Friendship Junior High School
Seventh Grade Advanced Math Packet

Exploring Topics In Algebra

Algebra Units 9-13

Foundation Skills
Simplifying Expressions
Radical Operations
Equations & Inequalities
Working With Monomials

UNIT 9: ANSWER KEY

Foundation Skills

1. INTEGERS & EXPONENTS

① $(-8)+(-7)=-15$

② $(-4)+(9)=5$

③ $(-7)-(-4)$
$(-7)+(4)=-3$

④ $(-12)-(8)$
$(-12)+(-8)=-20$

⑤ $(6)-(-9)$
$(6)+(9)=15$

⑥ $(-14)+(-3)=-17$

⑦ $(-6)(-4)=24$

⑧ $(12)(-3)=-36$

⑨ $(8)\div(-2)=-4$

⑩ $(27)\div(-3)=-9$

⑪ $(-18)\div(-9)=2$

⑫ $(-4)(5)=-20$

⑬ $(-8)+(9)+(-4)+(6)$
$(-12)+(15)=3$

⑭ $(-5)-(-3)+(-2)-(8)$
$(-5)+(3)+(-2)+(-8)$
$(-15)+(3)=-12$

⑮ $(-7)+(-9)-(-5)+(7)-(2)$
$(-7)+(-9)+(5)+(7)+(-2)$
$(-18)+(12)=-6$

⑯ $(-3)-(5)+(-11)+(4)-(-1)$
$(-3)+(-5)+(-11)+(4)+(1)$
$(-19)+(5)=-14$

⑰ $(8)-(4)-(-3)+(-5)$
$(8)+(-4)+(3)+(-5)$
$(-9)+(11)=2$

⑱ $(-3)-(-1)+(-7)-(8)-(-4)$
$(-3)+(1)+(-7)+(-8)+(4)$
$(-18)+(5)=-13$

⑲ $(-1)+(-1)-(-1)+(-1)-(-1)$
$(-1)+(-1)+(1)+(-1)+(1)$
$(-3)+(2)=-1$

⑳ $(-2)(3)(-4)(2)(-1)=-48$

㉑ $(-5)(-1)(-1)(-3)(3)=45$

㉒ $(4)(-2)(-3)(1)(-3)=-72$

㉓ $(-2)(-2)(-3)(-3)(-4)=-144$

㉔ $(2)(3)(1)(2)(-3)(2)=-72$

㉕ $(3)(-1)(-4)(5)(-2)=-120$

㉖ $(-1)(-3)(2)(-6)(-4)=144$

㉗ $2^4=16$

㉘ $1^6=1$

㉙ $3^3=27$

㉚ $7^2=49$

㉛ $8^0=1$

㉜ $(-2)^3=-8$

㉝ $(-4)^2=16$

㉞ $(-1)^5=-1$

Foundation Skills

35. $(-3)^4 = 81$
36. $(-5)^0 = 1$
37. $10^4 = 10{,}000$
38. $(-2)^5 = -32$
39. $(-2)^2 = 4$
40. $5^3 = 125$

2. ORDER OF OPERATIONS

1. $(-3) + (-2)(-4)$
   $(-3) + (8) = 5$

2. $(-8) - (6)(-2)$
   $(-8) - (-12)$
   $(-8) + (12) = 4$

3. $(-2) + (3 \times 4)$
   $(-2) + (12) = 10$

4. $(-2) + (-8) \div (-2)$
   $(-2) + (4) = 2$

5. $(-3) - (-6) \div (3)$
   $(-3) - (-2)$
   $(-3) + (2) = -1$

6. $(-4) + (-1)(5) - (2)$
   $(-4) + (-5) - (2)$
   $(-4) + (-5) + (-2) = -11$

7. $(-3) - (-4) \div (-2) - (-4)$
   $(-3) - (2) - (-4)$
   $(-3) + (-2) + (4)$
   $(-5) + (4) = -1$

8. $(2) - (3 \times 2) \div (2)$
   $(2) - (6) \div (2)$
   $(2) - (3)$
   $(2) + (-3) = -1$

9. $(-3) \times (-2) + (-4) - (-1)$
   $(6) + (-4) - (-1)$
   $(6) + (-4) + (1)$
   $(7) + (-4) = 3$

10. $(6) \div (-3) - (-2)(-3)$
    $(-2) - (6)$
    $(-2) + (-6) = -8$

11. $(-2)^4 = 16$
12. $-2^4 = -16$
13. $-3^2 = -9$
14. $(-3)^2 = 9$
15. $(-3)^3 = -27$
16. $-3^3 = -27$
17. $-4^2 = -16$
18. $-5^0 = -1$
19. $(-5)^0 = 1$
20. $-2^5 = -32$
21. $(-2)^5 = -32$
22. $-7^2 = -49$
23. $(-4)^3 = -64$
24. $(-5)^2 = 25$
25. $-3^4 = 81$
26. $-1^8 = -1$
27. $(-1)^0 = 1$

...IF I HAD IT TO DO ALL OVER AGAIN, I'D PROBABLY HAVE TO DO IT ALL OVER AGAIN...

Foundation Skills

(28) $-1^0 = -1$

(29) $(-3)^2 - 2^3$
$(9) - 8$
$(9) + (-8) = 1$

(30) $(-2)^0 - (-3)^2$
$(1) - (9)$
$(1) + (-9) = -8$

(31) $(-3)^3 + (-2)^2$
$(-27) + (4) = -23$

(32) $(-2)^4 - 2^2$
$(16) - 4$
$(16) + (-4) = 12$

(33) $(-2)^2 - (-3)^2 - 3^2$
$(4) - (9) - 9$
$(4) + (-9) + (-9)$
$(4) + (-18) = -14$

(34) $(-5)^0 - 4^0 - (-2)^5$
$(1) - 1 - (-32)$
$(1) + (-1) + (32)$
$(33) + (-1) = 32$

(35) $\dfrac{(-2)-(-4)}{(-3)+(5)}$

$\dfrac{(-2)+(4)}{(-3)+(5)} = \dfrac{2}{2} = 1$

(36) $\dfrac{(-3)-(-3)(-4)}{(-3)-(-15)}$

$\dfrac{(-3)-(12)}{(-3)-(-15)}$

$\dfrac{(-3)+(-12)}{(-3)+(15)} = \dfrac{-15}{12} = \dfrac{-5}{4}$

(37) $\dfrac{(-2)^2-(-3)^0}{-2^3}$

$\dfrac{(4)-(1)}{-8} = \dfrac{(4)+(-1)}{-8} = \dfrac{-3}{8}$

(38) $\dfrac{(-2)^3+(-1)}{-2^2-2} = \dfrac{(-8)+(-1)}{-4-2}$

$\dfrac{(-8)+(-1)}{(-4)+(-2)} = \dfrac{-9}{-6} = \dfrac{3}{2}$

(39) $\dfrac{-4^2-(-2)^2-(-5)^0}{-3}$

$\dfrac{-16-(4)-(1)}{-3}$

$\dfrac{-16+(-4)+(-1)}{-3} = \dfrac{-21}{-3} = 7$

(40) $\dfrac{-3-(-2)^3-(-2)^2}{3-3^2}$

$\dfrac{-3-(-8)-(4)}{3-9} = \dfrac{-3+(8)+(-4)}{3+(-9)}$

$\dfrac{(-7)+(8)}{-6} = \dfrac{-1}{6}$

3. EVAL EXPR

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

② $2b - 4c$
$2(-1) - 4(3)$
$(-2) - (12)$
$(-2) + (-12) = -14$

③ $3ab + c$
$3(-2)(-1) + (3)$
$(6) + (3) = 9$

④ $4ac - b$
$4(-2)(3) - (-1)$
$(-24) - (-1)$
$(-24) + (1) = -23$

Foundation Skills

⑤ $ab - ac$
$(-2)(-1) - (-2)(3)$
$(2) - (-6)$
$(2) + (6) = 8$

⑥ $abc - b$
$(-2)(-1)(3) - (-1)$
$(6) - (-1)$
$(6) + (1) = 7$

⑦ $3b + c - 2a$
$3(-1) + (3) - 2(-2)$
$(-3) + (3) - (-4)$
$(-3) + (3) + (4)$
$(-3) + (7) = 4$

⑧ $a + 3bc - b$
$(-2) + 3(-1)(3) - (-1)$
$(-2) + (-9) - (-1)$
$(-2) + (-9) + (1)$
$(-11) + (1) = -10$

⑨ $2ab - c + b$
$2(-2)(-1) - (3) + (-1)$
$(4) - (3) + (-1)$
$(4) + (-3) + (-1)$
$(4) + (-4) = 0$

⑩ $3b - 2ab + c$
$3(-1) - 2(-2)(-1) + (3)$
$(-3) - (4) + (3)$
$(-3) + (-4) + (3)$
$(-7) + (3) = -4$

⑪ $a^2 - 2b^2$
$(-2)^2 - 2(-1)^2$
$(4) - 2(1)$
$(4) - (2)$
$(4) + (-2) = 2$

⑫ $a^3 + b^2c$
$(-2)^3 + (-1)^2(3)$
$(-8) + (1)(3)$
$(-8) + (3) = -5$

⑬ $3b - 2a^2$
$3(-1) - 2(-2)^2$
$3(-1) - 2(4)$
$(-3) - (8)$
$(-3) + (-8) = -11$

⑭ $ab^3 - c^2$
$(-2)(-1)^3 - (3)^2$
$(-2)(-1) - (9)$
$(2) - (9)$
$(2) + (-9) = -7$

⑮ $2a^2b^2 - c$
$2(-2)^2(-1)^2 - (3)$
$2(4)(1) - (3)$
$(8) - (3)$
$(8) + (-3) = 5$

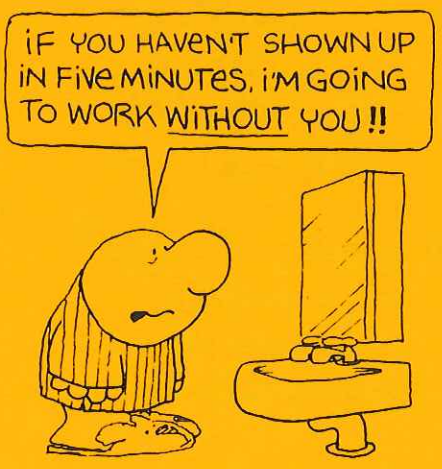
⑯ $3b^3 - abc$
$3(-1)^3 - (-2)(-1)(3)$
$3(-1) - (-2)(-1)(3)$
$(-3) - (6)$
$(-3) + (-6) = -9$

⑰ $4b^2 - 2a^3$
$4(-1)^2 - 2(-2)^3$
$4(1) - 2(-8)$
$(4) - (-16)$
$(4) + (16) = 20$

⑱ $4ac + 2b^2c$
$4(-2)(3) + 2(-1)^2(3)$
$4(-2)(3) + 2(1)(3)$
$(-24) + (6) = -18$

⑲ $a^3 - b^2 - c^2$
$(-2)^3 - (-1)^2 - (3)^2$
$(-8) - (1) - (9)$
$(-8) + (-1) + (-9) = -18$

⑳ a^2b^2c
$(-2)^2(-1)^2(3)$
$(4)(1)(3) = 12$



㉑ $2a - (b + c)$
$2(-2) - ((-1) + (3))$
$2(-2) - (2)$
$(-4) - (2)$
$(-4) + (-2) = -6$

continued

Foundation Skills

(22) $(a+b)-2b^2$

$((-2)+(-1))-2(-1)^2$

$(-3)-2(-1)^2$

$(-3)-2(1)$

$(-3)-(2)$

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

(23) $\frac{a^2bc}{b+c}=\frac{(-2)^2(-1)(3)}{(-1)+(3)}=\frac{(4)(-1)(3)}{(-1)+(3)}$

