1)

a) 

6 micro meters * (10^-6 meters/micrometers) = 6 * 10^-6 meters on one side

(6 * 10^-6)^2 = 3.6 * 10^-11 m^2

14 nanometers & (10^-9 meters/ nanometers) = 1.4 * 10^-8 meters on one side

(1.4* 10^-8)^2 = 1.96 * 10^-16 m^2

10,000 transistors * (3.6 * 10^-11 m^2/1.96 * 10^-16 m^2)

1.8 billion transistors

b)

Ratio of sizes

approximating

(13 inch diag/ 26 inch diag) = 2

larger display is about double the length on each side, so the area is (2*2 =4) times as much

i) There are 4 M pixels in the bigger display

ii) There are 3 bytes/pixel in RGB, so 12 M bytes

c)

i) Approx 350 GB of free disk space

ii) About 5000 undergrads so about

5000 * 350 = 1,500,000 GB

iii)

1500000 GB * (1 hour/4.5 GB ) = 333330 hours

or about 38 years of video

iv )

100 Mb = (approx) 10MB = 0.01 GB

1500000 GB * (sec/0.01GB) = 15,000,000 seconds or about 1700 days

2)
a)

i) 
250 seconds. Since each 100 items makes the program run quadratically longer you can find 250 seconds.

Solving the formula you get $n^2/1000$ so 500 will take you 250 seconds.

ii) 
it is $N^2$ time

b)

10 milliseconds = $10 \times 10^{-3}$ seconds
10 nanoseconds = $10 \times 10^{-9}$ seconds

$(1/2)^x \times 10 \times 10^{-3}$ seconds < $10 \times 10^{-9}$ seconds

$(1/2)^x < 10 \times 10^{-6}$

$log (1/2) * x < log (10 \times 10^{-6})$

$x < 16.609$

about 17 halving periods

so $17 \times 18$ months = 25.5 years

1990 + 25.5 years = 2016 approx

ii) 

10 picoseconds = $10 \times 10^{-12}$ seconds

$(1/2)^x \times 10 \times 10^{-3}$ seconds < $10 \times 10^{-12}$ seconds

$(1/2)^x < 10 \times 10^{-9}$

$log (1/2) * x < log (10 \times 10^{-9})$

$x < 26.575$

about 27 halving periods so

$27 \times 18 = 40.5$ years

1990 + 40.5 years = 2030 approx

3)
function countdown(m) {
    n = 1
    sum = 0
    while (sum < 1025) {
        b = Math.pow(2, n)
        n = n + 1
        sum = sum + b
    }
    window.alert(sum)
    window.alert("done!")
}

ii)

n = 0
sum = 0
while (sum < 1025) {
    b = Math.pow(2, n)
    sum = sum + b
    n = n + 1
}
print sum

iii)

first = 1
second = 1
counter = 0

while (counter < N) {
    sum = first + second
    window.alert(first)
    second = first
    first = sum
    counter = counter + 1
}