

1A 及 1E:

同學需以單行紙完成本練習內的:

Ex.7.1 Q.22, 29, 33, 35 和 Ex.7.4 Q.15, 16, 19, 26

以及完成另一份工作紙之文字題加強練習。

由於同學在第 7 課的課測中表現未如理想，故復課後會抽時間補測，請同學在停課期間溫習第 7 課之內容，形式與上次課測相約。所有功課請在 2 月 19 日前完成。



Book 1A Chapter 7 Manipulations of Polynomials

7.1 Laws of Positive Integral Indices

Level 1

Demonstration 1

Simplify each of the following expressions.

(a) $x^7 \times x^5$ (b) $u^6v \times u^4v^3$

Solution

(a) $x^7 \times x^5 = x^{7+5}$
 $= \underline{x^{12}}$

(b) $u^6v \times u^4v^3 = u^6 \times u^4 \times v \times v^3$
 $= u^{6+4} \times v^{1+3}$
 $= \underline{u^{10}v^4}$

Demonstration 2

Simplify each of the following expressions.

(a) $w^{10} \div w^4$ (b) $q^6 \div q^9$

Solution

(a) $w^{10} \div w^4 = w^{10-4}$
 $= \underline{w^6}$

(b) $q^6 \div q^9 = \frac{1}{q^{9-6}}$
 $= \underline{\underline{\frac{1}{q^3}}}$

Demonstration 3

Simplify each of the following expressions.

(a) $(v^6)^8$ (b) $5(y^9)^4$

Solution

(a) $(v^6)^8 = v^{6 \times 8}$
 $= \underline{v^{48}}$

(b) $5(y^9)^4 = 5y^{9 \times 4}$
 $= \underline{5y^{36}}$

1. Simplify each of the following expressions.

(a) $p^2 \times p^3$ (b) $st^5 \times s^8t$

2. Simplify each of the following expressions.

(a) $z^{15} \div z^8$ (b) $e^3 \div e^7$

3. Simplify each of the following expressions.

(a) $(l^3)^2$ (b) $8(h^4)^6$

Demonstration 4

Simplify each of the following expressions.

(a) $(2x)^4$

(b) $\left(\frac{k}{3}\right)^3$

Solution

(a) $(2x)^4 = 2^4 x^4$
 $= \underline{16x^4}$

(b) $\left(\frac{k}{3}\right)^3 = \frac{k^3}{3^3}$
 $= \underline{\underline{\frac{k^3}{27}}}$

4. Simplify each of the following expressions.

(a) $(mn)^8$

(b) $\left(\frac{r}{s}\right)^5$

Level 2

Simplify each of the following expressions and use index notation to represent the answer. (5 – 23)

5. (a) $3^4 \times 3^2$

(b) 2×2^6

6. (a) $a^6 \times a^4$

(b) $b^8 \times b^{12}$

7. (a) $2p^9 \times 5p^6$

(b) $-4q \times (-q^{10})$

8. (a) $6^8 \div 6^4$

(b) $9^{12} \div 9^5$

9. (a) $7^3 \div 7^{11}$

(b) $4 \div 4^{16}$

10. (a) $x^{13} \div x^6$

(b) $y^2 \div y^{10}$

11. (a) $\frac{a^{15}}{a^9}$

(b) $\frac{b}{b^8}$

12. (a) $(2^4)^3$

(b) $(5^7)^6$

13. (a) $(x^5)^2$

(b) $(y^8)^9$

14. (a) $(p^6)^n$, where n is a positive integer.

(b) $(q^m)^{20}$, where m is a positive integer.

15. (a) $(3a)^8$

(b) $(4b)^5$

16. (a) $(-5)^7$

(b) $(-7)^{18}$

17. (a) $(pq)^4$

(b) $(uv)^9$

18. (a) $\left(\frac{1}{7}\right)^{13}$

(b) $\left(\frac{4}{9}\right)^5$

19. (a) $\left(\frac{-1}{3}\right)^{10}$

(b) $\left(-\frac{15}{8}\right)^7$

20. (a) $\left(\frac{e}{6}\right)^{24}$

(b) $\left(\frac{a}{b}\right)^8$

21. (a) $(x^5)^3 \times x^7$

(b) $y^9 \div (y^8)^2$

22. (a) $(2w)^6 \times 5w^4$

(b) $(rs)^7 \div r^{10}s^3$

23. (a) $\frac{9}{e^5} \times \left(\frac{e}{3}\right)^8$

(b) $\frac{h^4}{h^7} \div \left(\frac{h^{10}}{h^6}\right)^8$

Simplify each of the following expressions and use index notation to represent the answer. (24 – 37)

24. (a) $7^4 \times 7^5 \times 7^3$

(b) $6^{10} \times 6^9 \div 6^{11}$

25. (a) $x^{19} \div x^{11} \div x^6$

(b) $y^{13} \div y^{15} \times y^4$

26. (a) $5m^7 \times 4m^3 \div (-8m^9)$

(b) $-3n^{16} \div (-6n^{22}) \times 12n^9$

27. (a) $72u^8 \div (15u^2 \times 16u)$

(b) $15v^9 \div (3v^4 \div v^9)$

28. (a) $5u^9v^4 \times 8uv$

(b) $36x^7y^3 \div 54x^3y^9$

29. (a) $u^7v^2 \times u^8v^6 \div u^9v^{12}$

(b) $24r^{10}s^{13} \div 18r^{15}s^8 \times 27r^4s^6$

30. (a) $p^{11} \div q^{12} \times q^{13} \div p^{14}$

(b) $a^{27} \times b^{28} \div a^{29} \times b^{30}$

31. (a) $\frac{6h^8k^4}{4h^5k^3}$

(b) $\frac{12u^3v^9}{-15u^{10}v^{17}}$

32. (a) $(b^6c^2)^9$

(b) $(-m^8n^{11})^4$

33. (a) $\frac{(h^4k^5)^3}{h^7k^{12}}$

(b) $\frac{(r^6s^9)^5}{(s^{10}r^8)^2}$

34. (a) $(p^4q \times p^2q^3)^8$

(b) $\left(\frac{u^5v^9}{2} \times 8v^4u^9\right)^3$

35. (a) $\left(\frac{6p^{15}}{q^5}\right)^2$

(b) $\left(-\frac{x^2y^7}{x^6}\right)^9$

36. (a) $18a^{12}b^{26} \times \left(-\frac{a^5}{3b^7}\right)^4$

(b) $(2e^9f^6)^5 \div \left(\frac{4e^{14}}{f^9}\right)^3$

37. (a) $\left(-\frac{3h^{14}}{k^{25}}\right)^7 \times \left(\frac{k^{19}}{3h^{12}}\right)^7$

(b) $\left(\frac{r^8t^{11}}{s^{23}}\right)^6 \div \left(\frac{r^{16}}{s^{15}t^4}\right)^6$

Find the value of each of the following expressions without using a calculator. (38 – 39)

38. (a) $5^6 \div 10^6$

(b) $36^5 \div 18^5$

39. (a) $2^3 \times 6^3 \times \left(\frac{1}{3}\right)^3$

(b) $8^3 \times 5^9$

Simplify each of the following expressions and use index notation to represent the answer. (40 – 42)

40. (a) $\left(\frac{24m^{18}n^{16}}{72n^9m^{20}}\right)^5$

(b) $\left(\frac{8r^{10}s^5 \times 2st^8}{32r^{12}s^4t^3}\right)^6$

41. (a) $\frac{(18u^5v^7)^4}{(12u^6v^{10})^4}$

(b) $\frac{(96a^{16}b^8)^5}{(48a^{13}b^{15})^5}$

42. (a) $\left(\frac{24x^{19}y^{12}}{35y^7z^{16}}\right)^3 \times \left(\frac{42x^5z^{20}}{18x^{18}y^{14}}\right)^3$

(b) $\left(\frac{84p^{23}q^{19}}{70r^{17}p^{18}}\right)^6 \div \left(\frac{54p^{15}r^{17}}{45q^{11}r^{24}}\right)^6$

43. It is given that $3^x = 9$ and $3^y = 27$, where x and y are positive integers. Find the value of 3^{x+y} .

44. It is given that $(-2)^m = 256$ and $(-2)^n = -32$, where m and n are positive integers. Find the value of $(-2)^{m-n}$.

