IBDP Mathematics
Analysis and approaches (SL)
Formula sheet

Prior learning

Area of a parallelogram	$A = bh$ b = base, h = height
Area of a triangle	$A = \frac{1}{2}bh$
Area of a trapezoid	$A = \frac{1}{2}(a + b)h$ a, b = parallel sides, h = height
Area of a circle	$A = \pi r^2$, r *is radius*
Circumference of a circle	$C = 2\pi r$, r *is radius*
Volume of a cuboid	$V = lwh$
Volume of a pyramid or cone	$V = \frac{1}{3}$ x base area x vertical height
Volume a cylinder	$V = \pi r^2 h$
Volume of a prism	$V = Ah$, where A is the area of cross-section, h is the height
Area of the curved surface of a cylinder	$A = 2\pi rh$
Two points distance	$d = \sqrt{(x_1 - x_2)^2 + (y_1 - y_2)^2}$
Midpoint	$\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right)$

Topic 2 Functions

Straight line gradient	$m = \frac{y_2 - y_1}{x_2 - x_1}$
Straight line equation	$y = mx + c$; $ax + by + d = 0$
Axis of symmetry	$f(x) = ax^2 + bx + c \rightarrow x = \frac{-b}{2a}$
Quadratic formula	$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$, $a \neq 0$
Discriminant	$\Delta = b^2 - 4ac$
Exponents and logarithms	$a^x = e^{x \ln a}$; $\log_a a^x = x = a^{\log_a x}$

Topic 1 Number and algebra

The nth term of A.S.	$u_n = u_1 + (n-1)d$
The sum of n terms of A.S.	$S_n = \frac{n}{2}(2u_1 + (n-1)d) = \frac{n}{2}(u_1 + u_n)$
The nth terms of G.S.	$u_n = u_1 r^{n-1}$
The sum of n terms of G.S.	$S_n = \frac{u_1(r^n - 1)}{r-1} = \frac{u_1(1-r^n)}{1-r}$, $r \neq 1$
The sum of an infinite G.S.	$S_\infty = \frac{u_1}{1-r}$, $\lvert r \rvert < 1$
Exponents and logarithms	$a^x = b \leftrightarrow x = \log_a b$
Logarithms	$\log_c a + \log_c b = \log_c ab$ $\log_c a - \log_c b = \log_c \frac{a}{b}$ $\log_c a^r = r\log_c a$ $\log_b a = \frac{\log_c a}{\log_c b}$
Binomial coefficient	$\binom{n}{r} = \frac{n!}{r!(n-r)!}$
Binomial theorem	$(a+b)^n = a^n + \binom{n}{1}a^{n-1}b + \binom{n}{r}a^{n-r}b^r + \cdots + b^n$
Compound interest	$FV = PV$ x $\left(1 + \frac{r}{100k}\right)^{kn}$, where FV= future value, PV = present value, n = number of years, k = number of compounding periods per year, $r\%$ = nominal annual rate interest

Topic 3 Geometry and trigonometry

Arc length	$l = r\theta$, where θ is in radians
Sector area	$A = \frac{1}{2}r^2\theta$, where θ is in radians
Cosine rule	$c^2 = a^2 + b^2 - 2ab\cos C$ $\cos C = \frac{a^2 + b^2 - c^2}{2ab}$
Sine rule	$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$
Area of a triangle	$A = \frac{1}{2}ab\sin C$
Surface area of a sphere	$A = 4\pi r^2$
Curved surface area of a cone	$A = \pi rl$, where l is the slant height
Volume of a sphere	$V = \frac{4}{3}\pi r^3$
Identity for $\tan\theta$	$\tan\theta = \frac{\sin\theta}{\cos\theta}$
Pythagorean identity	$\cos^2\theta + \sin^2\theta = 1$
Double angle identities	$\sin 2\theta = 2\sin\theta\cos\theta$ $\cos 2\theta = \cos^2\theta - \sin^2\theta$ $= 2\cos^2\theta - 1 = 1 - 2\sin^2\theta$

Topic 4 Statistics and probability		Topic 5 Calculus	
Mean of a set of data	$\bar{x} = \frac{\sum_{i=1}^{k} f_i x_i}{n}, where\ n \sum_{i=1}^{k} f_i$	**Derivative of x^n**	$f(x) = x^n \rightarrow f'(x) = nx^{n-1}$
Interquartile range	$IQR = Q_3 - Q_1$	**Derivative of $\sin x$**	$f(x) = \sin x \rightarrow f'(x) = \cos x$
Probability of an event *A*	$P(A) = \frac{n(A)}{n(U)}$	**Derivative of $\cos x$**	$f(x) = \cos x \rightarrow f'(x) = -\sin x$
Complementary events	$P(A) + P(A') = 1$	**Derivative of $\tan x$**	$f(x) = \tan x \rightarrow f'(x) = \frac{1}{cos^2 x}$
Combined events	$P(A \cup B) = P(A) + P(B) - P(A \cap B)$	**Derivative of e^x**	$f(x) = e^x \rightarrow f'(x) = e^x$
Mutually exclusive events	$P(A \cup B) = P(A) + P(B)$	**Derivative of $\ln x$**	$f(x) = \ln x \rightarrow f'(x) = \frac{1}{x}$
Conditional probability	$P(A\|B) = \frac{P(A \cap B)}{P(B)}$	**Chain rule**	$y = (f(x))^n$ $\rightarrow \frac{dy}{dx} = n(f(x))^{n-1} \times f'(x)$
Independent events	$P(A \cup B) = P(A)P(B)$	**Product rule**	$y = uv \rightarrow \frac{dy}{dx} = u\frac{dv}{dx} + v\frac{du}{dx}$
Expected value of a discrete random variable *X*	$E(X) = \sum xP(X = x)$	**Quotient rule**	$y = \frac{u}{v} \rightarrow \frac{dy}{dx} = \frac{v\frac{du}{dx} - u\frac{dv}{dx}}{v^2}$
Standardized normal variable	$z = \frac{x - \mu}{\sigma}$	**Velocity** **Acceleration**	$v = \frac{ds}{dt}$ $a = \frac{dv}{dt} = \frac{d^2s}{dt^2}$
Binomial distribution **Mean** **Variance**	$X \sim B(n, p)$ $\rightarrow P(X = r) = \binom{n}{r} p^r (1-p)^{n-r}$ $E(X) = np$ $Var(X) = np(1-p)$	**Standard integrals**	$\int x^n dx = \frac{x^{n+1}}{n+1} + C, n \neq 1$ $\int \frac{1}{x} dx = \lvert x \rvert + C$ $\int \sin x\, dx = -\cos x + C$ $\int \cos x\, dx = \sin x + C$ $\int e^x dx = e^x + C$
		Area under a curve between $x = a$ and $x = b$	$A = \int_a^b y\, dx$
		Distance travelled from t_1 to t_2	$Distance = \int_{t_1}^{t_2} \lvert v(t) \rvert\, dt$
		Displacement from t_1 to t_2	$Displacement = \int_{t_1}^{t_2} v(t)\, dt$