1. Using a Venn diagram:

	A	A'	
R	0.5	0.2	0.7
R'	0.1	0.2	0.3
	0.6	0.4	1

(a) $P(R') = 0.3$

(b) $P(R' \cap A') = 0.2$

(c) $P(R' \cap A) = 0.1$

(d) $P(A | R') = P(A \cap R')/P(R') = 0.1/0.3 = 1/3 = 0.333$

(e) $P(K) = P(E)P(K \mid E) + P(E')P(K \mid E') = (0.8)(0.75) + (0.2)(0.35) = 0.6 + 0.07 = 0.67$

(f) $P(E \mid K) = P(E \cap K)/P(K) = (0.8)(0.75)/0.67 = 60/67 = 0.8955$

2. X equals the number of service calls in T minutes; Poisson with rate $\lambda = 2.3$ calls per minute. Using TI Stats/List Editor F5 E:

(a) $P(X = 0) = 0.1003$

(b) $P(X \le 4) = 0.9162$

(c) $\mu = \lambda T = (2.3)(5) = 11.5$ calls in 5 minutes

(d) $P(X \le 15) = 0.8783$

(e) $\mu = \lambda T = (2.3)(0.5) = 1.15 : P(X \ge 1) = 1 - P(X = 0) = 1 - 0.3166 = 0.6834$

3.

(a) $P(X \le 2) = f(0) + f(1) + f(2) = 0.9728$

(b) $P(X > 1) = f(2) + f(3) + f(4) = 0.1808$

(c) $F(1) = P(X \le 1) = 1 - 0.1808 = 0.8192$ using the preceding part.

(d) $\mu = \sum_x x\, f(x) = (0)(0.4096) + (1)(0.4096) + (2)(0.1536) + (3)(0.0256) + (4)(0.0016) = 0.8$

(e) $E(X^2) = \sum_x x^2 f(x) = 1.28$ so $\sigma^2 = 1.28 - 0.8^2 = 0.64$

(f) $\sigma = \sqrt{0.64} = 0.8$

4. X has a hypergeometric distribution.

(a) $P(X = 0) = \dfrac{\binom{5}{0}\binom{15}{4}}{\binom{20}{4}} = 0.2817$

(b) $P(X = 3) = \dfrac{\binom{5}{3}\binom{15}{1}}{\binom{20}{4}} = 0.0310$

(c) $P(X \ge 1) = 1 - P(X = 0) = 0.7183$ using the first part

(d) $E(X) = n\dfrac{k}{N} = 4\dfrac{5}{20} = 1$ or calculate on TI: $\mu = \sum_x x\, f(x) = \sum_x x \dfrac{\binom{5}{x}\binom{15}{4-x}}{\binom{20}{4}}$

(e) Binomial $n=4$ and $p=0.25$ on TI Stats/List Editor F5 C: $P(X\geq 1)\approx 0.6836$ which is not a good approximation because sample size is not much smaller than population size here.

5.

(a) $P(0.5\leq X\leq 1)=\int_{0.5}^{1} f(x)\,dx=219/256=0.8555$

(b) $\mu=\int_{-\infty}^{+\infty} x\, f(x)\,dx=\int_{0}^{1} x\, f(x)\,dx=2/3=0.6667$

(c) $E(XY)=\int_0^1\left(\int_0^1 x\,y\,f(x,y)\,dy\right)dx=16/45=0.3556$

(d) $P(X\leq Y)=\int_0^1\left(\int_x^1 f(x,y)\,dy\right)dx=23/45=0.5111$

(e) $E(D)=\mu_U-\mu_V=-2.2$

(f) ${\sigma_D}^2={\sigma_U}^2+{\sigma_V}^2=0.9^2+0.7^2=1.3$ so $\sigma_D=\sqrt{1.3}=1.140$

6. Using TI Data/Matrix Editor:

(a) $P(A_4\cap D)=P(A_4)P(D\mid A_4)=(0.1)(0.6)=0.06$

(b) $P(A_3\cap D')=P(A_3)P(D'\mid A_3)=(0.3)(0.0)=0$

(c) $P(D)=\sum_i P(A_i\cap D)=0.58$

(d) $P(A_1\mid D')=P(A_1\cap D')/P(D')=0.7619$

(e) $P(D_1\cup D_2)=1-P(D_1'\cap D_2')=1-(0.42)(0.6905)=0.71$

(f) $P(A_1\mid D_1'\cap D_2')=0.8828$

7. **(b)** $15.6-8.5=7.1$ **(c)** $\tilde{x}=10.5$ **(d)** $\bar{x}=10.88$ **(e)** $s=2.082$ **(a)**

8	5	8			
9	0	2	3	6	8
10	5	7			
11	0				
12	1	2			
13	2	7			
14					
15	6				

8.

Supplier A: X is binomial with $p=0.95$; using TI Stats/List Editor F5 C:

(a) $P(X\leq 18)=0.2642$ with $n=20$

(b) $P(X\leq 45)=0.1036$ with $n=50$

Supplier B: X is normal:

(c) $P(X\geq 10)=0.8413$ using F5 #4

(d) $P(X\leq b)=0.10$ means $b=9.155$ using F5 #2 #1

(e) $\overline{X}$ is normal with mean 13 and standard deviation $3/\sqrt{100}=0.3$ so $P(12.5\leq\overline{X}\leq 13.5)=0.9044$

Supplier C:

(f) $\hat{x}\pm t_{0.005}\dfrac{s}{\sqrt{n}}=12.3\pm(2.68)\dfrac{4.2}{\sqrt{50}}=12.3\pm 1.59$ or $10.7<\mu<13.9$ is a 99% CI for μ

Supplier D:

(g) $\hat{p}\pm z_{0.025}\dfrac{\sqrt{(\hat{p})(1-\hat{p})}}{\sqrt{n}}=0.84\pm(1.96)\dfrac{\sqrt{(0.84)(0.16)}}{\sqrt{200}}=0.84\pm 0.0508$ or $0.789<p<0.891$ is a 99% CI for p