

# a/s/m


---

*Actuarial Study Materials*

Learning Made Easier

## **Flashcards for SOA Exam C**

5th Edition, Second Printing



©Copyright 2018 by Actuarial Study Materials (A.S.M.),  
PO Box 69, Greenland, NH 03840. All rights reserved.  
Reproduction in whole or in part without express written  
permission from the publisher is strictly prohibited.

**Table 3:** Rating system

★★★★★	Essential—appears repeatedly on every exam
★★★★	Important—appears on every exam
★★★	Average importance—regularly appears on exams
★★	Not so important—appears occasionally on exams, or easy to derive as needed
★	Obscure—on syllabus, but unlikely to appear on exam. Sometimes this indicates a formula not covered by all the reading options. No released exam uses this formula or concept, and students have never reported a question from an unreleased exam requiring this formula or concept.





*Definition of  $S(x)$*



$$S(x) = \Pr(X > x)$$



*Two general formulas for  $H(x)$*



$$H(x) = \int_{-\infty}^x h(t)dt = -\ln S(x)$$



*Two general formulas for  $h(x)$*





$$h(x) = \frac{f(x)}{S(x)} = -\frac{d \ln S(x)}{dx}$$



*Formula for third central moment in terms of  
third raw moment*



$$\mu_3 = \mu'_3 - 3\mu'_2\mu + 2\mu^3$$



*Formula for second central moment in terms of  
second raw moment*

Probability Review



$$\sigma^2 = \mu'_2 - \mu^2$$



$\mathbf{E}[X^k]$  in terms of  $S(x)$ , assuming  
 $\Pr(X < 0) = 0$

$$\mathbf{E}[X^k] = \int_0^{\infty} kx^{k-1}S(x)dx$$



$\mathbf{E}[X]$  *in terms of*  $S(x)$ , *assuming*  
 $\Pr(X < 0) = 0$





$$\mathbf{E}[X] = \int_0^{\infty} S(x)dx$$



$\mathbf{E}[(X \wedge u)^k]$  expressed in terms of an integral  
with  $f(x)$ , assuming  $\Pr(X < 0) = 0$

$$\mathbf{E} [(X \wedge u)^k] = \int_0^u x^k f(x) dx + u^k (1 - F(u))$$



$\mathbf{E}[X \wedge u]$  expressed in terms of an integral  
with  $f(x)$ , assuming  $\Pr(X < 0) = 0$



$$\mathbf{E}[X \wedge u] = \int_0^u x f(x) dx + u(1 - F(u))$$



$\mathbf{E}[(X \wedge u)^k]$  in terms of  $S(x)$ , assuming  
 $\Pr(X < 0) = 0$



$$\mathbf{E} [(X \wedge u)^k] = \int_0^u kx^{k-1}S(x)dx$$



## *Definition of truncation*





*A **truncated** observation is one that is conditional on the random variable not being in the truncated range.*



## *Definition of censoring*



*A **censored** observation is one that is known to be in the censored range, but whose exact value is not known.*



## *Kaplan-Meier Product Limit Estimator*



$$S_n(t) = \prod_{i=1}^{j-1} \left(1 - \frac{S_i}{r_i}\right), \quad y_{j-1} \leq t < y_j$$



*Recursive version of product limit estimator*

$$S_n(\mathbf{y}_j) = S_n(\mathbf{y}_{j-1}) \left(1 - \frac{s_j}{r_j}\right)$$



*Formula for exponential extrapolation of  
product limit estimator*





$$S_n(t) = S_n(u)^{t/u}$$

*where  $u$  is the ending time of the study and  $t > u$*