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I pledge my honor that I have abided by the Stevens Honor System.

Problem 1:

(a)

```
for (j=0; j<100; j++)
    c[j] = a[j] * b[j];
```

100 iterations * 8 bytes because double precision * 3 because there are three different vectors

100*8*3 = 2400
100/2400 = **0.04166**

(b)

```
for (j=0; j<100; j++)
    a[j] = a[j] * b[j];
```

100*8*2 = 1600
100/1600 = **.0625**

(c)

```
for (j=0; j<100; j++)
    c[j] = 4.2 * b[j];
```

100*8*2 = 1600
100/1600 = **.0625**

(d)

```
for (j=0; j<100; j++)
    d[j] = a[j] * b[j] + c[j];
```

100*8*4 = 3200
200/3200 = **.0625**

(e)

```
for (j=0; j<100; j++)
    a[j] = a[j] * b[j] + b[j];
```

100*8*2 = 1600
200/1600 = **.125**

Problem 2:

a.) 2.5*8*32 = **640 GFLOPs**
b.) arithmetic intensity = ⅛
640 GFLOPs/(⅛) = 3840 GB/S
We need a large throughput to support peak SP FP 112GB/s isn't enough.

Problem 3:

$$\text{Speedup} = \frac{1}{\underbrace{(1 - F_{\text{parallelizable}})}_{F_{\text{sequential}}} + \frac{F_{\text{parallelizable}}}{100}} = 90$$

For this problem all we have to do is use the formula above but replace the 100 with 2000 and the 90 with 100. Then we have to solve for F parallelizable.

After solving we get that F parallelizable is (**.**990495).

This means that 99.095% of the program is parallel. The other 0.9505% is sequential.

If we round these numbers we could say 99% of the program is parallel and 1% of the program is sequential.

Problem 4:

a.)
Bandwidths:
Ring: 1 * 16 = **16**
Mesh: 24
Fully Connected Network: 120

b.)
Minimum Bisection Bandwidths:
Ring: 1 * 2 = **2**
Mesh: 1 * sqrt(16) = 4
Fully Connected Network: 8^2 = 64

c.)
Ring: 1 broken link
Mesh: 24-15 = **9 broken link**

Fully Connected Network: 120-15 = **105 broken links**