frame = 1(start) + 8(data) + 1(finish) = 10 bits

$$T_{\text{bit}} = \frac{10}{9600} = 1.0416 \text{ ms}$$

One character takes 1.0416 ms so 3 digits take $1.0416 \times 3 = 3.1248 \text{ ms}$

Q 4.2

Total Characters = 2(commas) + 2(space) + 3(digits) $\times 3 = 13$

$$T_{(3\text{-digit})} = 13 \times 1.0416 = \underline{\underline{13.5408 \text{ ms}}}$$

1.0416 is calculated as Q 4.1

Total Characters = 62(numbers) $\times 3$ (digits) + 61(commas) + 61(space) = 308

$$\text{Total Time} = 308 \times 1.0416 = 320.8128 \text{ ms}$$

Q 4.3,

	Initial	Required	
UCSR0A	0x20	0x00	changed
UCSR0B	0x00	0x08	✓
UCSR0C	0x06	0x06	x
UBRR0H	0x00	0x00	✓ (as part of UBRR0)
UBRR0L	0x00	0x06	✓