Mathematical Methods (CAS)
Formulas

Mensuration

area of a trapezium: $\dfrac{1}{2}(a+b)h$

volume of a pyramid: $\dfrac{1}{3}Ah$

curved surface area of a cylinder: $2\pi rh$

volume of a sphere: $\dfrac{4}{3}\pi r^3$

volume of a cylinder: $\pi r^2 h$

area of a triangle: $\dfrac{1}{2}bc\sin A$

volume of a cone: $\dfrac{1}{3}\pi r^2 h$

Calculus

$$\frac{d}{dx}\left(x^n\right)=nx^{n-1}$$

$$\int x^n\,dx=\frac{1}{n+1}x^{n+1}+c, n\neq-1$$

$$\frac{d}{dx}\left(e^{ax}\right)=ae^{ax}$$

$$\int e^{ax}\,dx=\frac{1}{a}e^{ax}+c$$

$$\frac{d}{dx}\left(\log_e(x)\right)=\frac{1}{x}$$

$$\int \frac{1}{x}\,dx=\log_e|x|+c$$

$$\frac{d}{dx}\left(\sin(ax)\right)=a\,\cos(ax)$$

$$\int \sin(ax)\,dx=-\frac{1}{a}\cos(ax)+c$$

$$\frac{d}{dx}\left(\cos(ax)\right)=-a\,\sin(ax)$$

$$\int \cos(ax)\,dx=\frac{1}{a}\sin(ax)+c$$

$$\frac{d}{dx}\left(\tan(ax)\right)=\frac{a}{\cos^2(ax)}=a\,\sec^2(ax)$$

product rule: $\dfrac{d}{dx}(uv)=u\dfrac{dv}{dx}+v\dfrac{du}{dx}$

quotient rule: $\dfrac{d}{dx}\left(\dfrac{u}{v}\right)=\dfrac{v\dfrac{du}{dx}-u\dfrac{dv}{dx}}{v^2}$

chain rule: $\dfrac{dy}{dx}=\dfrac{dy}{du}\dfrac{du}{dx}$

approximation: $f(x+h)\approx f(x)+hf'(x)$

Probability

$\Pr(A)=1-\Pr(A')$

$\Pr(A\cup B)=\Pr(A)+\Pr(B)-\Pr(A\cap B)$

$\Pr(A|B)=\dfrac{\Pr(A\cap B)}{\Pr(B)}$

transition matrices: $S_n=T^n\times S_0$

mean: $\mu=E(X)$

variance: $\text{var}(X)=\sigma^2=E((X-\mu)^2)=E(X^2)-\mu^2$

Probability distribution		Mean	Variance
discrete	$\Pr(X=x)=p(x)$	$\mu=\sum x\,p(x)$	$\sigma^2=\sum(x-\mu)^2\,p(x)$
continuous	$\Pr(a<X<b)=\displaystyle\int_a^b f(x)dx$	$\mu=\displaystyle\int_{-\infty}^{\infty}x\,f(x)dx$	$\sigma^2=\displaystyle\int_{-\infty}^{\infty}(x-\mu)^2 f(x)dx$

END OF FORMULA SHEET