



Expanding Triple Brackets

← REVISE THIS TOPIC

1 Expand and simplify $(x + 1)(x + 2)(x + 5)$

$$\begin{aligned} (x + 1)(x + 2) &= x^2 + 2x + x + 2 \\ &= x^2 + 3x + 2 \end{aligned}$$

$$\begin{aligned} (x^2 + 3x + 2)(x + 5) \\ &= x^3 + 5x^2 + 3x^2 + 15x + 2x + 10 \\ &= x^3 + 8x^2 + 17x + 10 \end{aligned}$$

(Total for Question 1 is 3 marks)

2 Expand and simplify $(x + 3)(x + 4)(x + 6)$

$$\begin{aligned} (x + 3)(x + 4) &= x^2 + 4x + 3x + 12 \\ &= x^2 + 7x + 12 \end{aligned}$$

$$\begin{aligned} (x^2 + 7x + 12)(x + 6) \\ &= x^3 + 6x^2 + 7x^2 + 42x + 12x + 72 \\ &= x^3 + 13x^2 + 54x + 72 \end{aligned}$$

(Total for Question 2 is 3 marks)

3 Expand and simplify $(x + 5)(x - 2)(x + 1)$

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

$$\begin{aligned} (x^2 + 3x - 10)(x + 1) \\ &= x^3 + x^2 + 3x^2 + 3x - 10x - 10 \\ &= x^3 + 4x^2 - 7x - 10 \end{aligned}$$

(Total for Question 3 is 3 marks)



4 Expand and simplify $(x-3)(x-4)(x+2)$

$$\begin{aligned}
 (x-3)(x-4) &= x^2 - 4x - 3x + 12 \\
 &= x^2 - 7x + 12
 \end{aligned}$$

$$\begin{aligned}
 (x^2 - 7x + 12)(x + 2) \\
 = x^3 + 2x^2 - 7x^2 - 14x + 12x + 24
 \end{aligned}$$

$$\underline{x^3 - 5x^2 - 2x + 24}$$

(Total for Question 4 is 3 marks)

5 Expand and simplify $(y-2)(y-3)(y-4)$

$$\begin{aligned}
 (y-2)(y-3) &= y^2 - 2y - 2y + 4 \\
 &= y^2 - 4y + 4
 \end{aligned}$$

$$\begin{aligned}
 (y^2 - 4y + 4)(y - 4) \\
 = y^3 - 4y^2 - 4y^2 + 16y + 4y - 16
 \end{aligned}$$

$$\underline{y^3 - 8y^2 + 20y - 16}$$

(Total for Question 5 is 3 marks)

6 Expand and simplify $(x+5)(x+3)^2$

$$\begin{aligned}
 (x+5)(x+3) &= x^2 + 3x + 5x + 15 \\
 &= x^2 + 8x + 15
 \end{aligned}$$

$$\begin{aligned}
 (x^2 + 8x + 15)(x + 3) \\
 = x^3 + 3x^2 + 8x^2 + 24x + 15x + 45
 \end{aligned}$$

$$\underline{x^3 + 11x^2 + 39x + 45}$$

(Total for Question 6 is 3 marks)



7 Expand and simplify $(x + 10)(x - 6)^2$

$$\begin{aligned}(x + 10)(x - 6) &= x^2 - 6x + 10x - 60 \\ &= x^2 + 4x - 60\end{aligned}$$

$$\begin{aligned}(x^2 + 4x - 60)(x - 6) \\ &= x^3 - 6x^2 + 4x^2 - 24x - 60x + 360\end{aligned}$$

$$\underline{x^3 - 2x^2 - 84x + 360}$$

(Total for Question 7 is 3 marks)

8 Expand and simplify $(h - 5)^3$

$$\begin{aligned}(h - 5)(h - 5) &= h^2 - 5h - 5h + 25 \\ &= h^2 - 10h + 25\end{aligned}$$

$$\begin{aligned}(h^2 - 10h + 25)(h - 5) \\ &= h^3 - 5h^2 - 10h^2 + 50h + 25h - 125\end{aligned}$$

$$\underline{h^3 - 15h^2 + 75h - 125}$$

(Total for Question 8 is 3 marks)

9 Expand and simplify $(x + 12)(x - 2)(x + 2)$

$$\begin{aligned}(x + 2)(x - 2) &= x^2 - 2x + 2x - 4 \\ &= x^2 - 4\end{aligned}$$

$$(x^2 - 4)(x + 12) = x^3 + 12x^2 - 4x - 48$$

$$\underline{x^3 + 12x^2 - 4x - 48}$$

(Total for Question 9 is 3 marks)



