1. Marks of set of students for a certain subject are approximately normally distributed with mean 62 and variance 9. If 4 students are randomly selected what is probability that 3 of them have less than 60 marks.

Let X represent the marks obtained

$\mu = 62 \quad \sigma^2 = 9 \Rightarrow \sigma = 3$

$X \sim N(\mu, \sigma^2)$

$Z \sim N(0,1)$

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$z = \frac{X-\mu}{\sigma} = \frac{X-62}{3}$

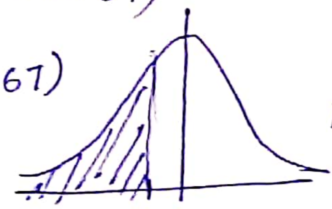
$z_1 = \frac{60-62}{3} = -\frac{2}{3}$

$p = P(X<60) = P(Z<-\frac{2}{3})$

$= P(Z<-0.67)$

$= 0.5 - P(0<z<0.67)$

$= 0.5 - 0.2486$



$-0.67$

$p = 0.2514$ —— (1)

∴ For 3 students out of 4 have <60 is of binomial distribution:

$n=4 \quad x=3 \quad p=0.2514 \quad q=1-p$

${}^4C_3 p^3 q^1 = 0.0475$ is required ans

2. The amount of time a postal clerk spends with his customers is known an exponential distribution with an avg amount of time equal to 4 minutes. Find the probility that clerk spends 4 to 5 minutes with randomly selected customer.

Let x be the time spend

$X \sim E(\beta)$

$\frac{1}{\beta} = \frac{1}{Mean} = \frac{1}{4} \qquad \beta = 4$

$f(x) = \begin{cases} \frac{1}{\beta} e^{-x/\beta} & x \geq 0 \\ 0 & x<0 \end{cases}$

$\therefore P(4<X<5) = \int_4^5 0.25\, e^{-x/0.25}\, dx$

$= 0.25 \left[e^{-x/0.25}\right]_4^5 \cdot -0.25$

$= -0.0625\left[e^{-5/0.25} - e^{-4/0.25}\right]$

$= -0.0625\left[e^{-20} - e^{-16}\right]$

$= 0.0625\left[e^{-16} - e^{-20}\right]$

$= 0.25 \cdot -4 \left[e^{-5/4} - e^{-1}\right] = 0.08137$

3. On the average a certain computer part last ten year. The length of time the computer part last is exponentially distributed. What is the probability that a computer part lasts more than 7

Let X be the years lasts by computer

Mean = 10 yrs = $\beta$

$X \sim E(\beta)$

$f(x) = \begin{cases} \frac{1}{\beta} e^{-x/\beta}, & x \geq 0 \\ 0, & x<0 \end{cases}$

$P(X \geq 7) = \int_7^\infty \frac{1}{\beta} e^{-x/\beta}\, dx$

$= \frac{1}{\beta} \int_7^\infty e^{-x/\beta}\, dx$

$= \frac{1}{10} \cdot -10 \cdot \left[e^{-x/10}\right]_7^\infty$

$= e^{-7/10} = 0.4966$