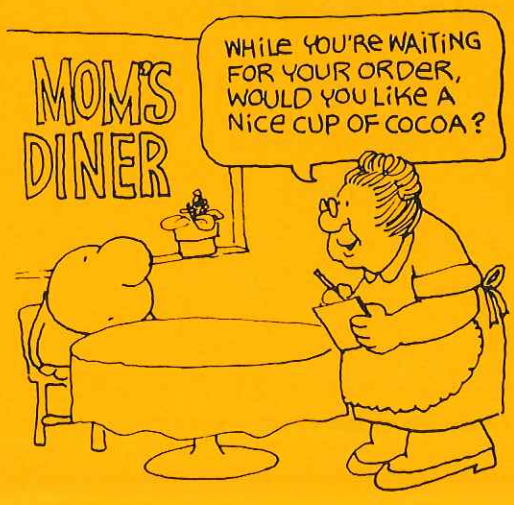
$\frac{-12}{(-1)+(3)}=\frac{-12}{2}=-6$

(24) $\frac{c^2-b}{8a-b}=\frac{(3)^2-(-1)}{8(-2)-(-1)}=\frac{(9)-(-1)}{8(-2)-(-1)}$

$\frac{(9)-(-1)}{(-16)-(-1)}=\frac{(9)+(1)}{(-16)+(1)}=\frac{10}{-15}=\frac{-2}{3}$

(25) $\frac{-2(a+b)}{3c+b}=\frac{-2((-2)+(-1))}{3(3)+(-1)}$

$\frac{-2(-3)}{9+(-1)}=\frac{6}{8}=\frac{3}{4}$



(26) $\frac{-3(b+c)}{5a}=\frac{-3((-1)+(3))}{5(-2)}$

$\frac{-3(2)}{5(-2)}=\frac{-6}{-10}=\frac{3}{5}$

(27) $\frac{ab^2c-a}{4b^2-ab}=\frac{(-2)(-1)^2(3)-(-2)}{4(-1)^2-(-2)(-1)}$

$\frac{(-2)(1)(3)-(-2)}{4(1)-(-2)(-1)}=\frac{(-6)-(-2)}{(4)-(2)}$

$\frac{(-6)+(2)}{(4)+(-2)}=\frac{-4}{2}=-2$

(28) $\frac{a^2b^3-2c}{2(a+b)}=\frac{(-2)^2(-1)^3-2(3)}{2((-2)+(-1))}$

$\frac{(-2)^2(-1)^3-2(3)}{2(-3)}=\frac{(4)(-1)-2(3)}{2(-3)}$

$\frac{(-4)-(6)}{(-6)}=\frac{(-4)+(-6)}{(-6)}=\frac{-10}{-6}=\frac{5}{3}$

REVIEW & PRACTICE

① $(-6)+(-8)=-14$

② $(-3)\times(-2)=6$

③ $(-4)-(-9)$

$(-4)+(9)=5$

④ $(-3)-(7)$

$(-3)+(-7)=-10$

⑤ $(12)\div(-4)=-3$

UNIT 9: ANSWER KEY

Foundation Skills

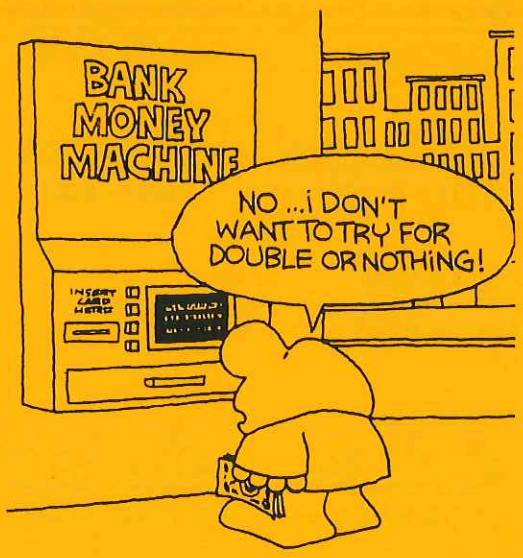
⑥ $(-8) \times (-7) = -56$

⑦ $(-9) - (8)$
$(-9) + (-8) = -17$

⑧ $(-7) - (-4)$
$(-7) + (4) = -3$

⑨ $(-3) + (11)$
8

⑩ $(9) \div (-3)$
-3



⑪ $(-8) + (-5) - (-2) - (7) - (-5)$
$(-8) + (-5) + (2) + (-7) + (5)$
$(-20) + (7) = -13$

⑫ $(-2) \times (-1) \times (3) \times (-4) = -24$

⑬ $(-3) \times (-2) \times (-2) \times (-2) = 24$

⑭ $(8) - (-4) + (-6) - (7) - (-2)$
$(8) + (4) + (-6) + (-7) + (2)$
$(-13) + (14) = 1$

⑮ $4^2 = 16$

⑯ $-2^3 = -8$

⑰ $(-1)^4 = 1$

⑱ $-3^2 = -9$

⑲ $5^3 = 125$

⑳ $(-3)^3 = -27$

㉑ $(-2)^4 = 16$

㉒ $7^0 = 1$

㉓ $7^2 = 49$

㉔ $-1^4 = -1$

㉕ $-5^2 = -25$

㉖ $(-8)^0 = 1$

㉗ $-3^3 = -27$

㉘ $(-2)^2 = 4$

㉙ $-3^4 = -81$

㉚ $(-4) - (-7) \times (-4) - (8)$
$(-4) - (28) - (8)$
$(-4) + (-28) + (-8) = -40$

㉛ $(6) - (-4)(-2) - (-12) \div (3)$
$(6) - (8) - (-12) \div (3)$
$(6) - (8) - (-4)$
$(6) + (-8) + (4)$
$(10) + (-8) = 2$

㉜ $(-2) + (-3) \times (-4) - (-6) + (-1)$
$(-2) + (12) - (-6) + (-1)$
$(-2) + (12) + (6) + (-1)$
$(-3) + (18) = 15$

㉝ $(-10) \div (-2) - (-3) + (-8) \div (2)$
$(5) - (-3) + (-8) \div (2)$
$(5) - (-3) + (-4)$
$(5) + (3) + (-4)$
$(8) + (-4) = 4$

㉞ $(-3)^2 + (-2)^3$
$(9) + (-8) = 1$

Foundation Skills

(35) $(-1)^3-(-4)^0$
$(-1)-(1)$
$(-1)+(-1)=-2$

(36) $(-2)-3^2-(-3)^3$
$(-2)-9-(-27)$
$(-2)+(-9)+(27)$
$(-11)+(27)=16$

(37) $-6^0-(-2)^4-2^3$
$-1-(16)-8$
$-1+(-16)+(-8)=-25$

(38) $-2^2-(-2)^2-(-2)^0$
$-4-(4)-(1)$
$-4+(-4)+(-1)=-9$

(39) $\dfrac{(-3)^2-2^3}{(-2)^2}=\dfrac{(9)-8}{4}=\dfrac{1}{4}$

(40) $\dfrac{(-2)(-3)-3^2}{(-2)-(-1)^3}=\dfrac{(-2)(-3)-9}{(-2)-(-1)}$

$\dfrac{(6)-9}{(-2)-(-1)}=\dfrac{(6)+(-9)}{(-2)+(1)}=\dfrac{-3}{-1}=3$

(41) $2a-b$
$2(-1)-(-3)$
$(-2)-(-3)$
$(-2)+(3)=1$

(42) $3a+2c$
$3(-1)+2(-2)$
$(-3)+(-4)=-7$

(43) $ab-3c$
$(-1)(-3)-3(-2)$
$(3)-(-6)$
$(3)+(6)=9$

(44) $4a-b-c$
$4(-1)-(-3)-(-2)$
$(-4)-(-3)-(-2)$
$(-4)+(3)+(2)=1$

(45) $2ac+b$
$2(-1)(-2)+(-3)$
$(4)+(-3)=1$

(46) $ac-abc$
$(-1)(-2)-(-1)(-3)(-2)$
$(2)-(-6)$
$(2)+(6)=8$

(47) a^2+b^2
$(-1)^2+(-3)^2$
$(1)+(9)=10$

(48) $2a-c^3$
$2(-1)-(-2)^3$
$2(-1)-(-8)$
$(-2)-(-8)$
$(-2)+(8)=6$

(49) $3ab^2-2a^2$
$3(-1)(-3)^2-2(-1)^2$
$3(-1)(9)-2(1)$
$(-27)-(2)$
$(-27)+(-2)=-29$

Foundation Skills

(50) $a^2c - 2b$

$(-1)^2(-2) - 2(-3)$

$(1)(-2) - 2(-3)$

$(-2) - (-6)$

$(-2) + (6) = 4$

(51) $a^3 - b^2 + c^3$

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

$(-1) - (9) + (-8)$

$(-1) + (-9) + (-8) = -18$

(52) a^2bc^3

$(-1)^2(-3)(-2)^3$

$(1)(-3)(-8) = 24$

(53) $2a + 3b - (b+c)$

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

$2(-1) + 3(-3) - (-5)$

$(-2) + (-9) - (-5)$

$(-2) + (-9) + (5)$

$(-11) + (5) = -6$

(54) $2(a+b) - c^3$

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

$2(-4) - (-2)^3$

$2(-4) - (-8)$

$(-8) - (-8)$

$(-8) + (8) = 0$

(55) $3(a+c) - a^2 + c^2$

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

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

$3(-3) - (1) + (4)$

$(-9) - (1) + (4)$

$(-9) + (-1) + (4)$

$(-10) + (4) = -6$

(56) $(a+b) + a^2b$

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

$(-4) + (1)(-3)$

$(-4) + (-3) = -7$

(57) $\frac{a^2bc}{a-b} = \frac{(-1)^2(-3)(-2)}{(-1) - (-3)} = \frac{(1)(-3)(-2)}{(-1) + (3)}$

$\frac{6}{2} = 3$

(58) $\frac{2a - ac^2}{a^2 - 2c} = \frac{2(-1) - (-1)(-2)^2}{(-1)^2 - 2(-2)}$

$\frac{2(-1) - (-1)(4)}{(1) - 2(-2)} = \frac{(-2) - (-4)}{(1) - (-4)} = \frac{(-2) + (4)}{(1) + (4)} = \frac{2}{5}$

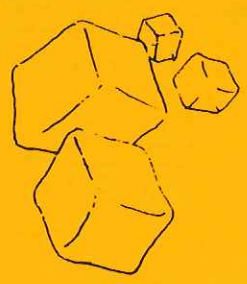
(59) $a^2 + \frac{2b}{3a} - ac^2$

$(-1)^2 + \frac{2(-3)}{3(-1)} - (-1)(-2)^2$

$(1) + \frac{(-6)}{(-3)} - (-1)(4)$

$(1) + (2) - (-4)$

$(3) + (4) = 7$



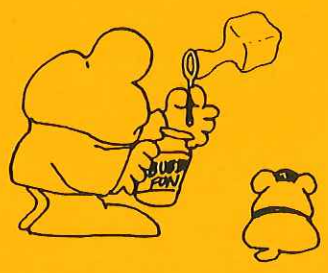
(60) $ab - \frac{c^3}{2a} + b^2$

$(-1)(-3) - \frac{(-2)^3}{2(-1)} + (-3)^2$

$(-1)(-3) - \frac{(-8)}{(-2)} + (9)$

$(3) - (4) + (9)$

$(3) + (-4) + (9) = 8$



UNIT 9: ANSWER KEY

Foundation Skills

PRACTICE TEST #1

① $(-12)-(+9)$
$(-12)+(-9)=-21$

② $-3^4=-81$

③ $(-2)-\boxed{(+5)(-3)}-(-4)$
$(-2)-(-15)-(-4)$
$(-2)+(+15)+(+4)=17$

④ $-2^2-(-2)^3-(-5)^0$
$-4-(-8)-(+1)$
$-4+(+8)+(-1)=3$

⑤ $3y^2-2xz^4$
$3(-2)^2-2(-3)(-1)^4$
$3(4)-2(-3)(1)$
$(12)-(-6)$
$(12)+(+6)=18$

⑥ $\dfrac{yz-(x+z)}{y^3-2x}=\dfrac{(-2)(-1)-((-3)+(-1))}{(-2)^3-2(-3)}$

$\dfrac{(-2)(-1)-(-4)}{(-8)-2(-3)}=\dfrac{(2)-(-4)}{(-8)-(-6)}$

$\dfrac{(2)+(4)}{(-8)+(6)}=\dfrac{6}{-2}=-3$

PRACTICE TEST #2

① $(-14)-(-8)$
$(-14)+(+8)=-6$

② $(-5)^2=25$

③ $(-4)-\boxed{(-8)\div(-2)}-\boxed{(-4)(+3)}$
$(-4)-(4)-(-12)$
$(-4)+(-4)+(+12)=4$

