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PSDA ASSIGNMENT 2.

## Question 1

a)  $n = 18$

$P = 0.9$

$q = 1 - 0.9$

$= 0.1$

$P(X = 18) = {}^{18}C_{18} \, (0.9)^{18} \, (0.1)^{0}$

$= 0.1501$

b)  $n = 20$

$P = 0.2$

$q = 1 - 0.2$

$= 0.8$

i)  $\mu = np$

$= 20 \, (0.2)$

$= 4$

ii)  $\sigma^2 = npq$

$= 20 \, (0.2)(0.8)$

$= 3.2$

c)  hits target $95\% = P$

miss target $5\% = q$

$P = 0.95$

$q = 1 - 0.95$

$= 0.05$

$P(X = 15) = (0.95)^{15-1} \times (0.05)$

$= 0.0244$

## Question 2

a) Total $= 60 + 150 + 300 + 580 + 678 + 1288 + 1378$

$= 4434$

$$P(50 \leqslant x \leqslant 59) = \frac{580}{4434}$$

$$= 0.1308$$

b) $P(x < 50) = \dfrac{60}{4434} + \dfrac{150}{4434} + \dfrac{300}{4434}$

$$= 0.1150$$

c) $P(40 \leqslant x \leqslant 69) = \dfrac{300}{4434} + \dfrac{580}{4434} + \dfrac{678}{4434}$

$$= 0.3514$$

d) $P(x \geqslant 70) = \dfrac{1288}{4434} + \dfrac{1378}{4434}$

$$= 0.6013$$

## Question 3

$n = 10$

$P = \dfrac{3}{5}$ $\qquad q = 1 - 0.6$

$\qquad\qquad = 0.6$ $\qquad\qquad = 0.4$

a)

$P(x = 6) = {}^{10}C_6 \, (0.6)^6 \, (0.4)^{10-6}$

$\qquad\qquad = 0.2508$

b) $P(x < 9) = 1 - P(x = 9) - P(x = 10)$

$\qquad\qquad = 1 - \left[ {}^{10}C_9 \, (0.6)^9 \, (0.4)^1 \right] - \left[ {}^{10}C_{10} \, (0.6)^{10} \, (0.4)^0 \right]$

$\qquad\qquad = 1 - 0.0403 - (6.0466 \times 10^{-3})$

$\qquad\qquad = 0.9537$

c) $P(x = 4) = (1 - 0.6)^{4-1} \times (0.6)$

$\qquad\qquad = 0.0384$

# Question 4

## a)

### i)
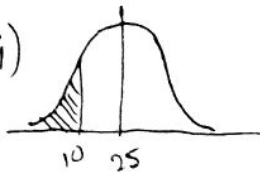
$\mu = 25$    $X \sim N(25, 6)$     $Z = \dfrac{X - \mu}{\sigma}$
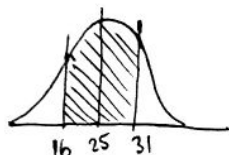
$\sigma = 6$    $x = 10$

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

$$= P(Z < -2.5) \quad \text{From table/using calculator}$$

$$= 0.00621 \times 100$$

$$= 0.621\%$$

### ii)

$$P(X < 31) - P(X < 16) \qquad Z = \frac{X - \mu}{\sigma}$$

$$= P\left(Z < \left(\frac{31 - 25}{6}\right)\right) - P\left(Z < \left(\frac{16 - 25}{6}\right)\right)$$

$$= P(Z < 1) - P(Z < -1.5) \quad \text{From table/using calculator}$$

$$= 0.8413 \quad - \quad 0.0668$$

$$= 0.7745 \times 100$$

$$= 77.45\%$$

### iii)

$P(X > a) = 0.33 \qquad \dfrac{33}{100} = 0.33$

$P(Z > b) = P(Z > 0.44) \quad b = \dfrac{a - 25}{6}$

$P\left(Z > \dfrac{a - 25}{6}\right) \quad \underset{\text{Table}}{\overset{\text{From}}{\uparrow}}$

