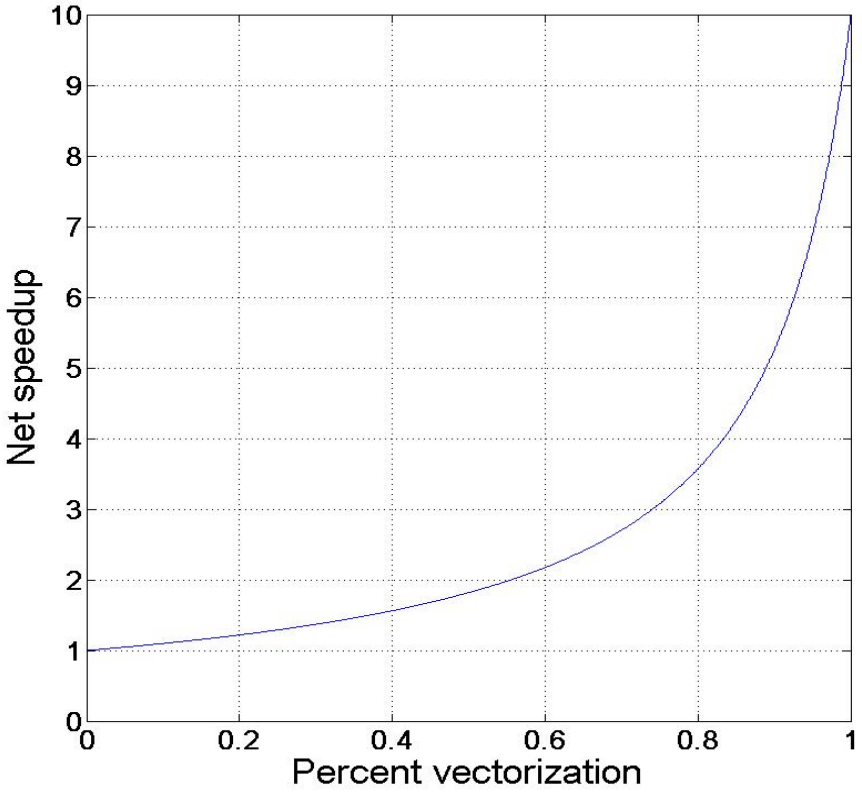
1.2

a) $\text{Speedup}_{\text{overall}} = \dfrac{1}{1 - \text{percent vectorization} + \dfrac{\text{percent vectorization}}{\text{Speedup}_{\text{vectorization}}}}$

$= \dfrac{1}{1 - \text{percent vectorization} + \dfrac{\text{percent vectorization}}{10}}$



b) $2 = \dfrac{1}{1 - \text{percent vectorization} + \dfrac{\text{percent vectorization}}{10}}$

percent vectorization = 55.56%

c) $\dfrac{55.56\%/10}{1 - 55.56\% + 55.56\%/10} = 11\%$

d) When percent vectorization = 100 %, total speedup = 10
then half speedup = 5

$5 = \dfrac{1}{1 - \text{percent vectorization} + \dfrac{\text{percent vectorization}}{10}}$

percent vectorization = 88.89%

e) When the speed of the vector hardware is doubled,

$$\text{speedup} = \frac{1}{1 - 0.7 + \frac{0.7}{10 \times 2}} = 2.9851$$

$$2.985 = \frac{1}{1 - \text{percent vectorization} + \frac{\text{percent vectorization}}{10}}$$

percent vectorization = 73.88 %

Then increase percentage = 73.88 % - 70 % =3.88%

1.21

a) Acer Altos R510 Mk2 (3.0 GHz Intel Xeon processor, 2MB L2, 8 1 core, 1 chip, 1 core/chip(Hyper-Threading Technology Disabled)

Frequency: 3.0 GHz Base: 1463

Acer Altos R510Mk2 (3.6 GHz Intel Xeon processor, 2MB L2) 1 core, 1 chip, 1 core/chip(Hyper-Threading Technology disabled)

Frequency: 3.6 GHz Base: 1715

Acer Altos R510 Mk2 (3.8 GHz Intel Xeon processor, 2MB L2, 8 1 core, 1 chip, 1 core/chip(Hyper-Threading Technology Disabled)

