

## Practice

### A

1. Find the product.

a)  $(x + 1)(x + 5)$

d)  $(y + 5)(y + 6)$

g)  $(b - 1)(b - 5)$

j)  $(c + 2)(c - 8)$

b)  $(x + 4)(x + 3)$

e)  $(x - 4)(x - 3)$

h)  $(y - 9)(y - 9)$

k)  $(t + 10)(t - 10)$

c)  $(a + 4)(a + 4)$

f)  $(a - 4)(a - 2)$

i)  $(x - 6)(x + 3)$

l)  $(q - 2)(q + 5)$

2. Expand. Verify the solution by substituting 1 for the variable.

a)  $(c + 3)(c - 4)$

d)  $(a + 9)(a - 5)$

g)  $(y - 12)(y + 3)$

j)  $(2 - y)(3 - y)$

b)  $(x + 2)(x - 5)$

e)  $(x - 3)(x + 3)$

h)  $(x - 7)(x + 1)$

k)  $(x + 7)(x + 7)$

c)  $(y + 6)(y - 2)$

f)  $(b - 7)(b + 10)$

i)  $(4 + x)(7 - x)$

l)  $(b - 8)(b + 8)$

3. Expand and simplify.

a)  $(x + 5)(2x + 1)$

d)  $(a - 3)(2a - 5)$

g)  $(3x - 4)(3x - 4)$

b)  $(3y + 1)(y + 2)$

e)  $(5y - 7)(y + 3)$

h)  $(1 - 6t)(4 + 5t)$

c)  $(x - 1)(2x - 1)$

f)  $(x - 5)(4x + 3)$

i)  $(3a - 5)(3a + 5)$

4. Expand the following.

a)  $2(x + 3)(x + 5)$

c)  $-(a + 3)(a - 2)$

e)  $3(2x - 1)(3x - 2)$

g)  $0.5(x - 1)(x + 3)$

b)  $4(x - 9)(x + 5)$

d)  $10(x + 7)(x - 5)$

f)  $-2(4y + 1)(y - 3)$

h)  $1.8(x + 1)(x + 1)$

5. Expand and simplify.

a)  $(x + 6)(x + 4) + (x + 2)(x + 3)$

c)  $(2x - 3)(x + 5) + (3x + 4)(4x + 1)$

e)  $3(x - 4)(x + 3) - 2(4x - 1)$

g)  $2(3x + 2)(3x + 2) - 3(2x - 1)(2x - 1)$

b)  $(y - 3)(y - 1) - (y + 2)(y - 6)$

d)  $2(m + 3)(m + 5) + 4(2m + 3)$

f)  $5(3t - 4)(2t - 1) - (6t - 5)$

h)  $12 - 2(3y - 2)(3y + 2) - (2y + 5)(2y + 5)$

## Applications and Problem Solving

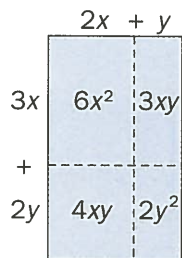
6. a) Verify that  $(x + 6)(x + 2) \neq x^2 + 12$  by substituting 1 for  $x$ .

b) Expand  $(x + 6)(x + 2)$  correctly.

### B

7. a) **Communication** Explain how the diagram models the product  $(2x + y)(3x + 2y)$ .

b) State the product in simplified form.



8. Expand and simplify.

a)  $(3x + y)(x + 4y)$

d)  $(4s - 3t)(5s - 6t)$

b)  $(4a - b)(2a - 5b)$

e)  $(7a + 8b)(a - b)$

c)  $(5m + 2n)(4m - 3n)$

f)  $(-3a + 4b)(2a + 3b)$

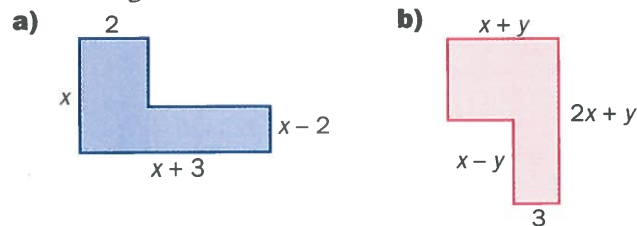
**9. Construction** A square building of side  $x$  metres is extended by 10 m on one side and 5 m on the other side to form a rectangle.

- Express the new area as the product of 2 binomials.
- Evaluate the new area for  $x = 20$ .

