

A - Level Maths 15 Minute Boost 4

What is $\binom{n}{r}$?	$\frac{n!}{(n-r)!r!}$
cosec(x) =	$\frac{1}{\sin(x)}$
$\log_a(x^n) =$	$n \log_a(x)$
What is the formal definition of the derivative of $f(x)$?	$f'(x) = \lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$
$\int \frac{1}{x} dx =$	$\ln x + C$

1) The coefficient of x^4 in the expansion of $(3 + 2x)^n$ is 15120. Find the value of n .

$$\binom{n}{4} \times 3^{n-4} (2)^4 = 15120$$

$$\frac{n!}{(n-4)!4!} \times 3^{n-4} \times 16 = 15120$$

$$\Rightarrow 3^{n-4} n(n-1)(n-2)(n-3) = 22680$$

$$22680 = 2^3 \times 3^4 \times 5 \times 7$$

$$= \underbrace{2^2}_4 \times 5 \times \underbrace{(2 \times 3)}_6 \times 7 \times 3^3$$

4, 5, 6, 7 are consecutive, so

$$3^{n-4} = 3^3 \quad \Rightarrow n = 7$$



2) Using integration by substitution find $\int_0^3 x\sqrt{3x+2} dx$

$$I = \int_0^3 x\sqrt{3x+2}$$

$$\text{Let } u = 3x+2 \Rightarrow x = \frac{u-2}{3}$$

$$\frac{du}{dx} = 3 \Rightarrow dx = \frac{1}{3} du$$

$$\text{When } x=0, u=2$$

$$x=3, u=11$$

S.

$$I = \int_2^{11} \left(\frac{u-2}{3}\right) u^{1/2} \times \frac{1}{3} du$$

$$= \frac{1}{9} \int_2^{11} u^{3/2} - 2u^{1/2} du$$

$$= \frac{1}{9} \left[\frac{2}{5} u^{5/2} - \frac{4}{3} u^{3/2} \right]_2^{11}$$

$$= \frac{1}{9} (\dots)$$

$$\approx 12.598$$

