

$$M = 1, \Delta = 0.03$$

a)

$$\epsilon(M, N, \Delta) = \sqrt{\frac{1}{2N} \ln \frac{2M}{\Delta}} \leq 0.05$$

$$= \sqrt{\frac{1}{2N} \ln \frac{2*1}{0.03}} \leq 0.05$$

$$= \sqrt{\frac{1}{2N} * 4.199} \leq 0.05$$

Squaring on both sides

$$= \frac{1}{2N} * 4.199 \leq 0.0025$$

$$= 4.199 \leq 0.005N$$

$$N \geq 840$$

b)

$$M = 100$$

$$\epsilon(M, N, \Delta) = \sqrt{\frac{1}{2N} \ln \frac{2M}{\Delta}} \leq 0.05$$

$$= \sqrt{\frac{1}{2N} \ln \frac{2*100}{0.03}} \leq 0.05$$

$$= \sqrt{\frac{1}{2N} \ln 6666.6} \leq 0.05$$

$$= \sqrt{\frac{1}{2N} * 8.80} \leq 0.05$$

Squaring on both sides

$$= \frac{1}{2N} * 8.80 \leq 0.0025$$

$$= 8.80 \leq 0.005N$$

$$N \geq 1760$$

c)

$$M = 10000$$

$$\epsilon(M, N, \Delta) = \sqrt{\frac{1}{2N} \ln \frac{2M}{\Delta}} \leq 0.05$$

$$= \sqrt{\frac{1}{2N} \ln \frac{2*10000}{0.03}} \leq 0.05$$

$$= \sqrt{\frac{1}{2N} \ln 666666.6} \leq 0.05$$

$$= \sqrt{\frac{1}{2N} * 13.410} \leq 0.05$$

Squaring on both sides

$$= \frac{1}{2N} * 13.410 \leq 0.0025$$

$$= 13.410 \leq 0.005N$$

$$N \geq 2682$$