# Chapter 5

## 5.1 The Language of Mathematics, pages 179–182

**5. a)** 3, trinomial **b)** 1, monomial **c)** 4, polynomial
**d)** 1, monomial
**6. a)** 1, monomial **b)** 3, trinomial **c)** 1, monomial
**d)** 2, binomial
**7. a)** $6x$ and $-15$ **b)** $7 + a + b$ **c)** $3x - y$ and $4c^2 - cd$
**8. a)** degree 1, 2 terms **b)** degree 2, 2 terms
**c)** degree 2, 3 terms
**9. a)** degree 2, 2 terms **b)** degree 2, 3 terms
**c)** degree 0, 1 term
**10. a)** $2 + p$ and $2x^2 - y^2$
**b)** $3b^2$, $4st + t - 1$, and $2x^2 - y^2$
**c)** $b$ **d)** $2 + p$ and $4st + t - 1$
**11. a)** $2x - 3$ **b)** $x^2 - 2x + 1$ **c)** $-x^2 + 3x - 2$
**12. a)** $2x^2 + 4$ **b)** $-x^2 - 2x - 4$ **c)** 4

**13. a)**  **b)**  **c)** 

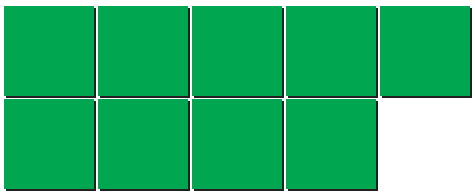
**14. a)** 

**b)** 

**c)** 

**15. a)** Example: $x + 2$ **b)** Example: $3x$

**c)** Example: $9x^2$



**d)** Example: $x^2 + x + y + 3$

**16. a)** Example: Both tiles share a common dimension of 1 unit. **b)** $x + 3$

**17. a)** $6x$ **b)** $2x + 3$ **c)** $x^2 + 4x$

**18.** Example: The expression $x^2 + 3x + 2$ is a trinomial of degree 2.

**19. a)** 2 **b)** 6 **c)** 1 **d)** 2 **e)** $-5$

**20. a)** $3x^2 - 2x + 1$

**b)** Example: $d^2 - 5d + 2$

**21. a)** $8 + x$, $x$ represents the unknown number

**b)** $x + 5$, $x$ represents the amount of money **c)** $w + 4$, $w$ represents the width of the page **d)** $5x + 2$, $x$ represents the unknown number **e)** $3n - 21$, $n$ represents the number of people

**22. a)** Example: The Riggers scored 5 more than triple the number of goals scored by the Raiders. **b)** Example: The number of coins remaining from a purse containing 10 coins after an unknown number of coins were removed

**23. a)** $a$ represents the number of adults and $c$ represents the number of children

**b)** \$215

**c)** $23a + 17c$

**24.** $10a + 5s$, where $a$ represents the number of adults and $s$ represents the number of students.

**25. a)** $2w + s$ **b)** $w$ represents the number of wins and $s$ represents the number of shoot-out losses **c)** 4 **d)** 28 **e)** Two possible records for Team B are: 8 wins, 12 shoot-out losses, and 0 losses in regulation time ($2 \times 8 + 12 = 28$); 10 wins, 8 shoot-out losses, and 2 losses in regulation time ($2 \times 10 + 8 = 28$).

**26. a)** binomial of degree 1 **b)** Example: 5 could be the charge per person, 75 could be the cost of renting the room. **c)** \$825

**27. a)** Example: $2c - w$, where $c$ represents the number of correct answers and $w$ represents the number of wrong answers. **b)** All 25 questions correct would result in a maximum score of 50 points. All 25 questions wrong would result in a minimum score of $-25$.

**c)**

| Number Correct | Number Wrong | Number Unanswered | Score |
|---|---|---|---|
| 20 | 5 | 0 | 35 |
| 20 | 4 | 1 | 36 |
| 20 | 3 | 2 | 37 |
| 20 | 2 | 3 | 38 |
| 20 | 1 | 4 | 39 |
| 20 | 0 | 5 | 40 |

