FANTASTIC FACTORING!

EXERCISE 1.3

A 1. Factor over the integers.

(a) $3x + 9$ (b) $7x - 14$
(c) $13st + 8s$ (d) $2xy + 5x$
(e) $3t^2 - 4t$ (f) $2mn - 3mnt$
(g) $6s - 6$ (h) $3xt - 6xy + 3x$

B 2. Factor over the integers.

(a) $3x^3 - 6x^2 - 9x$
(b) $36t^4 - 16t^3$
(c) $18x^2y - 9xy^2 + x^2y^2$
(d) $x^7 - x^6 + x^5 - x^4$
(e) $2mnt - 6mn + 8m$
(f) $6t^4 - 4t^5$
(g) $x^9y^8 - x^7y^6 + x^8y^9$
(h) $10m^2n - 15mn^2 - 5m^2n^2$

3. Factor.

(a) $7abc - 14ab + 21a$
(b) $2x^6 - 4x^4 - 2x^2$
(c) $39rst - 13rs$
(d) $25a^2b - 35a^2b^2 - 40a^3b^3$
(e) $27abc - abcd$
(f) $4x^7 + 8x^6 - 12x^8$
(g) $24xy^2 - xy - 8x^2y$
(h) $12x^2y^3 - 18x^3y^2 - 24x^2y^2$

4. Factor.

(a) $2x(a + b) + 3(a + b)$
(b) $4t(m + n) + 5s(m + n)$
(c) $5w(x - 3) + (x - 3)$
(d) $(x + 2)(x - 2) + 3(x + 2)$

EXERCISE 1.4

B 1. Complete the factoring.

(a) $3t(a + b) + 7(a + b)$
(b) $5(x - 1) + 2x(x - 1)$
(c) $3x(x - 5) - 7(x - 5)$
(d) $4m(x + y) + (x + y)$
(e) $2a(m - n) - (m - n)$
(f) $4x(2x - y) - 3(2x - y)$
(g) $(x + 3)^2 - 2(x + 3)$
(h) $m(x^2 - x - 1) + 3(x^2 - x - 1)$
(i) $7q(x - y) - (x - y)$

2. Factor.

(a) $ax + by + bx + ay$
(b) $mx + 2y + my + 2x$
(c) $y^2 + 1 - y^3 - y$
(d) $mx - ny + my - nx$
(e) $ax - 3a + 3b - bx$
(f) $cx^2 + d - dx^2 - cx$

3. Factor.

(a) $2 + x^3 - 2x^2 - x$
(b) $4mx + 2ny - 8my - nx$
(c) $10x^2 + 3y - 5xy - 6x$
(d) $15s^2 - 12s - 5st + 4t$
(e) $a^2 + 6bc - 3ac - 2ab$

EXERCISE 1.5

B 1. Factor.

(a) $x^2 + 7x + 12$ (b) $x^2 + 7x + 10$
(c) $w^2 - 8w + 15$ (d) $x^2 - 2x - 8$
(e) $x^2 + 3x - 10$ (f) $m^2 - 6m - 7$
(g) $t^2 - 9t + 20$ (h) $x^2 - 2x - 24$
(i) $x^2 + 2x - 15$ (j) $t^2 - t - 12$
(k) $w^2 - 4w - 45$ (l) $r^2 + 12r + 35$
(m) $x^2 + 11x + 28$ (n) $w^2 - 14w + 40$
(o) $t^2 - t - 20$ (p) $x^2 + 3x - 88$
(q) $r^2 + 2r - 24$ (r) $y^2 - 7y + 10$
(s) $x^2 + 7x - 30$ (t) $s^2 - 4s - 21$
(u) $x^2 + 6x - 27$ (v) $t^2 - 3t + 2$
(w) $x^2 - 3x - 40$ (x) $w^2 + 3w - 70$
(y) $m^2 + 16m + 63$ (z) $n^2 - 10n + 16$

2. If possible, determine integer values for m and n.

(a) $m + n = -1$, $mn = -12$
(b) $m + n = 7$, $mn = 10$
(c) $m + n = -2$, $mn = -42$
(d) $m + n = 5$, $mn = -50$
(e) $m + n = -5$, $mn = -36$
(f) $m + n = -2$, $mn = -10$
(g) $m + n = 15$, $mn = 44$
(h) $m + n = -12$, $mn = 20$
(i) $m + n = -2$, $mn = 1$
(j) $m + n = 3$, $mn = -18$
(k) $m + n = 0$, $mn = -36$
(l) $m + n = -8$, $mn = 16$

3. Factor over the integers, if possible.

(a) $2x^2 + 7x + 3$ (b) $2x^2 - 7x + 5$
(c) $3w^2 - 11w - 20$ (d) $6y^2 + y - 1$
(e) $6w^2 - 7w - 3$ (f) $10w^2 - w - 2$
(g) $3x^2 - 3x - 4$ (h) $2x^2 - 3x + 1$
(i) $2w^2 + 9w + 10$ (j) $2t^2 + 7t + 6$
(k) $6m^2 + 13m + 9$ (l) $3w^2 + 7t - 20$
(m) $4m^2 + 9m + 3$ (n) $10x^2 + x - 2$
(o) $8x^2 + 6x - 9$ (p) $4t^2 - 13t + 10$

*4. Factor over the integers, if possible. First remove any common factors.