④ $(-3)^2-(-2)^0-(-1)^4-2^2$
$(+9)-(+1)-(+1)-4$
$(9)+(-1)+(-1)+(-4)=3$

⑤ $3a^2b^3-2ab$
$3(-1)^2(-2)^3-2(-1)(-2)$
$3(1)(-8)-2(-1)(-2)$
$(-24)-(+4)$
$(-24)+(-4)=-28$

⑥ $\dfrac{2(b+c)-b^2}{-c^2-b}=\dfrac{2((-2)+(-3))-(-2)^2}{-(-3)^2-(-2)}$

$\dfrac{2(-5)-(4)}{-(9)-(-2)}=\dfrac{(-10)+(-4)}{(-9)+(2)}$

$\dfrac{-14}{-7}=2$

UNIT 10: ANSWER KEY

Simplifying Expressions

1. COMBINING TERMS

① $x+3x+2+5 = 4x+7$

② $3y+7+2+4y = 7y+9$

③ $6x-5+2x+3-x = 7x-2$

④ $4a+3b-2a+6-7+5 = 2a+4b-4$

⑤ $3b-4a-2b-1-5a = b-9a-1$

⑥ $12-4b-3a-b+5a-6 = 6-5b+2a$

⑦ $2a+3ab-a-2ab-2a$
$-a+ab$

⑧ $5x+2xy-x-3xy-2x$
$2x-xy$

⑨ $8n+2mn-4n+mn-4n$
$3mn$

⑩ $3b-2ab+b-5-ab+5$
$4b-3ab$

⑪ $4x^2+2x-3xy+x^2-3x$
$5x^2-x-3xy$

⑫ $xy-2x^2+3-4xy-x^2+2x$
$-3xy-3x^2+3+2x$

⑬ $2ab-3a+b+4b-2a-ab$
$ab-5a+5b$

⑭ $7b-2a-3ab-a+4ab-b$
$6b-3a+ab$

⑮ $3a^2-a+2ab-5a+2a^2-ab$
$5a^2-6a+ab$

⑯ $a^2-2b+5a^2-2a+2b-3a$
$6a^2-5a$

⑰ $1-2x-xy-3x^2+xy+x-5$
$1-x-3x^2$

⑱ $x^2-3y+2x^2-xy+y-3x+2xy$
$3x^2-2y+xy-3x$

⑲ $4m-2n-3mn+n-m+mn$
$3m-n-2mn$

⑳ $4m-3n-mn+2n-mn-n+m$
$5m-2n-2mn$

㉑ $3a^2+2ab-a^2+5-ab+2$
$2a^2+ab+7$

UNIT 10: ANSWER KEY

Simplifying Expressions

(22) $8 - 3ab + a^2 - 5 + ab + 2a^2 - 1$
$2 - 2ab + 3a^2$

(23) $4a - 2a + a - 3 + 5 + 1 - 3a$
3

(24) $x - 2xy + 3x^2 - xy + x - x^2$
$2x - 3xy + 2x^2$

(25) $3xy - 2x^2y + x^2 - xy - x^2y$
$2xy - 3x^2y + x^2$

(26) $5a^2b - ab^2 - 2 + a^2 - 3ab^2 - 2a^2b$
$3a^2b - 4ab^2 - 2 + a^2$

(27) $4x - 2x^3 - x^2 - 3x^3 + x - 2x^2$
$5x - 5x^3 - 3x^2$

(28) $6n^2 - n - 2n^3 - n^2 - 3n^3 - 5 - 2n^3$
$5n^2 - n - 7n^3 - 5$

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

(30) $4a - ab + 2abc - 3ab + 2a - abc$
$6a - 4ab + abc$

2. DISTRIBUTIVE PROPERTY

① $2(x+y) = 2x+2y$

② $3(a+b) = 3a+3b$

③ $4(3a-b) = 12a-4b$

④ $3(x-4y) = 3x-12y$

⑤ $2a(a+b) = 2a^2+2ab$

⑥ $3x(x-2y) = 3x^2-6xy$

⑦ $-5(3x-2) = -15x+10$

⑧ $-2(a-7) = -2a+14$

⑨ $-x(3x-2) = -3x^2+2x$

⑩ $-b(4a+b) = -4ab-b^2$

⑪ $3(x-2y)-2x+3y$
$3x-6y-2x+3y$
$x-3y$

⑫ $2(a+3b)+3a+2b$
$2a+6b+3a+2b$
$5a+8b$

⑬ $-3(x-2)-8+3x-4$
$-3x+6-8+3x-4 = -6$

⑭ $-4(n+5)-2n+7+n+13$
$-4n-20-2n+7+n+13 = -5n$

Simplifying Expressions

(15) $2x-3(x-4)-2x+5$
$2x-3x+12-2x+5$
$-3x+17$

(16) $3-2(2x+1)-x+7-3x$
$3-4x-2-x+7-3x$
$8-8x$

(17) $2x(x-3y)-3(x^2-2)+xy$
$2x^2-6xy-3x^2+6+xy$
$-x^2-5xy+6$

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

(19) $2a(3a+4b)-2b(a+4)$
$6a^2+8ab-2ab-8b$
$6a^2+6ab-8b$

(20) $3x(4x-3y)-2y(3x+4y)-2y^2$
$12x^2-9xy-6xy-8y^2-2y^2$
$12x^2-15xy-10y^2$

(21) $12a-3ab-2a(4-3b)-5a+ab$
$12a-3ab-8a+6ab-5a+ab$
$-a+4ab$

(22) $14x-2xy-x(3y-2)+xy-2x$
$14x-2xy-3xy+2x+xy-2x$
$14x-4xy$

(23) $3xy(x-2y)-4x(y^2+2xy)-2x^2y$
$3x^2y-6xy^2-4xy^2-8x^2y-2x^2y$
$-7x^2y-10xy^2$

(24) $4ab(a+3b)-2b(ab-2a^2)+ab^2$
$4a^2b+12ab^2-2ab^2+4a^2b+ab^2$
$8a^2b+11ab^2$

(25) $2a(a^2-3a)+a^2(4a-3)-5a^3$
$2a^3-6a^2+4a^3-3a^2-5a^3$
a^3-9a^2

(26) $2n(4n-n^2)-2n^2(5-3n)+n^2$
$8n^2-2n^3-10n^2+6n^3+n^2$
$-n^2+4n^3$

REVIEW & PRACTICE

① $3a+5+6a+2 = 9a+7$

② $4+3n+1+5n+1 = 12+7n$

③ $5x-1-3x-2 = 2x-9$

④ $8c+4-12c-6 = -4c-2$

UNIT 10: ANSWER KEY

Simplifying Expressions

(5) $8ab - 3a + 4a - 2ab = 6ab + a$

(6) $7x - 5xy + 3x + xy = 10x - 4xy$

(7) $3 - 2b + 5ab - 4 + b - 2a + ab$
$-1 - b + 6ab - 2a$

(8) $xy - 2y + 3x + 4 - 6xy + y - 1 + x$
$-5xy - y + 4x + 3$

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

(10) $-ab + b^2 + 2a^2 - 4ab - b^2 + 2a^2$
$-5ab + 4a^2$

(11) $12 - 3n + m - 4 - 2m + 5n$
$8 + 2n - m$

(12) $7x + y - 3 + 4y - 5 - 3x - 2$
$4x + 5y - 10$

(13) $4a^2 + 2a - 3a^2 + a - 5 + 5a$
$a^2 + 8a - 5$

(14) $11 - 2x^2 - 3 - 4x + 2x^2 - 3 + x$
$5 - 3x$

(15) $8mn - m^2 + 3m + 2n^2 - mn - 5m$
$7mn + n^2 - 2m$

(16) $2(x - y) = 2x - 2y$

(17) $3(a + b) = 3a + 3b$

(18) $3(2x - 4y) = 6x - 12y$

(19) $5(3a + 4b) = 15a + 20b$

(20) $-2x(x - y) = -2x^2 + 2xy$

(21) $-3n(2m + n) = -6mn - 3n^2$

(22) $2(a - 3b) + 3(2a + b)$
$2a - 6b + 6a + 3b$
$8a - 3b$

(23) $4(3x - y) - 5x + 4y$
$12x - 4y - 5x + 4y = 7x$

(24) $8a - 3b + 3(a - 2b)$
$8a - 3b + 3a - 6b$
$11a - 9b$

(25) $12x - 2(3x + y) - 4y$
$12x - 6x - 2y - 4y$
$6x - 6y$

(26) $8n - 4(2m - n) + 5n$
$8n - 8m + 4n + 5n$
$17n - 8m$

Simplifying Expressions

(27) $2(3x-y)-3(x+4y)$
$6x-2y-3x-12y$
$3x-14y$

(28) $3(2n+4m)-4(n+2m)$
$6n+12m-4n-8m$
$2n+4m$

(29) $a(2a-b)-b(3a+2)-4b$
$2a^2-ab-3ab-2b-4b$
$2a^2-4ab-6b$

(30) $4x(x-y)-x(3x+2y)$
$4x^2-4xy-3x^2-2xy$
x^2-6xy

(31) $2x(3x-5y)+4(xy-3x^2)$
$6x^2-10xy+4xy-12x^2$
$-6x^2-6xy$

(32) $-3a(a-2b)-4(2ab+a^2)$
$-3a^2+6ab-8ab-4a^2$
$-7a^2-2ab$

(33) $2x^2y-3xy^2-x^2y+4x^2+5xy^2$
$x^2y+2xy^2+4x^2$

(34) $2ab-3a^2b+4ab-2ab^2-a^2b$
$6ab-4a^2b-2ab^2$

(35) $3x(xy-2y^2)-2y(y-2x^2)$
$3x^2y-6xy^2-2y^2+4x^2y$
$7x^2y-6xy^2-2y^2$

(36) $2a(4ab+b^2)-3b(2b+4a^2)$
$8a^2b+2ab^2-6b^2-12a^2b$
$-4a^2b+2ab^2-6b^2$

(37) $2ab(a^2-3b)-4a^2(ab+2)-a^2$
$2a^3b-6ab^2-4a^3b-8a^2-a^2$
$-2a^3b-6ab^2-9a^2$