**28.** 2

**29. a)** $6x + 6$ **b)** $x + 3 = 2x$ **c)** $x + 3 = 2x$, subtract $x$ from both sides, $3 = x$

**30.** Example: $xz + 4y + 3$

**31. a)** Example: $d = st$, where $d$ represents distance, $s$ represent speed, and $t$ represents time.

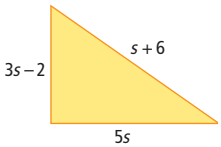
**b)**

| Part of Race | Distance (km) | Speed (km/h) | Time (h) |
|---|---|---|---|
| swim | $d_1$ | 1.3 | $\frac{d_1}{1.3}$ |
| cycle | $d_2$ | 28.0 | $\frac{d_2}{28}$ |
| run | $d_3$ | 12.0 | $\frac{d_3}{12}$ |

**c)** $\frac{d_1}{1.3} + \frac{d_2}{28} + \frac{d_3}{12}$ **d)** 3.416 h, assuming that Deidra races at her average pace **e)** 12.868 h

## 5.2 Equivalent Expressions, pages 187–189

**5. a)** coefficient: $-3$; number of variables: 1
**b)** coefficient: 1; number of variables: 1
**c)** coefficient: 0; number of variables: 0
**6. a)** coefficient: 4; number of variables: 1
**b)** coefficient: $-1$; number of variables: 3
**c)** coefficient: $-8$; number of variables: 2
**7. a)** $x^2$ and $xt$ **b)** $-ts$ and $xt$ **c)** $3x$ and $4t$ **d)** $-ts$
**8. a)** $2a$ and $-7.1a$ **b)** $3m$ and $\frac{4}{3}m$
**c)** $-1.9$ and 5; $6p^2$ and $p^2$
**9. a)** $-2k$ and $104k$ **b)** $\frac{1}{2}ab$ and $ab$
**c)** $-5$ and 5; $13d^2$ and $d^2$
**10. a)** $-4x^2 + 4x$ **b)** $-3n - 1$ **c)** $-q^2 - q$ **d)** $c - 4$
**e)** $5h^2 - h$ **f)** $-j^2 + 5j - 6$
**11. a)** $-2d^2 - 3d$ **b)** $-y^2 + 3y$ **c)** $p^2 + p - 2$
**d)** $4m + 2$ **e)** $3q^2 - 4q$ **f)** $-3w^2 + 3w - 4$
**12.** B, C, and E
**13.** Example: Yes. 2 m and 1 m are expressed in the same unit of measurement, so they can be considered like terms. Their sum is 3 m. 32 cm and 63 cm are expressed in the same unit of measurement, so they can be considered like terms. Their sum is 95 cm.
**14. a)** Example: The amount of liquid in a can is reduced by 3 mL. **b)** Example: The number of coloured markers is 5 more than twice the number of pens.
**15. a)** Example: $p^2 + p^2 - 6p + 3p + 5 - 3$
**b)** Example: $10x^2 - 13x^2 + x + 4x - 10 + 6$
**c)** $r^2 + r^2 + 2r^2 - 7q^2 + 5q^2 - 3qr$
**16. a)** $10d + 3$ **b)** $4w + 18$
**17. a)**




**b)** $9s + 4$
**18. a)** $5n - 700$, where $n$ represents the number of students **b)** \$550 **c)** Example: estimate: 150; actual: 141
**19. a)** $60n + 54$ **b)** \$174
**c)** $60n + 54 + \frac{60n + 54}{2}$; $90n + 81$
**20. a)** $3000 + 16b$ **b)** \$12 600 **c)** \$21 **d)** \$19
**21. a)** Raj combined $3x - 5x$ incorrectly; it should be $-2x$. He also combined $-8 + 9$ incorrectly; it should be 1.
**b)** $-2x + 1$
**22. a)** $x + 3x + 7 + 2x - 5$ **b)** $6x + 2$
**23.** When $y = w$. Example: Assign a value to $x$, such as $x = 10$. Substitute this value into the two expressions. The first expression becomes $y + 13$. The second expression becomes $w + 13$. If the two expression are equal, then $y = w$.

**24. a)**

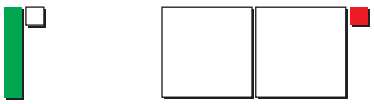
| Wholesale Price ($) | Expression for Retail Price | Retail Price ($) |
|---|---|---|
| 8.00 | $8 + (0.4)(8)$ | 11.20 |
| 12.00 | $12 + (0.4)(12)$ | 16.80 |
| 30.00 | $30 + (0.4)(30)$ | 42.00 |
| $x$ | $x + 0.4x$ | $1.4x$ |

**b)** Example: $x + 10 + (0.4)(x + 10) = x + 10 + 0.4x + 4$
$= 1.4x + 14$
Or multiply 1.4 by $x$, which yields $1.4x$, and multiply 1.4 by 10, which yields 14.
**25. a)** Zip: $100 + 2p$, where $p$ represents the number of posters; Henry: $150 + p$, where $p$ represents the number of posters **b)** Zip: \$350; Henry: \$275
**c)** Total cost is \$850. Add Zip's price to Henry's price: \$500 + \$350 = \$850. Or add like terms: $100 + 2p + 150 + p = 250 + 3p$, and then substitute $p = 200$. Simplify to \$850.

