

'Everything You Need to Know' A Level – Edexcel – C2

$Var(X) = E(X^2) - (E(X))^2$
 $E(X) = \sum xP(X=x)$
 $S_n = \frac{n}{2}[2a + (n-1)d]$
 $A = \pi r^2$
 $\sec^2 x = 1 + \tan^2 x$
 $S_{xx} = \sum x^2 - \frac{(\sum x)^2}{n}$
 $y \approx \frac{h}{2}(y_0 + y_n + 2(y_1 + y_2 + \dots + y_{n-1}))$
 $uv - \int v \frac{du}{dx} dx$
 $u \frac{dv}{dx} + v \frac{du}{dx}$
 $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

Remainder Theorem: If $(x + 2)$ has a remainder of -14 put $f(-2)$ into the equation and it will equal -14. e.g. $f(x) = 2x^2 + x^2 + 3x + 4 = 2(-2)^3 + (-2)^2 + 3(-2) + 4 = -14$.

Factor Theorem: If $(x + 1)$ has remainder 0 then it is a **factor** and you can carry out long division e.g.

$$(x + 1) \sqrt{x^3 + 2x^2 + 3x + 2}$$

Binomial Expansion: Make sure it starts with a 1 e.g. for $(2 + x)^5 = 2^5(1 + \frac{x}{2})^5$ then use

$$(1 + x)^n = 1 + \frac{nx}{1!} + \frac{n(n-1)x^2}{2!} + \frac{n(n-1)(n-2)x^3}{3!} \text{ (in formula book) e.g.}$$

$$2^5 \left(1 + \frac{x}{2}\right)^5 = 2^5 \left(1 + 5\left(\frac{x}{2}\right) + \frac{5(4)}{2!}\left(\frac{x}{2}\right)^2 + \frac{5(4)(3)}{3!}\left(\frac{x}{2}\right)^3 \dots\right) = 32 + 80x + 80x^2 + 40x^3 \dots$$

If you are given for example $2^5(1.005)^5$ then this is simply $2^5(1 + 0.005)^5$ which means that in this case $\frac{x}{2} = 0.005$ and $x = 0.01$. Then just substitute this into the expansion.

Trapezium Rule: Simply fill in the formula. e.g. If you are given or have to calculate the following:

x	0	0.5	1	1.5	2	2.5	3
$y = \sqrt{2^x + 1}$	1.414	1.554	1.732	1.957	2.236	2.580	3

Then $h = 0.5 - 0$ or $1.5 - 1$ so 0.5. and the y values given here so $y \approx \frac{h}{2}\{y_0 + y_n + 2(y_1 + y_2 \dots y_{n-1})\}$ becomes $y \approx \frac{0.5}{2}\{1.414 + 3 + 2(1.554 + 1.732 + 1.957 + 2.236 + 2.580)\}$ etc.

Logarithms: Remember and use the following

1) $\log_a b + \log_a c = \log_a bc$

2) $\log_a b - \log_a c = \log_a \frac{b}{c}$

3) If $\log_b c = a$ then $c = b^a$

4) $\log_a b^c = c \log_a b$

5) $\log_a b = \frac{\log b}{\log a}$

Solving Equations: for example if $7^{2x} - 4(7^x) + 3 = 0$ then let $u = 7^x$ to get $7u^2 - 4u + 3 = 0$. Then solve the quadratic and sub back in and solve for x .

Geometric Series: Same as arithmetic sequence (C1) in terms of setting up equations (where a is the first term and r is the multiple difference between one term and the next. Note the addition of $S_\infty = \frac{a}{1-r}$ (also in formula book).

Trigonometry: Learn $\sin^2 x + \cos^2 x = 1$ and $\frac{\sin x}{\cos x} = \tan x$

e.g. $3\sin^2 x + 7\sin x = \cos^2 x - 4$ becomes $3\sin^2 x + 7\sin x = (1 - \sin^2 x) - 4$ then rearrange.

Plot graphs to find ALL values of x . For example if $\sin x = \frac{1}{2}$ then $x_1 = \sin^{-1}(\frac{1}{2})$ and $x_2 = 180 - x_1$ for the region 0 to 360° .

Triangles: Triangles in C2 are general not right angled and so you need to use the formulas in the book. If you have mostly angles use $\frac{\sin A}{a} = \frac{\sin B}{b} = \frac{\sin C}{c}$. If you have mostly lengths then use

$a^2 = b^2 + c^2 - 2bc \cos A$. You may also be asked for the area of the triangle (also in the formula book) $= \frac{1}{2} ab \sin C$.

Arcs/Sectors/Segments of Circles: Use the formulas in the book. The length of arc $= r\theta$. And the area of a sector is Area $= \frac{1}{2} r^2 \theta$. You often then have to subtract a triangle to find the final area of the segment.

Circles: The equation of a circle is $(x - a)^2 + (y - b)^2 = r^2$ where (a, b) is the centre of the circle and r is the radius of the circle. If you are given for example $x^2 + 4x + y^2 - 2y + 9 = 0$ then complete the square for both $(x + 2)^2 + (y - 1)^2 = r^2$ and then compare to find r^2 .

To find a tangent to the circle find the gradient of the line from the point on the edge of the circle to the centre (effectively the radius) and do $-1/m$ to find gradient of tangent. Then fill in $y = mx + c$ and find c using the point on the tangent.

Differentiation: These questions usual give you information to get rid of one variable e.g. given a box which is right prism of height h which has a cross section which is a sector of a circle, radius r cm and angle 1 radian. The volume of the box is 300 cm^3 . Show the surface area is $S = r^2 + \frac{1800}{r}$. Use the volume to get rid of h . Vol = Area of base \times height, so $300 = \frac{1}{2} r^2 \times 1 \times h$ and $h = \frac{600}{r^2}$. Sub this into surface area $S = 2 \times \frac{1}{2} r^2 \times 1 + 2rh + r\theta h = r^2 + 2rh + rh = r^2 + \frac{1800}{r}$.

Then remember $\frac{d}{dx}(x^n) = nx^{n-1}$. And that at a minimum and maximum $\frac{d(\text{anything})}{dx} = 0$. For a minimum point $\frac{d^2(\text{anything})}{dx^2} > 0$ and is < 0 for maximum point.

Integration: Remember $\int x^n dx = \frac{1}{n+1}(x^{n+1})$

The area under a curve i.e. between the curve and the x-axis is given by $\int_{x_1}^{x_2} y dx$ between limits of x_2 and x_1 for example.

Often you have to subtract or add a triangle using $\frac{1}{2}(\text{base} \times \text{height})$.