10 Expand and simplify $(2x + 1)(x - 3)(x - 1)$

$$\begin{aligned}
 (2x+1)(x-3) &= 2x^2 - 6x + x - 3 \\
 &= 2x^2 - 5x - 3
 \end{aligned}$$

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

$$\underline{2x^3 - 7x^2 + 2x + 3}$$

(Total for Question 10 is 3 marks)

11 Expand and simplify $(3p + 2)(2p + 1)(p + 5)$

$$\begin{aligned}
 (3p+2)(2p+1) &= 6p^2 + 3p + 4p + 2 \\
 &= 6p^2 + 7p + 2
 \end{aligned}$$

$$\begin{aligned}
 (6p^2 + 7p + 2)(p + 5) \\
 = 6p^3 + 30p^2 + 7p^2 + 35p + 2p + 10
 \end{aligned}$$

$$\underline{6p^3 + 37p^2 + 37p + 10}$$

(Total for Question 11 is 3 marks)

12 Expand and simplify $(3x + 1)(2x - 1)(4x - 1)$

$$\begin{aligned}
 (3x+1)(2x-1) &= 6x^2 - 3x + 2x - 1 \\
 &= 6x^2 - x - 1
 \end{aligned}$$

$$\begin{aligned}
 (6x^2 - x - 1)(4x - 1) \\
 = 24x^3 - 6x^2 - 4x^2 + x - 4x + 1
 \end{aligned}$$

$$\underline{24x^3 - 10x^2 - 3x + 1}$$

(Total for Question 12 is 3 marks)



13 Show that $(3x + 1)(3x - 1)(2x + 3)$ can be written in the form $ax + bx^2 + cx + d$ where a, b, c and d are all integers.

$$\begin{aligned}
 (3x + 1)(3x - 1) &= 9x^2 - 3x + 3x - 1 \\
 &= 9x^2 - 1
 \end{aligned}$$

$$(9x^2 - 1)(2x + 3) = 18x^3 + 27x^2 - 2x - 3$$

$$\underline{18x^3 + 27x^2 - 2x - 3}$$

(Total for Question 13 is 3 marks)

14 Show that $(5x + 1)(x - 3)(x - 2) - (x + 2)^2$ can be written in the form $ax + bx^2 + cx + d$ where a, b, c and d are all integers.

$$\begin{aligned}
 (5x + 1)(x - 3) &= 5x^2 - 15x + x - 3 \\
 &= 5x^2 - 14x - 3
 \end{aligned}$$

$$\begin{aligned}
 (5x^2 - 14x - 3)(x - 2) \\
 &= 5x^3 - 10x^2 - 14x^2 + 28x - 3x + 6 \\
 &= 5x^3 - 24x^2 + 25x + 6
 \end{aligned}$$

$$\begin{aligned}
 (x + 2)(x + 2) &= x^2 + 2x + 2x + 4 \\
 &= x^2 + 4x + 4
 \end{aligned}$$

$$5x^3 - 24x^2 + 25x + 6 - x^2 - 4x - 4$$

$$\underline{5x^3 - 25x^2 + 21x + 2}$$

(Total for Question 14 is 6 marks)



15 $(x + 4)(x + 3)(x - 1) - (x + 2)(x - 2)(x + 5) \equiv (x + a)(x + b)$

Given that $a > b$, work out the values of a and b .

$$\begin{aligned}
 (x+4)(x+3) &= x^2 + 3x + 4x + 12 \\
 &= x^2 + 7x + 12
 \end{aligned}$$

$$\begin{aligned}
 (x^2 + 7x + 12)(x - 1) &= x^3 - x^2 + 7x^2 - 7x + 12x - 12 \\
 &= x^3 + 6x^2 + 5x - 12
 \end{aligned}$$

$$\begin{aligned}
 (x+2)(x-2) &= x^2 - 2x + 2x - 4 \\
 &= x^2 - 4
 \end{aligned}$$

$$(x^2 - 4)(x + 5) = x^3 + 5x^2 - 4x - 20$$

$$\begin{aligned}
 &x^3 + 6x^2 + 5x - 12 - (x^3 + 5x^2 - 4x - 20) \\
 &= x^3 + 6x^2 + 5x - 12 - x^3 - 5x^2 + 4x + 20 \\
 &= x^2 + 9x + 8 \\
 &= (x + 8)(x + 1)
 \end{aligned}$$

$$\begin{aligned}
 a &= \underline{\quad 8 \quad} \\
 b &= \underline{\quad 1 \quad}
 \end{aligned}$$

(Total for Question 15 is 8 marks)

