Worksheet ---- Factoring

1. Factor out the GCF.

   (a) $27b^2 + 18b + 9$
   (b) $2y(5x - 2) - 3(2 - 5x)$

2. Factor by Grouping.

   (a) $x^2 - 3x + 4ax - 12a$
   (b) $3y^2 - 6y - ay + 2a$

3. Factor each trinomial whose lead coefficient is = 1.

   (a) $x^2 + 9x + 20$
   (b) $x^2 - 20x + 75$

4. Factor each trinomial whose lead coefficient is $\neq 1$.

   (a) $2x^2 - x - 3$
   (b) $11a^2 - 54a - 5$

5. Factor each difference of squares. $[A^2 - B^2 = (A + B)(A - B)]$

   (a) $9x^2 - 16$
   (b) $25y^4 - 4t^2$

6. Factor each perfect-square trinomial. $[A^2 + 2AB + B^2 = (A + B)^2]$ or $[A^2 - 2AB + B^2 = (A - B)^2]$

   (a) $9x^2 + 48x + 64$
   (b) $36t^2 - 84t + 49$

7. Factor each sum/difference of cubes. [Sum of Cubes: $A^3 + B^3 = (A + B)(A^2 - AB + B^2)$]
   [Difference of Cubes: $A^3 - B^3 = (A - B)(A^2 + AB + B^2)$]

   (a) $8a^3 + 27$
   (b) $27w^6 - 216$

General Factoring Strategy

When factoring a polynomial completely, ask the following questions:

Question #1: Is there a GCF? If so, factor out the GCF.

Question #2: How many terms remain to be factored?

4 terms: try factoring by grouping

3 terms: try factoring as a perfect-square trinomial, then
try factoring as a trinomial with lead coefficient = 1 or
try factoring as a trinomial with lead coefficient $\neq 1$

2 terms: try factoring as a difference of squares, then
try factoring as a sum or difference of cubes

Question #3: Can any of the factors be factored further? If so, do so.

1. Factor Completely.

(a) $a^2 - 4a - 12$

(b) $p^2 - 17p + 66$

(c) $4k^2 - 12k + 9$

(d) $14k^3 + 7k^2 - 70k$

(e) $54m^2 - 24z^2$

(f) $16r^2 + 24rm + 9m^2$

(g) $y^4 - 16$

(h) $64r^3 - 343$

(i) $1000p^3 + 27$

(j) $x^2 - 4x - 5x + 20$

(k) $4y^2 - 25$

(l) $8p^2 + 23p - 3$

(m) $20 + 5m + 12n + 3mn$

(n) $2m^2 - 10m - 48$

(o) $50z^2 - 100$

(p) $13z^2 + 49z - 8$

Factoring Challenge

2. Factor Completely.

(a) $x^2(x-2) + y^2(2-x)$

(b) $y^8 - 81$

(c) $8s + 12r - 6s^2 - 9rs$

(d) $400a^2 + 81b^2$

(e) $y^3(a-b) - 8(b-a)$

(f) $x^2 - 6x + 9 - y^2$

(g) $(r+2)^2 - 4$

(h) $9x^2y - 30xy^2 + 25y^3$

(i) $14 + 27z - 2z^2$

(j) $m^2 - n^2 - 8n - 16$