

## Factoring By Grouping

Factor each completely.

1)  $12a^3 - 9a^2 + 4a - 3$

2)  $2p^3 + 5p^2 + 6p + 15$

3)  $3n^3 - 4n^2 + 9n - 12$

4)  $12n^3 + 4n^2 + 3n + 1$

5)  $m^3 - m^2 + 2m - 2$

6)  $5n^3 - 10n^2 + 3n - 6$

7)  $35xy - 5x - 56y + 8$

8)  $224az + 56ac - 84yz - 21yc$

9)  $mz - 5mh^2 - 5nz + 25nh^2$

10)  $12xy - 28x - 15y + 35$

$$11) 40xy + 30x - 100y - 75$$

$$12) 75a^2c - 45a^2d - 30bc + 18bd$$

$$13) 192x^2y + 72x^3 - 24rxy - 9rx^2$$

$$14) 90au - 36av - 150yu + 60yv$$

$$15) 140ab - 60a^2 + 168b - 72a$$

$$16) 105ab - 90a - 21b + 18$$

$$17) 16x^2c + 8xyd - 16x^2d - 8xyc$$

$$18) 150m^2nz + 20mn^2c - 120m^2nc - 25mn^2z$$

$$19) 105xuv + 60xv - 70xu - 90xv^2$$

$$20) 112xy - 16x + 128x^2 - 14y$$

## ANSWERS

$$1) 12a^3 - 9a^2 + 4a - 3 \\ (3a^2 + 1)(4a - 3)$$

$$2) 2p^3 + 5p^2 + 6p + 15 \\ (p^2 + 3)(2p + 5)$$

$$3) 3n^3 - 4n^2 + 9n - 12 \\ (n^2 + 3)(3n - 4)$$

$$4) 12n^3 + 4n^2 + 3n + 1 \\ (4n^2 + 1)(3n + 1)$$

$$5) m^3 - m^2 + 2m - 2 \\ (m^2 + 2)(m - 1)$$

$$6) 5n^3 - 10n^2 + 3n - 6 \\ (5n^2 + 3)(n - 2)$$

$$7) 35xy - 5x - 56y + 8 \\ (5x - 8)(7y - 1)$$

$$8) 224az + 56ac - 84yz - 21yc \\ 7(8a - 3y)(4z + c)$$

$$9) mz - 5mh^2 - 5nz + 25nh^2 \\ (m - 5n)(z - 5h^2)$$

$$10) 12xy - 28x - 15y + 35 \\ (4x - 5)(3y - 7)$$

$$11) 40xy + 30x - 100y - 75$$

$$5(2x - 5)(4y + 3)$$

$$12) 75a^2c - 45a^2d - 30bc + 18bd$$

$$3(5a^2 - 2b)(5c - 3d)$$

$$13) 192x^2y + 72x^3 - 24rxy - 9rx^2$$

$$3x(8x - r)(8y + 3x)$$

$$14) 90au - 36av - 150yu + 60yv$$

$$6(3a - 5y)(5u - 2v)$$

$$15) 140ab - 60a^2 + 168b - 72a$$

$$4(5a + 6)(7b - 3a)$$

$$16) 105ab - 90a - 21b + 18$$

$$3(5a - 1)(7b - 6)$$

$$17) 16x^2c + 8xyd - 16x^2d - 8xyc$$

$$8x(2x - y)(c - d)$$

$$18) 150m^2nz + 20mn^2c - 120m^2nc - 25mn^2z$$

$$5mn(6m - n)(5z - 4c)$$

$$19) 105xuv + 60xv - 70xu - 90xv^2$$

$$5x(7u - 6v)(3v - 2)$$

$$20) 112xy - 16x + 128x^2 - 14y$$

$$2(8x - 1)(7y + 8x)$$