



## Expanding Triple Brackets Exam Practice

Q1. Expand and simplify  $(x + 2)(x + 5)(x + 1)$

$$\begin{aligned} & (x+2)(x^2+6x+5) \\ = & x^3 + 6x^2 + 5x + 2x^2 + 12x + 10 \\ = & x^3 + 8x^2 + 17x + 10 \end{aligned}$$

Answer:  $x^3 + 8x^2 + 17x + 10$   
(2 marks)

Q2. Expand and simplify  $(x + 7)(x - 2)(x + 3)$

$$\begin{aligned} & (x+7)(x^2+x-6) \\ = & x^3 + x^2 - 6x + 7x^2 + 7x - 42 \\ = & x^3 + 8x^2 + x - 42 \end{aligned}$$

Answer:  $x^3 + 8x^2 + x - 42$   
(2 marks)



Q3. Expand and simplify  $(2x + 6)(x - 5)(x - 3)$

$$\begin{aligned} & (2x+6)(x^2-8x+15) \\ &= 2x^3 - 16x^2 + 30x + 6x^2 - 48x + 90 \\ &= 2x^3 - 10x^2 - 18x + 90 \end{aligned}$$

Answer:  $2x^3 - 10x^2 - 18x + 90$   
(2 marks)

Q4. Expand and simplify  $(3x - 1)(4 - x)(4 + x)$

$$\begin{aligned} & (3x-1)(16-x^2) \\ &= 48x - 3x^3 - 16 + x^2 \\ &= -3x^3 + x^2 + 48x - 16 \end{aligned}$$

Answer:  $-3x^3 + x^2 + 48x - 16$   
(2 marks)





Q5. Expand and simplify  $(x + 2)(x - 5)^2$

$$\begin{aligned} & (x+2)(x-5)(x-5) \\ = & (x+2)(x^2-10x+25) \\ = & x^3-10x^2+25x+2x^2-20x+50 \\ = & x^3-8x^2+5x+50 \end{aligned}$$

Answer:  $x^3-8x^2+5x+50$   
(3 marks)

Q6. Expand and simplify  $2(x + 4)^2(2x - 3)$

$$\begin{aligned} & 2(+4)(x+4)(2x-3) \\ = & 2(x^2+8x+16)(2x-3) \\ = & (4x-6)(x^2+8x+16) \\ = & 4x^3+32x^2+64x-6x^2-48x-96 \\ = & 4x^3+26x^2+16x-96 \end{aligned}$$

Answer:  $4x^3+26x^2+16x-96$   
(3 marks)



Q7. Expand and simplify  $(x - 3)(x + 3)(4x - 7)$

$$\begin{aligned} &= (4x - 7)(x^2 - 9) \\ &= 4x^3 - 36x - 7x^2 + 63 \\ &= 4x^3 - 7x^2 - 36x + 63 \end{aligned}$$

Answer:  $4x^3 - 7x^2 - 36x + 63$   
(4 marks)

Q8. Expand and simplify  $(x + 2)(x + 3)(x + 5) + (x + 1)(x + 4)$

$$\begin{aligned} &(x + 5)(x^2 + 5x + 6) + x^2 + 5x + 4 \\ &= x^3 + 5x^2 + 6x + 5x^2 + 25x + 30 + x^2 + 5x + 4 \\ &= x^3 + 11x^2 + 36x + 34 \end{aligned}$$

Answer:  $x^3 + 11x^2 + 36x + 34$   
(3 marks)





Q9. Let  $a$  be a fixed number. Expand and simplify:

$$(x - a)(x + 3)(x + 2)$$

You must express your answer in the form  $px^3 + qx^2 + rx + s$  where  $p, q, r$  and  $s$  are given in terms of  $a$ .

$$= (x - a)(x^2 + 5x + 6)$$

$$= x^3 + 5x^2 + 6x - ax^2 - 5ax - 6a$$

$$= x^3 + (5 - a)x^2 + (6 - 5a)x - 6a$$

Answer:  $\underline{x^3 + (5 - a)x^2 + (6 - 5a)x - 6a}$   
(4 marks)

Q10. Let  $b$  be a fixed number. Expand and simplify:

$$(x - 5)(2x + 5)(bx - 1)$$

You must express your answer in the form  $px^3 + qx^2 + rx + s$  where  $p, q, r$  and  $s$  are given in terms of  $b$ .

