Today's Learning:

To remove brackets by multiplying out.

Multiplying Out Brackets

23/11/17

Multiply each term in the first bracket by each term in the second brackets.

*remember the sign in front of the term matters

e.g. Multiply out and simplify:

1) (y + 1)(y + 5)

$= y^2 + 5y + y + 5$

$= y^2 + 6y + 5$

2) (m + 4)(m - 2)

$= m^2 - 2m + 4m - 8$

$= m^2 + 2m - 8$

3) (p - 3)(p - 6)

$= p^2 - 6p - 3p + 18$

$= p^2 - 9p + 18$

Starter

13/11

1) Without a calculator, find a seventh of 9422.

2) Simplify the expression: 6b + 8a - b^2 + b - 3b + 2a

5 + 4 = 9

4b + 10a - b^2

3) Calculate:

a) 3 x (-4) = -12 **b)** (-3) x (-10) = 30 **c)** (-4) x 2 = -8 **d)** (-2) x (-9) = 18

4) Find the highest common factor of...

a) 3g and 6 = 3 **b)** 2gh and 4h = 2h **c)** 10g and $12g^2$ = 2g

Today's Learning:

To practice multiplying out double brackets.

4) $(d + 2)^2$

$= (d+2)(d+2)$

$= d^2 + 2d + 2d + 4$

$= d^2 + 4d + 4$

5) $(w + 1)(w^2 + 2w - 4)$

$= w^3 + 2w^2 - 4w + w^2 + 2w - 4$

$= w^3 + 3w^2 - 2w - 4$

Starter

1) $\frac{1}{m} + \frac{1}{m} + \frac{1}{m} = \frac{1}{9}$ What is m?

$\frac{1}{18} + \frac{1}{18} + \frac{1}{18} = \frac{3}{18} = \frac{1}{6}$

$\frac{1}{3} + \frac{1}{3} + \frac{1}{3} = \frac{3}{3} = 1$

$\frac{1}{9} + \frac{1}{9} + \frac{1}{9} = \frac{3}{9} = \frac{1}{3}$

$\frac{1}{27} + \frac{1}{27} + \frac{1}{27} = \frac{3}{27} = \frac{1}{9}$ ✓

2) Simplify the following:

a) 2T + 3gT - 4T + 2g = -2T + 3gT + 2g

b) 2ab + 3a - 2ba - 4a + a

= 2ab - 2ba

= 2ab - 2ab

= 0

3) Without a calculator, calculate:

a) $2 - 3 \times 5 + (3 + 1)^2$

$= 2 - 3 \times 5 + 4^2$

$= 2 - 3 \times 5 + 16$

$= 2 - 15 + 16$

$= 3$

b) $2 + 3(2 + 1) - 4 \times (-1)$

$= 2 + 3 \times 3 - 4 \times (-1)$

$= 2 + 3 \times 3 + 4$

$= 2 + 9 + 4$

$= 15$

4) Write down all the square numbers from 1 to 100.

1 4 9 16 25 36 49 64 81 100

Today's Learning:

To practice multiplying out brackets to exam level.

6) $(m - 3)^2 - 2(m + 4)(m - 5)$

$= (m-3)(m-3) - 2(m+4)(m-5)$

$= m^2 - 3m - 3m + 9 - 2(m^2 - 5m + 4m - 20)$

$= m^2 - 6m + 9 - 2(m^2 - m - 20)$

$= m^2 - 6m + 9 - 2m^2 + 2m + 40$

$= -m^2 - 4m + 49$

$-2 \times m$
$-2m$

Starter

Multiply out the brackets and collect like terms

$(x-4)(x^2+x-2)$. 3

$x^3 + x^2 - 2x - 4x^2 - 4x + 8$

$= x^3 - 3x^2 - 6x + 8$

Multiply out the brackets and collect like terms:

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

$= 6x^2 + 2x - 15x - 5$

$= 6x^2 - 13x - 5$

Today's Learning:

To factorise an expression using a common factor and factorising using difference of two squares.

