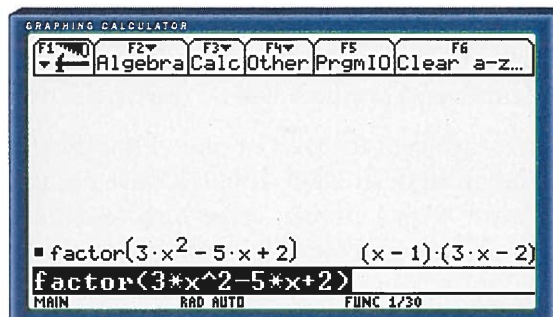


# Technology Extension: Factoring Polynomials With a Graphing Calculator

Complete each of the following using the **factor function** of a graphing calculator that has the capability to factor polynomials.



## 1 Factoring Polynomials

1. Remove the common factor.

a)  $6x^2 + 15x - 12$

b)  $14y^2 - 42y + 21$

c)  $20x + 15x^2 + 10$

d)  $4x^2y + 6xy - 8xy^2$

e)  $3p^3q + 18p^2q^2 + 6pq^3$

f)  $12a^3b^2 + 4a^2b^3 + 8ab^4 - 6b^5$

2. Factor, if possible.

a)  $x^2 + 19x + 34$

b)  $x^2 - 6x - 72$

c)  $x^2 - 24x + 40$

d)  $15 - 8t + t^2$

e)  $4n^2 + 13n + 9$

f)  $2m^2 - 5m + 6$

g)  $5x^2 - 17x - 12$

h)  $15y^2 + 11y - 14$

i)  $x^2 + 7xy + 10y^2$

j)  $3x^2 - 14xy + 8y^2$

k)  $15a^2 - ab - 6b^2$

l)  $14x^2 + 55xy - 36y^2$

m)  $(x + a)^2 + 6(x + a) + 8$

n)  $(x - y)^2 - 5(x - y) + 6$

o)  $x^4 + 2x^2 - 15$

3. Factor completely.

a)  $3x^2 - 30x + 27$

b)  $4x^2 + 10x - 24$

c)  $75y^2 + 215y + 40$

d)  $2u^2 - 6uv + 4v^2$

e)  $36x^2 + 42xy - 18y^2$

f)  $x^3 + 3x^2 + 2x$

g)  $4t^3 - 26t^2 - 14t$

h)  $30x^4 + 87x^2 + 30$

i)  $24x^4 - 16x^2 - 8$

## 2 Factoring Special Products

1. Factor.

a)  $25x^2 + 60x + 36$

b)  $9y^2 - 30y + 25$

c)  $9n^2 - 64$

d)  $25 - 169x^2$

e)  $4x^2 - 9y^2$

f)  $49a^2 - 56ab + 16b^2$

2. Factor completely.

a)  $16m^2 - 64$

b)  $36 - 16x^2$

c)  $125x^4 - 80$

d)  $72x^2 - 98y^4$

e)  $2x^2 - 28x + 98$

f)  $12x^2 + 60x + 75$

g)  $32w^3 - 160w^2 + 200w$

h)  $300 - 48x^4$

i)  $36y^4 + 120x^2y^2 + 100x^4$

3. Write two special products that can be factored. Have a classmate factor them.

- b)**  $\pm 13, \pm 14, \pm 22, \pm 41$  **c)**  $\pm 5, \pm 1$  **d)**  $\pm 35, \pm 16, \pm 9, \pm 5, 0$   
**9. a)**  $(2x^2 + 1)(x^2 + 1)$  **b)**  $(2x^2 - 1)(x^2 + 3)$   
**c)**  $(3x^2 - 4)(x^2 + 1)$  **d)**  $(2x^2 - 3)(3x^2 - 2)$   
**e)**  $(2x^2 + y)(x^2 + 2y)$  **f)**  $(3x^2 - y)(x^2 + 4y)$