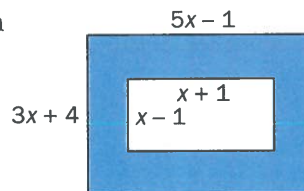
**10. Diving** Annie Pelletier won a bronze medal for Canada in women's springboard diving at the Summer Olympics in Atlanta. She dove from a springboard with dimensions that can be represented by the binomials  $7x - 2$  and  $x - 10$ .

- Multiply the binomials.
- If  $x$  represents 70 cm, what was the area of the board, in square centimetres? in square metres?

**11. Measurement** Write and simplify an expression to represent the area of each figure.



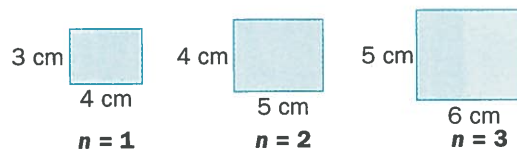
**12. Measurement** Write and simplify an expression to represent the area of the shaded region.



**C**

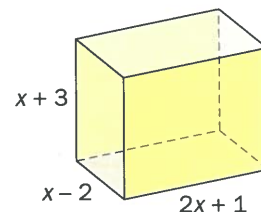
**13. Pattern** The diagrams show the first three rectangles in a pattern.

- State the area of the 4th rectangle.
- Write a product of two binomials to represent the area of the  $n$ th rectangle in terms of  $n$ .
- Multiply the binomials from part b).
- State the area of the 28th rectangle, in square centimetres.



**14. Measurement** The dimensions of a rectangular prism are represented by binomials, as shown.

- Write, expand, and simplify an expression that represents the surface area of this prism.
- If  $x$  represents 5 cm, what is the surface area, in square centimetres?



5. 20 km/h; 4 km/h 6. \$4000 in term deposit, \$8000 in bonds 7. 8 L of 30%, 12 L of 40%

Chapter 2 1. a)  $\sqrt{20}$ , 4.5 b)  $\sqrt{89}$ , 9.4 2. a) (5, 5)

b)  $\left(\frac{5}{2}, -\frac{5}{2}\right)$  3.  $x^2 + y^2 = 144$  4. 6 5. a) isosceles

b) 15.9 6. a) The diagonals have slopes 2 and  $-\frac{1}{2}$ ;

so they are perpendicular. b) The midpoint of GI

is  $\left(5, \frac{7}{2}\right)$ . The midpoint of HJ is (6, 3). The

equations of the lines containing the diagonals are  $x + 2y - 12 = 0$  and  $2x - y - 9 = 0$ . These lines intersect at (6, 3), the midpoint of GI. Thus, the diagonal HJ bisects GI, but the diagonal GI does not bisect HJ. 7. Opposite sides have equal slopes (two have slope  $-\frac{1}{5}$  and two have slope  $\frac{3}{2}$ ).

8. a)  $x + 5y - 23 = 0$  b)  $3x + y - 19 = 0$

c)  $x - y - 1 = 0$  9. a)  $\sqrt{8}$  b) 2.8

## Chapter 3

Getting Started p. 126

1. a) 8, 12, 16, 20, 24 b)  $4c + 4$  c) 44 d) 12, 20, 28, 36, 44 e)  $8c + 4$  f) 84 2. a) 10, 14, 18, 22, 26 b)  $2n + 6$  c) 50 3. a) 2, 5, 8, 11, 14 b)  $3x - 1$  c) 44

Review of Prerequisite Skills p. 127

1. a) 15 b) 30 c) 30 d) 3 e) 0 f) 31 g) 93 h) 36

2. a) -7 b) -22 c) 48 d) 11 e) 17 f) -18 g) 144 h) 6

3. a)  $2^7$  b)  $3^7$  c)  $y^9$  d)  $8y^5$  e)  $-8a^7$  f)  $8x^6$  g)  $12m^7$  h)  $2^2$

i)  $3^0$  j)  $m^3$  k)  $y^6$  l)  $4a^2$  4. a)  $6x$  b)  $-3a + 5b$

c)  $8a - 2b + 2$  d)  $7x^2 + x - 11$  5. a)  $2x - 10$

b)  $8a + 12b - 8c$  c)  $4 - 8x + 20y$  d)  $-6x + 14$

e)  $-3x^2 + 6x + 3$  f)  $-2a + 4b + c$  g)  $3x^2 + 6x$

h)  $-2y^3 - 2y^2 + 6y$  6. a)  $5x - 1$  b)  $5y + 7$

c)  $5m^2 + 3m + 1$  d)  $x^2 + 9x + 10$  e)  $3x^2 - 19x$

f)  $17z^2 - 17z - 12$  7. a)  $2y$  b)  $x$  c)  $7b$  d)  $10ab$  e)  $6y^2$

f)  $5cd$  g)  $rst$  h)  $2x^2y$  8. a)  $5x$  b)  $4c$  c)  $7xy$  d)  $3m$  e)  $5x$

