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POMOCNICZE WZORY

$$i = \left(1 + \frac{i^{(m)}}{m}\right)^m - 1,$$

$$k(t) = k(0)\mathrm{e}^{\delta t}, \quad \text{gdzie } \delta = \log(1+i)$$

$$d = \frac{i}{i+1}$$

$$d^{(m)} = \frac{i^{(m)}}{1 + \frac{i^{(m)}}{m}}$$

- $$\ddot{a}_{\overline{\infty}|} = \frac{1}{d}.$$
- $$a_{\overline{\infty}|} = \frac{1}{i}.$$
- $$\ddot{a}^{(m)}_{\overline{\infty}|} = \frac{1}{d^{(m)}}$$
- $$a^{(m)}_{\overline{\infty}|} = \frac{1}{i^{(m)}}$$
- $$(I\ddot{a})_{\overline{\infty}|} = \frac{1}{d^2}$$
- $$(Ia)_{\overline{\infty}|} = \frac{1}{id}.$$
- $$\ddot{a}_{\overline{n}|} = \frac{1-v^n}{d};$$
- $$a_{\overline{n}|} = \frac{1-v^n}{i};$$
- $$\ddot{a}^{(m)}_{\overline{n}|} = \frac{1-v^n}{d^{(m)}};$$
- $$a^{(m)}_{\overline{n}|} = \frac{1-v^n}{i^{(m)}}$$

$$\bar{a}_{\overline{\infty}|} = \frac{1}{\delta}.$$

$$\bar{a}_{\overline{n}|} = \frac{1}{\delta}(1 - \mathrm{e}^{-\delta n}).$$

$$_{s|t}q_x = {}_{s+t}q_x - {}_sq_x = {}_sp_x - {}_{s+t}p_x;$$

$$_tp_{[x]+s} = \frac{_{s+t}p_x}{_sp_x},$$

$$_tq_{[x]+s} = \frac{_{s|t}q_x}{_sp_x}$$

$$_{s+t}p_x = {}_sp_x \, {}_tp_{[x]+s}$$

$$_{s|t}q_x = {}_sp_x \, {}_tq_{[x]+s},$$

$$_kp_x = p_x \prod_{i=1}^{k-1} p_{[x]+i}.$$

$$\mathring{e}_x = \int_0^\infty {}_tp_x dt.$$

$$\mu_{[x]+t} = \frac{f_x(t)}{1 - F_x(t)} = -\frac{1}{_tp_x}\frac{d(_tp_x)}{dt}$$

$$\mathrm{P}(K_x = k) = {}_{k|1}q_x$$

$$e_x = \sum_{k=1}^{\infty} {}_kp_x.$$

- Rozkład de Moivre'a

$$\mu_t = \frac{1}{\omega - t}, \quad 0 \leqslant t \leqslant \omega.$$

- Rozkład Gompertza

$$\mu_t = Bc^t, \quad t > 0, \quad \text{gdzie } B > 0 \text{ i } c > 1.$$

- Rozkład Makehama

$$\mu_t = A + Bc^t, \quad t > 0, \quad \text{gdzie } B > 0 \text{ i } c > 1 \text{ oraz } A \geqslant -B.$$

- Rozkład Weibulla

$$\mu_t = kt^n, \quad t \geqslant 0, \quad \text{gdzie } k > 0,\ n > 0.$$

HJP

$$ {}_tp_x = \frac{{}_{x+t}p_0}{{}_xp_0} $$

$$ {}_tp_{[x]+u} = {}_tp_{x+u} \tag{*} $$

$$ \mu_{[x]+t} = \mu_{x+t}. \tag{**} $$

$$ {}_tp_x = \exp\left(-\int_x^{x+t} \mu_u du\right) $$

HA

$$ {}_kp_x = \frac{{}_{x+k}p_0}{{}_xp_0} $$

$$ p_{[x]+k} = p_{x+k} $$

$$ {}_kp_x = p_x p_{x+1} \dots p_{x+k-1}. $$

HU

$$ {}_{n+u}p_x = (1-u)_np_x + u \cdot {}_{n+1}p_x, \quad 0 \leqslant u < 1,\ n = 0, 1, 2, \dots . $$

$$ {}_up_x = 1 - uq_x, \quad {}_uq_x = uq_x. $$

HCFM

$$ \mu_{[x]+n+u} = \mu_{[x]+n}, \quad 0 \leqslant u < 1. $$

$$ \mu_{[x]+n+u} = \mu_{[x]+n} = -\log p_{[x]+n}, \quad 0 \leqslant u < 1,\ n = 0, 1, 2, \dots . $$

$$ {}_up_x = (p_x)^u, \quad {}_uq_x = 1 - (p_x)^u. $$

HB

$$ {}_{1-u}q_{[x]+n+u} = (1-u)q_{[x]+n}, \quad 0 \leqslant u < 1,\ n = 0, 1, 2, \dots . $$

$$ {}_up_x = \frac{p_x}{u + (1-u)p_x}, \quad {}_uq_x = \frac{uq_x}{u + (1-u)p_x}. $$