The flight time from Tokyo to Hong Kong is a normal random variable with a mean of 4 hours and a standard deviation of half an hour. The flight is cancelled with probability 10%. Given that the flight hasn't arrived in 5 hours what is the probability it was cancelled?

Here are some values of the CDF for a Normal$(0, 1)$ random variable N:

$n:$	-3	-2	-1	0
$\mathrm{P}(N \leq n):$	0.0013	0.0228	0.1587	0.5

Solution: Let T be the waiting time for the flight and C be the event it was cancelled. The probability that $T > 5$ given C^c (not cancelled) is the probability that a normal random variable exceeds two standard deviations above its mean, that is $\mathrm{P}(N > 2) = \mathrm{P}(N < -2) \approx 0.0228$. By Bayes' rule

$$\mathrm{P}(C|T > 5) = \frac{\mathrm{P}(T > 5|C)\,\mathrm{P}(C)}{\mathrm{P}(T > 5|C)\,\mathrm{P}(C) + \mathrm{P}(T > 5|C^c)\,\mathrm{P}(C^c)} \approx \frac{1 \cdot 0.1}{1 \cdot 0.1 + 0.0228 \cdot 0.9} \approx 0.830.$$