f)  $4m$  g)  $11y$  h) 1 i)  $9rs^2$  9. a) 2, 2 b) 2, 3 c) 1, 5

d) -4, 2 e) -4, -3 f) 2, 6 g) -5, 4 h) -8, -3 i) 4, 6

j) 2, 15 k) -1, -1 l) -2, 1 m) -5, 1 n) -3, 3 o) -2, 3

p) -2, 5 q) -7, -1 r) -4, -4 s) -8, -2 t) -5, 3

Section 3.1 pp. 131-133

Practice 1. a) degree 1, binomial

b) degree 2, binomial c) degree 3, trinomial

d) degree 3, polynomial e) degree 1, monomial

f) degree 0, monomial 2. a) 0 b) 14 c) 18

3. a)  $4x^3 + 6x^2 - 5x - 7$  b)  $-3x^3 - 8x^2 + 1$

4. a)  $11 + 2x - 6x^2 - 5x^3$  b)  $-4 - 2x^2 + 3x^3 - 5x^4$

5. a)  $8x + 6$  b)  $9a + 3$  c)  $9 + 3yz$  d)  $6m - n$  e)  $3x + 6$

f)  $2a - 3b$  g)  $2d$  h)  $-m - 5n$  6. a)  $7x^2 + x + 17$

b)  $15x^2 + 2xy - 3y^2$  c)  $a^2 + 4a + 4$  d)  $-t^2 - 5t - 19$  e) -6

f)  $x^2 - 6y^2$  7. a)  $28x^3$  b)  $-12a^2b^3$  c)  $42m^3n^5$  d)  $8x^4y^3z^3$

e)  $32r^3s^5t^2$  f)  $18x^5y^4$  8. a)  $4x^3$  b)  $2a$  c)  $-9x$  d)  $9ac^2$

e)  $-5yz^2$  f)  $3t^3$  9. a)  $6x^2 - 8x$  b)  $12a^2 - 9ab$

c)  $-20st + 4t^2$  d)  $-2x^2 + 7x$  e)  $-3m^2 + 18$  f)  $6x - 2$

g)  $20a^2 + 15a$  h)  $-3 + 18y$  i)  $-4x^2 + 12x$  10. a)  $7x + 7$

b)  $-3m + 33$  c)  $-12x - 73$  d)  $11t - 36$  e)  $-20x - 9$

f)  $-10 - 8y$  11. a)  $18a - 24b - 54$  b)  $-12t^2 + 4t + 4$

c)  $-4m^2 + m + 7$  d)  $63y^2 - 21y - 49$

e)  $-10x^2 - 15xy + 5y^2$  f)  $8y^2 + 12y - 4$

g)  $-18x^2 + 36xy + 54x$  h)  $6a - 8ab + 10a^2$

i)  $-3a^2 - 4ab + 2ac$  12. a) -15x

b)  $4a^2 + 16ab - 2b^2 - 6a + 6b$  c)  $-10x^2 - 3x - 23$

d)  $-3y^2 + 9y - 3$  e)  $6s^2 - st + 5s + 10$

Applications and Problem Solving 13. Answers may

vary. a)  $6x^3$  b)  $2x + 1$  c)  $x^2 - 2x + 3$  14. 291 m

15. a)  $x^2 + 7x - 9$  b)  $-x^2 - 7x + 9$  c) Reversing the

order changes the sign of every term. 16. x

17. a)  $x(x + 10) = x^2 + 10x$  b) 21 000 m<sup>2</sup>

18. a)  $18x^2y$  b)  $30xy + 12x^2$  19. a)  $\frac{\pi d^2}{4}$  b)  $d^2$  c)  $\frac{\pi}{4}$