(38) $3xy(2x-y)-y^2(x+2)-x^2y$
$6x^2y-3xy^2-xy^2-2y^2-x^2y$
$5x^2y-4xy^2-2y^2$

UNIT 10: ANSWER KEY

Simplifying Expressions

PRACTICE TEST #1

① $3a+2b-5ab+4b-5a+ab$
$-2a+6b-4ab$

② $8-y^2-6-4y^2+2+3y^2$
$4-2y^2$

③ $3(2x-5y)$
$6x-15y$

④ $2(a-3b)+3(4a-2b)$
$2a-6b+12a-6b$
$14a-12b$

⑤ $3a^2-2a(a-b)+3ab$
$3a^2-2a^2+2ab+3ab$
a^2+5ab

⑥ $3x^2y-2x(xy-x)+3x^2$
$3x^2y-2x^2y+2x^2+3x^2$
x^2y+5x^2

PRACTICE TEST #2

① $4x-3xy+8x-y+5y+4xy$
$12x+xy+4y$

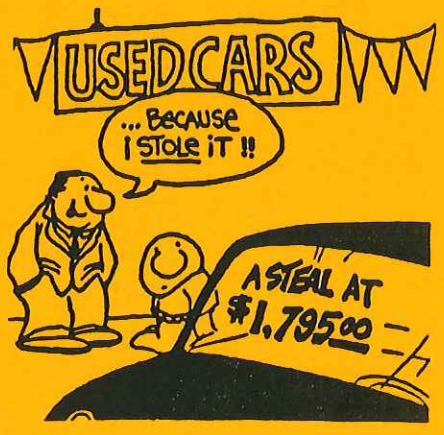
② $12-4x^2-2-x^2+5+3x^2$
$15-2x^2$

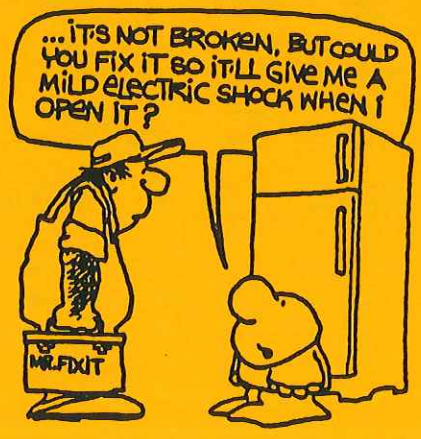
③ $2(4a-b)$
$8a-2b$

④ $3(2x-5y)-4(x-3y)$
$6x-15y-4x+12y$
$2x-3y$

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

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





UNIT 11: ANSWER KEY

Radical Operations

1. RADICAL VALUES

① $\sqrt{49} = 7$

② $\sqrt{144} = 12$

③ $\sqrt{25} = 5$

④ $\sqrt{1} = 1$

⑤ $-\sqrt{1} = -1$

⑥ $-\sqrt{81} = -9$

⑦ $-\sqrt{4} = -2$

⑧ $-\sqrt{121} = -11$

⑨ $\sqrt{169} = 13$

⑩ $\sqrt{400} = 20$

⑪ $\sqrt{16} = 4$

⑫ $-\sqrt{9} = -3$

⑬ $-\sqrt{196} = -14$

⑭ $\sqrt{225} = 15$

⑮ $\sqrt{9} < \sqrt{15} < \sqrt{16}$ $\quad 3 < \sqrt{15} < 4$

⑯ $\sqrt{36} < \sqrt{37} < \sqrt{49}$ $\quad 6 < \sqrt{37} < 7$

⑰ $-\sqrt{16} < -\sqrt{11} < -\sqrt{9}$ $\quad -4 < -\sqrt{11} < -3$

⑱ $-\sqrt{36} < -\sqrt{26} < -\sqrt{25}$ $\quad -6 < -\sqrt{26} < -5$

⑲ $\sqrt{81} < \sqrt{97} < \sqrt{100}$ $\quad 9 < \sqrt{97} < 10$

⑳ $\sqrt{81} < \sqrt{85} < \sqrt{100}$ $\quad 9 < \sqrt{85} < 10$

㉑ $-\sqrt{49} < -\sqrt{40} < -\sqrt{36}$ $\quad -7 < -\sqrt{40} < -6$

㉒ $-\sqrt{81} < -\sqrt{70} < -\sqrt{64}$ $\quad -9 < -\sqrt{70} < -8$

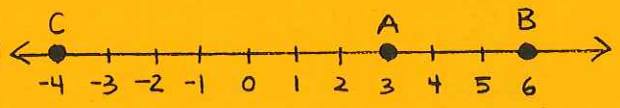
㉓ $\sqrt{49} < \sqrt{55} < \sqrt{64}$ $\quad 7 < \sqrt{55} < 8$

㉔ $\sqrt{1} < \sqrt{2} < \sqrt{4}$ $\quad 1 < \sqrt{2} < 2$

㉕ $-\sqrt{25} < -\sqrt{20} < -\sqrt{16}$ $\quad -5 < -\sqrt{20} < -4$

㉖ $-\sqrt{121} < -\sqrt{105} < -\sqrt{100}$ $\quad -11 < -\sqrt{105} < -10$

㉗



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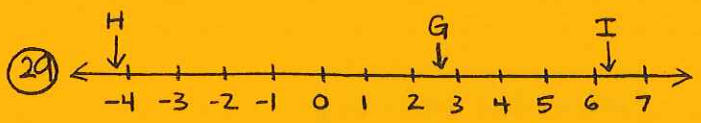

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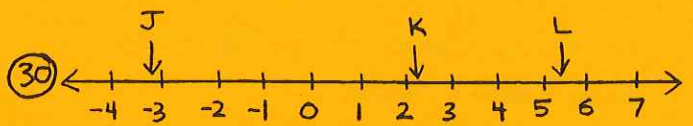


2. SIMPLIFYING RADICALS

① $\sqrt{96}$

$\sqrt{(2\cdot2)(2\cdot2)2\cdot3}$

$2\cdot2\sqrt{2\cdot3}$

$4\sqrt{6}$

② $\sqrt{54}$

$\sqrt{2(3\cdot3)3}$

$3\sqrt{2\cdot3}$

$3\sqrt{6}$

③ $\sqrt{120}$

$\sqrt{(2\cdot2)2\cdot3\cdot5}$

$2\sqrt{2\cdot3\cdot5}$

$2\sqrt{30}$

④ $\sqrt{216}$

$\sqrt{(2\cdot2)2(3\cdot3)\cdot3}$

$2\cdot3\sqrt{2\cdot3}$

$6\sqrt{6}$

⑤ $\sqrt{50}$

$\sqrt{2(5\cdot5)}$

$5\sqrt{2}$

⑥ $\sqrt{112}$

$\sqrt{(2\cdot2)(2\cdot2)\cdot7}$

$2\cdot2\sqrt{7}$

$4\sqrt{7}$

Radical Operations

(7) $\sqrt{48}$
$\sqrt{2\cdot2\cdot2\cdot2\cdot3}$
$2\cdot2\sqrt{3}$
$4\sqrt{3}$

(8) $\sqrt{80}$
$\sqrt{2\cdot2\cdot2\cdot2\cdot5}$
$2\cdot2\sqrt{5}$
$4\sqrt{5}$

(9) $\sqrt{90}$
$\sqrt{2\cdot3\cdot3\cdot5}$
$3\sqrt{2\cdot5}$
$3\sqrt{10}$

(10) $\sqrt{24}$
$\sqrt{2\cdot2\cdot2\cdot3}$
$2\sqrt{2\cdot3}$
$2\sqrt{6}$

(11) $\sqrt{12}$
$\sqrt{2\cdot2\cdot3}$
$2\sqrt{3}$

(12) $\sqrt{98}$
$\sqrt{2\cdot7\cdot7}$
$7\sqrt{2}$

(13) $\sqrt{15}$
$\sqrt{3\cdot5}$
$\sqrt{15}$

(14) $\sqrt{240}$
$\sqrt{2\cdot2\cdot2\cdot2\cdot3\cdot5}$
$2\cdot2\sqrt{3\cdot5}$
$4\sqrt{15}$

(15) $\sqrt{14}$
$\sqrt{2\cdot7}$
$\sqrt{14}$

(16) $\sqrt{6}$
$\sqrt{2\cdot3}$
$\sqrt{6}$

(17) $3\sqrt{40}$
$3\sqrt{2\cdot2\cdot2\cdot5}$
$3\cdot2\sqrt{2\cdot5}$
$6\sqrt{10}$

(18) $2\sqrt{32}$
$2\sqrt{2\cdot2\cdot2\cdot2\cdot2}$
$2\cdot2\cdot2\sqrt{2}$
$8\sqrt{2}$

(19) $5\sqrt{18}$
$5\sqrt{2\cdot3\cdot3}$
$5\cdot3\sqrt{2}$
$15\sqrt{2}$

(20) $3\sqrt{162}$
$3\sqrt{2\cdot3\cdot3\cdot3\cdot3}$
$3\cdot3\cdot3\sqrt{2}$
$27\sqrt{2}$

(21) $2\sqrt{250}$
$2\sqrt{2\cdot5\cdot5\cdot5}$
$2\cdot5\sqrt{2\cdot5}$
$10\sqrt{10}$

(22) $7\sqrt{8}$
$7\sqrt{2\cdot2\cdot2}$
$7\cdot2\sqrt{2}$
$14\sqrt{2}$

(23) $9\sqrt{75}$
$9\sqrt{3\cdot5\cdot5}$
$9\cdot5\sqrt{3}$
$45\sqrt{3}$

(24) $2\sqrt{60}$
$2\sqrt{2\cdot2\cdot3\cdot5}$
$2\cdot2\sqrt{3\cdot5}$
$4\sqrt{15}$

(25) $3\sqrt{56}$
$3\sqrt{2\cdot2\cdot2\cdot7}$
$3\cdot2\sqrt{2\cdot7}$
$6\sqrt{14}$

(26) $3\sqrt{450}$
$3\sqrt{2\cdot3\cdot3\cdot5\cdot5}$
$3\cdot3\cdot5\sqrt{2}$
$45\sqrt{2}$

(27) $7\sqrt{288}$
$7\sqrt{2\cdot2\cdot2\cdot2\cdot2\cdot3\cdot3}$
$7\cdot2\cdot2\cdot3\sqrt{2}$
$84\sqrt{2}$

(28) $4\sqrt{432}$
$4\sqrt{2\cdot2\cdot2\cdot2\cdot3\cdot3\cdot3}$
$4\cdot2\cdot2\cdot3\sqrt{3}$
$48\sqrt{3}$

(29) $2\sqrt{200}$
$2\sqrt{2\cdot2\cdot2\cdot5\cdot5}$
$2\cdot2\cdot5\sqrt{2}$
$20\sqrt{2}$

(30) $5\sqrt{243}$
$5\sqrt{3\cdot3\cdot3\cdot3\cdot3}$
$5\cdot3\cdot3\sqrt{3}$
$45\sqrt{3}$

UNIT 11: ANSWER KEY

Radical Operations

3. COMBINING RADICAL TERMS

① $3\sqrt{7} - \sqrt{7} = 2\sqrt{7}$

② $2\sqrt{5} - 5\sqrt{5} = -3\sqrt{5}$

③ $3\sqrt{6} + 2\sqrt{6} = 5\sqrt{6}$

④ $4\sqrt{3} + 7\sqrt{3} = 11\sqrt{3}$

⑤ $3\sqrt{2} - 2\sqrt{3} = 3\sqrt{2} - 2\sqrt{3}$

⑥ $4\sqrt{5} + 3\sqrt{7} = 4\sqrt{5} + 3\sqrt{7}$

⑦ $2\sqrt{7} - 3\sqrt{7} = -\sqrt{7}$

⑧ $6\sqrt{2} - 3\sqrt{2} = 3\sqrt{2}$

⑨ $\sqrt{7} - 2\sqrt{7} + 3\sqrt{7} = 2\sqrt{7}$

⑩ $5\sqrt{3} - 2\sqrt{3} - \sqrt{3} = 2\sqrt{3}$

⑪ $3\sqrt{3} - 2\sqrt{5} + 3\sqrt{5} - 3\sqrt{3} = \sqrt{5}$

⑫ $2\sqrt{7} - 3\sqrt{5} + 4\sqrt{7} - 2\sqrt{7} = 4\sqrt{7} - 3\sqrt{5}$

⑬ $4\sqrt{3} + 3\sqrt{2} - 2\sqrt{3} - 6\sqrt{2} = 2\sqrt{3} - 3\sqrt{2}$

⑭ $3\sqrt{5} + \sqrt{6} - 2\sqrt{5} + \sqrt{5} = 2\sqrt{5} + \sqrt{6}$

⑮ $3\sqrt{10} - 2\sqrt{5} + 3\sqrt{2} - 4\sqrt{10} = 3\sqrt{2} - 2\sqrt{5} - \sqrt{10}$