### Section 3.7 pp. 167–169

- Practice 1. a)**  $(x + 3)(x - 3)$  **b)**  $(y + 4)(y - 4)$  **c)** not possible **d)**  $(5a + 6)(5a - 6)$  **e)**  $(1 + 8t)(1 - 8t)$   
**f)**  $(6 + 7a)(6 - 7a)$  **g)** not possible **h)**  $(5x + 8y)(5x - 8y)$   
**i)**  $(2t + 3s)(2t - 3s)$  **j)**  $(10p + 11q)(10p - 11q)$   
**k)**  $(16 + 9y)(16 - 9y)$  **l)**  $(15b + a)(15b - a)$   
**2. a)** yes,  $(x + 3)^2$  **b)** yes,  $(y - 5)^2$  **c)** no **d)** yes,  $(2t + 1)^2$   
**e)** yes,  $(4t + 3)^2$  **f)** yes,  $(7 + x)^2$  **g)** yes,  $(1 - 8t)^2$  **h)** yes,  $(3x - 4)^2$  **i)** yes,  $(2 + 7r)^2$  **j)** no **k)** yes,  $(11m - 1)^2$  **l)** yes,  $(3a + 2b)^2$  **3. a)**  $(y + 12)(y - 12)$  **b)** not possible  
**c)**  $(3a - 4)^2$  **d)**  $2(x + 4)(x - 4)$  **e)** not possible  
**f)**  $3(x + 1)^2$  **g)**  $(m - 7)^2$  **h)**  $(2p + 5q)^2$   
**i)**  $(7x + 11y)(7x - 11y)$  **j)**  $5(4a + 3b)(4a - 3b)$  **k)** not possible  
**l)**  $y(y + 6)(y - 6)$  **m)**  $y(y - 9)^2$  **n)**  $4(9x^2 + 25y^2)$   
**o)**  $3x(x + 4)(x - 4)$  **p)**  $5m(m - 4)^2$  **q)**  $(9x + 12)(9x - 12)$   
**r)**  $3(b + 10)(b - 10)$

- Applications and Problem Solving 4. a)** 600 **b)** 800  
**c)** 640 000 **5. a)**  $2(x - 1)^2$  **b)**  $2(x - 1), x - 1$  **c)** 18 m by 9 m  
**6. a)**  $(x - 1)(x + 5)$  **b)**  $(1 + y)(7 - y)$  **c)**  $-(2m + 3)$

- d)**  $(x^2 + 11)^2$  **e)**  $(t^3 - 9)^2$  **f)**  $\left(\frac{x}{2} + \frac{1}{3}\right)\left(\frac{x}{2} - \frac{1}{3}\right)$   
**g)**  $(5x^2 + 9)(5x^2 - 9)$  **h)**  $8xy$  **7. a)**  $\pm 8$  **b)**  $\pm 42$  **c)** 4 **d)** 9  
**e)** 25 **f)** 16 **8. a)**  $2x(x - 6)^2$  **b)**  $x, (x - 6), 2(x - 6); 2x, (x - 6), (x - 6)$  **c)** 8 cm by 2 cm by 4 cm or 16 cm by 2 cm by 2 cm **d)** No, then two of the dimensions would be negative. **9.** 5, 2; -5, 2; 5, -2; -5, -2; 11, 10; -11, 10; 11, -10; -11, -10 **10.** 20, 12, 4  
**11. a)**  $(x + 3 + y)(x + 3 - y)$  **b)**  $(x - 2 + 3y)(x - 2 - 3y)$   
**c)**  $(2x + 3y + 2z)(2x + 3y - 2z)$  **d)**  $(x^2 - y + z)(x^2 - y - z)$   
**12.** 16 cm

### Modelling Math p. 169

- a)** side length minus one all squared **b)**  $(s - 1)^2$  **c)** 121; 8100 **d)** 24

### Career Connection p. 170

- 1. a)**  $10\pi[(1.2)^2 - 10\pi(1)^2]$  **b)**  $10\pi(1.2 + 1)(1.2 - 1)$ ;  $4.4\pi$  **c)** The inner cylinder contains no concrete.  
**d)**  $13.8 \text{ m}^3$  **2.** Evaluate the expression in question 1a) without factoring.

### Technology Extension pp. 171

- 1 Factoring Polynomials 1. a)**  $3(2x^2 + 5x - 4)$   
**b)**  $7(2y^2 - 6y + 3)$  **c)**  $5(4x - 3x^2 + 2)$

- d)**  $2xy(2x + 3 - 4y)$  **e)**  $3pq(p^2 + 6pq + 2q^2)$   
**f)**  $2b^2(6a^3 + 2a^2b + 4ab^2 - 3b^3)$  **2. a)**  $(x + 2)(x + 17)$   
**b)**  $(x - 12)(x + 6)$  **c)** not possible **d)**  $(5 - t)(3 - t)$   
**e)**  $(n + 1)(4n + 9)$  **f)** not possible **g)**  $(x - 4)(5x + 3)$   
**h)**  $(3y - 2)(5y + 7)$  **i)**  $(x + 2y)(x + 5y)$  **j)**  $(x - 4y)(3x - 2y)$   
**k)**  $(3a - 2b)(5a + 3b)$  **l)**  $(2x + 9y)(7x - 4y)$   
**m)**  $(x + a + 2)(x + a + 4)$  **n)**  $(x - y - 2)(x - y - 3)$   
**o)**  $(x^2 + 5)(x^2 - 3)$  **3. a)**  $3(x - 1)(x - 9)$   
**b)**  $2(2x - 3)(x + 4)$  **c)**  $5(5y + 1)(3y + 8)$   
**d)**  $2(u - 2v)(u - v)$  **e)**  $6(3x - y)(2x + 3y)$   
**f)**  $x(x + 1)(x + 2)$  **g)**  $2t(t - 7)(2t + 1)$   
**h)**  $3(5x^2 + 2)(2x^2 + 5)$  **i)**  $8(x + 1)(x - 1)(3x^2 + 1)$   
**2 Factoring Special Products 1. a)**  $(5x + 6)^2$   
**b)**  $(3y - 5)^2$  **c)**  $(3n + 8)(3n - 8)$  **d)**  $(5 + 13x)(5 - 13x)$   
**e)**  $(2x + 3y)(2x - 3y)$  **f)**  $(7a - 4b)^2$   
**2. a)**  $16(m + 2)(m - 2)$  **b)**  $4(3 + 2x)(3 - 2x)$   
**c)**  $5(5x^2 + 4)(5x^2 - 4)$  **d)**  $2(6x + 7y^2)(6x - 7y^2)$   
**e)**  $2(x - 7)^2$  **f)**  $3(2x + 5)^2$  **g)**  $8w(2w - 5)^2$   
**h)**  $12(5 + 2x^2)(5 - 2x^2)$  **i)**  $4(3y^2 + 5x^2)^2$