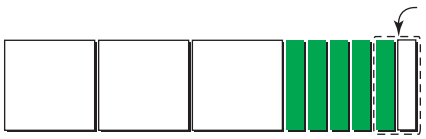
## 5.3 Adding and Subtracting Polynomials, pages 196–199

**5.** C
**6. a)** $5x - 7$ **b)** $-5a^2 - a + 2$ **c)** $10p$ **d)** $2y^2 + 6y - 6$
**7. a)** $3x + 4$ **b)** $-n + 3$ **c)** $b^2 - 1$ **d)** $a^2 - a - 1$
**8. a)** $-3x + 1$ **b)** $x^2 - 2x - 3$

**9. a)** $x - 1$ **b)** $-2x^2 + 1$



**10. a)** $9x$ **b)** $-5d - 6$ **c)** $2x^2 - 3x + 5$
**11. a)** $-3x + 7$ **b)** $-4g^2 + 4g - 2.5$ **c)** $-v^2 - 8v + 1$
**12.** B
**13.**



Remove $-2x^2$ $-x$.

**14. a)** $-3x - 2$ **b)** $-5b^2 - 9b$ **c)** $-3w + 7$
**d)** $-m^2 + m$
**15. a)** $13c - 3$ **b)** $-4r^2 - 3r - 6$ **c)** $2y^2 - 7y$
**d)** $8j^2 - 4j + 8$
**16. a)** the perimeter **b)** $6x$ **c)** 30; Example: The expression in part b) was used because it involved fewer steps.

**17.**

| | | | |
|---|---|---|---|
| | | $15x + 4$ | |
| | $7x + 3$ | | $8x + 1$ |
| $3x + 2$ | | $4x + 1$ | | $4x$ |
| $2x - 1$ | $x + 3$ | $3x - 2$ | $x + 2$ |

**18. a)** $399d + 160$; $d$ represents the number of days the backhoe is rented. **b)** $550d + 160$ **c)** $949d + 160$ **d)** $151d$

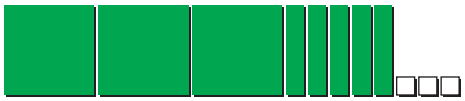
**19. a)** $-x + 5 + 3x + 1$ **b)** A: $(-x + 5) - (4x - 3) = -5x + 8$; B: $(3x + 1) - (4x - 3) = -x + 4$

**20. a)** $17n + 2150$ **b)** \$12 350 **c)** The expression represents the difference in the cost of printing and the cost of shipping; $13n + 1850$

**21.** The second line should be $4p^2 - p + 3 - p^2 - 3p + 2$, and the result of $(-p - 3p)$ is not $-3p$, so the answer should be $3p^2 - 4p + 5$.

**22. a)** $10x - 12$ **b)** $2a^2 - a - 4$ **c)** $5t^2 - 6t + 9$ **d)** $-2.3x + 0.4$

**23. a)** $3x^2 + 5x - 3$



**b)** $x^2 - 5x - 3$

**24.** $4x^2 + 2x$

**25. a)** Example: Assume you also pay \$0.12 for punctuation. For St. Mary's High School, $C = (25)(0.12)(31) + (25)(0.12)(19)$

**b)** Example: For St. Mary's High School, $C = (25)(0.12)(31) + (25)(0.12)(19) + (25)(17.95)$

**c)** Example: $C = (25)(17.95) + (25)(0.12)(n)$, where $n$ represents the number of letters.

**d)** $(3n + 448.75) + (3n + 448.75) = 6n + 897.5$

**26. a)** \$37 **b)** \$35 **c)** $7l + 5s + 38$, assuming at least one large print and at least one small print.

**27.** $w + 23 + w + 8 + w + 23 + w + 8 = 4w + 62$

**28. a)** $(-n^2 + 3600n) - (-3n^2 + 8600)$ $= 2n^2 + 3600n - 8600$ **b)** profit; Example: Replacing $n$ with 20 in the expression $2n^2 + 3600n - 8600$ yields a positive answer of \$64 200.