⑯ $3\sqrt{7} - 2\sqrt{3} + 2\sqrt{7} - 3\sqrt{3} = \sqrt{7} - 5\sqrt{3}$

⑰ $3\sqrt{2} + \sqrt{18} - \sqrt{50}$

$3\sqrt{2} + \sqrt{2 \cdot 3 \cdot 3} - \sqrt{2 \cdot 5 \cdot 5}$

$3\sqrt{2} + 3\sqrt{2} - 5\sqrt{2} = \sqrt{2}$

⑱ $4\sqrt{5} + \sqrt{20} - \sqrt{125}$

$4\sqrt{5} + \sqrt{2 \cdot 2 \cdot 5} - \sqrt{5 \cdot 5 \cdot 5}$

$4\sqrt{5} + 2\sqrt{5} - 5\sqrt{5} = \sqrt{5}$

⑲ $4\sqrt{2} - 3\sqrt{6} - \sqrt{8}$

$4\sqrt{2} - 3\sqrt{6} - \sqrt{2 \cdot 2 \cdot 2}$

$4\sqrt{2} - 3\sqrt{6} - 2\sqrt{2} = 2\sqrt{2} - 3\sqrt{6}$

⑳ $\sqrt{32} - \sqrt{18} + 2\sqrt{50}$

$\sqrt{2 \cdot 2 \cdot 2 \cdot 2 \cdot 2} - \sqrt{2 \cdot 3 \cdot 3} + 2\sqrt{2 \cdot 5 \cdot 5}$

$4\sqrt{2} - 3\sqrt{2} + 10\sqrt{2} = 11\sqrt{2}$

㉑ $2\sqrt{27} + \sqrt{12} - 8\sqrt{3}$

$2\sqrt{3 \cdot 3 \cdot 3} + \sqrt{2 \cdot 2 \cdot 3} - 8\sqrt{3}$

$6\sqrt{3} + 2\sqrt{3} - 8\sqrt{3} = 0$

㉒ $3\sqrt{3} - 2\sqrt{20} - \sqrt{5} + 2\sqrt{12}$

$3\sqrt{3} - 2\sqrt{2 \cdot 2 \cdot 5} - \sqrt{5} + 2\sqrt{2 \cdot 2 \cdot 3}$

$3\sqrt{3} - 4\sqrt{5} - \sqrt{5} + 4\sqrt{3} = 7\sqrt{3} - 5\sqrt{5}$

㉓ $2\sqrt{8} - 3\sqrt{12} + \sqrt{75}$

$2\sqrt{2 \cdot 2 \cdot 2} - 3\sqrt{2 \cdot 2 \cdot 3} + \sqrt{3 \cdot 5 \cdot 5}$

$4\sqrt{2} - 6\sqrt{3} + 5\sqrt{3} = 4\sqrt{2} - \sqrt{3}$

㉔ $3\sqrt{3} - 2\sqrt{45} + \sqrt{108} + 6\sqrt{5}$

$3\sqrt{3} - 2\sqrt{3 \cdot 3 \cdot 5} + \sqrt{2 \cdot 2 \cdot 3 \cdot 3 \cdot 3} + 6\sqrt{5}$

$3\sqrt{3} - 6\sqrt{5} + 6\sqrt{3} + 6\sqrt{5} = 9\sqrt{3}$

UNIT 11: ANSWER KEY

Radical Operations

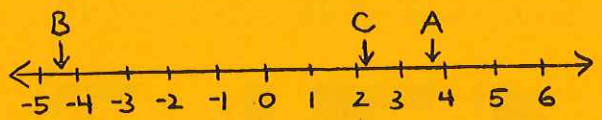
(25) $3\sqrt{18} - \sqrt{128} + 2\sqrt{8}$
$3\sqrt{2(3\cdot3)} - \sqrt{(2\cdot2)(2\cdot2)(2\cdot2)\cdot2} + 2\sqrt{(2\cdot2)\cdot2}$
$9\sqrt{2} - 8\sqrt{2} + 4\sqrt{2} = 5\sqrt{2}$

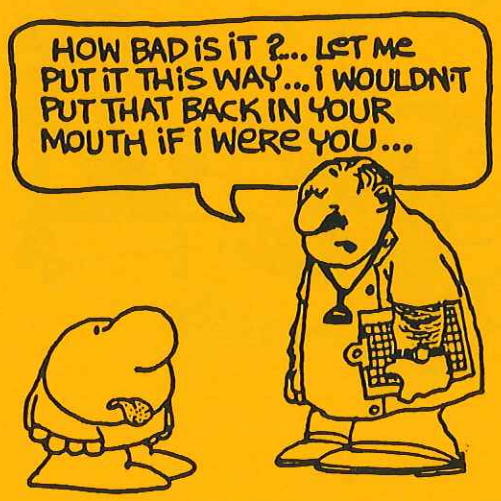
(26) $2\sqrt{6} - 3\sqrt{54} + \sqrt{12}$
$2\sqrt{6} - 3\sqrt{2(3\cdot3)\cdot3} + \sqrt{(2\cdot2)\cdot3}$
$2\sqrt{6} - 9\sqrt{6} + 2\sqrt{3} = 2\sqrt{3} - 7\sqrt{6}$

(27) $2\sqrt{8} - 3\sqrt{18} + \sqrt{50}$
$2\sqrt{(2\cdot2)\cdot2} - 3\sqrt{2(3\cdot3)} + \sqrt{2(5\cdot5)}$
$4\sqrt{2} - 9\sqrt{2} + 5\sqrt{2} = 0$

(28) $\sqrt{49} = 7$ (29) $-\sqrt{81} = -9$

(30)





4. MULTIPLYING RADICALS

(1) $(\sqrt{2})(\sqrt{5}) = \sqrt{10}$ (3) $(\sqrt{7})(\sqrt{3}) = \sqrt{21}$

(2) $(\sqrt{3})(\sqrt{2}) = \sqrt{6}$ (4) $(\sqrt{5})(\sqrt{3}) = \sqrt{15}$

(5) $(\sqrt{6})(\sqrt{2})$
$\sqrt{12} = \sqrt{(2\cdot2)3}$
$2\sqrt{3}$

(6) $(\sqrt{5})(\sqrt{10})$
$\sqrt{50} = \sqrt{2(5\cdot5)}$
$5\sqrt{2}$

(7) $(\sqrt{3})^2$
$\sqrt{9} = 3$

(8) $(\sqrt{6})^2$
$\sqrt{36} = 6$

(9) $(2\sqrt{5})^2$
$4\sqrt{25}$
$(4)(5) = 20$

(10) $(3\sqrt{2})^2$
$9\sqrt{4}$
$(9)(2) = 18$

(11) $(4\sqrt{10})(3\sqrt{6})$
$12\sqrt{60}$
$12\sqrt{(2\cdot2)3\cdot5}$
$24\sqrt{15}$

(12) $(3\sqrt{3})(6\sqrt{15})$
$18\sqrt{45}$
$18\sqrt{(3\cdot3)\cdot5}$
$54\sqrt{5}$

(13) $(2\sqrt{3})(\sqrt{2})(\sqrt{6})$
$2\sqrt{36}$
$(2)(6)$
12

(14) $(\sqrt{5})(2\sqrt{3})(\sqrt{6})$
$2\sqrt{90}$
$2\sqrt{2(3\cdot3)5}$
$6\sqrt{10}$

(15) $(3\sqrt{2})(4\sqrt{14})$
$12\sqrt{28}$
$12\sqrt{(2\cdot2)\cdot7}$
$24\sqrt{7}$

(16) $(2\sqrt{5})(5\sqrt{10})$
$10\sqrt{50}$
$10\sqrt{2(5\cdot5)}$
$50\sqrt{2}$

(17) $(\sqrt{6})(\sqrt{2})(\sqrt{10})$
$\sqrt{120}$
$\sqrt{(2\cdot2)2\cdot3\cdot5}$
$2\sqrt{30}$

(18) $(\sqrt{3})(2\sqrt{6})(\sqrt{2})$
$2\sqrt{36}$
$(2)(6) = 12$

(19) $3(2\sqrt{5} - \sqrt{3})$
$6\sqrt{5} - 3\sqrt{3}$

(20) $2\sqrt{3}(\sqrt{2} - 1)$
$2\sqrt{6} - 2\sqrt{3}$

(21) $3\sqrt{5}(2\sqrt{10} - \sqrt{5})$
$6\sqrt{50} - 3\sqrt{25}$
$6\sqrt{2(5\cdot5)} - 3\sqrt{5\cdot5}$
$30\sqrt{2} - 3(5)$
$30\sqrt{2} - 15$

Radical Operations

(22) $\sqrt{6}\,(2\sqrt{3}-\sqrt{2})$

$2\sqrt{18}-\sqrt{12}$

$2\sqrt{2\cdot3\cdot3}-\sqrt{2\cdot2\cdot3}$

$6\sqrt{2}-2\sqrt{3}$

(23) $2\sqrt{2}\,(3\sqrt{2}-\sqrt{18})$

$6\sqrt{4}-2\sqrt{36}$

$6(2)-2(6)$

$12-12=0$

(24) $\sqrt{3}\,(4\sqrt{12}-2\sqrt{3})$

$4\sqrt{36}-2\sqrt{9}$

$4(6)-2(3)$

$24-6=18$

(25)

