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1. (a) $P(\text{ripe}) = p = 0.9$

$P(18 \text{ ripe}) = ({}^{n}C_{r})p^{r}q^{n-r} = ({}^{18}C_{18})(0.9)^{18}(1-0.9)^{18-18}$
$= (1)(0.9)^{18}(1)$
$= 0.1501$

(b) (i)
it is a binomial distribution

mean $= np$
$= (20)(0.2) = 4$

(b) (ii) varience, $\sigma^2 = npq$
$= (20)(0.2)(1-0.2)$
$= \frac{16}{5}$
$= 3.2$

1. (c) Geometric Distribution
$P(\text{hit target}) = p = 0.95$
$P(\text{miss target}) = q = 1-0.95$
$= 0.05$

$P(x=15) = (p)^{15-1}(q)^{1}$
$= (0.95)^{14}(0.05)$
$= 0.02438$

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2.

Age group (years)	Number
0 - 19	60
20 - 39	150
40 - 49	300
50 - 59	580
60 - 69	678
70 - 79	1288
80 and above	1378
Total	4434

2. (a) P(in the age of 50s) $= \frac{580}{4432}$

$= 0.1308$

(b) P(less than 50 years old) = P(0-19) + P(20-39) + P(40-49)

$= \frac{60}{4434} + \frac{150}{4434} + \frac{300}{4434}$

$= \frac{85}{739}$

$= 0.1150$

(c) P(inclusive between 40 and 69 years old) = P(40-49) + P(50-59) + P(60-69)

$= \frac{300}{4434} + \frac{580}{4434} + \frac{678}{4434}$

$= \frac{779}{2219} = 0.3514$

(d) P(at least 70 years) = P(70-79) + P(80 and above)

$= \frac{1288}{4434} + \frac{1378}{4434}$

$= 0.6013$

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3. (a) $P = \frac{3}{5}$

$= 0.6$

$P(X=6) = {}^{10}C_6 (0.6)^6 (1-0.6)^{10-6}$

$= 0.2508$

(b) $P(X \leq 9) = 1 - P(X=9) - P(X=10)$

$= 1 - {}^{10}C_9 (0.6)^9 (0.4)^1 - {}^{10}C_{10} (0.6)^{10} (0.4)^0$

$= 1 - 0.0403 - 0.006$

$= 0.9537$

(c) $P(X=4) = (1-0.6)^3 (0.6)^1$

$= 0.0384$

4. (a) $\mu = 25$, $\sigma = 6$

(a)(i) $P(X<10) = P\left(Z < \frac{X-\mu}{\sigma}\right)$

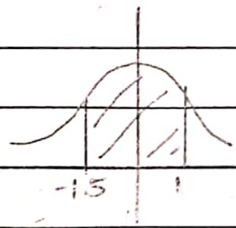
$= P\left(Z < \frac{10-25}{6}\right)$

$= P(Z < -2.5)$

$= P(Z > 2.5)$

$= 0.00621$

(a)(ii) $P(16 \leq X \leq 31) = P\left(\frac{16-25}{6} \leq Z \leq \frac{31-25}{6}\right)$



$= P(-1.5 \leq Z \leq 1)$

$= 1 - P(Z \geq 1) - P(Z \geq 1.5)$

$= 1 - 0.1587 - 0.0668$

$= 0.7745$

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4.(a)(iii) $P(Z \geq a) = 0.33$

$a = 0.44$

$\frac{x - 25}{6} = 0.44$

$x = 27.64$

4.(b)(i) uniformly distributed

$f(x) = \frac{1}{b-a}$ for $a \leq x \leq b$

$= \frac{1}{20-14}$ for $14 \leq x \leq 20$

$= \frac{1}{6}$ for $14 \leq x \leq 20$

(b)(ii) $P(x \geq 15)$

$= (20-15)(f(x))$

$= (5)(\frac{1}{6})$

$= \frac{5}{6}$

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5.(a) (a) binomial random variable.

(b) $P = {}^{12}C_4 (0.6)^4 (0.4)^{12-4}$ $p = 0.6$ (laptop), $q = 0.4$ (desktop)
$= 0.04204$

(c) $P(X=4) + P(X=5) + P(X=6) + P(X=7)$
$= ({}^{12}C_4 \times (0.6)^4 \times (0.4)^8) + ({}^{12}C_5 \times (0.6)^5 \times (0.4)^7)$
$({}^{12}C_6 \times (0.6)^6 \times (0.4)^6) + ({}^{12}C_7 \times 0.6^7 \times 0.4^5)$
$= 0.5465$

(d) $P(X = 10 \text{ laptop}) = P(X=10)$ $p = 0.6$ (laptop), $q = 0.4$ (destop)
$= ({}^{12}C_{10}) \times (0.6)^{10} \times (0.4)^2$
$= 0.06385$

(b) (a) x representing the amount of account that are audited before an account in error is faced

(b) $P(X=5) = (1-p)^{n-1}(p)$
$= (1-0.03)^{5-1}(0.03)$
$= (0.97)^4(0.03)$
$= 0.0266$

(c) $P(x \leq 5) = P(x=1) + P(x=2) + P(X=3) + P(X=4) + P(X=5)$
$= (1-0.03)^{1-1}(0.03) + (1-0.03)^{2-1}(0.03)$
$+ (1-0.03)^{3-1}(0.03) + (1-0.03)^{4-1}(0.03)$
$+ (1-0.03)^{4-1}(0.03)$
$= 0.03 + 0.0291 + 0.0282 + 0.0274 + 0.0266$
$= 0.1413.$

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6. Mean = 20 , $\sigma = 2$

(a) $P(x \geq 24) = P\left(Z \geq \frac{24-20}{2}\right)$

$= P(Z \geq 2)$

$= 0.0228$

(b) $P(x \geq 27) = P\left(Z \geq \frac{27-20}{2}\right)$

$= P(Z \geq 3.5)$

$= 0.00023$