Factorising

26/11/17

Factorising an expression means writing it as a product of its factors.

e.g. Factorise the following by taking out a common factor:

a) $24g + 16gf$

$= 4g(6 + 4f)$

$= 8g(3 + 2f)$

b) $14x^3 - 20x^2$

$= 2x(7x^2 - 10x)$

$= 2x^2(7x - 10)$

c) $14e^3 - 20e^2 + 30e$

$2e(7e^2 - 10e + 15)$

Difference of Two Squares

26/11/17

If you see 2 squared terms and one is negative, we can factorise using difference of two squares.

e.g. Factorise

a) $g^2 - 4$

$= (g + 2)(g - 2)$

$= g^2 + 2g - 2g - 4$

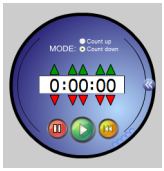
b) $m^2 - r^2$

$= (m + r)(m - r)$

c) $4t^2 - 16y^2$

$= (2t + 4y)(2t - 4y)$

Practice from Q8 on page 6



Starter

Multiply out the brackets, remembering to simplify where possible:

1) $(m + 1)(m - 1)$

$m^2 - 1$

2) $(p + 5)(p - 2)$

$p^2 + 3p - 10$

3) $(a + 3)(a - 10)$

$a^2 - 7a - 30$

4) $(2p + 5)(p - 1)$

$2p^2 + 3p - 5$

5) $(3q - 1)(q - 4)$

$-12q - 1q$

$3q^2 - 13q + 4$

6) $(T + 2r)(T - 3)$

$T^2 + 2rT - 3T - 6r$

7) $(2a + 5)(5a - 10)$

$10a^2 + 25a - 20a - 50$

$= 10a^2 + 5a - 50$

Sometimes we can take out a common factor, then use difference of two squares.

e.g. $3y^2 - 75$

$= 3(y^2 - 25)$

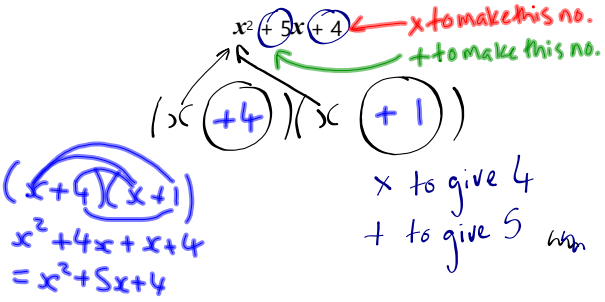
$= 3(y + 5)(y - 5)$

Today's Learning:

To start with an expression and factorise it using double brackets.

Factorising Trinomals

A trinomial usually has an x^2 term, an x term and a number.



$(x+4)(x+1)$

$x^2+4x+x+4$

$=x^2+5x+4$

e.g. Factorise the following:

