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Water Demand and Quantity Formulas

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List of 31 Water Demand and Quantity Formulas

Water Demand and Quantity

Determination of Population For Inter Censal and Post Censal Years

1) Constant Factor given Population at Last Census

Open Calculator

fx $$K_A = \frac{P_L - P_E}{T_L - T_E}$$

ex $$1.99 = \frac{20.01 - 22}{19 - 20}$$

2) Earlier Census Date given Constant Factor

Open Calculator

fx $$T_E = T_L - \left(\frac{P_L - P_E}{K_A}\right)$$

ex $$19.995 = 19 - \left(\frac{20.01 - 22}{2}\right)$$

3) Earlier Census Date given Proportionality Factor

Open Calculator

fx $$T_E = T_L - \left(\frac{\log(P_L, e) - \log(P_E, e)}{K_G} \right)$$

ex $$18.65876 = 19 - \left(\frac{\log(20.01, e) - \log(22, e)}{0.03} \right)$$

4) Last Census Date given Constant Factor

Open Calculator

fx $$T_L = T_E + \left(\frac{P_L - P_E}{K_A} \right)$$

ex $$19.005 = 20 + \left(\frac{20.01 - 22}{2} \right)$$

5) Last Census Date given Proportionality Factor

Open Calculator

fx $$T_L = T_E + \left(\frac{\log(P_L, e) - \log(P_E, e)}{K_G} \right)$$

ex $$20.34124 = 20 + \left(\frac{\log(20.01, e) - \log(22, e)}{0.03} \right)$$

6) Population at Earlier Census

Open Calculator

fx $$P_E = P_L - K_A \cdot (T_L - T_E)$$

ex $$22.01 = 20.01 - 2 \cdot (19 - 20)$$

7) Population at Last Census

Open Calculator

fx $$P_L = P_E + K_A \cdot (T_L - T_E)$$

ex $$20 = 22 + 2 \cdot (19 - 20)$$

8) Population at Last Census given Proportionality Factor

Open Calculator

fx $$P_L = \exp((T_L - T_E) \cdot K_G + \log 10(P_E))$$

ex $$3.715163 = \exp((19 - 20) \cdot 0.03 + \log 10(22))$$

9) Proportionality Factor given Population at Last Census

Open Calculator

fx $$K_G = \frac{\log 10(P_L) - \log 10(P_E)}{T_L - T_E}$$

ex $$0.041176 = \frac{\log 10(20.01) - \log 10(22)}{19 - 20}$$

Arithmetic Increase Method

Inter Censal Period

10) Constant Factor for Inter Censal Period

Open Calculator

fx $$K_A = \frac{P_M - P_E}{T_M - T_E}$$

ex $$2 = \frac{40 - 22}{29 - 20}$$

11) Earlier Census Date for Inter Censal Period

Open Calculator

fx $$T_E = T_M - \left(\frac{P_M - P_E}{K_A}\right)$$

ex $$20 = 29 - \left(\frac{40 - 22}{2}\right)$$

12) Mid Year Census Date for Inter Censal Period

Open Calculator

fx $$T_M = \left(\frac{P_M - P_E}{K_A}\right) + T_E$$

ex $$29 = \left(\frac{40 - 22}{2}\right) + 20$$

13) Population at Earlier Census for Inter Censal Period

Open Calculator

fx $$P_E = P_M - K_A \cdot (T_M - T_E)$$

ex $$22 = 40 - 2 \cdot (29 - 20)$$

14) Population at Mid Year

Open Calculator

fx $$P_M = P_E + K_A \cdot (T_M - T_E)$$

ex $$40 = 22 + 2 \cdot (29 - 20)$$

Post Censal Period

15) Constant Factor for Post Censal Period

Open Calculator

fx $$K_A = \frac{P_M - P_L}{T_M - T_L}$$

ex $$1.999 = \frac{40 - 20.01}{29 - 19}$$

16) Last Census Date for Post Censal Period

Open Calculator

fx $$T_L = T_M - \left(\frac{P_M - P_L}{K_A}\right)$$

ex $$19.005 = 29 - \left(\frac{40 - 20.01}{2}\right)$$

17) Mid Year Census Date for Post Censal Period

Open Calculator

fx $$T_M = T_L + \left(\frac{P_M - P_L}{K_A}\right)$$

ex $$28.995 = 19 + \left(\frac{40 - 20.01}{2}\right)$$

18) Population at Last Census for Post Censal Period

Open Calculator

fx $$P_L = P_M - K_A \cdot (T_M - T_L)$$

ex $$20 = 40 - 2 \cdot (29 - 19)$$

19) Population at Mid Year for Post Censal Period

Open Calculator

fx $$P_M = P_L + K_A \cdot (T_M - T_L)$$

ex $$40.01 = 20.01 + 2 \cdot (29 - 19)$$

Geometric Increase Method

Inter Censal Period

20) Earlier Census Date for Geometric Increase Method

Open Calculator

fx $$T_E = T_M - \left(\frac{\log 10(P_M) - \log 10(P_E)}{K_G} \right)$$

