1)

$$\begin{aligned}\frac{B_{time}}{A_{time}} &= 1 + \frac{n}{100} \\ \frac{40}{20} &= 1 + \frac{n}{100} \\ 100 &= n\end{aligned}$$

b is the correct answer

2)

$$\begin{aligned}\text{speedup} &= \frac{1}{(1 - f_1 - f_2 ... - f_n) + \frac{f_1}{s_1} ... + \frac{f_n}{s_n}} \\ &= \frac{1}{(1 - .35) + \frac{.35}{15}} \\ &= 1.48\end{aligned}$$

3)

a)

$$\begin{aligned}\text{speedup} &= \frac{1}{1 - .8 + \frac{.8}{20}} \\ &= 4.16\end{aligned}$$

b)

$$\begin{aligned}\text{speedup} &= \frac{1}{1 - .2 + \frac{.2}{80}} \\ &= 1.24\end{aligned}$$

c)

$$\begin{aligned}\text{speedup} &= \frac{1}{1 - .9 + \frac{.9}{10}} \\ &= 5.26\end{aligned}$$

d)

$$\begin{aligned}\text{speedup} &= \frac{1}{1 - .1 + \frac{.1}{90}} \\ &= 1.1\end{aligned}$$

the best option for improving the overall speedup of the program is option c.

4)

$$\text{module speedup} = 1 + \frac{\text{percent speedup of module}}{100}$$

a)

$$\begin{aligned}\text{speedup} &= \frac{1}{1 - .8 + \frac{.8}{1+.2}} \\ &= 1.15\end{aligned}$$

b)

$$\begin{aligned}\text{speedup} &= \frac{1}{1 - .2 + \frac{.2}{1+.8}} \\ &= 1.09\end{aligned}$$

c)

$$\begin{aligned}\text{speedup} &= \frac{1}{1 - .9 + \frac{.9}{1+.1}} \\ &= 1.08\end{aligned}$$

d)

$$\begin{aligned}\text{speedup} &= \frac{1}{1 - .1 + \frac{.1}{1+.9}} \\ &= 1.04\end{aligned}$$

a is the best option for overall speedup.

5)

a)

$$\begin{aligned}\text{speedup} &= \frac{1}{1 - .6 + \frac{.6}{10}} \\ &= 2.17\end{aligned}$$

b)

$$\begin{aligned}\text{speedup} &= \frac{1}{1 - .75 + \frac{.75}{10}} \\ &= 3.07\end{aligned}$$

c)

$$
\begin{aligned}
2.75 &= \frac{1}{1 - x + \frac{x}{10}} \\
2.75(1 - x + \frac{x}{10}) &= 1 \\
2.75(10 - 9x) &= 10 \\
x &= -\frac{10}{2.75 * 9} + \frac{10}{9} \\
x &= .707
\end{aligned}
$$

70.7 percent of the program needs to use the floating point processor

6)

a)

$$
\begin{aligned}
\text{speedup} &= \frac{1}{1 - .6 + \frac{.6}{1.3}} \\
&= 1.16
\end{aligned}
$$

b)

$$
\begin{aligned}
\text{cost/speedup 1} &= 50000(1 - .7 + \frac{.7}{1.3}) \\
&= 41923 \\
\text{cost/speedup 2} &= 53000(1 - .5 + \frac{.6}{2}) \\
&= 39750
\end{aligned}
$$

I would select the second option because the cost per percent speed increase is lower.