1) $m^2 + 6m + 8$

$(m+4)(m+2)$

8
4,2
1,8

2) $g^2 + 12g + 20$

$(g+10)(g+2)$

20
5,4
10,2
1,20

3) $t^2 - 9t + 20$

$=(t-5)(t-4)$

~~$t^2-5t-4t-20$~~

~~$t^2-5t+4t-20$~~

20
10,2
1,20
5,4

4) $q^2 - 13q + 30$

$=(q-3)(q-10)$

30
15,2
30,1
5,6
10,3

Starter

1) Solve for g: $3g + 5 = 7g - 11$

$-3g \quad -3g$

$5 = 4g - 11$

$+11 \quad +11$

$16 = 4g$

$\div 4 \quad \div 4$

$4 = g$

2) Solve for m: $\frac{4m}{7} = 2$

$\times 7 \quad \times 7$

$4m = 14$

$\div 4 \quad \div 4$

$m = \frac{14}{4}$

$= \frac{7}{2}$

3) Solve for H: $2H + 3 > 5 - H$

$+H \quad +H$

$3H + 3 > 5$

$-3 \quad -3$

$3H > 2$

$\div 3 \quad \div 3$

$H > \frac{2}{3}$

4) Find a fifth of 238

47.6

5) Factorise the expression $r^2 - 49$

$(r-7)(r+7)$

5) $m^2 - 5m - 50$

$(m-10)(m+5)$

~~$m^2+10m-5m-50$~~

50
5,10
25,2
1,50

6) $R^2 + R - 20$

$(R+5)(R-4)$

20
2,10
1,20
5,4

$+5-4=1$

$-5+4=-1$

7) $3f^2 - 14f - 24$

~~$(3f-12)(f+2)$~~

$3f^2-12f+6f-24$

~~$(3f+8)(f-3)$~~

$3f^2+8f-9f-24$

~~$(3f \quad 3)(f \quad 8)$~~

$3f^2 \quad 3f \quad 24f \quad 24$

$(3f+4)(f-6)$

8) $6m^2 + 5m - 4$

$(3m+4)(2m-1)$

24
6,4
24,1
12,2
8,3

$6m^2+8m-3m-4$

4
2,2
4,1

Starter

1) Solve for m: 3 - 14m = 2 + 4m

+14m +14m

3 = 2 + 18m

-2 -2

1 = 18m

$m = \frac{1}{18}$

2) Find $\frac{3}{4}$ of 428

107 x 3 = 321

3) Solve for p: 3 - 2p < 4 - 4p

+2p +2p

3 < 4 - 2p

+2p +2p

3 + 2p < 4

-3 -3

2p < 1

$p < \frac{1}{2}$

4) Factorise the expression $3x^2 - 2xy$

$x(3x - 2y)$

Starter

1) Factorise fully: $3x(x-4)$

a) $3x^2 - 12$ b) $2x^2 + 4x - 6$ c) $3x^2 + 23x + 14$

$3(x^2-4)$ $(3x+2)(x+7)$

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

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

2) Solve for g: $\frac{3g}{2} - 9 = 11$

$\frac{3g}{2} = 20$

$3g - 18 = 22$

$3g = 40$

$3g = 40$

$g = \frac{40}{3}$

3) Solve for m: 3 - 2m < 2 + m

+2m +2m

3 < 2 + 3m

-2 -2

1 < 3m

÷3 ÷3

$\frac{1}{3} < m$

Factorising Expressions

2/12/17

To factorise any expression, look for

- A common factor
- Difference of two squares
- Trinomial to factorise

e.g. Factorise fully:

a) $3k^2 - 27$

$3(k^2-9)$

$3(k+3)(k-3)$

b) $4c^2 + 36c + 56$

$= 4(c^2 + 9c + 14)$

$= 4(c+7)(c+2)$

Starter

Today's Learning:

To write trinomials in completed square form.

Completing the Square

Sometimes we want to write a trinomial as a squared bracket plus or minus an integer, ie. $(x + a)^2 + b$.

e.g. $x^2 + 4x + 3 = (x + 2)^2 - 1$ (completed square form)

Later, this will make sketching these graphs easier.

e.g. Write these trinomials in completed square form:

a) $x^2 + 8x + 7$ half it

$(x+4)^2 = (x+4)(x+4)$

$= x^2 + 4x + 4x + 16$

$= x^2 + 8x + 16$

$= (x+4)^2 - 9$

b) $x^2 - 2x + 1$ half it

$(x-1)^2 = (x-1)(x-1)$

$= x^2 - x - x + 1$

$= x^2 - 2x + 1$

$= (x-1)^2$

Write the following in completed square form...