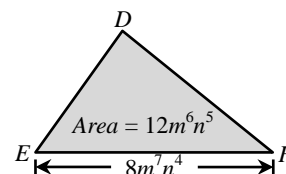
45. It is given that $a^6 = 5$. Find the value of a^{18} .

46. It is given that $b^5 = 400$. Find the value of $\left(\frac{b}{2}\right)^5$.

47. It is given that $c^6 = 0.25$ and $d^3 = 32$, find the value of $(c^2d)^6$.

48. It is given that $p^m = 12$ and $p^n = 5$, where m and n are positive integers. Find the value of $\frac{30}{p^{m+2n}}$.

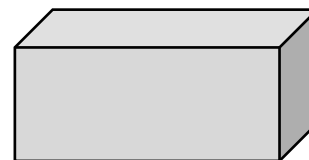
49. In the figure, DEF is a triangle whose base and area are $8m^7n^4$ and $12m^6n^5$ respectively. Find the height of the triangle.



50. The figure shows a cuboid with dimensions $2^a \times 2^a \times 2^b$.

(a) Express the volume of the cuboid in terms of a and b .

(b) Express the total surface area of the cuboid in terms of a and b .



51. Write down two sets of possible values of p and q such that $(x^p)^2 \div (x^3)^q = x^7$ and p and q are positive integers.

52. Write down two sets of possible values of u and v such that $\frac{u^3}{v^6} = 27$ and $v \neq 1$.

Level 3

53. Judge whether 4800 is a factor of $2^9 \times 3^6 \times 5^4$ without using a calculator.

54. It is given that $u^4 = 2$ and $v^2 = 5$, find the value of $(u^3v)^4$ without using a calculator.

55. Find the value of $\frac{(-4)^{497}}{(-2)^{998}}$.

Multiple Choice Questions

56. $(a^2)^4 =$

A. a^6 .

B. a^8 .

C. a^{12} .

D. a^{16} .

57. Which of the following is/are true?

I. $8^6 = 8^2 \times 8^3$

II. $2^8 \div 2^4 = 2^4$

III. $(5^m)^n = (5^n)^m$

A. III only

B. I and II only

C. II and III only

D. I, II and III

58. Simplify $\frac{x^{36}y^{18}}{(x^6y^4)^5}$.

A. $x^{30}y^{14}$

B. $x^{25}y^9$

C. $\frac{x^6}{y^2}$

D. $\frac{x^4}{y^2}$

7.2 Polynomials

Level 1

Demonstration 1

Consider the polynomial $-5x^4 + 8 - 6x^6 - 9x$.

Arrange the terms of the polynomial

- (a) in descending powers of x ,
- (b) in ascending powers of x .

Solution

- (a) Arrange the terms in descending powers of x :

$$-6x^6 - 5x^4 - 9x + 8$$

- (b) Arrange the terms in ascending powers of x :

$$8 - 9x - 5x^4 - 6x^6$$

Demonstration 2

In each of the following, find the value of the polynomial $2x^3 - 7x^2 + 3x + 5$.

- (a) $x = 2$ (b) $x = -3$

Solution

- (a) When $x = 2$,

the value of the polynomial

$$= 2(2)^3 - 7(2)^2 + 3(2) + 5$$

$$= 16 - 28 + 6 + 5$$

$$= \underline{\underline{-1}}$$

- (b) When $x = -3$,

the value of the polynomial

$$= 2(-3)^3 - 7(-3)^2 + 3(-3) + 5$$

$$= -54 - 63 - 9 + 5$$

$$= \underline{\underline{-121}}$$

Level 2

3. Determine whether each of the following algebraic expressions is a monomial.

(a) $9 - x^2 + 8x$

(b) $\frac{x^3}{2}$

(c) $\frac{4}{y^5}$

(d) x^6

(e) 7^x

(f) $3xy$

4. Determine whether each of the following algebraic expressions is a polynomial.

(a) $\frac{x^2 + x}{4x}$

(b) $x^8 + 7x + 6$

(c) $3x^5$

(d) $2xy^3 - x^6 + x^4y^4$

(e) $\frac{5x^3 - x}{3}$

(f) $\frac{6}{9x + 7} - x^2$

1. Consider the polynomial $2z^2 - z - 3z^4 + 6$.

Arrange the terms of the polynomial

- (a) in descending powers of z ,
- (b) in ascending powers of z .

2. In each of the following, find the value of the polynomial $8x^2 - 12x + 9$.

- (a) $x = 1$ (b) $x = -1$

5. Find the constant term of the polynomial $8x^2 + 6x + 3$.
6. Find the constant term of the polynomial $2x + 15 - 4x^3$.
7. Consider the polynomial $3x^4 - 5x^3 - x + 7$. Find the coefficients of
 (a) x^4 , (b) x .
8. Consider the polynomial $9x^2y + 4x^3 - 16xy^5 + 7y - 12y^4$. Find the coefficients of
 (a) xy^5 , (b) y .

9. Complete the following table.

	Polynomial	Coefficient of			Constant term
		x	y	xy	
(a)	$3y^2 - 5y + 9$				
(b)	$6x + y - 8$				
(c)	$7x - 2xy - 4y^2 + 3y$				
(d)	$-y - 9xy + 6 - 10x$				

10. Complete the following table.

	Polynomial	Number of terms	Degree of polynomial
(a)	$x^3 + 4x^2 - 6x + 2$		
(b)	$5x^6 - 8x^4 - 3$		
(c)	$9xy^2 - x + 7y^2 + 6x^4$		
(d)	$3x + 12y - y^2 + 10 - 8x$		

11. Complete the following table.

	Polynomial	Number of terms	Coefficient of				Constant term
			x	x^2	xy	y	
(a)	$7x^2 - 3y + 1$						
(b)	$8xy + 2x - y - 6$						
(c)	$9x - 4x^2 + 5xy + 10y - 12$						
(d)	$16xy + 8x^2 - 13 + 7x$						

12. Consider the polynomial $-4x^3 + 9x - 6x^2 + 2$. Find the coefficient of the term with the highest degree.
13. Consider the polynomial $5xy^3 + 3x^2y^2 - 8x^4y$. Find the coefficient of the term with the highest degree.
14. Arrange the terms of the polynomial $7x^2 - 6x^3 - x + 1$ in descending and ascending powers of x .