$$= (bx - 1)(x - 5)(2x + 5)$$

$$= (bx - 1)(2x^2 - 5x - 25)$$

$$= 2bx^3 - 5bx^2 - 25bx - 2x^2 + 5x + 25$$

$$= 2bx^3 - (5b - 2)x^2 + (5 - 25b)x + 25$$

Answer:  $\underline{2bx^3 - (5b - 2)x^2 + (5 - 25b)x + 25}$   
(3 marks)



Q11. Show that  $(3x + 2)(x + 3)(2x - 5) \equiv 6x^3 + 7x^2 - 43x - 30$

$$= (3x+2)(2x^2+6x-5x-15)$$

$$= 6x^3 + 18x^2 - 15x^2 - 45x + 4x^2 + 12x - 10x - 30$$

$$= 6x^3 + 7x^2 - 43x - 30$$

Answer: \_\_\_\_\_

(4 marks)

Q12. Show that  $(2x - 7)(3x + 8)(2x - 9) \equiv 12x^3 - 64x^2 - 67x + 504$

$$= (2x-7)(6x^2+16x-27x-72)$$

$$= 12x^3 + 32x^2 - 54x^2 - 144x - 42x^2 - 112x + 189x + 504$$

$$= 12x^3 - 64x^2 - 67x + 504$$

Answer: \_\_\_\_\_

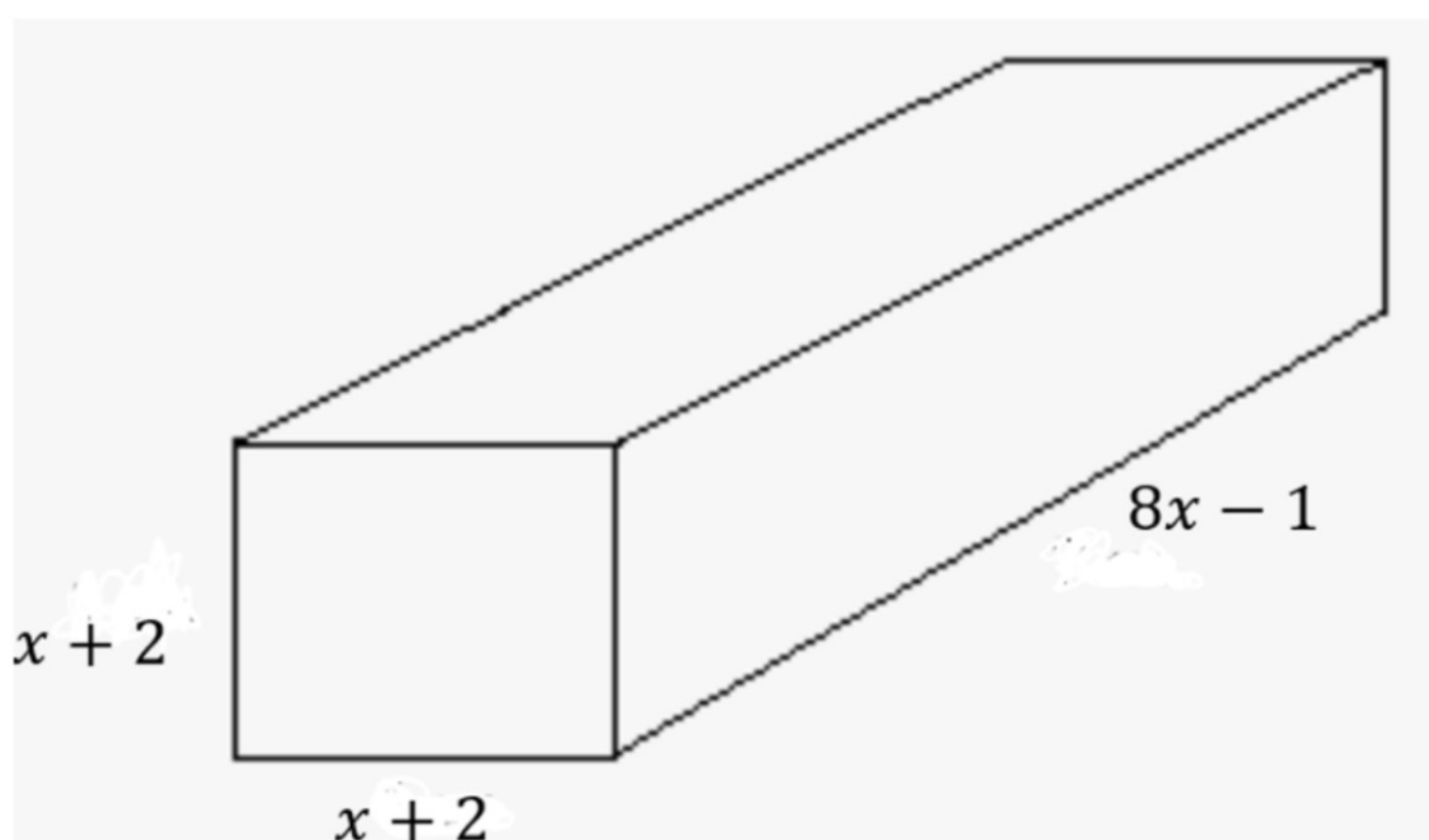
(4 marks)





