Binomial Expansion

$$(a+b)^0 = \qquad\qquad\qquad 1$$

$$(a+b)^1 = \qquad\qquad a \quad + \quad b$$

$$(a+b)^2 = \qquad\qquad a^2 \; + \; 2a^1b^1 \; + \; b^2$$

$$(a+b)^3 = \qquad a^3 \; + \; 3a^2b^1 \; + \; 3a^1b^2 \; + \; b^3$$

$$(a+b)^4 = a^4 \; + \; 4a^3b^1 + 6a^2b^2 \; + \; 4a^1b^3 \; + \; b^4$$

$$(a+b)^n = a^n \; + \; \binom{n}{1}a^{n-1}b^1 + \binom{n}{2}a^{n-2}b^2 + \binom{n}{3}a^{n-3}b^3 + \ldots$$

$$\cdots\cdots\cdots$$

where $\quad \dbinom{n}{r} = {}^nC_r = \dfrac{n!}{r!\,(n-r)!}$

Identifying Values

$$(1 + 2x)^{10} \qquad\qquad a=1 \qquad b = 2x \qquad n = 10$$

$$\left(10 - \tfrac{1}{2}x\right)^6 \qquad a = 10 \qquad b = -\tfrac{1}{2}x \quad n = 6$$

$$\left(x - \tfrac{1}{x}\right)^5 \qquad a = x \qquad b = -\tfrac{1}{x} \qquad n = 5$$

Comparing Coefficients

$$1 \; + \; (8q)x \; + \; (28q^2)x^2$$

coefficient of x coefficient of x^2

x^2 coefficient is double the coefficient of x

$$2(8q) = 28q^2$$
$$16q = 28q^2$$
$$16 = 28q$$
$$q = \frac{16}{28}$$

Binomial Expansion Estimation

Estimate 0.975^{10} to 4dp

Given

$$\left(1 - \frac{x}{4}\right)^{10} = 1 - 2.5x + 2.8125x^2 - 1.875x^3$$

$$0.975 = 1 - \frac{x}{4}$$

$$x = 0.1$$

Now sub $x = 0.1$ into the binomial expasion.