1) $x^2 - 14x + 5$ $(x-7)^2-44$
2) $x^2 + 6x - 10$ $(x+3)^2-19$
3) $x^2 + 2x - 1$
4) $x^2 - 4x - 10$
5) $x^2 - 10x + 3$
6) $x^2 + 18x + 17$
7) $x^2 - 6x + 2$
8) $x^2 + 26x + 40$

Challenge: How would you write $x^2 + 5x + 3$ in completed square form?

$\frac{5}{2} \times \frac{5}{2} = \frac{25}{4}$

$(x+\frac{5}{2})^2$

$=(x+\frac{5}{2})(x+\frac{5}{2})$

$=x^2+\frac{5}{2}x+\frac{5}{2}x+\frac{25}{4}$

$=x^2+5x+\frac{25}{4}$

$\frac{25}{4}=6\frac{1}{4}$

x^2+5x+3

$=(x+\frac{5}{2})^2-3$

Starter

1) Solve the equation: $5m - 3 = 3 - m$

$+3 \quad +3$

$5m = 6-m$

$+m \quad +m$

$6m=6$

$m=1$

2) Fully factorise the following: $7p^2 - 26p - 8$

$(7p+2)(p-4)$

$7p^2-28p+2p-8$ $\quad 8 \quad 8,1 \quad 2,4$

3) Solve for g: $4g - 3 > 7 - g$

$+g \quad +g$

$5g-3>7$

$+3 \quad +3$

$5g>10$

$g>2$

4) Calculate 0.34 x 1.5

0.5×0.34

$+ 0.34$

0.51

Today's Learning:

To practise trickier examples of completing the square.

Write in completed square form:

1) $x^2 - x + 1$
2) $x^2 - 7x + 3$ $(x-3.5)^2-9.25$
3) $x^2 + 3x + 2$ $(x-\frac{3}{2})^2-\frac{1}{4}$
4) $x^2 + x + 6$ $(x+\frac{1}{2})^2+5.75$
5) $x^2 - 15x - 1$ $(x+\frac{15}{2})^2-55.25$
6) $x^2 + 7x + 10$ $(x+\frac{7}{2})^2-2.25$

Write in completed square form:

1) $x^2 - x + 1$
2) $x^2 - 7x + 3$ $(x-3.5)^2-9.25$
3) $x^2 + 3x + 2$ $(x-\frac{3}{2})^2-\frac{1}{4}$
4) $x^2 + x + 6$ $(x+\frac{1}{2})^2+5.75$
5) $x^2 - 15x - 1$ $(x+\frac{15}{2})^2-55.25$
6) $x^2 + 7x + 10$ $(x+\frac{7}{2})^2-2.25$

When the coefficient of x is an odd number, halve it as normal:

c) $x^2 - 1x + 2$

$=(x-\frac{1}{2})^2+1\frac{3}{4}$

$(x-\frac{1}{2})^2=(x-\frac{1}{2})(x-\frac{1}{2})$

$=x^2-\frac{1}{2}x-\frac{1}{2}x+\frac{1}{4}$

$=x^2-x+\frac{1}{4}$

$\frac{1}{2} \times \frac{1}{2} = \frac{1}{4}$

When there's a negative or non-unitary coefficient of x^2, use brackets to deal with it, then multiply out later.

the expression can be written in the form $p(x + a)^2 + q$

e.g. Write in the form $p(x + a)^2 + q$:

1) $-x^2 + 4x - 5$

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

$= -((x-2)^2 + 1)$

$= -(x-2)^2 - 1$

$(x-2)^2$
$= (x-2)(x-2)$
$= x^2 - 2x - 2x + 4$
$= x^2 - 4x + 4$

2) $3x^2 - 6x + 2$

$= 3(x^2 - 2x + \frac{2}{3})$

$= 3((x-1)^2 - \frac{1}{3})$

$= 3(x-1)^2 - 1$

$(x-1)^2$
$= (x-1)(x-1)$
$= x^2 - x - x + 1$
$= x^2 - 2x + 1$