15. Arrange the terms of the polynomial $9x^4 - 5x^2 + x - 2$ in descending and ascending powers of x .
16. Arrange the terms of the polynomial $4y^2 - 7y^3 - 3 + y^7$ in descending and ascending powers of y .
17. Arrange the terms of the polynomial $8y^3 + 9y^6 - 6y^2 + 3y^4 - 10$ in descending and ascending powers of y .
18. Find the value of the polynomial $2 - x^2 + 5x$ for each of the following values of x .
 (a) $x = 3$ (b) $x = -4$
19. Find the value of the polynomial $9 + 7x^3 - 3x^2 - 4x$ for each of the following values of x .
 (a) $x = -1$ (b) $x = 2$
20. Find the value of the polynomial $18y^3 - 5 + 6y - 12y^2$ for each of the following values of y .
 (a) $y = -\frac{1}{2}$ (b) $y = \frac{1}{3}$
21. Find the value of the polynomial $2y - 3 - 4y^3 + y^2$ for each of the following values of y .
 (a) $y = \frac{1}{3}$ (b) $y = \frac{1}{4}$
22. Consider the polynomial $24x - 3x^2 - 10$.
 (a) Find the value of the polynomial when $x = 2$.
 (b) Suggest a value of x at which the value of the polynomial is smaller than the value found in (a).

23. Complete the following table.


	Polynomial	Number of terms	Constant term	Degree of polynomial
(a)	$5x^3y - 3x^2 + y - 2$			
(b)	$6x - y^2 + 7x^2y^2$			
(c)	$9y + 3x^5 - 4x^3y^4 - 8y^9 + 10$			
(d)	$-2x^3y^2 + 5x^2y^3 + 6 - xy^7 - 3x^4$			

24. Arrange the terms of the polynomial $x^5 - 8x^2y^4 + 2x^3y + 3x^4y^3 + 4y^6 - 10$ in descending and ascending powers of each of the following variables.
 (a) x
 (b) y

25. Consider the polynomial $5y^7 - 6x^5y^5 + x^3 - 9x^8y^3 - 5x^2y^3 + 7$.
- Arrange the terms of the polynomial in ascending powers of x .
 - Find the term with the highest degree.
 - Find the degree of the polynomial.
26. Consider the polynomial $xy^3 + 2x^5y^2 - 4x^2y^4 + 8 - 13x^6$.
- Arrange the terms of the polynomial in descending powers of y .
 - Find the degree of the polynomial.
27. Consider the polynomial $9x^6y - 10y^2 + 3x^8 - 4x^3y^5 - 6$.
- Arrange the terms of the polynomial in descending powers of x .
 - Find the degree of the polynomial.
28. Find the value of the polynomial $-x^2 + 3xy^2 - y$ when $x = 3$ and $y = -2$.
29. Find the value of the polynomial $2y + 5x^2 - 4xy^2 + 1$ when $x = 4$ and $y = \frac{1}{2}$.
30. Find the value of the polynomial $-6x^3y^3 - 8x^2 - 7 + 3xy^2$ when $x = 2$ and $y = -1$.
31. Find the value of the polynomial $9x^2y + 10x^4y^5 - 7x^3y^3 - 24$ when $x = 5$ and $y = -\frac{1}{5}$.

 32. Give a polynomial in two variables x and y that satisfies all conditions below.

- The degree of the polynomial is 4.
- The sum of the coefficients of all the terms in the polynomial is 10.
- The polynomial has 5 terms.

 33. Suggest two sets of values of x and y such that the value of $2x - 3xy + x^2$ is smaller than that of $4y^2 + x - 5$.

Level 3

34. When $x = 4$, the value of the polynomial $kx^2 - 3x - 12k$ is 8, where k is an integer.
- Find the value of k .
 - Find the value of the polynomial when $x = -2$.

Multiple Choice Questions

35. Which of the following are monomials?

I. $5xy^2$

II. $3x + y^2$

III. 7^6

IV. x^4

A. I and II only

B. I and IV only

C. III and IV only

D. I, III and IV only

36. Consider the polynomial $-5xy^4 + xy - 6x^2 + 2x^3y^3 + 8$. Which of the following is/are true?

I. The degree of the polynomial is 5.

II. The sum of the coefficients of all the terms is 0.

III. When the terms of the polynomial are arranged in descending powers of y , the result is $-5xy^4 + 2x^3y^3 + xy - 6x^2 + 8$.

A. I only

B. I and II only

C. III only

D. none of the above

37. When $x = 2$, the value of the polynomial $x^3 + 5x^2 + a$ is 31. When $x = -2$, the value of the polynomial is

A. 15.

B. -3.

C. -25.

D. -31.

7.3 Addition and Subtraction of Polynomials

Level 1

Demonstration 1

Simplify each of the following expressions.

(a) $(3x - 7) + (5x + 9)$

(b) $(4x - 2y + 3) - (2y - x + 1)$

Solution

(a) $(3x - 7) + (5x + 9)$

$$= 3x - 7 + 5x + 9$$

$$= 3x + 5x + 9 - 7$$

$$= \underline{8x + 2}$$

(b) $(4x - 2y + 3) - (2y - x + 1)$

$$= 4x - 2y + 3 - 2y + x - 1$$

$$= 4x + x - 2y - 2y + 3 - 1$$

$$= \underline{5x - 4y + 2}$$

Demonstration 2

(a) Add $5x + 2x^2 - 6$ to $3x - x^3 + 4$.

(b) Subtract $3x^3 - 4x^2 + 2x - 8$ from $5x - x^3 - 6x^2$.

Solution

(a) $(3x - x^3 + 4) + (5x + 2x^2 - 6)$

$$= 3x - x^3 + 4 + 5x + 2x^2 - 6$$

$$= -x^3 + 2x^2 + 3x + 5x + 4 - 6$$

$$= \underline{-x^3 + 2x^2 + 8x - 2}$$

(b) $(5x - x^3 - 6x^2) - (3x^3 - 4x^2 + 2x - 8)$

$$= 5x - x^3 - 6x^2 - 3x^3 + 4x^2 - 2x + 8$$

$$= -x^3 - 3x^3 - 6x^2 + 4x^2 + 5x - 2x + 8$$

$$= \underline{-4x^3 - 2x^2 + 3x + 8}$$

Demonstration 3

Simplify each of the following expressions and present the steps in columns.

(a) $(x^2 + 5x - 2) + (3x^2 - 9x + 7)$

(b) $(8x^2 - 4x + 3) - (5x^2 + 7x - 1)$

Solution

(a) $x^2 + 5x - 2$ (b) $8x^2 - 4x + 3$

+) $3x^2 - 9x + 7$ -) $5x^2 + 7x - 1$

$4x^2 - 4x + 5$ $3x^2 - 11x + 4$

1. Simplify each of the following expressions.

(a) $(2x + 3) + (7x + 6)$

(b) $(x + 8y + 5) - (3x - y + 12)$

2. (a) Add $x^2 + 4x - 8$ to $5 - x + 2x^3$.

(b) Subtract $8x^2 - 5x + 2$ from $9 + 7x^2 - 3x$.

