

BINOMIAL EXPANSIONSEXERCISE

Use Pascal's Triangle to help evaluate:

1) $(2+x)^4$

2) $(5+2x)^3$

3) $(1-x)^5$

Without a calculator evaluate:

4) $\binom{9}{7}$

5) 8C_4

6) ${}_{10}C_7$

Use combination notation to help evaluate:

7) the coefficient of x^3 in $(1+2x)^7$

8) the coefficient of x^{17} in $(3-x)^{19}$

9) the coefficient of x^4 in $(2+x)^{10}$

BINOMIAL EXPANSIONSEXERCISE

$$\begin{aligned}
 1) \quad & (2+x)^4 \\
 & = 2^4 + 4(2)^3x + 6(2)^2x^2 + 4(2)x^3 + x^4 \\
 & = 16 + 32x + 24x^2 + 8x^3 + x^4
 \end{aligned}$$

$$\begin{array}{cccccc}
 & & & & & 1 \\
 & & & & & 1 & 2 & 1 \\
 & & & & & 1 & 3 & 3 & 1 \\
 & & & & & 1 & 4 & 6 & 4 & 1 \\
 & & & & & 1 & 5 & 10 & 10 & 5 & 1
 \end{array}$$

$$\begin{aligned}
 2) \quad & (5+2x)^3 \\
 & = 5^3 + 3(5)^2(2x) + 3(5)(2x)^2 + (2x)^3 \\
 & = 125 + 150x + 60x^2 + 8x^3
 \end{aligned}$$

$$\begin{aligned}
 3) \quad & (1-x)^5 \\
 & = 1^5 + 5(1)^4(-x) + 10(1)^3(-x)^2 + 10(1)^2(-x)^3 + 5(1)(-x)^4 + (-x)^5 \\
 & = 1 - 5x + 10x^2 - 10x^3 + 5x^4 - x^5
 \end{aligned}$$

$$4) \quad \binom{9}{7} = \frac{9!}{7!2!} = \frac{9 \cdot 8^4}{2 \cdot 1} = 36$$

$$5) \quad {}^8C_4 = \frac{8!}{4!4!} = \frac{8 \cdot 7 \cdot 6 \cdot 5}{4 \cdot 3 \cdot 2 \cdot 1} = 70$$

$$6) \quad {}^{10}C_7 = \frac{10!}{7!3!} = \frac{10 \cdot 9 \cdot 8^4}{3 \cdot 2 \cdot 1} = 120$$

7) Find coeff. of x^3 in $(1+2x)^7$

$$\text{Term will be } \binom{7}{3} (2x)^3 (1)^4$$

$$= \frac{7 \cdot 6 \cdot 5}{3 \cdot 2 \cdot 1} \times 8x^3 \times 1 = 35 \times 8x^3$$

BINOMIAL EXPANSIONS

EXERCISE

7 cont)

$$= 280x^3$$

∴ coeff of x^3 is 280

$$\begin{array}{r} 35 \\ \underline{8x} \\ 280 \end{array}$$

8) Find coeff of x^{17} in $(3-x)^{19}$

$$\text{Term will be } \binom{19}{17} (-x)^{17} (3)^2$$

$$= \frac{19 \cdot 18}{2 \cdot 1} x (-x^{17}) \times 9$$

$$= -1539x^{17}$$

Coeff of x^{17} is -1539.

$$\begin{array}{r} 19 \\ \underline{9x} \\ 171 \\ \underline{9x} \\ 1539 \end{array}$$

9) Find coeff of x^4 in $(2+x)^{10}$

$$\text{Term will be } \binom{10}{4} (x)^4 (2)^6$$

$$= \frac{10 \cdot 9 \cdot 8 \cdot 7}{4 \cdot 3 \cdot 2 \cdot 1} x^4 \times 64$$

$$= 210 \times 64 \times x^4$$

$$= 13440x^4$$

Coeff of x^4 is 13,440

$$\begin{array}{r} 210 \\ \underline{64x} \\ 840 \\ \underline{12600} \\ 13440 \end{array}$$