# MATH METHODS WACE EXAM Cheat Sheet

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## Exponential Growth

population of bacteria is known to increase in size by 50% every 2 hours. There are 2000 bacteria in the population at 12 noon

i) the constant of proportionality correct to four decimal places

> k=0.5 t=2 a= 2000 : a= $2000e^{kt}$ : $3000=2000e^{2(k)}$: k= 0.2027

ii) the time when population will reach 8000

> a= $2000e^{0.2027t}$ : $8000=2000e^{0.2027t}$ : t= 6.84 : after 12 pm

## Binomial Distribution

E(X) = np

Var(X)= npq

## Binomial

Binomial experiment has 7 trials. prob. of successes is 0.4. what is the probability that:

X=3

> 0.2903 (BinPDF)

X is at least 3

> 0.58009 (BinCDF)

X is more than 5

> (go from 5.5)= 0.018842

## Rate of Change

ROC is modelled by d/dx= $-x^2+e^{0.4x}$, where A is the area, x is the time- days from June 1st. on june 1st there was 6000m infested

i) the ROC in area on June 5th. ie when x=4

> $-(4)^2 + e^{0.4(4)}$= -11.047 : 11m/sq

ii) the date when ROC is a minimum

> f(x)0= $2x+0.4e^{0.4x}$ solve: x=9.7 =10th June

iii) what is the total change in area infested between June 1st and June 12th inclusive

> integral from 0 to 12 of $-x^2 + e^{0.4x}$ = -274.7 thus decreases by 275 m/sq

iv) what is the total area infested by end of june 15th

> 6000 + integral from 0 to 15 of $-x^2 + e^{0.4x}$ = 5881.1 m/sq