3. Simplify each of the following expressions and present the steps in columns.

(a) $(2x^2 - x - 6) + (4x^2 + 3x - 5)$

(b) $(3x^2 + x - 7) - (x^2 - 2x + 8)$

Level **2**

Simplify each of the following expressions. (4 – 19)

4. (a) $x^2 + 4x^2 + 5x - 2x$ (b) $6y^2 - 4y^2 + 3y - 7y$
5. (a) $2x^3 + x^3 - 6x + 9x - 3x^3 + x$ (b) $5y + y^2 - 12y^2 + 12y - 8y + 10y^2$
6. (a) $6x^2 - 7x + 2 + 14x - 8x^2 - x$ (b) $3y + 9y^2 - 2y^3 - 4y + 3y^3 - 5y^2$
7. (a) $(2x - 5) + (3x + 8)$ (b) $(9x + 3) - (x - 7)$
8. (a) $(10x + 4) - (10 + 4x)$ (b) $(5x - 11) - (13 - 8x)$
9. (a) $(x + 6y + 3) + (2x - y + 5)$ (b) $(7x - 2y - 6) + (8y - 15x + 9)$
10. (a) $(9 - 15y + 10x) - (6x - 8y + 10)$ (b) $(3x - 27 - 5y) - (4y + 9x - 16)$
11. (a) $(2x^2 - 5x - 6) + (2 - 5x^2 - 6x)$ (b) $(4x^3 + 2x^2 - 8) - (x^2 + 1 - 7x^2)$
12. (a) $(6y - y^3 + 7) - (3y^3 + 4y + 12)$ (b) $(6y^2 + 3y - 9y^3) - (y^3 - y^2 + 6y)$
13. (a) $(x^3 - 3x^2 + 9) + (8x^2 + 10x - 3)$ (b) $(-x^3 + 2x - 7x^2) - (4x - 8x^4 + 13x^2)$
14. (a) $(5y + 6y^3 - 2y^2) + (4y^2 - 12y^3 - 11)$ (b) $(3y^2 - 13y + 12y^3) - (16y - 5y^2 - 17)$
15. (a) $5xy - x^2 + 3x + 4x^2 - 7x + 2xy$ (b) $8x^2 + 9yz - 3y - 10yz + 7x^2 + 9y$
16. (a) $3pq + 10rq - 8pq + 5pr - pr - 3rq$ (b) $-4qr^2 + 2pr^2 - 2qr^2 + 7pqr - 13pqr - 8pr^2$
17. (a) $(6a^2 - 7ab + 12b^2) - (15a^2 + 3ab - 4b^2) + (9a^2 - 2ab - 8b^2)$
 (b) $(8xy - yz + 3xz) - (2xy + 6xz - 5yz) - (4xz + 3yz - 10xy)$
18. (a) $(3r^3 - r^2 + 2) + (r^2 + 2r - 5) - (3r^3 - 5r + r^2)$
 (b) $(4x^2 + 6xy + y^2) - (3xy - 8x^2 + 2y^2) + (4y^2 + 2x^2 - 10xy)$
19. (a) $(7xy^2z - 5xyz^2) - [(4x^2yz + 13xy^2z) - (6xyz^2 - 8x^2yz)]$
 (b) $(3ab + 2bc - ac) + [(ac - 3bc) - (-4bc + ab)] - (7bc - 5ab - 8ac)$
20. (a) Add $x - 4x^2 + 3$ to $6x^2 - 2 + 5x$. (b) Add $1 - 2x^3 - 5x$ to $4x + 5x^3 + 2$.
21. (a) Add $-2y^4 + 9 - 14y^2$ to $7y^2 - 3y^4 - 5$. (b) Add $16y^3 + y - 7y^2$ to $12y^2 - 7y - 3$.

22. (a) Subtract $x^3 + 3x^2 - 7$ from $3x^3 + 4x^2 + 2$. (b) Subtract $-4x + 5x^4 + 8$ from $2x^4 + 6 - 10x$.
23. (a) Subtract $5y + 4y^2 - 6$ from $5y^2$. (b) Subtract $13y^2 - 7y^3 - 9$ from $4 - 3y^3 - 8y^2$.

Complete each of the following operations. (24 – 28)

24. (a)

$$\begin{array}{r} 4x \quad - \quad 6 \\ +) \quad 3x \quad + \quad 2 \\ \hline \end{array}$$

(b)

$$\begin{array}{r} x \quad - \quad 8 \\ -) \quad -5x \quad + \quad 10 \\ \hline \end{array}$$

25. (a)

$$\begin{array}{r} -2x \quad + \quad 4y \\ -) \quad 8x \quad + \quad 9y \\ \hline \end{array}$$

(b)

$$\begin{array}{r} -7x \quad - \quad 18y \\ -) \quad -3x \quad - \quad 6y \\ \hline \end{array}$$

26. (a)

$$\begin{array}{r} -10x^2 \quad - \quad 5x \quad + \quad 3 \\ +) \quad x^2 \quad + \quad 2x \quad - \quad 4 \\ \hline \end{array}$$

(b)

$$\begin{array}{r} 17x^2 \quad - \quad x \quad - \quad 1 \\ -) \quad 9x^2 \quad - \quad 8x \quad + \quad 5 \\ \hline \end{array}$$

27. (a)

$$\begin{array}{r} 4x^3 \quad + \quad 8x \quad - \quad 6 \\ -) \quad 7x^3 \quad + \quad 13x \quad - \quad 10 \\ \hline \end{array}$$

(b)

$$\begin{array}{r} x^4 \quad + \quad 5x^2 \quad - \quad x \\ -) \quad 3x^4 \quad - \quad x^2 \quad + \quad 4x \\ \hline \end{array}$$

28. (a)

$$\begin{array}{r} 12x^5 \quad - \quad 6x^3 \quad - \quad 2y \\ -) \quad 5x^5 \quad + \quad 4x^3 \quad + \quad 8y \\ \hline \end{array}$$

(b)

$$\begin{array}{r} -7x^2 \quad - \quad 3x \quad - \quad 14y \\ +) \quad 2x^2 \quad + \quad 3x \quad - \quad 9y \\ \hline \end{array}$$

Simplify each of the following expressions and present the steps in columns. (29 – 32)

29. (a) $(x^2 - 5x - 7) + (3x^2 + 8x + 1)$ (b) $(4x^3 + 6x^2 + 7) - (6x^3 - 2x^2 + 10)$
30. (a) $(3x^4 - 8x + 4) - (6x^4 + x - 5)$ (b) $(-12x^3 + 3xy - 2y) - (5x^3 - 4xy - 8y)$
31. (a) $(2x^3 - 4x^2 + x - 6) + (5x^3 + x^2 - 9)$ (b) $(7x^2 - 12x + 8) - (3x^3 + 6x^2 - 4x - 5)$
32. (a) $(-3x^3 - 12x^2 + 5) - (8x^2 - 10x - 7)$ (b) $(-6x^3 + 2x^2 - 7x + 4) + (9x - 3x^3 + 15 - x^2)$

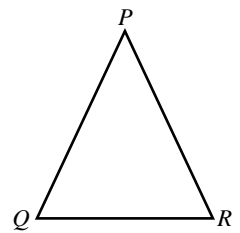
33. Fanny, Ken and Paul have $\$(9 - 6x^2 - 5x)$, $\$(-4x + 3x^2 + 7)$ and $\$(x^2 - 10x + 8)$ respectively.