### Rich Problem pp. 172–173

- 1 Writing Expressions for Areas 1.**  $\pi r^2$  **2.**  $r; r + 1$   
**3. a)**  $\pi(r + 1)^2 - \pi r^2$  **b)**  $\pi(2r + 1)$   
**4. a)**  $\pi(r + 2)^2 - \pi(r + 1)^2$ ;  $\pi(2r + 3)$   
**b)**  $\pi(r + 3)^2 - \pi(r + 2)^2$ ;  $\pi(2r + 5)$   
**c)**  $\pi(r + 4)^2 - \pi(r + 3)^2$ ;  $\pi(2r + 7)$   
**d)**  $\pi(r + 5)^2 - \pi(r + 4)^2$ ;  $\pi(2r + 9)$  **5. a)** The area is  $\pi$  times the sum of twice the radius and one less than twice the ring number. **b)**  $\pi(2r + 2n - 1)$  **c)**  $\pi(2r + 15)$   
**6. a)**  $44 \text{ m}^2$  **b)**  $57 \text{ m}^2$  **c)**  $75 \text{ m}^2$  **d)**  $88 \text{ m}^2$   
**7. a)**  $13\pi(2r + 13)$  **b)**  $740 \text{ m}^2$   
**2 Writing Expressions for Circumferences 1.**  $2\pi r$   
**2. a)**  $2\pi(r + 1)$  **b)**  $2\pi(r + 2)$  **c)**  $2\pi(r + 5)$  **d)**  $2\pi(r + 12)$   
**3. a)**  $26\pi(r + 6)$  **b)** 690 m  
**3 Estimating Seating Capacities 1.** Answers may vary. Assume each person needs about 1 m of inner circumference. **a)** 22 **b)** 41 **c)** 60 **d)** 690 **2.** 785 000

### Review of Key Concepts pp. 174–179

- 1. a)**  $5x - 3y$  **b)**  $8x^2 - 4x + 3$  **c)**  $-a^2 - 6a - 8$   
**d)**  $m^2 + 3mn + n^2$  **2. a)**  $-12x^4y^4$  **b)**  $24r^2s^4t^6$  **3. a)**  $-4a$   
**b)**  $4n^3p$  **4. a)**  $8x + 18$  **b)**  $4a + 28$  **c)**  $8t^2 - 3t$  **d)**  $y^2 - 7$   
**5. a)**  $x^2 + 2x - 8$  **b)**  $a^2 - a - 30$  **c)**  $6y^2 - y - 12$   
**d)**  $3x^2 - 11xy - 4y^2$  **6. a)**  $2x^2 - 4x - 6$  **b)**  $-2y^2 - 6y + 8$   
**c)**  $12m^2 - 28m + 8$  **d)**  $12x^2 - 12x - 9$  **7. a)**  $2y^2 - 4y - 6$   
**b)**  $-7x^2 - 12x + 6$  **c)**  $8a^2 + 12a + 19$  **d)**  $17x^2 - 10x + 12$   
**8. a)**  $x^2 + 8x + 16$  **b)**  $y^2 - 16$  **c)**  $a^2 - 10a + 25$  **d)**  $9t^2 - 1$   
**e)**  $4x^2 - 12xy + 9y^2$  **f)**  $25a^2 - 9b^2$  **g)**  $18m^2 + 12m + 2$   
**h)**  $1 - 4x + 4x^2$  **i)**  $48x^2 - 27$  **9. a)**  $2m^2 - 8m + 7$   
**b)**  $-12x + 61$  **c)**  $30t^2 + 12t + 1$  **d)**  $-9x^2 + 18xy - 11y^2$