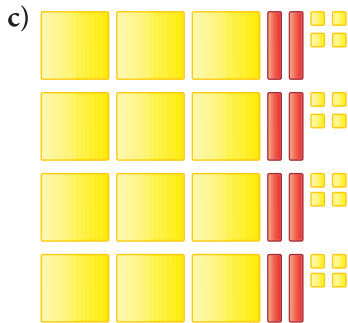
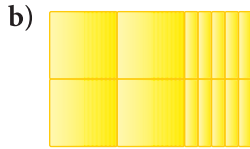


# Exercises

## A

4. For each arrangement of algebra tiles, write the polynomial they represent and identify its factors.



5. Factor the terms in each set, then identify the greatest common factor.

a)  $6, 15n$                       b)  $4m, m^2$

6. Use the greatest common factors from question 5 to factor each expression.

a) i)  $6 + 15n$                       ii)  $6 - 15n$   
     iii)  $15n - 6$                       iv)  $-15n + 6$   
 b) i)  $4m + m^2$                       ii)  $m^2 + 4m$   
     iii)  $4m - m^2$                       iv)  $m^2 - 4m$

## B

7. Use algebra tiles to factor each binomial. Sketch the tiles you used.

a)  $5y + 10$                       b)  $6 + 12x^2$   
 c)  $9k + 6$                       d)  $4s^2 + 14s$   
 e)  $y + y^2$                       f)  $3h + 7h^2$

8. Factor each binomial. Why can you not use algebra tiles? Check by expanding.

a)  $9b^2 - 12b^3$                       b)  $48s^3 - 12$   
 c)  $-a^2 - a^3$                       d)  $3x^2 + 6x^4$   
 e)  $8y^3 - 12y$                       f)  $-7d - 14d^4$

9. Use algebra tiles to factor each trinomial. Sketch the tiles you used.

a)  $3x^2 + 12x - 6$                       b)  $4 - 6y - 8y^2$   
 c)  $-7m - 7m^2 - 14$                       d)  $10n - 6 - 12n^2$   
 e)  $8 + 10x + 6x^2$                       f)  $-9 + 12b + 6b^2$

10. Factor each trinomial. Why can you not use algebra tiles? Check by expanding.

a)  $5 + 15m^2 - 10m^3$                       b)  $27n + 36 - 18n^3$   
 c)  $6v^4 + 7v - 8v^3$                       d)  $-3c^2 - 13c^4 - 12c^3$   
 e)  $24x + 30x^2 - 12x^4$                       f)  $s^4 + s^2 - 4s$

11. a) Write the polynomial these algebra tiles represent.



- b) Factor the polynomial.  
 c) Compare the factors with the dimensions of the rectangle. What do you notice?

12. a) Here are a student's solutions for factoring polynomials. Identify the errors in each solution. Write a correct solution.

i) Factor:  $3m^2 + 9m^3 - 3m$   
 Solution:  $3m^2 + 9m^3 - 3m = 3m(m + 3m^2)$

ii) Factor:  $-16 + 8n - 4n^3$   
 Solution:  $-16 + 8n - 4n^3 = -4(4 + 2n + n^2)$

- b) What should the student have done to check his work?

13. Suppose you are writing each term of a polynomial as the product of a common factor and a monomial. When is the monomial 1? When is the monomial  $-1$ ?

14. Simplify each expression by combining like terms, then factor.

a)  $x^2 + 6x - 7 - x^2 - 2x + 3$   
 b)  $12m^2 - 24m - 3 + 4m^2 - 13$   
 c)  $-7n^3 - 5n^2 + 2n - n^2 - n^3 - 12n$

15. a) Factor the terms in each set, then identify the greatest common factor.
- $4s^2t^2, 12s^2t^3, 36st^2$
  - $3a^3b, 8a^2b, 9a^4b$
  - $12x^3y^2, 12x^4y^3, 36x^2y^4$
- b) Use the greatest common factors from part a to factor each trinomial.
- $4s^2t^2 + 12s^2t^3 + 36st^2$
  - $12s^2t^3 - 4s^2t^2 - 36st^2$
  - $-3a^3b - 9a^4b + 8a^2b$
  - $9a^4b + 3a^3b - 8a^2b$
  - $36x^2y^4 + 12x^3y^2 + 12x^4y^3$
  - $-36x^2y^4 - 12x^4y^3 - 12x^3y^2$

16. Factor each trinomial. Check by expanding.
- $25xy + 15x^2 - 30x^2y^2$
  - $51m^2n + 39mn^2 - 72mn$
  - $9p^4q^2 - 6p^3q^3 + 12p^2q^4$
  - $10a^3b^2 + 12a^2b^4 - 5a^2b^2$
  - $12cd^2 - 8cd - 20c^2d$
  - $7r^3s^3 + 14r^2s^2 - 21rs^2$

17. A formula for the surface area,  $SA$ , of a cylinder with base radius  $r$  and height  $h$  is:

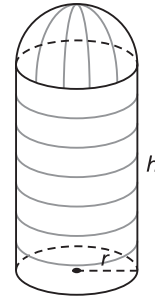
$$SA = 2\pi r^2 + 2\pi rh$$

- Factor this formula.
  - Use both forms of the formula to calculate the surface area of a cylinder with base radius 12 cm and height 23 cm. Is one form of the formula more efficient to use than the other? Explain.
18. A formula for the surface area,  $SA$ , of a cone with slant height  $s$  and base radius  $r$  is:

$$SA = \pi r^2 + \pi rs$$

- Factor this formula.
- Use both forms of the formula to calculate the surface area of a cone with base radius 9 cm and slant height 15 cm. Is one form of the formula more efficient to use than the other? Explain.

19. A silo has a cylindrical base with height  $h$  and radius  $r$ , and a hemispherical top.



- Write an expression for the surface area of the silo. Factor the expression. Determine the surface area of the silo when its base radius is 6 m and the height of the cylinder is 10 m. Which form of the expression will you use? Explain why.
  - Write an expression for the volume of the silo. Factor the expression. Use the values of the radius and height from part a to calculate the volume of the silo. Which form of the expression will you use? Explain why.
20. Suppose  $n$  is an integer. Is  $n^2 - n$  always an integer? Justify your answer.

### C

21. A cylindrical bar has base radius  $r$  and height  $h$ . Only the curved surface of a cylindrical bar is to be painted.
- Write an expression for the fraction of the total surface area that will be painted.
  - Simplify the fraction.
22. A diagonal of a polygon is a line segment joining non-adjacent vertices.
- How many diagonals can be drawn from one vertex of a pentagon? A hexagon?
  - Suppose the polygon has  $n$  sides. How many diagonals can be drawn from one vertex?
  - The total number of diagonals of a polygon with  $n$  sides is  $\frac{n^2}{2} - \frac{3n}{2}$ . Factor this formula. Explain why it is reasonable.

### Reflect

If a polynomial factors as a product of a monomial and a polynomial, how can you tell when you have factored it fully?