- (a) Express the total amount of money they have in terms of x .
- (b) If Ken and Paul each pays $\$(7 + 9x - 2x^2)$ to buy a present for Fanny, express the total amount of money left in terms of x .



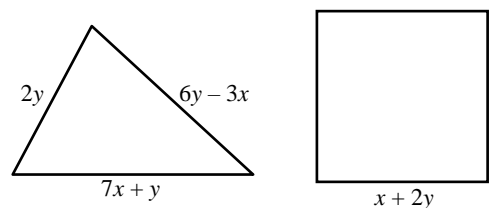
Level **3**

34. The figure shows a triangle PQR whose perimeter is $(x^2 + 8x + 12)$. It is given that $PQ = 4 - 2x^2 + 3x$ and $QR = 5x^2 + 2x + 4$. Is $\triangle PQR$ an isosceles triangle? Explain your answer.

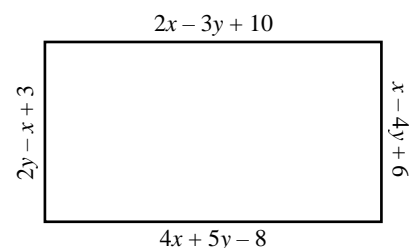


35. In a convex polyhedron, there are $(x^2 - 5x + 6)$ vertices and $(84 - 2x^2 + 13x)$ edges. Express the number of faces of the polyhedron in terms of x .

36. The figure shows a triangle and a square. Which figure has a larger perimeter? Explain your answer.



37. The figure shows a rectangle.
- Express the perimeter in terms of x and y .
 - It is given that the perimeter of the rectangle is 29.
 - Find the value of x .
 - Find the value of y .



Multiple Choice Questions

38. $(x^3 - 5x^2 + 4x - 6) - (x^2 - 5 + 4x^3 - 6x) =$
- 0.
 - $-6x^3 - 5x^2 + 4x + 1$.
 - $-3x^3 - 6x^2 + 10x - 1$.
 - $-3x^3 - 6x^2 - 2x - 11$.
39. Simplify $(x^2 - 3x^3 + 7) - (2x^3 + 5x - x^2) + (6x^2 + 4x - 9)$.
- $6x^2 + 6x^3 - 2$
 - $-5x^3 + 4x^2 + 9x - 2$
 - $-5x^3 + 8x^2 - x - 2$
 - $-5x^3 + 8x^2 - x + 16$

40. In a convenience shop, a bottle of drink costs $\$(20 - 3x)$ and a news magazine costs $\$6x$. Derek pays $\$(7x + 54)$ for two bottles of drink and a news magazine. Find the change.
- A. $\$(34 - 2x)$
 - B. $\$(7x + 14)$
 - C. $\$(7x + 94)$
 - D. $\$(13x + 14)$

7.4 Multiplication of Polynomials

Level 1

Demonstration 1

Expand each of the following expressions.

- (a) $(2x - 5)(3x + 1)$
 (b) $(4x + 3y)(2y - x)$

Solution

- (a) $(2x - 5)(3x + 1)$
 $= 2x(3x + 1) + (-5)(3x + 1)$
 $= 2x(3x) + 2x(1) + (-5)(3x) + (-5)(1)$
 $= 6x^2 + 2x - 15x - 5$
 $= \underline{6x^2 - 13x - 5}$
- (b) $(4x + 3y)(2y - x)$
 $= (4x + 3y)(2y) + (4x + 3y)(-x)$
 $= 4x(2y) + 3y(2y) + 4x(-x) + 3y(-x)$
 $= 8xy + 6y^2 - 4x^2 - 3xy$
 $= \underline{\underline{-4x^2 + 5xy + 6y^2}}$

Demonstration 2

Expand each of the following expressions and present the steps in columns.

- (a) $(3x + 5)(x - 7)$
 (b) $(2x^2 - 1)(-4x + 1)$

Solution

(a)

$$\begin{array}{r} 3x + 5 \\ \times) \quad x - 7 \\ \hline 3x^2 + 5x \\ +) \quad -21x - 35 \\ \hline \underline{\underline{3x^2 - 16x - 35}} \end{array}$$

(b)

$$\begin{array}{r} 2x^2 + 0x - 1 \\ \times) \quad -4x + 1 \\ \hline -8x^3 - 0x^2 + 4x \\ +) \quad 2x^2 + 0x - 1 \\ \hline \underline{\underline{-8x^3 + 2x^2 + 4x - 1}} \end{array}$$

1. Expand each of the following expressions.

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

2. Expand each of the following expressions and present the steps in columns.

- (a) $(x - 6)(2x + 3)$
 (b) $(x^2 + 8)(x - 1)$

Level 2

Expand each of the following expressions. (3 – 28)

3. (a) $3(x + 1)$

(b) $4(x - 6)$

4. (a) $-5(4x - 3)$

(b) $-2(9 - 3x)$

5. (a) $-16(x + 2y)$

(b) $9(x^2 - 4x)$

6. (a) $x(x + 1)$

(b) $7x(x - 2)$

7. (a) $-2x(4 - x^2)$

(b) $-8x(2x^2 + 3)$

8. (a) $(7x - y)(-x)$

(b) $(y + 5x)(3y)$

9. (a) $(-x - 2y^2)(-8y)$

(b) $(4x^3 - 9x^2)(x^2)$

10. (a) $6(2x + 5) + 7$

(b) $9 - 8(3x - 1)$

11. (a) $(6x - 1)x + 8x$

(b) $15x - 2x(10 - 7x)$

12. (a) $5(2x^2 - 4x + 1)$

(b) $-7x(x^2 - 5x - 7)$

13. (a) $4x^2(1 - 7x - 3x^2)$

(b) $(2x^3 - 8x - 9)(-3x^2)$

14. (a) $(12x - 4y + 5)xy$

(b) $-2xy(16x - 4y - 11)$

15. (a) $(x + 1)(x + 3)$

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

16. (a) $(y + 4)(y - 9)$

(b) $(y - 7)(y - 6)$

17. (a) $(5x + 3)(x + 3)$

(b) $(4 - x)(2x + 7)$

18. (a) $(x + 2)(y - 4)$

(b) $(x - 8)(y - 5)$

19. (a) $(3x + y)(x + 6y)$

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

20. (a) $(x^2 - 1)(4x^2 + 1)$

(b) $(5x - x^2)(3x^2 + 7x)$

21. (a) $(3x + 5)^2$

(b) $(-8x - 3y)^2$

22. (a) $(x - 4)(3x + 1) + 12x$

(b) $(x^2 - 8x)(2x + 5x^2) + 9x^2$

23. (a) $(x + 3)(x^2 + 7x + 4)$

(b) $(5x^2 - 4x - 1)(8 - x)$

24. (a) $(6x - 1)(5x - x^2 + 2)$

(b) $(3x^2 + 2)(12x^2 - 17x + 9)$

25. (a) $4[5x + 3x(2x - 1)]$

(b) $-2[4x(3 - 8x)] - 75x^2$

26. (a) $(9 - 4x)(x - 6) + 8x(x - 5)$

(b) $(3x + 7)(10 - x) - (5x + 14)(2x + 1)$

27. (a) $8x(x^2 - 5x + 3) + (1 - 2x)(4x^2 + 5)$

(b) $(3x + 2)(x + 1)^2 - (x - 1)(2x^2 + 3x - 1)$

28. (a) $(x - 3)(2x + 1)(5x - 3)$

(b) $y(x^2 - 2y + 3) + x(2xy - 4x - y) - xy(3x + 5)$

Expand each of the following expressions and present the steps in columns. (29 – 37)

