On average, it is found that 5% of AirPods made on a production line are faulty.

a) Find the probability that in a random sample of 10, there are

i) No faulty AirPods

ii) more than one faulty set of AirPods

b) A sample of ***n*** sets of AirPods is taken from the production line. If the probability that there is at least one faulty AirPod is **more than 75%,** find the smallest possible value of ***n***

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a) This is a Binomial Distribution. Let ***X*** be the number of faulty sets of AirPods

$X \sim B(10, 0.05)$

i) $P(X = 0) = 0.95^{10} \approx \mathbf{0.599}$

ii) 0 1 2 3 4 5 6 7 8 9 10

$P(X > 1) = P(X \geq 2) \approx \mathbf{0.0861}$

Use BinomialCDF:

Lower = 2

Upper = 10

Number of Trials = 10

P = 0.05

b) $X \sim B(\boldsymbol{n}, 0.05)$

0 1 2 3 4 5 6 ...

$P(X \geq 1) > 75\%$

$1 - P(X = 0) > 0.75$

$P(X = 0) < 0.25$

$0.95^n < 0.25$

We can solve by trial and error or using the table function of our graphical calculator $0.95^{26} \approx 0.264$ $0.95^{27} \approx 0.250$ $0.95^{28} \approx 0.238$ Hence $\boldsymbol{n = 28}$	We can use logs to solve $0.95^n = 0.25$ $\log(0.95^n) = log0.25$ $nlog0.95 = log0.25$ $n = \frac{log0.25}{log0.95}$ $n \approx 27.03$ *It is tempting to round this number down. Checking this answer like we have done on the left shows that n=28 is the first number that takes this probability under 25%* $\boldsymbol{n = 28}$