Frequency: 3.8 GHz Base: 1806

	3.0 GHz vs. 3.6 GHz	3.0 GHz vs. 3.8 GHz	3.6 GHz vs. 3.8 GHz
$\text{Speedup}_{\text{clock}}$	1.2	1.2667	1.0556
$\text{Speedup}_{\text{base}}$	1.1722	1.2344	1.0531

When other configurations are some, the clock speedup closely reflects benchmark speedup.

b)

1	Load program	5 s
2	Invoke spell checking	5 s
3	Complete spell checking	1 s
4	Absorb the information	2 s
5	Initiate printing	5 s
6	Printing dialog to appear	2 s
7	Accept printing options	2 s
8	Printer to start	8 s
9	Printing	60 s

When the computer response time is less than 2 seconds, any computer response time is matched by double that amount of improvement in the human response time. Steps 3 and 6 are carried out by computer and their respective response time is equal to 2 seconds, which means the computer response time will be less

than 2 seconds after improvement. Correspondingly, the followed human response times (steps 4 and 7) will be improved by 2 times of the computer response time improvement.

	3.0 GHz vs. 3.6 GHz	3.0 GHz vs. 3.8 GHz	3.6 GHz vs. 3.8 GHz
$Speedup_{clock}$	1.2	1.2667	1.0556

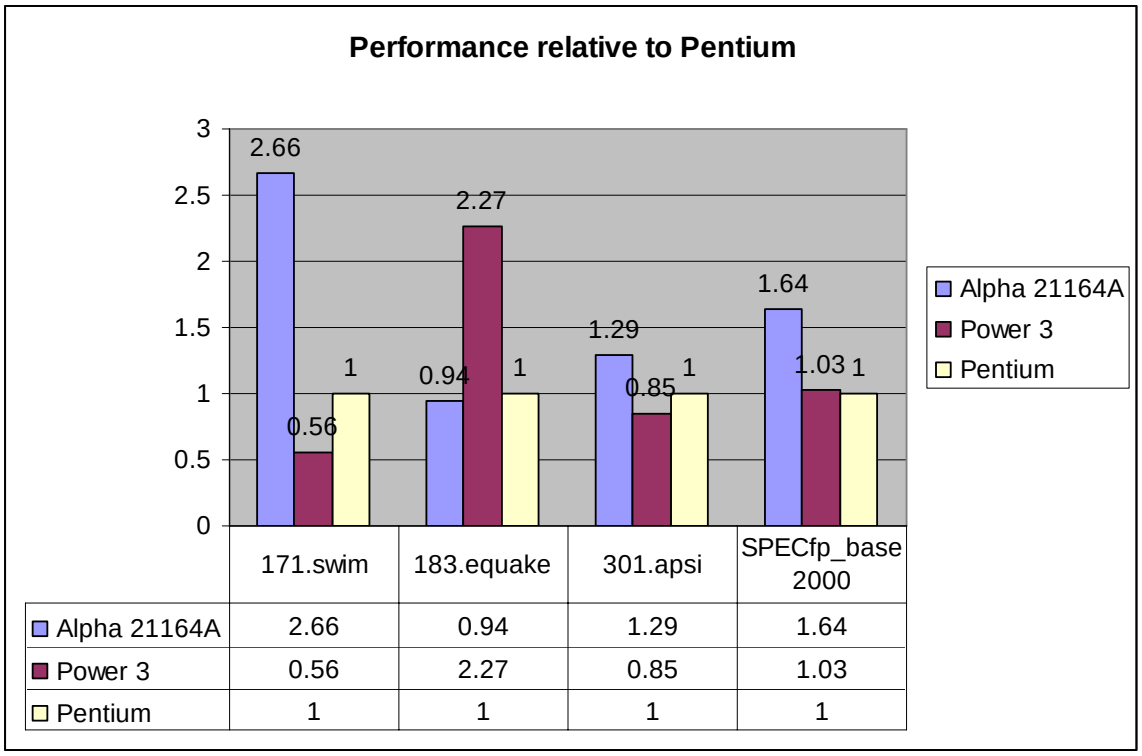
Here give 3.0 GHz vs. 3.6 GHz as an example

