Topic: Factoring by grouping

Question: Factor the polynomial by grouping.

$$5k - kxy + 5pc - pcxy$$

Answer choices:

A $(5 + xy)(k - pc)$

B $(5 - xy)(k + pc)$

C $(5 + xy)(pc - k)$

D $(xy - 5)(k + pc)$

Solution: B

Since we've been asked to use grouping to factor the polynomial, we need to look for a way to split the terms of the polynomial into two groups that can be factored separately. Since the first two terms have a factor of k in common, and the last two terms have a factor of pc in common, we'll group the first two terms separately from the last two terms.

$$5k - kxy + 5pc - pcxy$$

$$(5k - kxy) + (5pc - pcxy)$$

With our terms grouped, we need to look for the greatest common factor in each group. In this case, those are the factors we identified earlier (k in the first group, and pc in the second group). Factoring these out of the respective groups separately, we get

$$k(5 - xy) + pc(5 - xy)$$

Notice that the two groups of terms do indeed have a factor in common (specifically, $5 - xy$), so we can now factor that out of each group.

$$(5 - xy)(k + pc)$$

This is the correct solution, but it can also be written as $(k + pc)(5 - xy)$.

Remember, there are usually different ways to group our terms before we factor. We could have used grouping to factor our polynomial this way:

$$5k - kxy + 5pc - pcxy$$

$$(5k + 5pc) + (-kxy - pcxy)$$

$$5(k+pc)-xy(k+pc)$$

$$(5-xy)(k+pc)$$

Topic: Factoring by grouping

Question: Factor the polynomial by grouping.

$$xya - 4a + xyb - 4b$$

Answer choices:

A $(a + b)(xy - 4)$

B $(a - b)(xy + 4)$

C $(a + b)(xy + 4)$

D $(a - b)(xy - 4)$

Solution: A

Since we've been asked to use grouping to factor the polynomial, we need to look for a way to split the terms of the polynomial into two groups that can be factored separately. Since the first two terms have a factor of a in common, and the last two terms have a factor of b in common, we'll group the first two terms separately from the last two terms.

$$xya - 4a + xyb - 4b$$

$$(xya - 4a) + (xyb - 4b)$$

With our terms grouped, we need to look for the greatest common factor in each group. In this case, those are the factors we identified earlier (a in the first group, and b in the second group). Factoring these out of each group separately, we get

$$a(xy - 4) + b(xy - 4)$$

Notice that the two groups of terms do indeed have a factor in common (specifically, $xy - 4$), so we can now factor that out of each group.

$$(xy - 4)(a + b)$$

This is the correct solution, but it can also be written as $(a + b)(xy - 4)$.

Remember, there are usually different ways to group our terms before we factor. We could have used grouping to factor our polynomial this way:

$$xya - 4a + xyb - 4b$$

$$(xya + xyb) + (-4a - 4b)$$

$xy(a+b)-4(a+b)$

$(a+b)(xy-4)$

Topic: Factoring by grouping

Question: Factor the polynomial by grouping.

$$12ahx + 6akx + 12bchx + 6bckx + 4ahy + 2aky + 4bchy + 2bcky$$

Answer choices:

A $2(bc - a)(k - 2h)(y - 3x)$

B $2(a + bc)(2h - k)(3x + y)$

C $2(a - bc)(2h - k)(3x - y)$

D $2(a + bc)(2h + k)(3x + y)$

Solution: D

Since we've been asked to use grouping to factor the polynomial, we need to look for a way to split the terms of the polynomial into two groups that can be factored separately. For this polynomial, let's group together the terms with a factor of a separately from the terms with a factor of bc.

$$12ahx + 6akx + 12bchx + 6bckx + 4ahy + 2aky + 4bchy + 2bcky$$

$$(12ahx + 6akx + 4ahy + 2aky) + (12bchx + 6bckx + 4bchy + 2bcky)$$

With our terms grouped, we need to look for the greatest common factor in each group. In this case, those are $2a$ (in the first group) and $2bc$ (in the second group). Factoring these out of the respective groups separately, we get

$$2a(6hx + 3kx + 2hy + ky) + 2bc(6hx + 3kx + 2hy + ky)$$

$$(2a + 2bc)(6hx + 3kx + 2hy + ky)$$

Within $(6hx + 3kx + 2hy + ky)$, we can group together the terms with a factor of x separately from the terms with a factor of y, and then pull out the greatest common factor in each group separately ($3x$ in the first group, and y in the second group).

$$(2a + 2bc)\big[(6hx + 3kx) + (2hy + ky)\big]$$

$$(2a + 2bc)\big[3x(2h + k) + y(2h + k)\big]$$

$$(2a + 2bc)\big[(3x + y)(2h + k)\big]$$

$$(2a + 2bc)(2h + k)(3x + y)$$

Notice that the two terms in the first factor ($2a$ and $2bc$) have a common factor of 2, so we can factor our polynomial even further.

$$2(a + bc)(2h + k)(3x + y)$$

This is the correct solution, but there are several other ways we could have grouped the terms together, all of which will result in the same answer.