Solutions

2.1

- $1/(1-0.8) = 5\times$ ✓.

2.2

- $1/(0.25 + 0.75/3) = 1/0.5 = 2.00\times$ ✓.

2.3

- ILP within a core, threads per core, cores per chip ✓.

3.1

- $f = 88/100 = 0.88$ ✓.
- $p = 4$: $1/(0.12 + 0.22) = 2.94\times$, runtime 34.0 s ✓.
- $p = 16$: $1/(0.12 + 0.055) = 5.71\times$, runtime 17.5 s ✓.
- $4\times$ needs $0.12 + 0.88/p \le 0.25 \Rightarrow 0.88/p \le 0.13 \Rightarrow p \ge 6.77$ – smallest integer $p = 7$ ✓.
- Ceiling $= 1/0.12 \approx 8.3\times$: 64 cores cannot pass it – the serial 12 s owns the rest ✓.

3.2

- A: $f = 0.9$, $p = 8$: $1/(0.1 + 0.1125) = 4.71\times$, runtime $50/4.71 = 10.6$ s ✓.
- B: the serial 5 s halves to 2.5 s: new time $= 2.5{+}45 = 47.5$ s; speedup $50/47.5 = 1.05\times$ ✓.
- Combined: serial $2.5 + 45/8 = 2.5 + 5.6 = 8.1$ s, speedup $50/8.125 = 6.15\times$ ✓.
- Prefer A: one line – cutting the parallel part multiplies; cutting the serial tail by half moved 2.5 s ✓.

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