d) 79% 20. a)  $3x(4x + 1) = 12x^2 + 3x$  b) 117 m<sup>2</sup>

21. Answers may vary. 3, 5 22. 30 cm by 20 cm

Section 3.2 pp. 137-139

Practice 1. a)  $x^2 + 6x + 5$  b)  $x^2 + 7x + 12$

c)  $a^2 + 8a + 16$  d)  $y^2 + 11y + 30$  e)  $x^2 - 7x + 12$

f)  $a^2 - 6a + 8$  g)  $b^2 - 6b + 5$  h)  $y^2 - 18y + 81$

i)  $x^2 - 3x - 18$  j)  $c^2 - 6c - 16$  k)  $t^2 - 100$  l)  $q^2 + 3q - 10$

2. a)  $c^2 - c - 12$  b)  $x^2 - 3x - 10$  c)  $y^2 + 4y - 12$

d)  $a^2 + 4a - 45$  e)  $x^2 - 9$  f)  $b^2 + 3b - 70$  g)  $y^2 - 9y - 36$

h)  $x^2 - 6x - 7$  i)  $28 + 3x - x^2$  j)  $6 - 5y + y^2$

k)  $x^2 + 14x + 49$  l)  $b^2 - 64$  3. a)  $2x^2 + 11x + 5$

b)  $3y^2 + 7y + 2$  c)  $2a^2 - 3x + 1$  d)  $2a^2 - 11a + 15$

e)  $5y^2 + 8y - 21$  f)  $4x^2 - 17x - 15$  g)  $9x^2 - 24x + 16$

h)  $4 - 19t - 30t^2$  i)  $9a^2 - 25$  4. a)  $2x^2 + 16x + 30$

b)  $4x^2 - 16x - 180$  c)  $-a^2 - a + 6$  d)  $10x^2 + 20x - 350$

e)  $18x^2 - 21x + 6$  f)  $-8y^2 + 22y + 6$  g)  $0.5x^2 + x - 1.5$

h)  $1.8x^2 + 3.6x + 1.8$  5. a)  $2x^2 + 15x + 30$  b) 15

c)  $14x^2 + 26x - 11$  d)  $2m^2 + 24m + 42$

e)  $3x^2 - 11x - 34$  f)  $30t^2 - 61t + 25$  g)  $6x^2 + 36x + 5$

h)  $-22y^2 - 20y - 5$

Applications and Problem Solving 6. a) L.S. = 21,

R.S. = 13 **b)**  $x^2 + 8x + 12$  **7. a)** The length of the rectangle is  $3x + 2y$ . The width is  $2x + y$ . The area is  $(3x + 2y)(2x + y)$ . **b)**  $6x^2 + 7xy + 2y^2$   
**8. a)**  $3x^2 + 13xy + 4y^2$  **b)**  $8a^2 - 22ab + 5b^2$   
**c)**  $20m^2 - 7mn - 6n^2$  **d)**  $20s^2 - 39st + 18t^2$   
**e)**  $7a^2 + ab - 8b^2$  **f)**  $-6a^2 - ab + 12b^2$   
**9. a)**  $(x + 10)(x + 5)$  **b)**  $750 \text{ m}^2$  **10. a)**  $7x^2 - 72x + 20$   
**b)**  $29 \text{ 280 cm}^2$ ;  $2.928 \text{ m}^2$  **11. a)**  $x^2 + x - 2$   
**b)**  $x^2 + 3xy + 2y^2 + 3x - 3y$  **12. a)**  $14x^2 + 17x - 3$   
**13. a)**  $42 \text{ cm}^2$  **b)**  $(n + 2)(n + 3)$  **c)**  $n^2 + 5n + 6$   
**d)**  $930 \text{ cm}^2$  **14. a)**  $10x^2 + 10x - 10$  **b)**  $290 \text{ cm}^2$   
**15.** No, the product of  $(x - 1)$  and  $(x + 1)$  is  $x^2 - 1$ , which is a binomial. The product of  $(a + b)$  and  $(c + d)$  is  $ac + ad + bc + cd$ , which has four terms. **16. a)** Take four consecutive numbers. Subtract the product of the outer numbers from the product of the inner numbers. **b)** 2, 2, 2, 2 **c)**  $(x + 1)(x + 2) - (x)(x + 3) = 2$   
**d)** The expression simplifies to 2.

### Modelling Math p. 139

**a)** The product of three consecutive numbers plus the middle number. **b)** 8, 27, 64, 125 **c)** The answer is the cube of the middle number.  
**d)**  $(x - 1)(x + 1) + x = x^3$  **e)** The expression simplifies to  $x^3$ .

