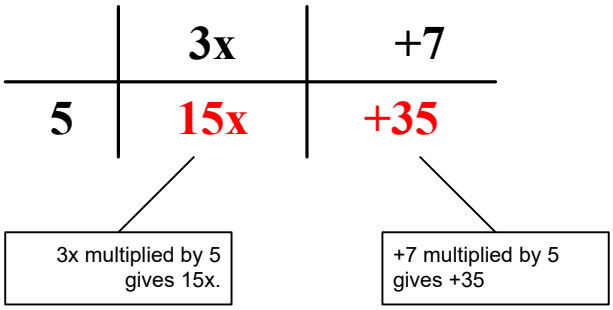
Expanding Expressions with Brackets.

Example 1

$$\mathbf{5(3}\boldsymbol{x}\mathbf{+7)}$$

We solve this by drawing a grid like the one below where the 5 is on the left and the 3x+7 is along the top:



$$\mathbf{5(3}\boldsymbol{x}\mathbf{+7)=15}\boldsymbol{x}\mathbf{+35}$$

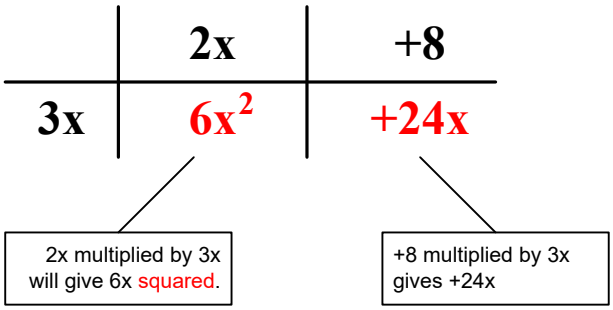
Try these

1	$7(4x-2)$	7	$3(2x-14)$
2	$8(6x-8)$	8	$14(6x+12)$
3	$5(3x-2)$	9	$6(4x+11)$
4	$12(7x-8)$	10	$8(7x+4)$
5	$11(5x-6)$	11	$7(5x-2)$
6	$9(8x+14)$	12	$4(8x+7)$

Example 2

$$\mathbf{3}\boldsymbol{x}\mathbf{(2}\boldsymbol{x}\mathbf{+8)}$$

We solve this problem in exactly the same way as we solved the last one. Draw a grid but this time, we are multiplying by x and so you will have $x \times x = x^2$ to consider.



$$\mathbf{3}\boldsymbol{x}\mathbf{(2}\boldsymbol{x}\mathbf{+8)=6}\boldsymbol{x}^{\mathbf{2}}\mathbf{+24}\boldsymbol{x}$$

It's important that you don't forget the *x* terms or the x^2 term.

You might think that drawing the grid is a waste of time but if you get used to it, more challenging expansion and factorising questions will become easier later – so bear with it.

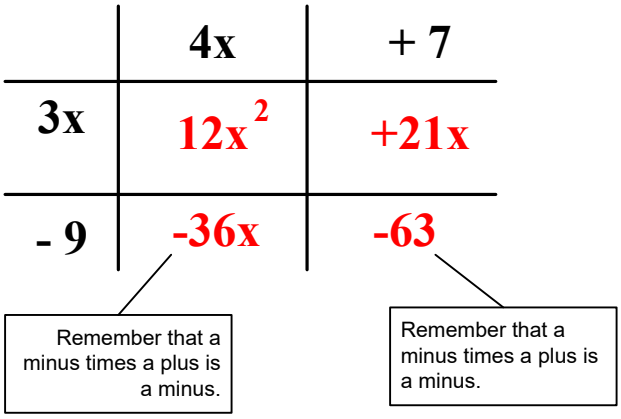
Try these

13	$7x(6x-2)$	19	$3(6x-16)$
14	$8x(8x-7)$	20	$14x(4x+12)$
15	$5x(2x-4)$	21	$6x(8x+13)$
16	$12x(9x-2)$	22	$8(4x+15)$
17	$11x(4x-6)$	23	$7x(9x-13)$
18	$9x(23x+14)$	24	$4(4x+11)$

Example 3

This is where it starts to get a little more interesting as you can apply the next stage to real life examples.

$$(\mathbf{3x-9})(\mathbf{4x+7})$$



$$(\mathbf{3x-9})(\mathbf{4x+7}) = \mathbf{12x^2+21x-36x-63}$$

Now we group the like terms in this final expression which means, in this case that we add $21x$ to $-36x$ which gives us $-15x$.