ex $$20.34542 = 29 - \left(\frac{\log 10(40) - \log 10(22)}{0.03} \right)$$

21) Mid Year Census Date for Geometric Increase Method

Open Calculator

fx $$T_M = T_E + \left(\frac{\log 10(P_M) - \log 10(P_E)}{K_G} \right)$$

ex $$28.65458 = 20 + \left(\frac{\log 10(40) - \log 10(22)}{0.03} \right)$$

22) Population at Earlier Census for Geometric Increase Method

Open Calculator

fx $$P_E = \exp(\log 10(P_M) - K_G \cdot (T_M - T_E))$$

ex $$3.78884 = \exp(\log 10(40) - 0.03 \cdot (29 - 20))$$

23) Population at Mid Year for Geometric Increase Method

Open Calculator

$$P_M = \exp(\log 10(P_E) + K_G \cdot (T_M - T_E))$$

ex $$5.014946 = \exp(\log 10(22) + 0.03 \cdot (29 - 20))$$

24) Proportionality Factor for Geometric Increase Method

Open Calculator

$$K_G = \frac{\log 10(P_M) - \log 10(P_E)}{T_M - T_E}$$

ex $$0.028849 = \frac{\log 10(40) - \log 10(22)}{29 - 20}$$

Post Censal Period

25) Last Census Date for Geometric Increase Method Post Censal

Open Calculator

$$T_L = T_M - \left(\frac{\log 10(P_M) - \log 10(P_L)}{K_G}\right)$$

ex $$18.9729 = 29 - \left(\frac{\log 10(40) - \log 10(20.01)}{0.03}\right)$$

26) Mid Year Census Date for Geometric Increase Method Post Censal

Open Calculator

$$T_M = T_L + \left(\frac{\log 10(P_M) - \log 10(P_L)}{K_G}\right)$$

ex $$29.0271 = 19 + \left(\frac{\log 10(40) - \log 10(20.01)}{0.03}\right)$$

27) Population at Earlier Census given Proportionality Factor

Open Calculator

$$P_E = \exp(\log 10(P_L) - (T_L - T_E) \cdot K_G)$$

$$3.785762 = \exp(\log 10(20.01) - (19 - 20) \cdot 0.03)$$

28) Population at Last Census for Geometric Increase Method Post Censal

Open Calculator

$$P_L = \exp(\log 10(P_M) - K_G \cdot (T_M - T_L))$$

$$3.676863 = \exp(\log 10(40) - 0.03 \cdot (29 - 19))$$

29) Population at Mid Year for Geometric Increase Method Post Censal

Open Calculator

$$P_M = \exp(\log 10(P_L) + K_G \cdot (T_M - T_L))$$

$$4.959213 = \exp(\log 10(20.01) + 0.03 \cdot (29 - 19))$$

30) Proportionality Factor for Geometric Increase Method Post Censal

Open Calculator

$$K_G = \frac{\log 10(P_M) - \log 10(P_L)}{T_M - T_L}$$

$$0.030081 = \frac{\log 10(40) - \log 10(20.01)}{29 - 19}$$

Variation In Rate of Demand

31) Percentage of Annual Average Consumption by Goodrich Formula

Open Calculator

fx $$\mathrm{APR} = \left(180 \cdot (\mathrm{t})^{-0.10}\right)$$

ex $$142.9791 = \left(180 \cdot (10\mathrm{d})^{-0.10}\right)$$

Variables Used

- **APR** Annual Percentage Rate
- K_A Constant Factor
- K_G Proportionality Factor
- P_E Population at Earlier Census
- P_L Population at Last Census
- P_M Population at Mid Year Census
- **t** Time in days *(Day)*
- T_E Earlier Census Date
- T_L Last Census Date
- T_M Mid-Year Census Date

Constants, Functions, Measurements used

- Constant: **e**, 2.71828182845904523536028747135266249
  Napier's constant
- Function: **exp**, exp(Number)
  n an exponential function, the value of the function changes by a constant factor for every unit change in the independent variable.
- Function: **log**, log(Base, Number)
  Logarithmic function is an inverse function to exponentiation.
- Function: **log10**, log10(Number)
  The common logarithm, also known as the base-10 logarithm or the decimal logarithm, is a mathematical function that is the inverse of the exponential function.
- Measurement: **Time** in Day (d)
  Time Unit Conversion

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- Design of a Circular Settling Tank Formulas
- Design of a Plastic Media Trickling Filter Formulas
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- Design of an Aerated Grit Chamber Formulas
- Design of an Aerobic Digester Formulas
- Design of an Anaerobic Digester Formulas
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