### Section 3.3 pp. 142–145

**Practice 1. a)**  $x^2$  **b)**  $a^2$  **c)**  $4x^2$  **d)**  $81t^2$  **e)**  $9y^2$  **f)**  $49p^2$   
**g)**  $16j^2$  **h)**  $36q^2$  **2. a)**  $-6x$  **b)**  $+16y$  **c)**  $+2xy$  **d)**  $-2ab$   
**e)**  $+12x$  **f)**  $-40a$  **g)**  $+12xy$  **h)**  $-84p$  **3. a)**  $a + 7$  **b)**  $x - 2$   
**c)**  $3m + 7$  **d)**  $9x - 8$  **e)**  $x + y$  **f)**  $2a - 3b$   
**4. a)**  $x^2 + 10x + 25$  **b)**  $y^2 + 2y + 1$  **c)**  $x^2 - 12x + 36$   
**d)**  $m^2 - 6m + 9$  **e)**  $x^2 - 9$  **f)**  $y^2 - 36$  **g)**  $m^2 - 49$  **h)**  $t^2 - 64$   
**5. a)**  $9x^2 + 12x + 4$  **b)**  $25x^2 - 10x + 1$  **c)**  $4x^2 - 9$   
**d)**  $4m^2 + 28m + 49$  **e)**  $9y^2 - 4$  **f)**  $16y^2 - 24y + 9$   
**g)**  $1 - 25m^2$  **h)**  $4 - 12t + 9t^2$  **6. a)**  $4x^2 - 9y^2$   
**b)**  $4x^2 + 12xy + 9y^2$  **c)**  $9a^2 - b^2$  **d)**  $16t^2 - 40ts + 25s^2$   
**e)**  $16m^2 - 25n^2$  **f)**  $9c^2 + 42cd + 49d^2$  **g)**  $y^2 - 36x^2$   
**h)**  $a^2 - 16ab + 64b^2$  **7. a)**  $2x^2 + 4x + 20$   
**b)**  $2y^2 + 14y + 13$  **c)**  $-16m + 65$  **d)**  $5a^2 + 12a - 6$   
**e)**  $-2x^2 + 100x - 94$  **f)**  $-19t^2 - 30t + 105$   
**8. a)**  $-x^2 - 26x - 107$  **b)**  $-8x^2 - 23x + 14$   
**c)**  $-7m^2 - 33m + 24$  **d)**  $19t^2 + 12t - 14$   
**e)**  $-21y^2 + 13y + 28$  **f)**  $54t^2 - 12t - 2$   
**g)**  $100s^2 - 22t^2 + 6t$  **h)**  $12m^2 - 12mn + 2n^2 - 3m + 45$   
**i)**  $5x^2 + 4xy - 3y^2$  **j)**  $-13a^2 - 28ab + 8b^2$

**Applications and Problem Solving 9. a)** L.S. = 16, R.S. = 10 **b)**  $x^2 + 6x + 9$  **10. a)**  $x + 10$  **b)**  $x^2, (x + 10)^2 = x^2 + 20x + 100$  **c)**  $625 \text{ cm}^2$ ;  $1225 \text{ cm}^2$