So the final answer is: $(\mathbf{3x-9})(\mathbf{4x+7}) = \mathbf{12x^2-15x-63}$

Try these

25	$(3x+5)(4x-2)$	31	$(9x-2)(5x-5)$
26	$(6x-2)(3x+3)$	32	$(4x+6)(5x+3)$
27	$(4x+7)(x-6)$	33	$(6x-5)(5x+8)$
28	$(7x+3)(7x+3)$	34	$(2x+2)(5x-5)$
29	$(2x-8)(x-7)$	35	$(8x-5)(5x+2)$
30	$(8x+5)(4x+12)$	36	$(3x-27)(5x-25)$

More Challenging Questions

37	$\left(3x+\frac{1}{2}\right)\left(4x-\frac{3}{4}\right)$	39	$\left(9x-\frac{3}{5}\right)\left(8x-\frac{5}{7}\right)$
38	$\left(8x+\frac{2}{3}\right)\left(5x+\frac{7}{8}\right)$	40	$\left(\frac{3x}{2}+\frac{1}{2}\right)\left(5x-\frac{3}{8}\right)$

Example 4

$$(2x-9)(3x-5)(5x-7)$$

	3x	- 5
2x	$6x^2$	-10x
- 9	-27x	+45

We transfer all the answers from the squared grid to the top of the cubed grid.

Note that x squared times x is x cubed.

Here: I have grouped the like terms so: -27x add -10x = -37x

	$6x^2$	-37x	+45
5x	$30x^3$	$-185x^2$	+225x
- 7	$-42x^2$	+259x	-315

$$(2x-9)(3x-5)(5x-7) = 30x^3 - 185x^2 - 42x^2 + 225x + 259x - 315$$

Again, here we can group the like terms. In this case, we combine the x^2 terms and the x terms.

$$(2x-9)(3x-5)(5x-7) = 30x^3 - 227x^2 + 484x - 315$$

Try these

41 $(x+5)(3x-2)(x-5)$

42 $(x-2)(5x+3)(2x+1)$

43 $(6x+3)(x-6)(x-3)$

44 $(8x+9)(7x+3)(x+2)$

45 $(3x-6)(x-7)(x-6)$

46 $(5x+5)(4x+12)(3x-7)$

47 $(3x-4)(5x-5)(x+3)$

48 $(7x+2)(5x+3)(x-8)$

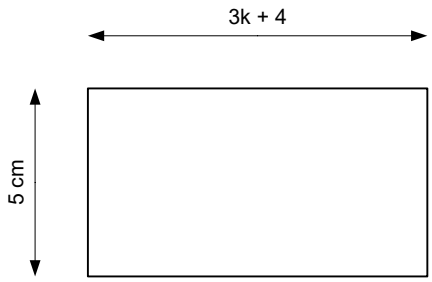
More Challenging Questions

49 $\left(2x+\frac{7}{9}\right)\left(x-\frac{5}{8}\right)\left(3x-\frac{2}{3}\right)$

50 $\left(2x+\frac{2}{3}\right)\left(x+\frac{7}{8}\right)\left(4x-\frac{2}{5}\right)$

Application Questions For all questions in this section, give your solution in its simplest terms.

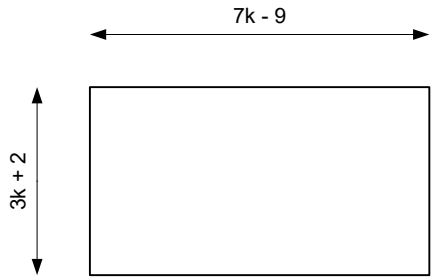
51 Below is a diagram of an oblong.



a Derive an expression for the area of the oblong.

b Derive an expression for the perimeter of the oblong.

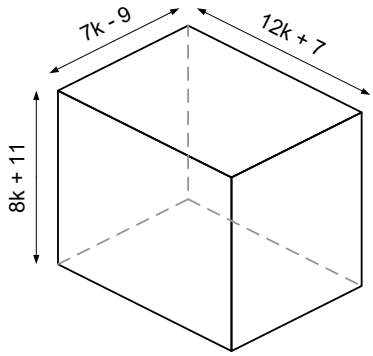
52 Below is a diagram of an oblong.



