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No:

PSDA (Assignment 2)

1) (a) $n=18,\ p=90\%=0.9,\ x=18$

$p(x=18) = {}^{18}C_{18}(0.9)^{18}(1-0.9)^{18-18}$

$= {}^{18}C_{18}(0.9)^{18}(0.1)^{0}$

$\therefore\ p(x=18) = 0.1501$

(b) $n=20,\ p=0.2,\ q=1-p=1-0.2=0.8$

i) Mean, $\bar{x}=np=20(0.2)=4$

ii) Variance $=npq=20(0.2)(0.8)=3.2$

(c) $p(\text{hit target})=95\%=0.95$

$p(\text{miss})=1-0.95=0.05$

$p(x=15)=(1-0.05)^{15-1}(0.05)$

$=(0.95)^{14}(0.05)$

$\therefore\ p(x=15)=0.0244$

2) Total patients, $n=60+150+300+580+678+1288+1378=4434$

(a) $P(50\leq x\leq 59)$

$=\frac{580}{4434}$

$=0.1308$

(b) $P(x<50)$

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

$=\frac{510}{4434}$

$=0.1150$

(c) $P(40\leq x\leq 69)$

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

$=\frac{1558}{4434}$

$=0.3514$

(d) $P(x\geq 70)$

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

$=\frac{2666}{4434}$

$=0.6013$

3) $n=10,\ p=\frac{3}{5}=0.6$

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

$={}^{10}C_6(0.6)^6(0.4)^4$

$\therefore P(X=6)=0.2508$

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

$P(X=9)={}^{10}C_9(0.6)^9(0.4)^1=0.0403$

$P(X=10)={}^{10}C_{10}(0.6)^{10}(0.4)^0=0.0060$

$\therefore P(X<9)=1-0.0403-0.0060$

$P(X<9)=0.9537$

(c) Geometric distribution used.

$P(X=4)=(1-0.6)^{4-1}(0.6)$

$=(0.4)^3(0.6)$

$\therefore P(X=4)=0.0384$

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

i) $P(X<10)=P(z<\frac{X-\mu}{\sigma})$

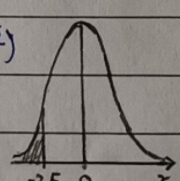
$=P(z<\frac{10-25}{6})$

$=P(z<-2.5)$

$=P(z>2.5)$

$=0.5-0.4938$

$\therefore\ P(X<10)=0.0062\approx 0.62\%$



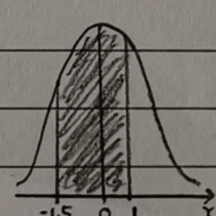
ii) $P(16<X<31)$

$=P(\frac{16-25}{6}<z<\frac{31-25}{6})$

$=P(-1.5<z<1)$

$=0.4332+0.3413$

$\therefore\ P(16<X<31)=0.7745\approx 77.45\%$



iii) $P(X>x)=33\%=0.33$

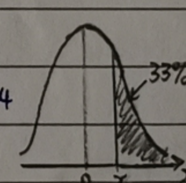
$0.5-0.33=0.17$

For area 0.17, $z=0.44$

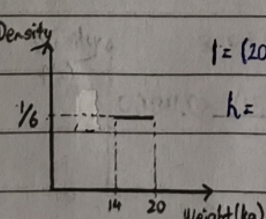
$P(z>0.44)=0.33$

$\frac{X-\mu}{\sigma}=\frac{X-25}{6}=0.44$

$\therefore$ Aishah's score, $X=0.44(6)+25=27.64$



(b) i)



$1=(20-14)h$

$h=1/6$

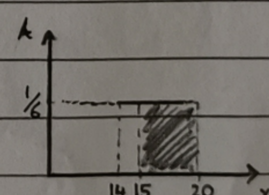
$f(x)=\begin{cases} 1/6, & 14<x<20 \\ 0, & \text{otherwise} \end{cases}$

ii) $P(X\geq 15)=\text{Area}$

$=1/6\,(20-15)$

$=5/6$

$\therefore\ P(X\geq 15)=0.8333$



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5) (a) a. x is a binomial random variable, each trial results in one of two mutually exclusive outcomes, which are laptops or desktop models.

b. $n=12$, $p=60\% = 0.6$

$P(X=4) = {}^{12}C_4(0.6)^4(1-0.6)^{12-4}$

$= {}^{12}C_4(0.6)^4(0.4)^8$

$\therefore P(X=4) = 0.0420$

c. $P(4 \leq X \leq 7) = P(X=4)+P(X=5)+P(X=6)+P(X=7)$

From b, $P(X=4) = 0.0420$

$P(X=5) = {}^{12}C_5(0.6)^5(0.4)^7 = 0.1009$

$P(X=6) = {}^{12}C_6(0.6)^6(0.4)^6 = 0.1766$

$P(X=7) = {}^{12}C_7(0.6)^7(0.4)^5 = 0.2270$

$\therefore P(4 \leq X \leq 7) = 0.0420+0.1009+0.1766+0.2270$

$= 0.5465$

d. $n=12$, $p=40\% = 0.4$

$P(x=2) = {}^{12}C_2(0.4)^2(1-0.4)^{12-2}$

$= {}^{12}C_2(0.4)^2(0.6)^{10}$

$\therefore P(x=2) = 0.0639$

(b) a. x represents geometry random variable, each trial results in one of two possible outcomes, in error or no error.

b. $x=6$, $p=3\% = 0.03$

$P(x=6) = (1-0.03)^{6-1}(0.03)$

$= (0.97)^5(0.03)$

$\therefore P(x=6) = 0.0258$

c. $P(x \leq 5) = P(x=1)+P(x=2)+P(x=3)$
$+P(x=4)+P(x=5)$

$P(x=1) = (0.97)^0(0.03) = 0.0300$

$P(x=2) = (0.97)^1(0.03) = 0.0291$

$P(x=3) = (0.97)^2(0.03) = 0.0282$

$P(x=4) = (0.97)^3(0.03) = 0.0274$

$P(x=5) = (0.97)^4(0.03) = 0.0266$

$\therefore P(x \leq 5) = 0.03+0.0291+0.0282$
$+0.0274+0.0266$

$P(x \leq 5) = 0.1413$

6) (a) $\mu=20$, $\sigma=2$,

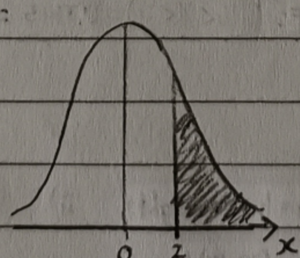
$P(X \geq 24) = P(z \geq \frac{X-\mu}{\sigma})$

$= P(z \geq \frac{24-20}{2})$

$= P(z \geq 2)$

$= 0.5 - 0.4772$

$\therefore P(X \geq 24) = 0.0228$



(b) $P(25 \leq X \leq 27)$

$= P(\frac{25-20}{2} \leq z \leq \frac{27-20}{2})$

$= P(2.5 \leq z \leq 3.5)$

$= 0.4998 - 0.4938$

$\therefore P(25 \leq X \leq 27) = 0.0060$