29. (a) $(x + 1)(x + 8)$

(b) $(x - 4)(x - 3)$

30. (a) $(6 + x)(x - 5)$

(b) $(x + 7)(2 - x)$

31. (a) $(12x - 1)(x + 3)$

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

32. (a) $(x + y)(x - 2y)$

(b) $(3x - 2y)(2x - y)$

33. (a) $(4x^2 - 7x)(x^2 + 2x)$

(b) $(7x^2 + x)(8x^2 - 6x)$

34. (a) $(3x^2 + x + 3)(x + 2)$

(b) $(5x^2 - 6x - 1)(x - 7)$

35. (a) $(2x - 3)(x^2 + 8x - 4)$

(b) $(1 - 3x)(2x^2 - 10x + 9)$

36. (a) $(8x^2 + 0x + 9)(3x - 5)$

(b) $(-12x^2 + 7)(4x + 1)$

37. (a) $(-x + 7)(x - 2x^3 - 6)$

(b) $(8x^3 + 3 - 5x^2)(x^2 + 2)$

38. Consider the polynomial $(2y + 1)(y^3 - ky^2 + k)$, where k is an integer.

(a) Expand the polynomial.

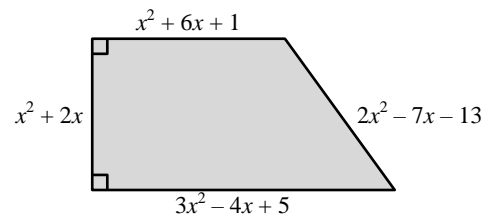
(b) If the coefficient of y^3 in the expansion is -5 , find the constant term.

39. The perimeter of a square is $(10x - 16)$.

(a) Find the length of a side of the square.

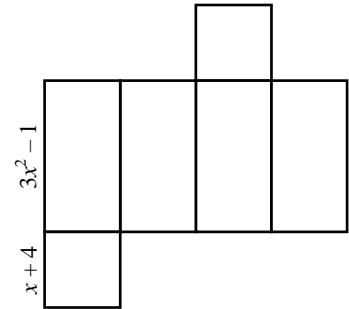
(b) Find the area of the square.

40. Express the area of the quadrilateral shown in the figure in terms of x .

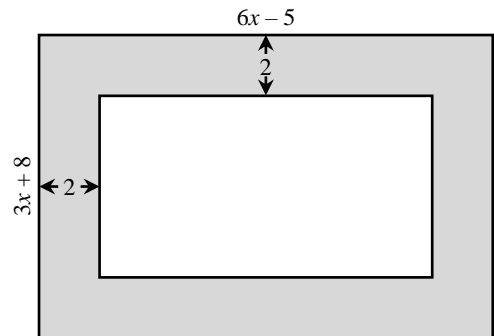


Level 3

41. The figure shows a net of a right prism with a square base.
- Express the total surface area of the prism in terms of x .
 - Express the volume of the prism in terms of x .



42. The figure shows a photo frame of uniform width.
- Express the area of the photo frame in terms of x .
 - Find the value of x if the area of the photo frame is 140.



43. In a bag, there are \$2 coins and \$5 coins. Suppose the total number of coins is $(x^2 + 2x + 6)$ and the total number of \$5 coins is $(2x^2 - 8x + 1)$.
- Express the total value of the coins in terms of x .
 - Can ' $x = 20$ ' be true? Explain your answer.
44. There are $(4x - 7)$ students in a class. A teacher and the students organize a barbecue. If each student pays $\$(8x + 5)$, the teacher needs to pay $\$5x(3x - 8)$ to cover the expense.
- Find the total expense of the barbecue.
 - It is given that there are 25 students in the class. At least how much should each student pay if the teacher does not need to pay for the barbecue?

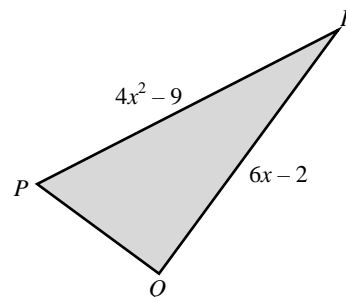
Multiple Choice Questions

45. $(x - 3)(2x^2 + 1) - (3x^2 + x - 3) =$

- A. $-x^2 - 6x.$
- B. $-x^2 - 4x - 6.$
- C. $2x^3 - 9x^2.$
- D. $2x^3 - 9x^2 + 2x - 6.$

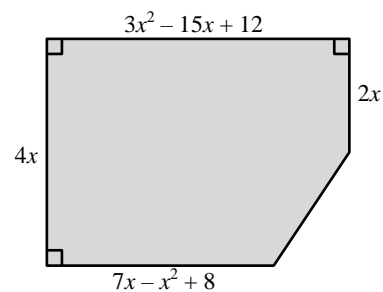
46. The perimeter of the right-angled triangle PQR on the right is $(7x^2 - 20)$. Find the area of the triangle.

- A. $9x^3 - 21x^2 - 21x + 9$
- B. $12x^3 - 4x^2 - 27x + 9$
- C. $18x^3 - 42x^2 - 42x + 18$
- D. $21x^3 - 7x^2 - 60x + 20$



47. Express the area of the polygon shown on the right in terms of x .

- A. $4x^3 - 22x + 4x$
- B. $4x^3 - 16x^2 + 40x$
- C. $8x^3 - 38x^2 + 44x$
- D. $12x^3 - 60x + 48x$



Answers**1A Chapter 7****Section 7.1****Level 1**

- | | |
|-----------------|-----------------------|
| 1. (a) p^5 | (b) s^9t^6 |
| 2. (a) z^7 | (b) $\frac{1}{e^4}$ |
| 3. (a) f^6 | (b) $8h^{24}$ |
| 4. (a) m^8n^8 | (b) $\frac{r^5}{s^5}$ |