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

$$a = 27.64 \quad \text{is Aishah's score}$$

# Question 4

b)

i) interval from 14 to 20

$$\frac{1}{b-a} = \frac{1}{20-14}$$

$$= \frac{1}{6}$$

$$f(x) = \begin{cases} \frac{1}{b-a} & , \quad a \leq x \leq b \\ 0 & , \quad \text{otherwise} \end{cases}$$

$$f(x) = \begin{cases} \frac{1}{6} & , \quad 14 \leq x \leq 20 \\ 0 & , \quad \text{otherwise} \end{cases}$$

ii) $P(x \geq 15)$

$$\int_{15}^{20} f(x)\, dx = \int_{15}^{20} \frac{1}{6}\, dx$$

$$= \left[ \frac{1}{6} x \right]_{15}^{20}$$

$$= \left[ \frac{1}{6}(20) - \frac{1}{6}(15) \right]$$

$$= \frac{5}{6}$$

a)

a) X is a binomial random variables because there is fixed number that trials given.

b) $n = 12$ customer
$P = 0.6$ laptop
$q = 1 - 0.6$
$= 0.4$ desktop

$P(x = 4) = {}^{12}C_4 (0.6)^4 \times (0.4)^{12-4}$
$= 0.0420.$

c) $P(4 \leqslant x \leqslant 7) = P(x=4) + P(x=5) + P(x=6) + P(x=7)$

$P(x = 4) = {}^{12}C_4 (0.6)^4 \times (0.4)^{12-4}$
$= 0.0420$

$P(x = 5) = {}^{12}C_5 (0.6)^5 \times (0.4)^{12-5}$
$= 0.1009$

$P(x = 6) = {}^{12}C_6 (0.6)^6 \times (0.4)^{12-6}$
$= 0.1766$

$P(x = 7) = {}^{12}C_7 (0.6)^7 \times (0.4)^{12-7}$
$= 0.2270$

$P(4 \leqslant x \leqslant 7) = 0.0420 + 0.1009 + 0.1766 + 0.2270$
$= 0.5465$ #

d) $P(x = 2) = {}^{12}C_2 (0.4)^2 (0.6)^{10} = 0.06385$ #

## Question 5

a) d) $P(X=2) = {}^{12}C_2 (0.4)^2 \times (0.6)^{10}$

$$= 0.06385$$

b)

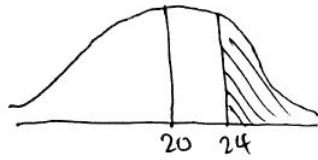a) X represents number of accounts in a large company accounting population

b) $P(X=5) = (1-p)^{n-1}(p)$        $p = 3\%$

              $= 0.03$ in error

          $= (1-0.03)^{5-1} \times (0.03)$      $q = 1- 0.03$

          $= 0.0266$                  $= 0.97$ not error

c) $P(X <= 5) = P(x=1) + P(x=2) + P(x=3) + P(x=4) + P(x=5)$

$$= \left((0.97)^0 (0.03)\right) + \left((0.97)^1 (0.03)\right) + \left((0.97)^2 (0.03)\right) + \left((0.97)^3 (0.03)\right)$$

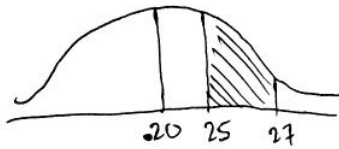$$+ \left((0.97)^4 (0.03)\right)$$

$$= 0.1413$$

## Question 6

a)   $X \sim N(20, 2)$



$Z = \dfrac{X - \mu}{\sigma}$

$$P(X \geqslant 24) = P\left(z \geqslant \left(\frac{24 - 20}{2}\right)\right)$$

$$= P(z \geqslant 2)$$

$$= 0.02275$$

b)



$Z = \dfrac{X - \mu}{\sigma}$

$$= P(25 \leqslant X \leqslant 27)$$

$$= P(X \geqslant 25) - P(X \geqslant 27)$$

$$= P\left(z \geqslant \left(\frac{25 - 20}{2}\right)\right) - P\left(z \geqslant \left(\frac{27 - 20}{2}\right)\right)$$

$$= P(z \geqslant 2.5) - P(z \geqslant 3.5)$$

$$= 0.00621 - 0.00023$$

$$= 0.00598$$