1.5

A

$$Instructions\ per\ second\ P1 = \frac{3x10^9}{1.5} = 2000MIPS$$
$$Instructions\ per\ second\ P2 = \frac{2.5x10^9}{1.0} = 2500MIPS$$
$$Instructions\ per\ second\ P3 = \frac{4x10^9}{2.2} = 1818MIPS$$
$$P2\ has\ the\ highest\ instructions\ per\ second$$

B

$$P1\ cycles = 30\ billion \qquad instructions = 20\ billion$$
$$P2\ cycles = 25\ billion \qquad instructions = 25\ billion$$
$$P3\ cycles = 40\ billion \qquad instructions = 18.1\ billion$$

C

P1.

$$CPI = 1.5 + 1.5 * .2 = 1.8$$
$$Need\ MIPS = 2000 + 2000 * .3 = 2600$$
$$\frac{clock}{1.8} = 2600x10^6$$
$$clock = 4.68Ghz$$

P2.

$$CPI = 1.0 + 1.0 * .2 = 1.2$$
$$Need\ MIPS = 2500 + 2500 * .3 = 3250$$
$$\frac{clock}{1.2} = 3250x10^6$$
$$clock = 3.9Ghz$$

P3.

$$CPI = 2.2 + 2.2 * .2 = 2.6$$
$$Need\ MIPS = 1818 + 1818 * .3 = 2363$$
$$\frac{clock}{2.6} = 2363x10^6$$
$$clock = 6.14Ghz$$