Outcome 2 – Multiplying out trickier brackets

Worked Example:

Use the Binomial Theorem to multiply out the brackets $\left(x-\frac{4}{x^2}\right)^3$.

1. Write down the corresponding row of Pascals Triangle (In this case the THIRD row)
2. DESCEND the powers of the first term in the bracket
3. ASCEND the powers of the second term in the bracket
4. Multiply the columns together to get the terms

1	3	3	1
x^3	x^2	x	1
1	$-\frac{4}{x^2}$	$\frac{16}{x^4}$	$-\frac{64}{x^6}$

$$\left(x-\frac{4}{x^2}\right)^3 = x^3 - 12 + \frac{48}{x^3} - \frac{64}{x^6}$$

Key Facts/Formulae:

The Binomial Theorem is a quick way of multiplying out brackets with larger powers.

You will need to know Pascals triangle in order to do this.

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                1
              1   1
            1   2   1
          1   3   3   1
        1   4   6   4   1
      1   5  10  10   5   1
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Questions…

Use the Binomial Theorem to multiply out the brackets below.

1. $\left(x-\frac{5}{x^3}\right)^2$
2. $\left(2x-\frac{7}{x^2}\right)^3$
3. $\left(x+\frac{6}{x^3}\right)^4$
4. $\left(x^2-\frac{4}{x^3}\right)^3$
5. $\left(3x^3-\frac{2}{x^5}\right)^3$
6. $\left(9x^2+\frac{3}{x^3}\right)^4$

Answers

1. $x^2 - \frac{10}{x^2} + \frac{25}{x^6}$

2. $8x^3 - 84 + \frac{294}{x^3} - \frac{343}{x^6}$

3. $x^4 + 24 + \frac{216}{x^4} + \frac{864}{x^8} + \frac{1296}{x^{12}}$

4. $x^6 - 12x + \frac{48}{x^4} - \frac{64}{x^9}$

5. $27x^9 - 54x + \frac{36}{x^7} - \frac{8}{x^{15}}$

6. $6561x^8 + 8748x^3 + \frac{4374}{x^2} + \frac{972}{x^7} + \frac{81}{x^{12}}$