(26) $3\sqrt{12}+\sqrt{8}-3\sqrt{2}-\sqrt{3}$

$3\sqrt{2\cdot2\cdot3}+\sqrt{2\cdot2\cdot2}-3\sqrt{2}-\sqrt{3}$

$6\sqrt{3}+2\sqrt{2}-3\sqrt{2}-\sqrt{3}$

$5\sqrt{3}-\sqrt{2}$

(27) $4\sqrt{18}-\sqrt{125}+\sqrt{32}+\sqrt{5}$

$4\sqrt{2\cdot3\cdot3}-\sqrt{5\cdot5\cdot5}+\sqrt{2\cdot2\cdot2\cdot2}+\sqrt{5}$

$12\sqrt{2}-5\sqrt{5}+4\sqrt{2}+\sqrt{5}$

$16\sqrt{2}-4\sqrt{5}$

(28) $2\sqrt{24}-\sqrt{27}$

$2\sqrt{2\cdot2\cdot2\cdot3}-\sqrt{3\cdot3\cdot3}$

$4\sqrt{6}-3\sqrt{3}$

(29) $5\sqrt{8}+\sqrt{128}$

$5\sqrt{2\cdot2\cdot2}+\sqrt{2\cdot2\cdot2\cdot2\cdot2\cdot2\cdot2}$

$10\sqrt{2}+8\sqrt{2}=18\sqrt{2}$

(30) $\sqrt{3}\,(\sqrt{6}-2\sqrt{3})-3\sqrt{2}$

$\sqrt{18}-2\sqrt{9}-3\sqrt{2}$

$\sqrt{2\cdot3\cdot3}-2\sqrt{3\cdot3}-3\sqrt{2}$

$3\sqrt{2}-6-3\sqrt{2}=-6$

(31) $5\sqrt{3}-3\sqrt{2}\,(\sqrt{6}+\sqrt{12})$

$5\sqrt{3}-3\sqrt{12}-3\sqrt{24}$

$5\sqrt{3}-3\sqrt{2\cdot2\cdot3}-3\sqrt{2\cdot2\cdot2\cdot3}$

$5\sqrt{3}-6\sqrt{3}-6\sqrt{6}=-\sqrt{3}-6\sqrt{6}$

REVIEW & PRACTICE

① $\sqrt{144}=12$

② $-\sqrt{64}=-8$

③ $-\sqrt{81}=-9$

④ $\sqrt{169}=13$

⑤ $-\sqrt{49}=-7$

⑥ $\sqrt{1}=1$

⑦ $\sqrt{121} < \sqrt{125} < \sqrt{144}$

$11 < \sqrt{125} < 12$

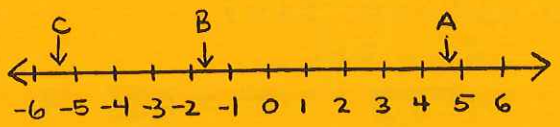
UNIT 11: ANSWER KEY

Radical Operations

(8) $-\sqrt{25} < -\sqrt{19} < -\sqrt{16}$
$-5 < -\sqrt{19} < -4$

(9) $-\sqrt{100} < -\sqrt{85} < -\sqrt{81}$
$-10 < -\sqrt{85} < -9$

(10)



(11)

(12) $\sqrt{160}$
$\sqrt{2\cdot2\cdot2\cdot2\cdot5}$
$2\cdot2\sqrt{2\cdot5}$
$4\sqrt{10}$

(13) $\sqrt{84}$
$\sqrt{2\cdot2\cdot3\cdot7}$
$2\sqrt{3\cdot7}$
$2\sqrt{21}$

(14) $\sqrt{180}$
$\sqrt{2\cdot2\cdot3\cdot3\cdot5}$
$2\cdot3\sqrt{5}$
$6\sqrt{5}$

(15) $\sqrt{150}$
$\sqrt{2\cdot3\cdot5\cdot5}$
$5\sqrt{2\cdot3}$
$5\sqrt{6}$

(16) $2\sqrt{96}$
$2\sqrt{2\cdot2\cdot2\cdot2\cdot2\cdot3}$
$2\cdot2\cdot2\sqrt{2\cdot3}$
$8\sqrt{6}$

(17) $4\sqrt{360}$
$4\sqrt{2\cdot2\cdot2\cdot3\cdot3\cdot5}$
$4\cdot2\cdot3\sqrt{2\cdot5}$
$24\sqrt{10}$

(18) $3\sqrt{12}$
$3\sqrt{2\cdot2\cdot3}$
$3\cdot2\sqrt{3}$
$6\sqrt{3}$

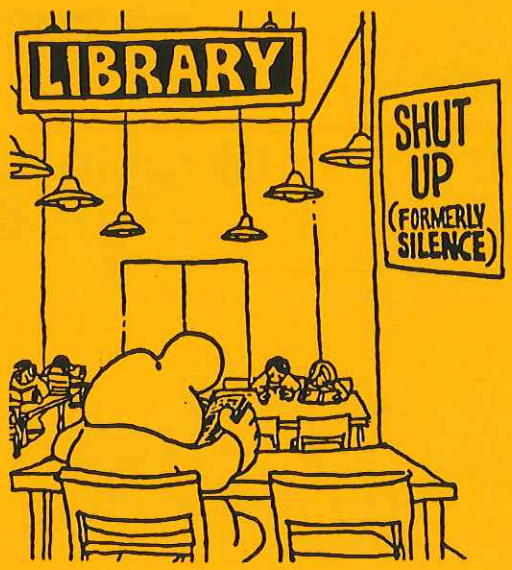
(19) $5\sqrt{126}$
$5\sqrt{2\cdot3\cdot3\cdot7}$
$5\cdot3\sqrt{2\cdot7}$
$15\sqrt{14}$

(20) $3\sqrt{375}$
$3\sqrt{3\cdot5\cdot5\cdot5}$
$3\cdot5\sqrt{3\cdot5}$
$15\sqrt{15}$

(21) $4\sqrt{196}$
$4\sqrt{2\cdot2\cdot7\cdot7}$
$4\cdot2\cdot7$
56

(22) $2\sqrt{27}$
$2\sqrt{3\cdot3\cdot3}$
$2\cdot3\sqrt{3}$
$6\sqrt{3}$

(23) $3\sqrt{128}$
$3\sqrt{2\cdot2\cdot2\cdot2\cdot2\cdot2\cdot2}$
$3\cdot2\cdot2\cdot2\sqrt{2}$
$24\sqrt{2}$



(24) $3\sqrt{5}+2\sqrt{3}-4\sqrt{5}-3\sqrt{3} = -\sqrt{5}-\sqrt{3}$

(25) $\sqrt{6}-2\sqrt{3}+3\sqrt{2}-\sqrt{2}+2\sqrt{3} = \sqrt{6}+2\sqrt{2}$

(26) $4\sqrt{5}-3\sqrt{5}-2\sqrt{7}+3\sqrt{7} = \sqrt{5}+\sqrt{7}$

(27) $-\sqrt{3}-3\sqrt{2}+\sqrt{2}-4\sqrt{2} = -\sqrt{3}-5\sqrt{2}$

(28) $3\sqrt{5}-2\sqrt{3}+\sqrt{5}+2\sqrt{3}-4\sqrt{5} = 0$

(29) $5\sqrt{6}-\sqrt{7}-3\sqrt{6}-2\sqrt{7}+\sqrt{6} = 3\sqrt{6}-3\sqrt{7}$

(30) $(\sqrt{3})(2\sqrt{5})$
$2\sqrt{15}$

(31) $(3\sqrt{2})(\sqrt{6})$
$3\sqrt{12}$
$3\sqrt{2\cdot3\cdot3}$
$6\sqrt{3}$

(32) $(\sqrt{5})(2\sqrt{15})$
$2\sqrt{75}$
$2\sqrt{3\cdot5\cdot5}$
$10\sqrt{3}$

(33) $(3\sqrt{3})(2\sqrt{6})$
$6\sqrt{18} = 6\sqrt{2\cdot3\cdot3}$
$18\sqrt{2}$

UNIT 11: ANSWER KEY

Radical Operations

(34) $(3\sqrt{2})^2$
$9\sqrt{4}$
$(9)(2) = 18$

(35) $(2\sqrt{5})^2$
$4\sqrt{25}$
$(4)(5) = 20$

(36) $(3\sqrt{6})^2$
$9\sqrt{36}$
$(9)(6) = 54$

(37) $(\sqrt{7})^2$
$\sqrt{49} = 7$

(38) $(\sqrt{6})(\sqrt{8})$
$\sqrt{48}$
$\sqrt{2\cdot2}\sqrt{2\cdot2}\cdot3$
$4\sqrt{3}$

(39) $(3\sqrt{2})(4\sqrt{12})$
$12\sqrt{24} = 12\sqrt{2\cdot2}2\cdot3$
$24\sqrt{6}$

(40) $2\sqrt{12} - 3\sqrt{3} + 4\sqrt{75}$
$2\sqrt{2\cdot2}\cdot3 - 3\sqrt{3} + 4\sqrt{3}\cdot\sqrt{5\cdot5}$
$4\sqrt{3} - 3\sqrt{3} + 20\sqrt{3} = 21\sqrt{3}$

(41) $\sqrt{8} + 3\sqrt{18} - 4\sqrt{50}$
$\sqrt{2\cdot2}2 + 3\sqrt{2}\sqrt{3\cdot3} - 4\sqrt{2}\sqrt{5\cdot5}$
$2\sqrt{2} + 9\sqrt{2} - 20\sqrt{2} = -9\sqrt{2}$

(42) $3\sqrt{125} - 2\sqrt{8} + 3\sqrt{5}$
$3\sqrt{5\cdot5}\cdot5 - 2\sqrt{2\cdot2}\cdot2 + 3\sqrt{5}$
$15\sqrt{5} - 4\sqrt{2} + 3\sqrt{5} = 18\sqrt{5} - 4\sqrt{2}$

(43) $4\sqrt{27} + 2\sqrt{45} - 3\sqrt{12}$
$4\sqrt{3\cdot3}\cdot3 + 2\sqrt{3\cdot3}5 - 3\sqrt{2\cdot2}\cdot3$
$12\sqrt{3} + 6\sqrt{5} - 6\sqrt{3} = 6\sqrt{3} + 6\sqrt{5}$

(44) $\sqrt{18} - \sqrt{32} + \sqrt{98}$
$\sqrt{2}\sqrt{3\cdot3} - \sqrt{2\cdot2}\sqrt{2\cdot2}\cdot2 + \sqrt{2}\sqrt{7\cdot7}$
$3\sqrt{2} - 4\sqrt{2} + 7\sqrt{2}$
$6\sqrt{2}$

(45) $\sqrt{200} - 3\sqrt{108} + 2\sqrt{50}$
$\sqrt{2\cdot2}2\sqrt{5\cdot5} - 3\sqrt{2\cdot2}\cdot3\sqrt{3\cdot3} + 2\sqrt{2}\sqrt{5\cdot5}$
$10\sqrt{2} - 18\sqrt{3} + 10\sqrt{2} = 20\sqrt{2} - 18\sqrt{3}$

(46) $\sqrt{3}(2\sqrt{6} - 3\sqrt{3})$
$2\sqrt{18} - 3\sqrt{9}$
$2\sqrt{2\cdot3\cdot3} - 3(3) = 6\sqrt{2} - 9$

(47) $\sqrt{2}(\sqrt{8} - 2\sqrt{2})$
$\sqrt{16} - 2\sqrt{4}$
$4 - 2(2) = 0$

(48) $3\sqrt{3}(\sqrt{6} - 5\sqrt{2})$
$3\sqrt{18} - 15\sqrt{6}$
$3\sqrt{2}\sqrt{3\cdot3} - 15\sqrt{6} = 9\sqrt{2} - 15\sqrt{6}$

(49) $2\sqrt{5}(3\sqrt{5} + \sqrt{2})$
$6\sqrt{25} + 2\sqrt{10}$
$6(5) + 2\sqrt{10} = 30 + 2\sqrt{10}$

UNIT 11: ANSWER KEY

Radical Operations

PRACTICE TEST #1

① $-\sqrt{11}$

② $\sqrt{180} = \sqrt{2\cdot2\cdot3\cdot3\cdot5} = 6\sqrt{5}$

③ $4\sqrt{400} = 4\sqrt{2\cdot2\cdot2\cdot2\cdot5\cdot5}$

$4\cdot2\cdot2\cdot5 = 80$

④ $4\sqrt{2} - \sqrt{3} + 2\sqrt{2} + 3\sqrt{3}$

$6\sqrt{2} + 2\sqrt{3}$

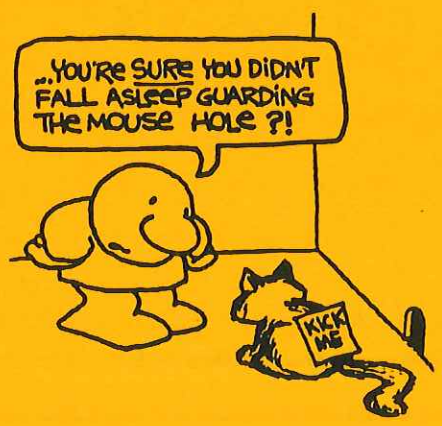
⑤ $(3\sqrt{10})(5\sqrt{2}) = 15\sqrt{20}$