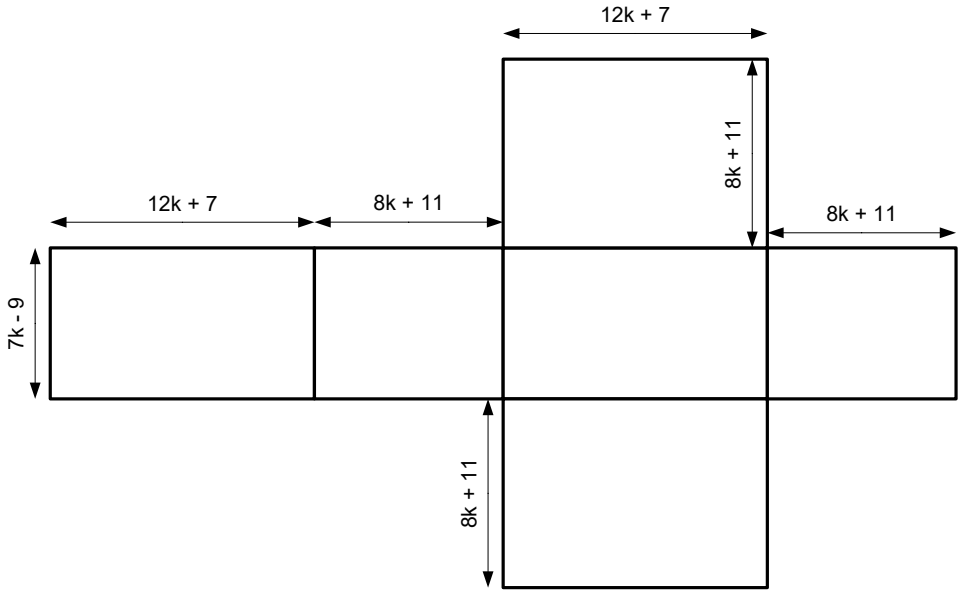
a Derive an expression for the area of the oblong.

b Derive an expression for the perimeter of the oblong.

53 Below is a diagram of a cuboid.



Below is a net of the same cuboid.



Derive expressions for

- the length of edges;
- the surface area;
- and the volume of the cuboid.

We find the area of a circle using the following formula.

$$A = \pi r^2$$

Where A is the area of the circle, π is a number that you can find on your calculator and r is the radius of the circle.

So, if we had a circle with a radius of 10cm, the are would be found like this:

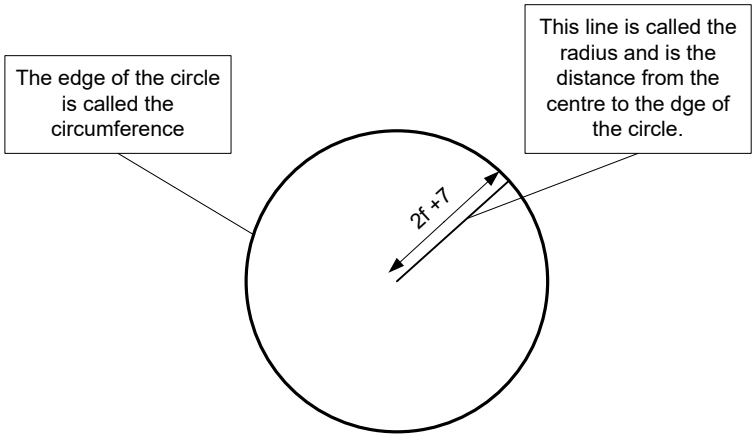
$$A = \pi r^2$$

$$= \pi \times 10^2$$

$$= 100\pi \text{ (the exact answer)}$$

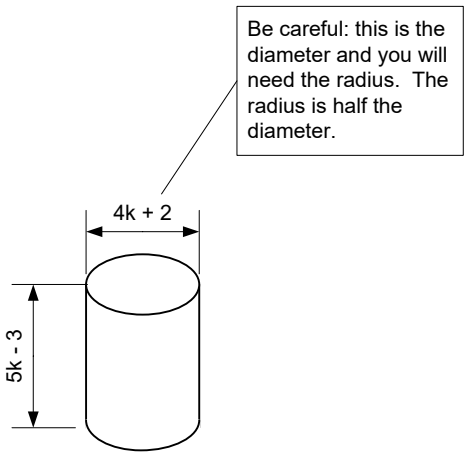
$$\approx 314.159\ cm^2$$

54 Below is a diagram of a circle.



Derive an expression for the area of the circle.

55 To find the volume of a cylinder, we ***multiply the area of the circular face by the height***.



Above is a diagram of a cylinder. Find expression for the volume of the cylinder.

56 In a computer game, a golfer hits the ball from the tee. On the screen, the size of the ball increases or decreases depending on the angle of the shot. The size of the ball on screen is determined by an expression for the radius. The expression is $r = \frac{3t}{4}$ where r is the radius of the ball and t is the time since the ball was hit.

a Determine an expression for the area of the circle on the screen that represents the ball.

b Substitute 2, 4, 6, 8 and 10 for t to determine whether the ball is flying towards the computer user or away from them.