Level 2

- | | |
|---------------------------------|-------------------------|
| 5. (a) 3^6 | (b) 2^7 |
| 6. (a) a^{10} | (b) b^{20} |
| 7. (a) $10p^{15}$ | (b) $4q^{11}$ |
| 8. (a) 6^4 | (b) 9^7 |
| 9. (a) $\frac{1}{7^8}$ | (b) $\frac{1}{4^{15}}$ |
| 10. (a) x^7 | (b) $\frac{1}{y^8}$ |
| 11. (a) a^6 | (b) $\frac{1}{b^7}$ |
| 12. (a) 2^{12} | (b) 5^{42} |
| 13. (a) x^{10} | (b) y^{72} |
| 14. (a) p^{6n} | (b) q^{20m} |
| 15. (a) 3^8a^8 | (b) 4^5b^5 |
| 16. (a) -5^7 | (b) 7^{18} |
| 17. (a) p^4q^4 | (b) u^9v^9 |
| 18. (a) $\frac{1}{7^{13}}$ | (b) $\frac{4^5}{9^5}$ |
| 19. (a) $\frac{1}{3^{10}}$ | (b) $-\frac{15^7}{8^7}$ |
| 20. (a) $\frac{e^{24}}{6^{24}}$ | (b) $\frac{a^8}{b^8}$ |
| 21. (a) x^{22} | (b) $\frac{1}{y^7}$ |
| 22. (a) $320w^{10}$ | (b) $\frac{s^4}{r^3}$ |
| 23. (a) $\frac{e^3}{3^6}$ | (b) $\frac{1}{h^{35}}$ |
| 24. (a) 7^{12} | (b) 6^8 |
| 25. (a) x^2 | (b) y^2 |
| 26. (a) $-\frac{5}{2}m$ | (b) $6n^3$ |
| 27. (a) $\frac{3}{10}u^5$ | (b) $5v^{14}$ |
| 28. (a) $40u^{10}v^5$ | (b) $\frac{2x^4}{3y^6}$ |

29. (a) $\frac{u^6}{v^4}$ (b) $\frac{36s^{11}}{r}$
30. (a) $\frac{q}{p^3}$ (b) $\frac{b^{58}}{a^2}$
31. (a) $\frac{3h^3k}{2}$ (b) $-\frac{4}{5u^7v^8}$
32. (a) $b^{54}c^{18}$ (b) $m^{32}n^{44}$
33. (a) h^5k^3 (b) $r^{14}s^{25}$
34. (a) $p^{48}q^{32}$ (b) $64u^{42}v^{39}$
35. (a) $\frac{36p^{30}}{q^{10}}$ (b) $-\frac{y^{63}}{x^{36}}$
36. (a) $\frac{2a^{32}}{9b^2}$ (b) $\frac{e^3f^{57}}{2}$
37. (a) $-\frac{h^{14}}{k^{42}}$ (b) $\frac{t^{90}}{s^{48}r^{48}}$
38. (a) $\frac{1}{64}$ (b) 32
39. (a) 64 (b) 1 000 000 000
40. (a) $\frac{n^{35}}{3^5m^{10}}$ (b) $\frac{s^{12}t^{30}}{2^6r^{12}}$
41. (a) $\frac{81}{16u^4v^{12}}$ (b) $\frac{32a^{15}}{b^{35}}$
42. (a) $\frac{512x^{18}z^{12}}{125y^{27}}$ (b) $\frac{q^{180}}{p^{60}r^{60}}$
43. 243 44. -8
45. 125 46. $\frac{25}{2}$
47. 64 48. $\frac{1}{10}$
49. $\frac{3n}{m}$
50. (a) 2^{2a+b} (b) $2^{2a+1} + 2^{a+b+2}$
51. $p = 5, q = 1; p = 8, q = 3$ (or other reasonable answers)
52. $u = 12, v = 2; u = 27, v = 3$ (or other reasonable answers)

Level 3

53. yes 54. 200
55. $-\frac{1}{16}$

Multiple Choice Questions

56. B 57. C
58. C

Section 7.2

Level 1

1. (a) $-3z^4 + 2z^2 - z + 6$
(b) $6 - z + 2z^2 - 3z^4$
2. (a) 5 (b) 29

Level 2

3. (a) no (b) yes
 (c) no (d) yes
 (e) no (f) yes
4. (a) no (b) yes
 (c) yes (d) yes
 (e) yes (f) no
5. 3 6. 15
7. (a) 3 (b) -1
8. (a) -16 (b) 7
9. (a) /, -5, /, 3, 9 (b) 6, 1, /, /, -8
 (c) 7, 3, -2, -4, / (d) -10, -1, -9, /, 6
10. (a) 4, 3 (b) 3, 6
 (c) 4, 4 (d) 5, 2
11. (a) 3, /, 7, /, -3, 1
 (b) 4, 2, /, 8, -1, -6
 (c) 5, 9, -4, 5, 10, -12
 (d) 4, 7, 8, 16, /, -13
12. -4 13. -8
14. descending: $-6x^3 + 7x^2 - x + 1$
 ascending: $1 - x + 7x^2 - 6x^3$
15. descending: $9x^4 - 5x^2 + x - 2$
 ascending: $-2 + x - 5x^2 + 9x^4$
16. descending: $y^7 - 7y^3 + 4y^2 - 3$
 ascending: $-3 + 4y^2 - 7y^3 + y^7$
17. descending: $9y^6 + 3y^4 + 8y^3 - 6y^2 - 10$
 ascending: $-10 - 6y^2 + 8y^3 + 3y^4 + 9y^6$
18. (a) 8 (b) -34
19. (a) 3 (b) 45
20. (a) $-\frac{53}{4}$ (b) $-\frac{11}{3}$
21. (a) $-\frac{64}{27}$ (b) $-\frac{5}{2}$
22. (a) 26
 (b) 1 (or other reasonable answers)
23. (a) 4, -2, 4 (b) 3, /, 4
 (c) 5, 10, 9 (d) 5, 6, 8
24. (a) descending: $x^5 + 3x^4y^3 + 2x^3y - 8x^2y^4 + 4y^6 - 10$
 ascending: $-10 + 4y^6 - 8x^2y^3 + 2x^3y + 3x^4y^3 + x^5$
 (b) descending: $4y^6 - 8x^2y^4 + 3x^4y^3 + 2x^3y + x^5 - 10$
 ascending: $-10 + x^5 + 2x^3y + 3x^4y^3 - 8x^2y^4 + 4y^6$
25. (a) $7 + 5y^7 - 5x^2y^3 + x^3 - 6x^5y^5 - 9x^8y^3$
 (b) $-9x^8y^3$
 (c) 11
26. (a) $-4x^2y^4 + xy^3 + 2x^5y^2 - 13x^6 + 8$
 (b) 7
27. (a) $3x^8 + 9x^6y - 4x^3y^5 - 10y^2 - 6$
 (b) 8
28. 29 29. 78
30. 15 31. -64
32. $3x^2y^2 + x^2 + 2y^2 - xy + 5y$ (or other reasonable answers)
33. $x = 0, y = 2; x = 1, y = 3$ (or other reasonable answers)

Level 3

34. (a) 5 (b) -34

Multiple Choice Questions

35. D 36. C
37. A

Section 7.3**Level 1**

1. (a) $9x + 9$ (b) $-2x + 9y - 7$
2. (a) $2x^3 + x^2 + 3x - 3$ (b) $-x^2 + 2x + 7$
3. (a) $6x^2 + 2x - 11$ (b) $2x^2 + 3x - 15$

