Problem 1

b is the correct answer.
We want the probability bound $2Me^{2\epsilon^2 N}$ to be at most .03. So, we can solve for

$$2Me^{-2\epsilon^2 N} = .03$$
$$2e^{-2(.05)^2 N} = .03$$
$$e^{-2(.05)^2 N} = .015$$
$$N = 839.94$$

So for any N less than this value, our probability bound will be greater than .03. So the answer is 1000. We can check this by plugging in 500 and 1000 into $2Me^{2\epsilon^2 N}$. At 500, we get .164, which is too big. At 1000, we get .013, which is below the desired bound. Thus 1000 is the correct answer.

Problem 2

c is the correct answer.
We want the probability bound $2Me^{2\epsilon^2 N}$ to be at most .03. So, we can solve for

$$2Me^{-2\epsilon^2 N} = .03$$
$$20e^{-2(.05)^2 N} = .03$$
$$e^{-2(.05)^2 N} = .0015$$
$$N = 1300.46$$

So for any N less than this value, our probability bound will be greater than .03. So the answer is 1500. We can check this by plugging in 1000 and 1500 into $2Me^{2\epsilon^2 N}$. At 1000, we get .135, which is too big. At 1500, we get .011, which is below the desired bound. Thus 1500 is the correct answer.

Problem 3

We want the probability bound $2Me^{2\epsilon^2 N}$ to be at most .03. So, we can solve for

$$2Me^{-2\epsilon^2 N} = .03$$
$$200e^{-2(.05)^2 N} = .03$$
$$e^{-2(.05)^2 N} = .00015$$
$$N = 1760.98$$

So for any N less than this value, our probability bound will be greater than .03. So the answer is 1500. We can check this by plugging in 1000 and 1500 into $2Me^{2\epsilon^2 N}$. At 1000, we get .135, which is too big. At 1500, we get .011, which is below the desired bound. Thus 1500 is the correct answer.

Problem 4

Problem 5

Problem 6

Problem 7

Problem 8

Problem 9

Problem 10