

Math 80 Worksheet #5 Solutions

1. Find the Greatest Common Factor of the following lists of terms:

(a) $18t^2$ and $27t^3$

Note that $18 = 2 \cdot 3 \cdot 3$ and $27 = 3 \cdot 3 \cdot 3$ (Prime Factorization). So the GCF of 18 and 27 is $3 \cdot 3 = 9$.

The GCF of t^2 and t^3 is t^2 .

$$\Rightarrow \text{The GCF of } 18t^2 \text{ and } 27t^3 \text{ is } 9t^2.$$

(b) $4a^5b$, $6a^3b^2$, and $12a^6b^3$

Note that $4 = 2 \cdot 2$ and $6 = 2 \cdot 3$ and $12 = 2 \cdot 2 \cdot 3$. So the GCF of 4, 6, and 12 is 2.

The GCF of a^5 , a^3 , and a^6 is a^3 .

The GCF of b , b^2 , and b^3 is b .

$$\Rightarrow \text{The GCF of } 4a^5b, 6a^3b^2, \text{ and } 12a^6b^3 \text{ is } 2a^3b.$$

2. Factor the following as much as possible (Factoring out the GCF, Factoring by Grouping, Factoring Trinomials):

(a) $6x^3 + 21x^2$

The GCF of $6x^3$ and $21x^2$ is $3x^2$.

Factoring: $6x^3 + 21x^2 = 3x^2(2x + 7)$

(b) $24a^3 - 16a + 32$

The GCF of $24a^3$, $-16a$, and 32 is 8.

Factoring: $24a^3 - 16a + 32 = 8(3a^3 - 2a + 4)$

(c) $-25a^8b^2 + 15a^5b^4 - 30a^7b^3$

The GCF of $-25a^8b^2$, $15a^5b^4$, and $-30a^7b^3$ is $5a^5b^2$.

Factoring: $-25a^8b^2 + 15a^5b^4 - 30a^7b^3 = 5a^5b^2(-5a^3 + 3b^2 - 6a^2b)$

Note: You can also factor out $-5a^5b^2$, which would result in the product $-5a^5b^2(5a^3 - 3b^2 + 6a^2b)$.

(d) $2(1 + t) - 3s(1 + t)$

The GCF of $2(1 + t)$ and $-3s(1 + t)$ is $(1 + t)$.

Factoring: $2(1 + t) - 3s(1 + t) = (1 + t)(2 - 3s)$

(e) $2mn - 3m + 18n - 27$

Factoring by grouping The GCF of $2mn$ and $-3m$ is m . The GCF of $18n$ and -27 is 9 .

Factoring: $2mn - 3m + 18n - 27 = m(2n - 3) + 9(2n - 3)$
 $= (2n - 3)(m + 9)$

(f) $5st + t^2 - 20s - 4t$

Factoring by grouping The GCF of $5st$ and t^2 is t . The GCF of $-20s$ and $-4t$ is 4 .

Note: Instead of factoring a 4 out of the last two terms, I will factor out a -4 .

Factoring: $5st + t^2 - 20s - 4t = t(5s + t) - 4(5s + t)$
 $= (5s + t)(t - 4)$

(g) $x^2 + 3x + 2$

We want to factor $x^2 + 3x + 2$ into two factors of the form $(x + a)$ and $(x + b)$ for the constants a and b .

We must have that $a \cdot b = 2$ and $a + b = 3$.

The factors of 2 are 1 and 2 , which means that our only possible values for a and b are 1 and 2 . Since $1 + 2 = 3$, we know that $x^2 + 3x + 2 = (x + 1)(x + 2)$.

(**Check FOILING:** $(x + 1)(x + 2) = x^2 + 2x + x + 2 = x^3 + 3x + 2$)

(h) $y^2 - 11y + 24$

The factors of 24 are 1, 2, 3, 4, 6, 8, 12, 24.

Since the coefficient of y is negative and the constant term 24 is positive, we need to consider the negative factors of 24.

Pairs of Factors	Product	Sum
-1 & -24	24	-25
-2 & -12	24	-14
-3 & -8	24	-11
-4 & -6	24	-10

Since the sum of -3 and -8 is -11, we know that $y^2 - 11y + 24 = (y - 3)(y - 8)$.

(**Check FOILING:** $(y - 3)(y - 8) = y^2 - 8y - 3y + 24 = y^2 - 11y + 24$)

(i) $s^2 - 4s - 12$

The factors of 12 are 1, 2, 3, 4, 6, 12.

Since the constant term -12 is negative, we need to consider the following pairs of factors:

Pairs of Factors	Product	Sum
-1 & 12	-12	11
1 & -12	-12	-11
-2 & 6	-12	4
2 & -6	-12	-4
-3 & 4	-12	1
3 & -4	-12	-1

Since the sum of 2 and -6 is -4, we know that $s^2 - 4s - 12 = (s + 2)(s - 6)$.

(**Check FOILING:** $(s + 2)(s - 6) = s^2 - 6s + 2s - 12 = s^2 - 4s - 12$)

(j) $t^2 + 2t - 15$

The factors of 15 are 1, 3, 5, 15.

Since the constant term -15 is negative, we need to consider the following pairs of factors:

Pairs of Factors	Product	Sum
-1 & 15	-15	14
1 & -15	-15	-14
-3 & 5	-15	2
3 & -5	-15	-2

Since the sum of -3 and 5 is 2, we know that $t^2 + 2t - 15 = (t - 3)(t + 5)$.

(**Check FOILing:** $(t - 3)(t + 5) = t^2 + 5t - 3t - 15 = t^2 + 2t - 15$)