## Applied Mixed Practice Problems

Q13. Here is a cuboid:



An expression for the volume of the cuboid is of the form,  $ax^3 + bx^2 + cx + d$  where  $a, b, c$  and  $d$  are integers. Find the values of  $a, b, c$  and  $d$ .

$$\begin{aligned} \text{Volume} &= (8x-1)(x+2)(x+2) \\ &= (8x-1)(x^2+4x+4) \\ &= 8x^3+32x+32x-x^2-4x-4 \\ &= 7x^3+60x-4 \end{aligned}$$

$$\Rightarrow a=7, b=60, c=-4$$

Answer:  $a=7, b=60, c=-4$   
(3 marks)



Q14. A student is asked to expand  $(x - 5)(2x + 8)(3x - 9)$ .

His answer is  $6x^3 - 20x^2 - 102x + 360$ .

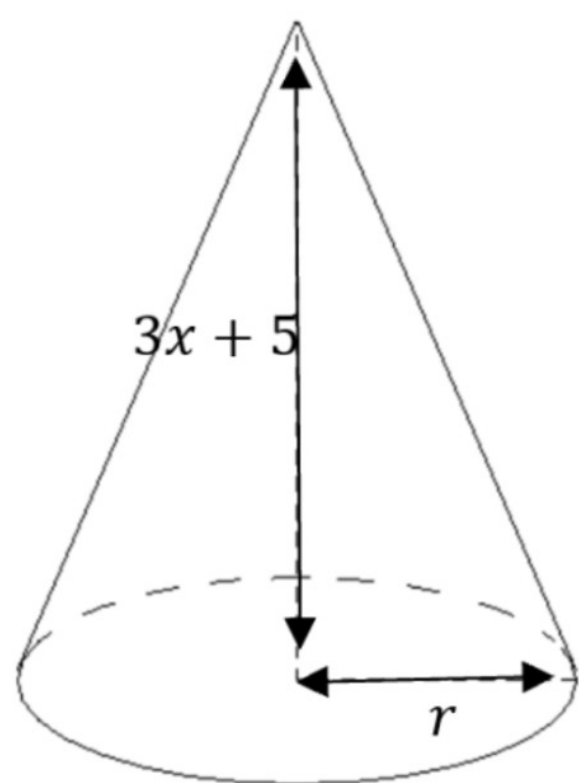
He is unsure about the  $x^2$  term, but knows from his teacher that the other terms are correct. Check this term, and correct it if necessary.

$$(x-5)(2x+8)(3x-9)$$

$$\left. \begin{array}{l} x^2 \text{ term: } x \times 2x \times (-9) \\ + (-5) \times 2x \times 3x \\ + x \times 8 \times 3x \end{array} \right\} -18x^2 - 30x^2 + 24x^2$$

Answer:  $-24x^2$   
(3 marks)

Q15. A sweets manufacturer produces chocolates in the shape of a cone.



The volume of chocolate required to make 30 sweets is given by  $\pi(30x^3 + 350x^2 + 1250x + 1250)$ .

Find  $r$  giving your answer in terms of  $ax + b$  where  $a$  and  $b$  are positive integers to be found.

•  $V = \frac{1}{3}\pi r^2 h$  for a cone.

$$30 \times \frac{1}{3} \pi (ax+b)(ax+b)(3x+5) = \pi(30x^3 + 350x^2 + 1250x + 1250)$$

$$\Rightarrow (ax+b)(ax+b)(3x+5) = 3x^3 + 35x^2 + 125x + 125$$

$$\Rightarrow a=1, \text{ as } 3x^3 = ax \times ax \times 3x \Rightarrow 3x^3 = 3a^2x^3, a=1$$

$$\Rightarrow b=5, \text{ as } b \times b \times 5 = 125 \Rightarrow 5b^2 = 125 \Rightarrow b^2 = 25$$

Answer:  $(x+5)$

(4 marks)