Level 2

4. (a) $5x^2 + 3x$ (b) $2y^2 - 4y$
5. (a) $4x$ (b) $-y^2 + 9y$
6. (a) $-2x^2 + 6x + 2$ (b) $y^3 + 4y^2 - y$
7. (a) $5x + 3$ (b) $8x + 10$
8. (a) $6x - 6$ (b) $13x - 24$
9. (a) $3x + 5y + 8$ (b) $-8x + 6y + 3$
10. (a) $4x - 7y - 1$ (b) $-6x - 9y - 11$
11. (a) $-3x^2 - 11x - 4$ (b) $4x^3 + 8x^2 - 9$
12. (a) $-4y^3 + 2y - 5$ (b) $-10y^3 + 7y^2 - 3y$
13. (a) $x^3 + 5x^2 + 10x + 6$
(b) $8x^4 - x^3 - 20x^2 - 2x$
14. (a) $-6y^3 + 2y^2 + 5y - 11$
(b) $12y^3 + 8y^2 - 29y + 17$
15. (a) $3x^2 + 7xy - 4x$
(b) $15x^2 - yz + 6y$
16. (a) $-5pq + 4pr + 7rq$
(b) $-6qr^2 - 6pr^2 - 6pqr$
17. (a) $-12ab + 8b^2$ (b) $16xy + yz - 7xz$
18. (a) $-r^2 + 7r - 3$ (b) $14x^2 - 7xy + 3y^2$
19. (a) $-6xy^2z + xyz^2 - 12x^2yz$
(b) $8ac - 4bc + 7ab$
20. (a) $2x^2 + 6x + 1$ (b) $3x^3 - x + 3$
21. (a) $-5y^4 - 7y^2 + 4$ (b) $16y^3 + 5y^2 - 6y - 3$
22. (a) $2x^3 + x^2 + 9$ (b) $-3x^4 - 6x - 2$
23. (a) $y^2 - 5y + 6$ (b) $4y^3 - 21y^2 + 13$
24. (a) $7x - 4$ (b) $6x - 18$
25. (a) $-10x - 5y$ (b) $-4x - 12y$
26. (a) $-9x^2 - 3x - 1$ (b) $8x^2 + 7x - 6$
27. (a) $-3x^2 - 5x + 4$ (b) $-2x^4 + 6x^2 - 5x$
28. (a) $7x^5 - 10x^3 - 10y$ (b) $-5x^2 - 23y$
29. (a) $4x^2 + 3x - 6$ (b) $-2x^3 + 8x^2 - 3$
30. (a) $-3x^4 - 9x + 9$ (b) $-17x^3 + 7xy + 6y$
31. (a) $7x^3 - 3x^2 + x - 15$
(b) $-3x^3 + x^2 - 8x + 13$
32. (a) $-3x^3 - 20x^2 + 10x + 12$
(b) $-9x^3 + x^2 + 2x + 19$
33. (a) $\$(-2x^2 - 19x + 24)$
(b) $\$(2x^2 - 37x + 10)$

Level 3

34. yes 35. $-3x^2 + 18x + 80$
 36. the triangle
 37. (a) $6x + 11$
 (b) (i) 3 (ii) 1.5

Multiple Choice Questions

38. C 39. C
 40. B

Section 7.4

Level 1

1. (a) $2x^2 + 5x + 3$ (b) $-x^2 - 5xy + 6y^2$
 2. (a) $2x^2 - 9x - 18$ (b) $x^3 - x^2 + 8x - 8$

Level 2

3. (a) $3x + 3$ (b) $4x - 24$
 4. (a) $-20x + 15$ (b) $6x - 18$
 5. (a) $-16x - 32y$ (b) $9x^2 - 36x$
 6. (a) $x^2 + x$ (b) $7x^2 - 14x$
 7. (a) $2x^3 - 8x$ (b) $-16x^3 - 24x$
 8. (a) $-7x^2 + xy$ (b) $3y^2 + 15xy$
 9. (a) $16y^3 + 8xy$ (b) $4x^5 - 9x^4$
 10. (a) $12x + 37$ (b) $17 - 24x$
 11. (a) $6x^2 + 7x$ (b) $14x^2 - 5x$
 12. (a) $10x^2 - 20x + 5$ (b) $-7x^3 + 35x^2 + 49x$
 13. (a) $-12x^4 - 28x^3 + 4x^2$
 (b) $-6x^5 + 24x^3 + 27x^2$
 14. (a) $12x^2y - 4xy^2 + 5xy$
 (b) $-32x^2y + 8xy^2 + 22xy$
 15. (a) $x^2 + 4x + 3$ (b) $x^2 + 3x - 10$
 16. (a) $y^2 - 5y - 36$ (b) $y^2 - 13y + 42$
 17. (a) $5x^2 + 18x + 9$ (b) $-2x^2 + x + 28$
 18. (a) $xy - 4x + 2y - 8$ (b) $xy - 5x - 8y + 40$
 19. (a) $3x^2 + 19xy + 6y^2$ (b) $4x^2 - y^2$
 20. (a) $4x^4 - 3x^2 - 1$ (b) $-3x^4 + 8x^3 + 35x^2$
 21. (a) $9x^2 + 30x + 25$ (b) $64x^2 + 48xy + 9y^2$
 22. (a) $3x^2 + x - 4$ (b) $5x^4 - 38x^3 - 7x^2$
 23. (a) $x^3 + 10x^2 + 25x + 12$
 (b) $-5x^3 + 44x^2 - 31x - 8$
 24. (a) $-6x^3 + 31x^2 + 7x - 2$
 (b) $36x^4 - 51x^3 + 51x^2 - 34x + 18$
 25. (a) $24x^2 + 8x$ (b) $-11x^2 - 24x$
 26. (a) $4x^2 - 7x - 54$ (b) $-13x^2 - 10x + 56$
 27. (a) $-36x^2 + 14x + 5$ (b) $x^3 + 7x^2 + 11x + 1$
 28. (a) $10x^3 - 31x^2 + 9$
 (b) $-2y^2 + 3y - 4x^2 - 6xy$
 29. (a) $x^2 + 9x + 8$ (b) $x^2 - 7x + 12$
 30. (a) $x^2 + x - 30$ (b) $-x^2 - 5x + 14$
 31. (a) $12x^2 + 35x - 3$ (b) $5x^2 - 49x + 36$
 32. (a) $x^2 - xy - 2y^2$ (b) $6x^2 - 7xy + 2y^2$
 33. (a) $4x^4 + x^3 - 14x^2$ (b) $56x^4 - 34x^3 - 6x^2$

34. (a) $3x^3 + 7x^2 + 5x + 6$
 (b) $5x^3 - 41x^2 + 41x + 7$
35. (a) $2x^3 + 13x^2 - 32x + 12$
 (b) $-6x^3 + 32x^2 - 37x + 9$
36. (a) $24x^3 - 40x^2 + 27x - 45$
 (b) $-48x^3 - 12x^2 + 28x + 7$
37. (a) $2x^4 - 14x^3 - x^2 + 13x - 42$
 (b) $8x^5 - 5x^4 + 16x^3 - 7x^2 + 6$
38. (a) $2y^4 + (1 - 2k)y^3 - ky^2 + 2ky + k$
 (b) 3
39. (a) $\frac{5}{2}x - 4$ (b) $\frac{25}{4}x^2 - 20x + 16$
40. $2x^4 + 5x^3 + 5x^2 + 6x$

Level 3

41. (a) $12x^3 + 50x^2 + 12x + 16$
 (b) $3x^4 + 24x^3 + 47x^2 - 8x - 16$
42. (a) $36x - 4$ (b) 4
43. (a) $\$(8x^2 - 20x + 15)$ (b) no
44. (a) $\$(47x^2 - 76x - 35)$
 (b) $\$94.6$

Multiple Choice Questions

45. C 46. A
47. C