(a) $4x^2 - 10x + 6$ (b) $9m^2 + 33m + 30$
(c) $8t^2 + 4t + 4$ (d) $16y^2 - 10y - 21$
(e) $12y^2 - 17y + 6$ (f) $20x^2 + 46x + 24$
(g) $5m^2 + 30m + 30$ (h) $6x^2 - 6x - 21$
(i) $12x^2 - 2x - 30$ (j) $6t^2 + 13t - 28$

EXERCISE 1.6

A 1. Factor.

(a) $x^2 - 8x + 16$
(b) $y^2 + 10y + 25$
(c) $x^2 - 16$
(d) $m^2 + 12m + 36$
(e) $t^2 - 49$
(f) $w^2 - 14w + 49$
(g) $x^2 - 20x + 100$
(h) $s^2 - 1$
(i) $y^2 + 2y + 1$

2. Factor.

(a) $4x^2 - 9$
(b) $36y^2 - 49$
(c) $100x^2 - 81$
(d) $1 - 16y^2$
(e) $121y^2 - 4$
(f) $9m^2 - 1$

B 3. Factor.

(a) $16x^2 - 49y^2$
(b) $4m^2 + 12mn + 9n^2$
(c) $36s^2 - 60st + 25t^2$
(d) $81p^2 + 144pq + 64q^2$
(e) $9d^2 - 25y^2$
(f) $16x^2 - 88xy + 121y^2$
(g) $25a^2 + 30ab + 9b^2$
(h) $49s^2 - 56st + 16t^2$
(i) $100m^2 - 121n^2$

4. Factor.

(a) $49x^4y^2 - 4z^2$
(b) $25m^2n^2 + 40mnt + 16t^2$
(c) $36x^6 - 25y^4$
(d) $4x^6y^4 - 28x^3y^2 + 49$
(e) $16m^6 - 40m^3n + 25n^2$
(f) $36s^4 + 60s^2t + 25t^2$
(g) $0.25x^2 - 0.64y^2$
(h) $1.44s^2 + 6st^2 + 6.25t^4$

5. Factor.

(a) $(x - y)^2 - 16$
(b) $(s + 3t)^2 - 9$
(c) $(a + 2b)^2 - 144$
(d) $(3x - 2y)^2 - 25$

6. Factor.

(a) $49 - (2y - w)^2$
(b) $1 - (x - y)^2$
(c) $(x + y)^2 - (a + b)^2$
(d) $(3m + n)^2 - (2s - 5t)^2$

7. Factor.

(a) $x^2 + 6xy + 9y^2 - 36$
(b) $s^2 - 8s + 16 - t$
(c) $p^2 + 2pq + q^2 - 25$
(d) $x^2 - y^2 - 14y - 49$
(e) $a^2 + 2ab + b^2 - c^2 + 6c - 9$
(f) $m^2 + 2mn + n^2 - s^2 - 2st - t^2$
(g) $25y^2 - 30y + 9 - 4c^2 - 4cd - d^2$

8. Factor.

(a) $-9y^2 + 12y - 4$
(b) $2a^3b - 4a^2b + 2ab$
(c) $-3x^2 + 27$
(d) $-4xy^2 - 4xy - x$
(e) $2x^3 - 50xy^2$
(f) $36s^3t + 120s^2t^2 + 100st^3$
(g) $-p^3 + 6p^2q - 9pq^2$
(h) $-9a^2 + 32$

9. Evaluate mentally.

(a) $81^2 - 80^2$
(b) $134^2 - 133^2$
(c) $93^2 - 83^2$
(d) $443^2 - 433^2$

C 10. Factor.

(a) $x^{4n} - y^{6n}$
(b) $9x^{6n} - 12x^{3n}y^{2n} + 4y^{4n}$
(c) $16x^{4n+z} + 24x^{2n+1}y^{4n} + 9y^{8n}$

11. To evaluate 31^2 mentally, we can use a complete square pattern.

31^2 can be written as
$(30 + 1)^2$, which fits the pattern

$$(a + b)^2 = a^2 + 2ab + b^2$$

$$\begin{aligned} 31^2 &= (30 + 1)^2 \\ &= (900 + 60 + 1) \\ &= 961 \end{aligned}$$

Use patterns to evaluate each of the following.

(a) 51^2 (b) 49^2
(c) 32^2 (d) 58^2