$15\sqrt{2\cdot2\cdot5} = 15\cdot2\sqrt{5} = 30\sqrt{5}$

⑥ $\sqrt{12} - 4\sqrt{3} - 3\sqrt{75}$

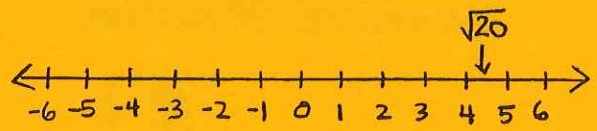
$\sqrt{2\cdot2\cdot3} - 4\sqrt{3} - 3\sqrt{3\cdot5\cdot5}$

$2\sqrt{3} - 4\sqrt{3} - 15\sqrt{3} = -17\sqrt{3}$



PRACTICE TEST #2

① $\sqrt{20}$



② $\sqrt{250} = \sqrt{2\cdot5\cdot5\cdot5} = 5\sqrt{10}$

③ $3\sqrt{128} = 3\sqrt{2\cdot2\cdot2\cdot2\cdot2\cdot2\cdot2}$

$3\cdot2\cdot2\cdot2\sqrt{2} = 24\sqrt{2}$

④ $\sqrt{6} - 2\sqrt{2} - 3\sqrt{6} + 3\sqrt{2}$

$-2\sqrt{6} + \sqrt{2}$

⑤ $(\sqrt{3})(2\sqrt{6})(3\sqrt{5}) = 6\sqrt{90}$

$6\sqrt{2\cdot3\cdot3\cdot5} = 6\cdot3\sqrt{10} = 18\sqrt{10}$

⑥ $\sqrt{125} - 4\sqrt{5} + 2\sqrt{45}$

$\sqrt{5\cdot5\cdot5} - 4\sqrt{5} + 2\sqrt{3\cdot3\cdot5}$

$5\sqrt{5} - 4\sqrt{5} + 6\sqrt{5} = 7\sqrt{5}$

UNIT 11: ANSWER KEY

Radical Operations

THE PYTHAGOREAN THEOREM

① $a^2 + b^2 = c^2$
$(4)^2 + (8)^2 = c^2$
$16 + 64 = c^2$
$80 = c^2$
$c = \sqrt{80} = \sqrt{2\cdot2\cdot2\cdot2\cdot5} = 4\sqrt{5}$ km

② $a^2 + b^2 = c^2$
$(2\sqrt{2})^2 + b^2 = (6)^2$
$(2\sqrt{2})(2\sqrt{2}) + b^2 = 36$
$(4\sqrt{4}) + b^2 = 36$
$8 + b^2 = 36$
$b^2 = 36 - 8$
$b^2 = 28$
$b = \sqrt{28} = \sqrt{2\cdot2\cdot7} = 2\sqrt{7}$ ft.

③ $a^2 + b^2 = c^2$
$(3\sqrt{2})^2 + (6\sqrt{2})^2 = c^2$
$(3\sqrt{2})(3\sqrt{2}) + (6\sqrt{2})(6\sqrt{2}) = c^2$
$(9\sqrt{4}) + (36\sqrt{4}) = c^2$
$(18) + (72) = c^2$
$90 = c^2$
$c = \sqrt{90} = \sqrt{2\cdot3\cdot3\cdot5} = 3\sqrt{10}$ ft.

④ If the diameter of the cone's base is 8, the radius is 4

$a^2 + b^2 = c^2$
$(4)^2 + b^2 = (8)^2$
$16 + b^2 = 64$
$b^2 = 64 - 16$
$b^2 = 48$
$b = \sqrt{48} = \sqrt{2\cdot2\cdot2\cdot2\cdot3} = 4\sqrt{3}$ in

⑤ $a^2 + b^2 = c^2$
$(100)^2 + b^2 = (125)^2$
$(10{,}000) + b^2 = (15{,}625)$
$b^2 = 15{,}625 - 10{,}000$
$b^2 = 5{,}625$
$b = \sqrt{5{,}625} = 75$ m

use the $\sqrt{\ }$ key on your calculator to determine that $\sqrt{5{,}625} = 75$

⑥ $a^2 + b^2 = c^2$
$(6)^2 + (8)^2 = c^2$
$36 + 64 = c^2$
$c^2 = 100$
$c = \sqrt{100} = 10$ ft.

Radical Operations

⑦ $a^2 + b^2 = c^2$
$(3)^2 + (6)^2 = c^2$
$9 + 36 = c^2$
$c^2 = 45$
$c = \sqrt{45} = \sqrt{(3\cdot3)5} = 3\sqrt{5}$ m

⑧ $a^2 + b^2 = c^2$
$(8)^2 + (12)^2 = c^2$
$64 + 144 = c^2$
$c^2 = 208$
$c = \sqrt{208} = \sqrt{(2\cdot2)(2\cdot2)13} = 4\sqrt{13}$ ft.

⑨ If the base of the roof is 24 ft, half the base is 12 ft.

$a^2 + b^2 = c^2$
$(5)^2 + (12)^2 = c^2$
$25 + 144 = c^2$
$c^2 = 169$
$c = \sqrt{169} = 13$ ft.

⑩ $a^2 + b^2 = c^2$
$(4)^2 + b^2 = (10)^2$
$16 + b^2 = 100$
$b^2 = 100 - 16$
$b^2 = 84$
$b = \sqrt{84} = \sqrt{(2\cdot2)\cdot3\cdot7} = 2\sqrt{21}$ ft.

⑪ $a^2 + b^2 = c^2$
$(4\sqrt{2})^2 + b^2 = (4\sqrt{10})^2$
$(4\sqrt{2})(4\sqrt{2}) + b^2 = (4\sqrt{10})(4\sqrt{10})$
$(16\sqrt{4}) + b^2 = (16\sqrt{100})$
$32 + b^2 = 160$
$b^2 = 160 - 32$
$b^2 = 128$
$b = \sqrt{128} = \sqrt{(2\cdot2)(2\cdot2)(2\cdot2)2} = 8\sqrt{2}$ m

⑫ If the base of the large triangle is $6\sqrt{3}$, half the base is $3\sqrt{3}$

$a^2 + b^2 = c^2$
$(3\sqrt{3})^2 + b^2 = (9)^2$
$(9\sqrt{9}) + b^2 = 81$
$27 + b^2 = 81$
$b^2 = 81 - 27$
$b^2 = 54$
$b = \sqrt{54} = \sqrt{2(3\cdot3)\cdot3} = 3\sqrt{6}$ in

UNITS 9-11: ANSWER KEY

Cumulative Review

① $(-3)+(+7)=4$

② $(-8)\times(-3)=24$

③ $(-7)-(-5)$
$(-7)+(+5)=-2$

④ $(-4)\div(+4)=-1$

⑤ $(-3)+(-4)-(-7)+(-6)-(+8)$
$(-3)+(-4)+(+7)+(-6)+(-8)$
$(+7)+(-21)=-14$

⑥ $(-3)\times(-1)\times(+2)\times(-2)=-12$

⑦ $-5^2=-25$

⑧ $(-5)^2=25$

⑨ $(-4)^0=1$

⑩ $(-3)^3=-27$

⑪ $(-6)-\boxed{(-2)\times(-3)}+(+4)$
$(-6)-(+6)+(+4)$
$(-6)+(-6)+(+4)=-8$

⑫ $\boxed{(-4)\div(-1)}-\boxed{(-2)\times(+5)}$
$(+4)-(-10)$
$(+4)+(+10)=14$

⑬ $(-2)^3-(-3)^2$
$(-8)-(+9)$
$(-8)+(-9)=-17$

⑭ $(-3)^0-3^2+(-2)^4$
$(+1)-9+(+16)$
$(+1)+(-9)+(+16)=8$

⑮ $\dfrac{(-1)^2-(-3)^3}{(-6)^2-2^5}=\dfrac{(+1)-(-27)}{(+36)-32}$

$\dfrac{(+1)+(+27)}{(+36)+(-32)}=\dfrac{28}{4}=7$

⑯ $\dfrac{(-1)(-3)-4^2+5^0}{(-2)^2-2(-1)}=\dfrac{(-1)(-3)-16+1}{(+4)-2(-1)}$

$\dfrac{(+3)+(-16)+1}{(+4)+(-2)}=\dfrac{-12}{2}=-6$

⑰ $2a-3b+c$
$2(-3)-3(-2)+(-1)$
$(-6)-(-6)+(-1)$
$(-6)+(+6)+(-1)=-1$

⑱ ab^2-2bc^3
$(-3)(-2)^2-2(-2)(-1)^3$
$(-3)(+4)-2(-2)(-1)$
$(-12)-(+4)$
$(-12)+(-4)=-16$

⑲ $-3(a+b)-c^2$
$-3((-3)+(-2))-(-1)^2$
$-3(-5)-(+1)$
$(-15)+(-1)=-16$

UNITS 9-11: ANSWER KEY

Cumulative Review

(20) $2ab - abc$
$2(-3)(-2) - (-3)(-2)(-1)$
$(+12) - (+6)$
$(+12) + (+6) = 18$

(21) $\frac{a^2b^2c}{2b} = \frac{(-3)^2(-2)^2(-1)}{2(-2)}$

$\frac{(+9)(+4)(-1)}{2(-2)} = \frac{-36}{-4} = 9$

(22) $\frac{3a+2b}{b^2c^3} = \frac{3(-3)+2(-2)}{(-2)^2(-1)^3}$

$\frac{3(-3)+2(-2)}{(+4)(-1)} = \frac{(-9)+(-4)}{(-4)} = \frac{-13}{-4} = \frac{13}{4}$

(23) $4x-3+2x+7 = 6x+4$

(24) $n-3m+4-2n+m-3$
$-n-2m+1$

(25) $-a^2-ab+3ab-2a^2-4ab$
$-3a^2-2ab$

(26) $n^2-2nm+3n^2-4+5nm$
$4n^2+3nm-4$

(27) $3(x-2y)-4(2x+y)$
$3x-6y-8x-4y$
$-5x-10y$

(28) $2(a+b)-3(2a-3b)$
$2a+2b-6a+9b = -4a+11b$

(29) $a(a-b)+3a^2-2ab$
$a^2-ab+3a^2-2ab = 4a^2-3ab$

(30) $2x(x-3y)+y(x-3y)$
$2x^2-6xy+xy-3y^2 = 2x^2-5xy-3y^2$

(31) $2a(a-b^2)-b(ab-2)$
$2a^2-2ab^2-ab^2+2b$
$2a^2-3ab^2+2b$

(32) $4(2x-y^2)-y(x+3y)+2x$
$8x-4y^2-xy-3y^2+2x$
$10x-7y^2-xy$

(33) $\sqrt{108} = \sqrt{2\cdot2\cdot3\cdot3\cdot3} = 6\sqrt{3}$

(34) $\sqrt{40} = \sqrt{2\cdot2\cdot2\cdot5} = 2\sqrt{10}$

(35) $\sqrt{245} = \sqrt{5\cdot7\cdot7} = 7\sqrt{5}$

(36) $2\sqrt{27} = 2\sqrt{3\cdot3\cdot3} = 6\sqrt{3}$

(37) $-3\sqrt{96} = -3\sqrt{2\cdot2\cdot2\cdot2\cdot2\cdot3} = -12\sqrt{6}$

(38) $2\sqrt{80} = 2\sqrt{2\cdot2\cdot2\cdot2\cdot5} = 8\sqrt{5}$

Cumulative Review

(39) $(\sqrt{3})(2\sqrt{6}) = 2\sqrt{18}$
$2\sqrt{2 \cdot 3 \cdot 3} = 6\sqrt{2}$