**11.**  $(20 + 4)(20 - 4) = 384$ ;  $(50 - 3)(50 + 3) = 2491$ ;  
 $(60 + 2)(60 - 2) = 3596$  **12. a)** 96 **b)** 216 **c)** 396 **d)** 84  
**e)** 391 **f)** 896 **13. a)**  $y^2 - 6y + 11$  **b)**  $3y^2 - 7y - 7$   
**14.**  $2(x - 3)^2 + 4(x - 3)(x + 3) = 6x^2 - 12x - 18$   
**15.**  $6(2x - y)^2 = 24x^2 - 24xy + 6y^2$  **16. a)**  $(x + 7)^2$   
**b)**  $(x - 8)^2$  **c)**  $(2a + 3)^2$  **d)**  $(3b - 4)^2$  **e)**  $(8m - 2)^2$   
**f)**  $(9n + 5)^2$  **17. a)**  $x^2 + 12x + 36$  **b)**  $a^2 + 8a + 16$   
**c)**  $y^2 - 6y + 9$  **d)**  $m^2 - 8m + 16$  **e)**  $4x^2 - 4x + 1$   
**f)**  $9y^2 + 12y + 4$  **18. a)**  $x^4 + 2x^2 + 1$  **b)**  $y^4 - 2y^2 + 1$   
**c)**  $x^4 + 2x^2y^2 + y^4$  **d)**  $x^4 - 2x^2y^2 + y^4$  **e)**  $4x^4 + 12x^2 + 9$   
**f)**  $9y^4 - 24y^2 + 16$  **g)**  $x^4 - 4x^2y^2 + 4y^4$   
**h)**  $16x^4 + 24x^2y^2 + 9y^4$  **19. a)**  $x^4 - 1$  **b)**  $y^4 - 4$  **c)**  $x^4 - y^4$   
**d)**  $64a^4 - 9$  **e)**  $9x^4 - 4y^4$  **f)**  $16 - 9c^4$  **20.** The square, by  $9 \text{ cm}^2$ . **21.** The original garden is  $25 \text{ m}^2$  larger than the new garden. **22. a)**  $a^2 + b^2 + c^2 + 2ab + 2ac + 2bc$   
**b)**  $4x^2 + 9y^2 + 1 + 12xy + 4x + 6y$  **23.** 1 term, 5 terms  
**24. a)** {7, 24, 25}; {9, 40, 41}, {9, 12, 15}; {12, 35, 37}, {12, 16, 20}, {9, 12, 15}, {5, 12, 13} **b)** Let  $a$  represent the given leg,  $c + b$  represent one factor of  $a^2$ , and  $c - b$  represent the other factor of  $a^2$ . Thus  $(c + b)(c - b) = a^2$ , or  $c^2 - b^2 = a^2$ , or  $c^2 = a^2 + b^2$ . So  $\{a, b, c\}$  is a Pythagorean triple, and represents the sides of a right triangle.

### Technology Extension p. 146

**1 Multiplying Binomials 1. a)**  $8x^2 + 42x + 27$   
**b)**  $6x^2 - 5x - 25$  **c)**  $20y^2 - 52y + 33$   
**d)**  $32x^2 - 4xy - 21y^2$  **e)**  $20x^2 + 7xy - 6y^2$  **f)**  $9x - 14$   
**g)**  $7x^2 + 9x - 13$  **h)**  $-6y^2 - 26y + 49$  **i)**  $22x^2 + 12xy + y^2$   
**2 Special Products 1. a)**  $x^2 + 30x + 225$   
**b)**  $t^2 - 10t + 25$  **c)**  $81 - 18y + y^2$  **d)**  $16m^4 + 56m^2 + 49$   
**e)**  $36 - 60r + 25r^2$  **f)**  $64x^2 + 48xy + 9y^2$   
**2. a)**  $4x^2 - 121$  **b)**  $16 - 25x^2$  **c)**  $9y^2 - 25x^2$  **3. a)**  $4x$   
**b)**  $-4x - 13$  **c)**  $44y^2 + 68y + 26$  **d)**  $15 + 48m - 40m^2$

### Section 3.4 p. 150–151

**Practice 1. a)**  $5(x + 5)$  **b)** not possible **c)**  $9(y - 1)$   
**d)**  $3(x - 5y)$  **e)**  $5x(5x + 2)$  **f)**  $2a(2x + 4y - 3z)$   
**g)**  $pq(5r - s - 10t)$  **h)**  $2(x^2 - x - 3)$  **i)** not possible  
**2. a)**  $9(a^3 + 3b^2)$  **b)**  $3x(x^4 - 2x^2 + 3)$  **c)**  $4y(3 - 2y + 6y^2)$   
**d)**  $6w^3(4w^2 + 1)$  **e)** not possible **f)**  $11b(3a + 2c - b)$   
**g)**  $8xy(3y + 2x)$  **h)**  $5y(7x - 2y)$  **i)** not possible  
**j)**  $12xy(2y - 1 + 3x)$  **k)**  $9a^2b^2(3b + 1 - 2a)$   
**l)**  $6mn^2(m^2 + 3mn - 2)$  **3. a)**  $(a + b)(5x + 3)$   
**b)**  $(x - 1)(3m + 5)$  not possible **d)**  $(p + q)(4y - x)$   
**e)**  $(m + 7)(4t + 1)$  not possible **f)** not possible **4. a)**  $(x + y)(w + z)$   
**b)**  $(x + 3)(y + 4)$  **c)**  $(x + 1)(x - y)$  **d)**  $(m + 4)(m - n)$   
**e)**  $(x + 2)(2x + 3y)$  **f)**  $(t - 2)(5m^2 + t)$