$Speedup_{clock} = 1.2$
Time_step3 = 1 s
Time_step4 = 2 s
Computer_Improvement = $1 – 1/ speedup_{clock} = 0.1667$
Human_ Improvement = 2 * Computer_Improvement = 0.3334
Time_step3_after_improved = 1 * (1 – 0.1667) = 0.8333
Time_step4_ after_improved = 2 *(1 - 0.3334) = 1.3332

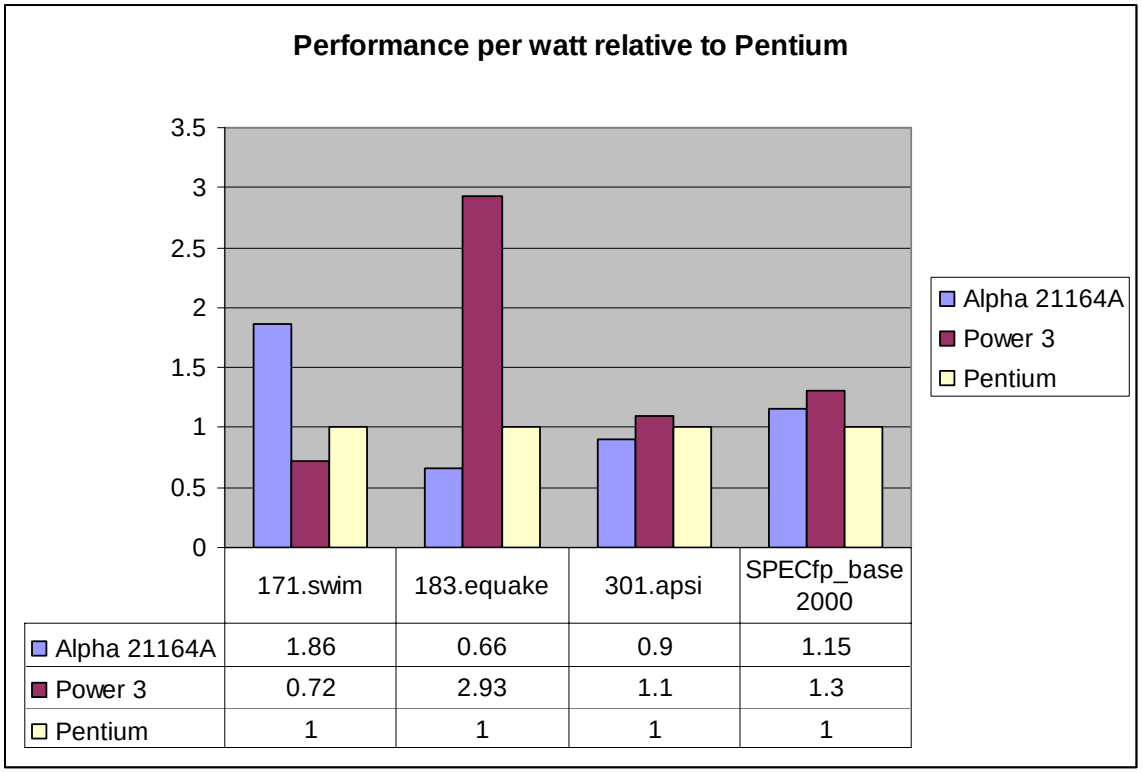
Time_step6 = 2 s
Time_step7 = 2 s
Computer_Improvement = $(2 – 2/ speedup_{clock}) / 2 = 0.1667$
Human_ Improvement = 2 * Computer_Improvement = 0.3334
Time_step6_improved = 2 * (1 – 0.1667) = 1.6666
Time_step7_ improved = 2 *(1 - 0.3334) = 1.3332
$Speedup_{wordprocessing} = 90 / (80 - 0.1667 – 2*0.1667- 2*2* 0.3334) = 1.1514$

c) Relative permanence is a ratio. You need first choose a baseline computer, then the performance of your current computer divided by that of the baseline computer is the relative performance.

1.23



	171.swim	183.equake	301.apsi	SPECfp_base 2000
Alpha 21164A	2.66	0.94	1.29	1.64
Power 3	0.56	2.27	0.85	1.03
Pentium	1	1	1	1



	171.swim	183.equake	301.apsi	SPECfp_base 2000
Alpha 21164A	1.86	0.66	0.9	1.15
Power 3	0.72	2.93	1.1	1.3
Pentium	1	1	1	1