Qn:You purchase a certain product. The manual states that the lifetime T of the product, defined as the amount of time (in years) the product works properly until it breaks down, satisfies

P(T≥t)=exp(-t/5), for all t≥0.P(T≥t)=exp(−t/5), for all t≥0.

For example, the probability that the product lasts more than (or equal to) 2 years isP(T≥2)=exp(-⅖)=0.6703. I purchase the product and use it for two years without any problems. What is the probability that it breaks down in the third year?

Sol:

Let A be the event that a purchased product breaks down in the third year. Also, let B be the event that a purchased product does not break down in the first two years. We are interested in P(A|B). We have

|  |  |
| --- | --- |
| P(B) | =P(T≥2) |
|  | =exp(-⅖). |

We also have

|  |  |
| --- | --- |
| P(A) | =P(2≤T<3) |
|  | =P(T≥2)−P(T≥3) |
|  | =exp(-⅖)−exp(-⅗) |

Finally, since A⊂B, we have A∩B=A. Therefore,

|  |  |
| --- | --- |
| P(A|B) | =P(A∩B)/P(B) |
|  | =P(A)/P(B) |
|  | =[exp(-⅖)−exp(-⅗)]/exp(- ⅖). |
|  | =0.1813=0.1813 |