**29.** $1004x$

**30.** $8w + 142$

## Chapter 5 Review, pages 200–201

**1.** D

**2.** E

**3.** D

**4.** A

**5.** C

**6.** B

**7. a)** 4 terms, polynomial **b)** 2 terms, binomial **c)** 1 term, monomial **d)** 3 terms, trinomial

**8. a)** This is a degree 2 polynomial because the term with the highest degree ($6x^2$) has a degree of 2.

**b)** This is a degree 2 polynomial because the term with the highest degree ($ab$) has a degree of 2.

**c)** This is a degree 1 polynomial because the term with the highest degree ($y$) has a degree of 1.

**9. a)** Example: $3y - 11$ **b)** Example: $a + 2b - 7c$ **c)** $m^2 - 4$ **d)** 18

**10. a)**

**b)**

**11. a)** $x^2 - 3x + 2$ **b)** $-2x^2 + x$ **c)** $-3x + 2$

**12. a)** $x$ represents the number of video games sold and $y$ represents the number of books sold. **b)** \$104

**c)** $7.25d + 5c$, where $d$ represents the number of DVDs and $c$ represents the number of CDs

**13.** One term has the variable $x$; the other does not have the variable $x$. So, the two terms cannot be like terms.

**14. a)** coefficient: 8, variables: $x$ and $y$, exponent: 2

**b)** coefficient: $-1$, variable: $c$, exponent: 2

**c)** There are no coefficients or variables because this term is a constant.

**15. a)** $3s$ and $-8s$ **b)** $-2x^2$ and $x^2$, $3xy$ and $3xy$

**16.** Example: Like terms must be identical except for the coefficients. Four sets of examples that contain at least three like terms are:

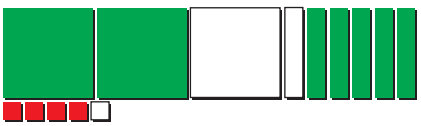
**a)** $16z$, $x$, $2z$, $-z$, $y$ **b)** $-ab$, $a$, $4b$, $6ab$, $-2ba$

**c)** $m$, $m^2$, $-m$, $m^3$, $6m$ **d)** $xy$, $4yx$, $-11yx$, $10s^2$, $-4yx$

**17.** $-x^2 - 3x + 5$

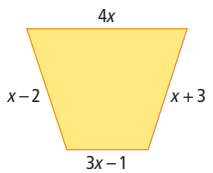
**18. a)** $4 + 3x$

**b)** $x^2 + 4x + 3$



**19. a)** $13a + 4$ **b)** $-2b^2 + 3b$ **c)** $7c + 2$

**20.** Perimeter $= 9x$




**21. a)** $20 + 1.50n$, where $n$ represents the number of hours renting the locker **b)** $20 + 3n$, where $n$ represents the number of hours renting the tube **c)** $40 + 4.5n$

**22. a)** $5x - 4$, $3x - 2$ **b)** Example: The processes are similar in that the like terms were combined. The processes are different in that one involved addition and the other involved subtraction.

**23.** Yes. Example: The opposite term of $2x^2$ is $-2x^2$ and the opposite term for $-3x$ is $3x$.

**24. a)** $3$ **b)** $-7 + a$ **c)** $-x^2 + 2x - 4$

**25. a)** Example: Group together the like terms: $(3p - p) + (4q - 5q) + (-9 + 2) = 2p - q - 7$. Another method is to change the order of the terms and line up the polynomials vertically.

$$\begin{array}{r} 3p + 4q - 9 \\ -p - 5q + 2 \\ \hline 2p - \ \ q - 7 \end{array}$$

**b)** Example: The first method is preferred because the terms are grouped horizontally.

**26. a)** $3p + 2$ **b)** $4a^2 - 7a - 7$

**27.**

| | | |
|---|---|---|
| | $-4t-2$ | |
| $-t-4$ | | $3t-2$ |
| $t-1$ | $2t+3$ | $-t+5$ |

**28. a)** $140 + 12n$, where $n$ represents the number of people attending **b)** Example: Another class decides to spend more on food and refreshments for their party and less on printing, decorations, and awards. Their cost for food is \$15/person and \$100 for the other items. The sum of the costs for both classes is $(140 + 12n) + (100 + 15n) = 240 + 27n$. The difference of the costs is $(140 + 12n) - (100 + 15n) = 40 - 3n$.