Answer Key

Section 10-1

1. 9	2. $\frac{3}{16}$	3. 9	4. 155	5. D
6. 3	7. $\frac{2}{3}$	8. 9	9. 4	

Section 10-2

1. A	2. C	3. B	4. B	5. 2
6. 3				

Section 10-3

1. C	2. B	3. D	4. D	5. A
6. C				

Section 10-4

1. B	2. A	3. D	4. 9	5. 8
6. 143				

Section 10-5

1. B	2. C	3. D	4. A	5. C
6. B				

Chapter 10 Practice Test

1. B	2. B	3. A	4. B	5. D
6. D	7. A	8. D	9. C	10. 5
11. $\frac{1}{4}$	12. 10			

Answers and Explanations

Section 10-1

1. 9

$(-a^2b^3)(2ab^2)(-3b)$

$= (-1)(2)(-3)a^2ab^3b^2b$

$= 6a^3b^6 = ka^mb^n$

If the equation is true, $m = 3$ and $n = 6$, thus $m + n = 3 + 6 = 9$.

2. $\frac{3}{16}$

$(\frac{2}{3}a^2b)^2(\frac{4}{3}ab)^{-3}$

$= \dfrac{(\frac{2}{3}a^2b)^2}{(\frac{4}{3}ab)^3}$ $\qquad a^{-n} = \frac{1}{a^n}$

$= \dfrac{\frac{4}{9}a^4b^2}{\frac{64}{27}a^3b^3}$

$= \frac{4}{9}\cdot\frac{27}{64}\frac{a}{b} = \frac{3}{16}\frac{a}{b}$

If $(\frac{2}{3}a^2b)^2(\frac{4}{3}ab)^{-3} = ka^mb^n$, then $k = \frac{3}{16}$.

3. 9

$\dfrac{(x)^3(-y)^2z^{-2}}{(x)^{-2}y^3z} = \dfrac{x^3y^2(x)^2}{y^3zz^2}$ $\qquad a^{-n} = \frac{1}{a^n}$ and $\frac{1}{a^{-n}} = a^n$

$= \dfrac{x^5y^2}{y^3z^3} = \dfrac{x^5}{yz^3} = \dfrac{x^m}{y^nz^p}$

If the equation is true, $m = 5$, $n = 1$, and $p = 3$, thus $m + n + p = 5 + 1 + 3 = 9$.

4. 155

$2^x + 2^{2x} + 2^{3x}$

$= 2^x + (2^x)^2 + (2^x)^3$ $\qquad (a^m)^n = a^{m\cdot n}$

$= (5) + (5)^2 + (5)^3$ $\qquad 2^x = 5$

$= 155$

5. D

$(3^x + 3^x + 3^x)\cdot 3^x$

$= (3\cdot 3^x)\cdot 3^x$

$= (3^{1+x})\cdot 3^x$ $\qquad a^ma^n = a^{m+n}$

$= 3^{1+2x}$ $\qquad a^ma^n = a^{m+n}$

6. 3

$\dfrac{(6xy^2)(2xy)^2}{8x^2y^2}$

$= \dfrac{(6xy^2)(4x^2y^2)}{8x^2y^2}$

$= \dfrac{24x^3y^4}{8x^2y^2} = 3xy^2$

If the expression above is written in the form ax^my^n, $a = 3$, $m = 1$, and $n = 2$.

Therefore, $m + n = 1 + 2 = 3$.

7. $\frac{2}{3}$

$$\frac{(2x)^3(3x)}{(6x^2)^2} = \frac{(8x^3)(3x)}{36x^4} = \frac{24\cancel{x^4}}{36\cancel{x^4}} = \frac{2}{3}$$

8. 9

$8,200 \times 300,000 = 8.2 \times 10^3 \times 3 \times 10^5$
$= 24.6 \times 10^8 = 2.46 \times 10 \times 10^8 = 2.46 \times 10^9$

9. 4

$$\frac{24\cancel{0}}{80,00\cancel{0}} \times \frac{6,\cancel{000}}{900,\cancel{000}}$$
$$= \frac{24 \times 6}{8,000 \times 900}$$
$$= \frac{144}{72 \times 10^5} = \frac{2}{10^5}$$
$$= \frac{2}{10 \times 10^4} = \frac{1}{5 \times 10^4}$$

If the above expression is equal to $\frac{1}{5 \times 10^n}$, then the value of n is 4.

