

Elementary Algebra
Skill-Builder # PF – 1B
Factoring out the GCF II

Sometimes the GCF consists of two or more terms.

Examples Factor the following.

1. $x(a+3)+4(a+3)$

Solution: The expression consists of the two terms $x(a+3)$ and $4(a+3)$. The quantity $a+3$ is common to the two terms and can be factored out either as a left factor or as a right factor as follows:

$$x(a+3)+4(a+3)=(a+3)(x+4)$$

or $x(a+3)+4(a+3)=(x+4)(a+3)$.

2. $2r(x-2y+3z)-3t(x-2y+3z)+6w(x-2y+3z)$

Solution: The expression has three terms with the quantity $x-2y+3z$ common to all three. Factoring out this quantity from all three terms, we get

$$\begin{aligned}2r(x-2y+3z)-3t(x-2y+3z)+6w(x-2y+3z) \\ = (x-2y+3z)(2r-3t+6w).\end{aligned}$$

We can, of course, write the factored form as $(2r-3t+6w)(x-2y+3z)$ by the commutative property for multiplication.

Sometimes the GCF has to be factored out more than once.

3. $3a(4x+10y)-2b(4x+10y)$

Solution: The quantity $4x+10y$ is common to the two terms, and factoring it out, we get

$$3a(4x+10y)-2b(4x+10y)=(4x+10y)(3a-2b).$$

Note that the factor $4x+10y$ has two terms with a GCF of 2, so factoring this out, we get the complete factored form of the expression which is

$$2(2x+5y)(3a-2b).$$

4. $4x^2(6a-9ab)+6x(6a-9ab)$

Solution: The quantity $6a-9ab$ is common to the two terms, and factoring it out, we get

$$4x^2(6a-9ab)+6x(6a-9ab)=(6a-9ab)(4x^2+6x).$$

Note that the first factor has a GCF of $3a$ while the second factor has a GCF of $2x$. Factoring these out, we get

$$(6a-9ab)(4x^2+6x)=3a(2a-3b)\cdot 2x(2x+3),$$

which we can write as

$$6ax(2a-3b)(2x+3).$$

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Factor out the greatest common factor (GCF):

1. $x(a+b) + y(a+b)$	2. $3y(x-6) - 5w(x-6)$
3. $a(x+y+z) - 2b(x+y+z) + 3c(x+y+z)$	4. $a^2(2x-y+5) + b(2x-y+5) + (2x-y+5)$
5. $-20(3x+10) + 4y(10+3x)$	6. $15n(4p+5q) - 10(5q+4p)$
7. $16x^2(3y+21) - 20x(3y+21)$	8. $-8a^2b^3(4x-6y) + 12ab^2(4x-6y)$

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Answers

1. $(a+b)(x+y)$	2. $(x-6)(3y-5w)$
3. $(x+y+z)(a-2b+3c)$	4. $(2x-y+5)(a^2+b+1)$
5. $-4(5-y)(3x+10)$	6. $5(3n-2)(4p+5q)$
7. $12x(y+7)(4x-5)$	8. $-8ab^2(2x-3y)(2ab-3)$

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