Binomial Expansion Questions
(From the Oxford MAT Tests)

For answers, see the MAT website

Specimen A, Question 1i:

I. The power of x which has the greatest coefficient in the expansion of $\left(1+\frac{1}{2}x\right)^{10}$ is

(a) x^2 (b) x^3 (c) x^5 (d) x^{10}

Specimen B, Question 1h:

H. The equation

$$\left(x^2+1\right)^{10} = 2x - x^2 - 2$$

(a) has $x = 2$ as a solution;
(b) has no real solutions;
(c) has an odd number of real solutions;
(d) has twenty real solutions.

2008, Question 1e:

E. The highest power of x in

$$\left\{\left[\left(2x^6+7\right)^3+\left(3x^8-12\right)^4\right]^5+\left[\left(3x^5-12x^2\right)^5+\left(x^7+6\right)^4\right]^6\right\}^3$$

is

(a) x^{424}, (b) x^{450}, (c) x^{500}, (d) x^{504}.

2013, Question 1e:

E. The expression

$$\frac{\mathrm{d}^2}{\mathrm{d}x^2}\left[(2x-1)^4(1-x)^5\right]+\frac{\mathrm{d}}{\mathrm{d}x}\left[(2x+1)^4\left(3x^2-2\right)^2\right]$$

is a polynomial of degree

(a) 9; (b) 8; (c) 7; (d) less than 7.

2014, Question 1g:

G. Let n be a positive integer. The coefficient of x^3y^5 in the expansion of

$$(1+xy+y^2)^n$$

equals

(a) n, (b) 2^n, (c) $\binom{n}{3}\binom{n}{5}$, (d) $4\binom{n}{4}$, (e) $\binom{n}{8}$.