Section 10-2

1. A

$a(2-a)+(a^2+3)-(2a+1)$
$= 2a - a^2 + a^2 + 3 - 2a - 1$
$= 2$

2. C

$(-m^2n - n^2 + 3mn^2) - (m^2n - n^2 + mn^2)$
$= -m^2n - \cancel{n^2} + 3mn^2 - m^2n + \cancel{n^2} - mn^2$
$= -2m^2n + 2mn^2$

3. B

$(2x^2 - 3x + 1) - (-2x^2 - 3x + 2)$
$= 2x^2 - \cancel{3x} + 1 + 2x^2 + \cancel{3x} - 2$
$= 4x^2 - 1$

If the expression above is written in the form $ax^2 + bx + c$, $a = 4$, $b = 0$, and $c = -1$. Therefore, $a + b + c = 4 + 0 + (-1) = 3$.

4. B

$$\begin{array}{r|l l}
 & x^2 + 3 & \text{Quotient} \\
x-1 & x^3 - x^2 + 3x - 3 & \text{Dividend} \\
 & x^3 - x^2 & x^2 \times (x-1) = x^3 - x^2 \\
 & 0 & \text{Result of subtraction} \\
 & 3x - 3 & \\
 & 3x - 3 & 3 \times (x-1) = 3x - 3 \\
 & 0 & \text{Result of subtraction}
\end{array}$$

Therefore, $(x^3 - x^2 + 3x - 3) \div (x-1) = x^2 + 3$.

5. 2

$$(14x^2 + 9x - 20) \div (ax - 1) = 7x + 8 + \frac{-12}{ax-1}$$

Multiply each side of the equation by $ax - 1$.

$(ax-1)[14x^2 + 9x - 20) \div (ax-1)]$
$= (ax-1)[7x + 8 + \frac{-12}{ax-1}]$
$\Rightarrow 14x^2 + 9x - 20 = (ax-1)(7x+8) + (-12)$
$\Rightarrow 14x^2 + 9x - 20 = 7ax^2 + (8a-7)x - 20$

The coefficients of x- terms have to be equal, so $9 = 8a - 7$.

$$14x^2 + 9x - 20 = 7ax^2 + (8a-7)x - 20$$

The coefficients of x^2- terms have to be equal, so $14 = -7a$.

Since the coefficients of x^2- terms have to be equal on both sides of the equation, $14 = 7a$, or $a = 2$.

6. 3

$$\frac{6x^2 - 5x + 4}{-3x + 1} = -2x + 1 + \frac{A}{-3x+1}$$

Multiply each side of the equation by $-3x + 1$.

$(-3x+1)[\frac{6x^2 - 5x + 4}{-3x+1}]$
$= (-3x+1)[-2x + 1 + \frac{A}{-3x+1}]$
$\Rightarrow 6x^2 - 5x + 4 = 6x^2 - 5x + 1 + A$

Since the constant terms have to be equal on both sides of the equation, $4 = 1 + A$, or $A = 3$

Section 10-3

1. C

$(x+3)(x-5) = x^2 - 5x + 3x - 15$
$= x^2 - 2x - 15$

Choice A gives x-term $+2$ and constant term -13.
Choice B gives x-term -2 and constant term -11.
Choice C gives x-term -2 and constant term -15.
Choice C is correct.

2. B

$(2-5x)(5x+2)$
$= (2)(5x) + (2)(2) - (5x)(5x) - (5x)(2)$
$= 10x + 4 - 25x^2 - 10x$
$= 4 - 25x^2$

3. D

$4x^2 - 12xy + 9y^2$
$= (2x)^2 - 2(2x)(3y) + (3y)^2$
$= (2x - 3y)^2$

4. D

$(x+y)(x-y)(x^2+y^2)$
$= (x^2 - y^2)(x^2 + y^2)$ $\quad (x+y)(x-y) = x^2 - y^2$
$= x^2x^2 + \cancel{x^2y^2} - \cancel{y^2x^2} - y^2y^2$
$= x^4 - y^4$

5. A

$\dfrac{3^{(a-b)} \cdot 3^{(a+b)}}{3^{2a+1}}$
$= 3^{(a-b)+(a+b)-(2a+1)}$ $\quad a^m a^n = a^{m+n}$ and $\dfrac{a^m}{a^n} = a^{m-n}$
$= 3^{-1} = \dfrac{1}{3}$

6. C

$\dfrac{2^{(a-1)(a+1)}}{2^{(a-2)(a+2)}}$
$= \dfrac{2^{(a^2-1)}}{2^{(a^2-4)}}$ $\quad$ FOIL
$= 2^{(a^2-1)-(a^2-4)}$ $\quad \dfrac{a^m}{a^n} = a^{m-n}$
$= 2^3 = 8$

Section 10-4

1. B

$42x^2y^2 + 63xy^3$
$= 21xy^2(2x + 3y)$ $\quad$ GCF is $21xy^2$.

