1.

	[illegible] %	P(claim)
new	0.4	0.08
senior	0.6	0.05

a. $P(\text{claim}) = P(\text{claim} \mid N)P(N) + P(\text{claim} \mid S)P(S) = 0.4 \cdot 0.08 + 0.6 \cdot 0.05 = 0.062$

b. $P(S \mid \text{claim}) = \dfrac{P(S \cap \text{claim})}{P(\text{claim})} = \dfrac{P(\text{claim} \mid S)\, P(S)}{P(\text{claim})} =$

$$= \frac{0.08 \cdot 0.6}{0.062} \approx 0.774$$

2.

$$f(x) = \begin{cases} k(1-x) & , 0 \le x < 1 \\ 0 & , \text{otherwise} \end{cases}$$

a. $\int_0^1 k(1-x)\, dx = 1$

$k - kx$

$kx - \dfrac{kx^2}{2} \Big|_0^1 = 1$

$k - \dfrac{k}{2} = 1$

$k = 2$

$$f(x) = \begin{cases} 2 - 2x & , x \in (0,1) \\ 0 & \text{otherwise} \end{cases}$$

b. $P(A) = P(X > 0.4) = \int_{0.4}^{1} f(x)\, dx = 0.36$

$P(B) = P(X < 0.75) = \int_0^{0.75} f(x)\, dx = 0.9375$

$P(A \cap B) = P(0.4 < X < 0.75) = \int_{0.4}^{0.75} f(x)\, dx = 0.2975$

$\cancel{0.36 + 0.2975}$

$$P(B \mid A) = \frac{P(A \cap B)}{P(A)} = \frac{0.2975}{0.36} = 0.826$$

c. $E(X) = \int_0^1 x(f(x))\, dx = \dfrac{1}{3} = 0.\overline{3}$

$\text{Var}(X) = \int_0^1 (x - \tfrac{1}{3})^2 \cdot f(x) = \int_0^1 x^2 f(x)\, dx - \left(\int_0^1 x f(x)\, dx\right)^2 = \dfrac{1}{18} = 0.0\overline{5}$

3. exponential distr $\mu = 5$

$f(x) =$

$F(x) = 1 - e^{-x/\beta}$ $x \in \mathbb{R}^+$

$\overset{x_1}{5} + \overset{x_2}{3} = 8$

a. $P(x_2 \geq 3) = 1 - (1 - e^{-3/5}) \approx 0.549$

b. Given the ~~average~~ mean time for each pad is 5 hours and she

beginning ~~trying~~ the second immediately after the first dies

the mean ~~of~~ for total time is that of the sum of the two

means, thus $5 + 5 = 10$ hours

c. $Var(X) = \int_0^\infty x^2 \frac{1}{\beta} \cdot e^{-x/5}\,dx - \left(\int_0^\infty \frac{1}{\beta} \cdot e^{-x/5}\,dx\right)^2 = 50 - 25 = 25$

$= \beta^2 = 5^2 = 25$

4. Normally distr $\mu = 89$ $\sigma^2 = 9$

$$P(x < 94 \mid x > 89) := \frac{P(89 < x < 94)}{P(x > 89)} = 2 \cdot P(89 < x < 94)$$

$$= P(89 < x < 94) \cdot 2 = 2 \cdot \int_{89}^{94} \frac{1}{9\sqrt{2\pi}} \cdot e^{\left(-\frac{(x-89)^2}{2 \cdot 9}\right)} dx \approx 0.9044$$

5. $\sigma = 0.4$ $\mu \sim 0.1$

$\to \sigma_T = 0.1$

$2 \times \sigma = 1.2$

$$n = \left\lceil \left(\frac{z_{\alpha/2}\, \sigma}{\varepsilon}\right)^2 \right\rceil$$

$$= \left\lceil \left(\frac{2 \cdot 0.4}{0.1}\right)^2 \right\rceil = 144$$

6. $n = 1000$ $\hat{\mu} = 0.78$

a. $CI = 0.78 \pm 2 \cdot \sqrt{\frac{0.78 \cdot (1-0.78)}{1000}} = 0.78 \pm 0.0262$

$= \cancel{0.78}$

$\mu \in [0.754, 0.8062]$

b assuming the sample is a randomly selected group we can conclude with nearly 100% certainty that the majority of students prefer in-person classes.

7. dataset = 11, 10, 7, 23, 15, 4, 9, 8, 3, 6, 2, 4

median = 7.5

a. mean: sum (dataset) / 12 = $\frac{102}{12}$ = $8.5 = \mu$

~~stddev = 8~~

$\sigma = \sqrt{\frac{(11-8.5)^2 + (10-8.5)^2 + \dots + (4-8.5)^2}{12}} \approx 5.90$

~~191.5~~

~~200.75~~

b. $CI = 8.5 \pm z_{\alpha/2} \frac{5.9}{\sqrt{12}} \approx 8.5 \pm z_{\frac{0.9}{2}} \cdot 20.438$

c. $CI =$