2. A

$12x^2y - 18xy^2z$
$= 6xy(2x - 3yz)$ $\quad$ GCF is $6xy$.

3. D

$5a^2b - 10abc + 5bc^2$
$= 5b(a^2 - 2ac + c^2)$ $\quad$ GCF is $5b$.
$= 5b(a-c)^2$ $\quad (a-c)^2 = a^2 - 2ac + c^2$

4. 9

$12^3 = 2^x \cdot 3^y$
$(2^2 \cdot 3)^3 = 2^x \cdot 3^y$ $\quad 12 = 2^2 \cdot 3$
$2^6 \cdot 3^3 = 2^x \cdot 3^y$ $\quad (2^2)^3 = 2^6$

So, we can conclude that $x = 6$ and $y = 3$.
Therefore, $x + y = 6 + 3 = 9$.

5. 8

$2 \times 5^9 - k \times 5^8 = 2 \times 5^8$
$2 \times 5 \cdot 5^8 - k \times 5^8 = 2 \times 5^8$ $\quad 5^9 = 5 \cdot 5^8$
$10 \cdot 5^8 - k \times 5^8 = 2 \times 5^8$ $\quad$ Simplify.
$(10 - k)5^8 = 2 \times 5^8$ $\quad$ Factor.

Therefore, $10 - k = 2$, or $k = 8$.

6. 143

$12^{99} - 12^{97} = 12^{97} \times n$
$12^2 \times 12^{97} - 12^{97} = 12^{97} \times n$ $\quad 12^{99} = 12^2 \times 12^{97}$
$12^{97}(12^2 - 1) = 12^{97} \times n$ $\quad$ Factor.

Therefore, $12^2 - 1 = n$, or $n = 143$.

Section 10-5

1. B

$1 + 2x - x(1 + 2x)$
$= 1(1 + 2x) - x(1 + 2x)$
$= (1 + 2x)(1 - x)$ $\quad$ GCF is $1 + 2x$.

2. C

$rx + sx = 3$

$x(r+s) = 3$ Factor.

$x(\frac{1}{3}) = 3$ Substitute $\frac{1}{3}$ for $r+s$.

$x = 9$

3. D

$2ax - 6a - 3x + 9$

$= (2ax - 6a) - (3x - 9)$ Group terms with common factors. $-3x + 9 = -(3x - 9)$

$= 2a(x-3) - 3(x-3)$ Factor the GCF.

$= (x-3)(2a-3)$ Distributive Property

4. A

$mn - 5n - m + 5$

$= (mn - 5n) - (m - 5)$ Group terms with common factors. $-m + 5 = -(m - 5)$

$= n(m-5) - (m-5)$ Factor the GCF.

$= (m-5)(n-1)$ Distributive Property

5. C

$7y^2 - 21xy - 2y + 6x$

$= (7y^2 - 21xy) - (2y - 6x)$

$= 7y(y - 3x) - 2(y - 3x)$

$= (7y - 2)(y - 3x)$

6. B

$x - 2y + 3z - 2wx + 4wy - 6wz$

$= (x - 2y + 3z) - (2wx - 4wy + 6wz)$

$= (x - 2y + 3z) - 2w(x - 2y + 3z)$

$= (1 - 2w)(x - 2y + 3z)$

Chapter 10 Practice Test

1. B

$\frac{2^{(a+b)^2}}{2^{(a-b)^2}}$

$= 2^{(a+b)^2 - (a-b)^2}$ $\frac{a^m}{a^n} = a^{m-n}$

$= 2^{(a^2+2ab+b^2)-(a^2-2ab+b^2)}$

$= 2^{4ab}$

$= (2^4)^{ab}$ $(a^m)^n = a^{m \cdot n}$

$= (16)^{ab}$

2. B

$2m^2n - mnp - 6m + 3p$

$= (2m^2n - mnp) - (6m - 3p)$

$= mn(2m - p) - 3(2m - p)$

$= (2m - p)(mn - 3)$

3. A

$(\frac{a+b}{2})^2 - (\frac{a-b}{2})^2 = \frac{(a+b)^2}{4} - \frac{(a-b)^2}{4}$

$= \frac{a^2 + 2ab + b^2}{4} - \frac{a^2 - 2ab + b^2}{4}$

$= \frac{4ab}{4} = ab$

4. B

$(x + \frac{1}{x})^2 = 9$

$x^2 + 2x \cdot \frac{1}{x} + (\frac{1}{x})^2 = 9$

$x^2 + 2 + \frac{1}{x^2} = 9$

$x^2 + \frac{1}{x^2} = 7$

$(x - \frac{1}{x})^2 = x^2 - 2x \cdot \frac{1}{x} + \frac{1}{x^2}$

$= x^2 - 2 + \frac{1}{x^2} = x^2 + \frac{1}{x^2} - 2$

$= 7 - 2 = 5$ Substitute 7 for $x^2 + \frac{1}{x^2} = 7$.

5. D

$8^{\frac{4}{3}} \cdot 8^{-\frac{8}{3}} = 8^{\frac{4}{3} - \frac{8}{3}} = 8^{-\frac{4}{3}} = (2^3)^{-\frac{4}{3}}$

$= 2^{-4} = \frac{1}{2^4}$

If $8^{\frac{4}{3}} \cdot 8^{-\frac{8}{3}} = \frac{1}{2^m}$, then $m = 4$.

6. D

$\frac{(-2xy^2)^3}{4x^4y^5} = \frac{-8x^3y^6}{4x^4y^5}$

$= -\frac{2y}{x}$

7. A

Given $x^{12} = 32n^4$ and $x^9 = 4n$.

$x^{12} = 32n^4$

$\frac{x^{12}}{x^9} = \frac{32n^4}{x^9}$ Divide each side by x^9.

$x^3 = \frac{32n^4}{x^9}$ Simplify.

$x^3 = \frac{32n^4}{4n}$ Substitute $4n$ for x^9.

$x^3 = 8n^3$ Simplify.

$(x)^3 = (2n)^3$ $8n^3 = (2n)^3$

Therefore, $x = 2n$.

8. D

$(3x^3 - 2x^2 - 7) - (-2x^2 + 6x + 2)$

$= 3x^3 - 2x^2 - 7 + 2x^2 - 6x - 2$

$= 3x^3 - 6x - 9$

$= 3(x^3 - 2x - 3)$

9. C

$9x - (x-3)(x+12)$

$= 9x - (x^2 + 9x - 36)$

$= 9x - x^2 - 9x + 36$

$= 36 - x^2$

$= (6-x)(6+x)$

10. 5

$\frac{(2.1\times 10^{-3})(2\times 10^5)}{7\times 10^{-4}}$

$= \frac{4.2\times 10^2}{7\times 10^{-4}}$

$= \frac{4.2\times 10^2\times 10^4}{7}$ $\frac{1}{a^{-n}} = a^n$

$= 0.6\times 10^2\times 10^4$

$= 0.6\times 10^6$

$= 6\times 10^5$

If $\frac{(2.1\times 10^{-3})(2\times 10^5)}{7\times 10^{-4}} = 6\times 10^n$, then $n = 5$.

11. $\frac{1}{4}$

$a^{\frac{3}{4}} = 8$

$(a^{\frac{3}{4}})^{\frac{4}{3}} = (8)^{\frac{4}{3}}$

$a = (2^3)^{\frac{4}{3}}$

$a = 2^4$

Therefore, $a^{-\frac{1}{2}} = (2^4)^{-\frac{1}{2}} = 2^{-2} = \frac{1}{2^2} = \frac{1}{4}$.

12. 10

$\frac{x^2 - x - a}{x-2} = x + 1 - \frac{8}{x-2}$

Multiply each side of the equation by $x-2$.

$(x-2)[\frac{x^2 - x - a}{x-2}] = (x-2)[x + 1 - \frac{8}{x-2}]$

$\Rightarrow x^2 - x - a = (x-2)(x+1) - 8$

$\Rightarrow x^2 - x - a = x^2 - x - 2 - 8$

$\Rightarrow x^2 - x - a = x^2 - x - 10$

Since the constant terms have to be equal on both sides of the equation, $a = 10$.