(40) $(3\sqrt{2})(4\sqrt{10}) = 12\sqrt{20}$
$12\sqrt{2 \cdot 2 \cdot 5} = 24\sqrt{5}$

(41) $(3\sqrt{3})^2 = (9)(3) = 27$

(42) $(2\sqrt{5})^2 = (4)(5) = 20$

(43) $2\sqrt{3}(4\sqrt{3} - \sqrt{6})$
$(8)(3) - (2)(\sqrt{18})$
$24 - 2\sqrt{2 \cdot 3 \cdot 3} = 24 - 6\sqrt{2}$

(44) $\sqrt{2}(3\sqrt{10} - \sqrt{6})$
$3\sqrt{20} - \sqrt{12}$
$3\sqrt{2 \cdot 2 \cdot 5} - \sqrt{2 \cdot 2 \cdot 3} = 6\sqrt{5} - 2\sqrt{3}$

(45) $\sqrt{3} + 2\sqrt{12} - 4\sqrt{75}$
$\sqrt{3} + 2\sqrt{2 \cdot 2 \cdot 3} - 4\sqrt{3 \cdot 5 \cdot 5}$
$\sqrt{3} + 4\sqrt{3} - 20\sqrt{3}$
$-15\sqrt{3}$

(46) $3\sqrt{20} - 2\sqrt{27} + 2\sqrt{45}$
$3\sqrt{2 \cdot 2 \cdot 5} - 2\sqrt{3 \cdot 3 \cdot 3} + 2\sqrt{3 \cdot 3 \cdot 5}$
$6\sqrt{5} - 6\sqrt{3} + 6\sqrt{5}$
$12\sqrt{5} - 6\sqrt{3}$

(47) $2\sqrt{32} - 3\sqrt{50} + \sqrt{63}$
$2\sqrt{2 \cdot 2 \cdot 2 \cdot 2 \cdot 2} - 3\sqrt{2 \cdot 5 \cdot 5} + \sqrt{3 \cdot 3 \cdot 7}$
$8\sqrt{2} - 15\sqrt{2} + 3\sqrt{7}$
$-7\sqrt{2} + 3\sqrt{7}$

(48) $\sqrt{125} + 5\sqrt{80} + 2\sqrt{81}$
$\sqrt{5 \cdot 5 \cdot 5} + 5\sqrt{2 \cdot 2 \cdot 2 \cdot 2 \cdot 5} + 2\sqrt{3 \cdot 3 \cdot 3 \cdot 3}$
$5\sqrt{5} + 20\sqrt{5} + 18$
$25\sqrt{5} + 18$

(49) $3\sqrt{200} - 2\sqrt{98} - 3\sqrt{72}$
$3\sqrt{2 \cdot 2 \cdot 2 \cdot 5 \cdot 5} - 2\sqrt{2 \cdot 7 \cdot 7} - 3\sqrt{2 \cdot 2 \cdot 2 \cdot 3 \cdot 3}$
$30\sqrt{2} - 14\sqrt{2} - 18\sqrt{2}$
$-2\sqrt{2}$

(50) $\sqrt{24} + 2\sqrt{54} - 5\sqrt{150}$
$\sqrt{2 \cdot 2 \cdot 2 \cdot 3} + 2\sqrt{2 \cdot 3 \cdot 3 \cdot 3} - 5\sqrt{2 \cdot 3 \cdot 5 \cdot 5}$
$2\sqrt{6} + 6\sqrt{6} - 25\sqrt{6}$
$-17\sqrt{6}$

PRACTICE TEST

① $(-3) + (-4) - (-5) - (+4)$
$(-3) + (-4) + (+5) + (-4)$
$(+5) + (-11) = -6$

② $(-20) \div (-4) = 5$

③ $(-3)^2 = 9$

④ $-3^2 = -9$

⑤ $(-4)^0 - (-2)^3$
$(+1) - (-8) = (+1) + (+8) = 9$

Cumulative Review

⑥ $(-3)^2 - \boxed{(-4)(+3)} + (-2)$
$(+9) - (-12) + (-2)$
$(+9) + (+12) + (-2) = 19$

⑦ $-2a - 3b$
$-2(3) - 3(-2)$
$(-6) - (-6)$
$(-6) + (+6) = 0$

⑧ $a - b^3 + 2c^2$
$(3) - (-2)^3 + 2(-1)^2$
$(3) - (-8) + 2(+1)$
$(3) - (-8) + (+2)$
$(3) + (+8) + (+2) = 13$

⑨ $2a(b+c)^2$
$2(3)((-2)+(-1))^2$
$2(3)(-3)^2$
$2(3)(9) = 54$

⑩ $3a + 2b - 4a - 3b$
$-a - b$

⑪ $2a^2 - 3ab + 4 - 5ab - 3a^2$
$-a^2 - 8ab + 4$

⑫ $2(a+b) - 3a + 4b$
$2a + 2b - 3a + 4b$
$-a + 6b$

⑬ $3a(a-b) - 2b(b+3)$
$3a^2 - 3ab - 2b^2 - 6b$

⑭ $4a(a+b^2) - 2a^2(3-2b)$
$4a^2 + 4ab^2 - 6a^2 + 4a^2b$
$-2a^2 + 4ab^2 + 4a^2b$

⑮ $\sqrt{60} = \sqrt{(2\cdot2)\cdot3\cdot5} = 2\sqrt{15}$

⑯ $3\sqrt{72} = 3\sqrt{(2\cdot2)\cdot2\cdot(3\cdot3)} = 18\sqrt{2}$

⑰ $(3\sqrt{5})^2 = (9)(5) = 45$

⑱ $(2\sqrt{3})(4\sqrt{21})$
$8\sqrt{63} = 8\sqrt{(3\cdot3)\cdot7} = 24\sqrt{7}$

⑲ $\sqrt{12} - 2\sqrt{108} + 2\sqrt{48}$
$\sqrt{(2\cdot2)3} - 2\sqrt{(2\cdot2)(3\cdot3)3} + 2\sqrt{(2\cdot2)(2\cdot2)3}$
$2\sqrt{3} - 12\sqrt{3} + 8\sqrt{3}$
$-2\sqrt{3}$

⑳ $3\sqrt{20} - \sqrt{45} + 2\sqrt{25}$
$3\sqrt{(2\cdot2)5} - \sqrt{(3\cdot3)5} + 2(5)$
$6\sqrt{5} - 3\sqrt{5} + 10$
$3\sqrt{5} + 10$

UNIT 12: ANSWER KEY

Equations & Inequalities

1. SOLVING EQUATIONS

① $x-3 \overset{+3}{=} 12 \overset{+3}{}$
$x = 15$

② $12 \overset{-12}{+} n = -5 \overset{-12}{}$
$n = -17$

③ $7 \overset{-15}{=} 15 \overset{-15}{-} a$
$-8 = -a$
$a = 8$

④ $13 \overset{-13}{-} n = -1 \overset{-13}{}$
$-n = -14$
$n = 14$

⑤ $2n - 5 \overset{+5}{=} 11 \overset{+5}{}$
$2n = 16$
$(\frac{1}{2})(2n) = (\frac{1}{2})(16)$
$n = 8$

⑥ $8 \overset{-8}{-} 3n = 20 \overset{-8}{}$
$-3n = 12$
$(-\frac{1}{3})(-3n) = (-\frac{1}{3})(12)$
$n = -4$

⑦ $-14 \overset{+4}{=} 5x - 4 \overset{+4}{}$
$-10 = 5x$
$(\frac{1}{5})(-10) = (\frac{1}{5})(5x)$
$-2 = x$
$x = -2$

⑧ $4 \overset{-4}{-} 6a = -8 \overset{-4}{}$
$-6a = -12$
$(-\frac{1}{6})(-6a) = (-\frac{1}{6})(-12)$
$a = 2$

⑨ $4n - 3 - n + 7 = 2n + 3$
$3n \overset{-2n}{+} 4 = 2n \overset{-2n}{+} 3$
$n + 4 \overset{-4}{=} 3 \overset{-4}{}$
$n = -1$

⑩ $9 - x + 3 + 5x = x - 4 + 7x - 4$
$4x \overset{-8x}{+} 12 = 8x \overset{-8x}{-} 8$
$-4x + 12 \overset{-12}{=} -8 \overset{-12}{}$
$-4x = -20$
$(-\frac{1}{4})(-4x) = (-\frac{1}{4})(-20)$
$x = 5$

⑪ $a - 2a - 3a + 1 = 2 - 2a + 3$
$-4a \overset{+2a}{+} 1 = 5 - 2a \overset{+2a}{}$
$-2a + 1 \overset{-1}{=} 5 \overset{-1}{}$
$-2a = 4$
$(-\frac{1}{2})(-2a) = (-\frac{1}{2})(4)$
$a = -2$

⑫ $-3 + 4n - 5 - 7n = n + 7 - 2n - 1$
$-8 - 3n \overset{+n}{=} -n \overset{+n}{} + 6$
$-8 \overset{+8}{-} 2n = 6 \overset{+8}{}$
$-2n = 14$
$(-\frac{1}{2})(-2n) = (-\frac{1}{2})(14)$
$n = -7$

⑬ $2(4n - 3) = 5n + 15$
$8n \overset{-5n}{-} 6 = 5n \overset{-5n}{+} 15$
$3n - 6 \overset{+6}{=} 15 \overset{+6}{}$
$3n = 21$
$(\frac{1}{3})(3n) = (\frac{1}{3})(21)$
$n = 7$

⑭ $10 - 3(x - 4) = x + 2$
$10 - 3x + 12 = x + 2$
$22 - 3x \overset{-x}{=} x \overset{-x}{} + 2$
$22 \overset{-22}{-} 4x = 2 \overset{-22}{}$
$-4x = -20$
$(-\frac{1}{4})(-4x) = (-\frac{1}{4})(-20)$
$x = 5$

⑮ $4 - 2(3a + 5) = 3(a - 4) - 3$
$4 - 6a - 10 = 3a - 12 - 3$
$-6 - 6a \overset{-3a}{=} 3a \overset{-3a}{} - 15$
$-6 \overset{+6}{-} 9a = -15 \overset{+6}{}$
$-9a = 9$
$(-\frac{1}{9})(-9a) = (-\frac{1}{9})(-9)$
$a = 1$

continued

Equations & Inequalities

⑯ $2-3(n-4)=2(3n-1)-2$
$2-3n+12=6n-2-2$
$14-3n=6n-4$
$-6n \quad -6n$
$14-9n=-4$
$-14 \quad -14$
$-9n=-18$
$(-1/9)(-9n)=(-1/9)(-18)$
$n=2$

⑰ $2(n+4)-3(2n-4)=8$
$2n+8-6n+12=8$
$-4n+20=8$
$-20 \quad -20$
$-4n=-12$
$(-1/4)(-4n)=(-1/4)(-12)$
$n=3$

⑱ $3(4x-2)-2(5x+3)=6x$
$12x-6-10x-6=6x$
$2x-12=6x$
$-2x \quad -2x$
$-12=4x$
$(1/4)(-12)=(1/4)(4x)$
$-3=x$
$x=-3$

⑲ $n-2(4n-5)=2n-3$
$n-8n+10=2n-3$
$-7n+10=2n-3$
$-2n \quad -2n$
$-9n+10=-3$
$-10 \quad -10$
$-9n=-13$
$(-1/9)(-9n)=(-1/9)(-13)$
$n=13/9$

⑳ $7-3(4x-2)+x=-3$
$7-12x+6+x=-3$
$-11x+13=-3$
$-13 \quad -13$
$-11x=-16$
$(-1/11)(-11x)=(-1/11)(-16)$
$x=16/11$

2. PROBLEM SOLVING

① $n+4=13$
$-4 \quad -4$
$n=9$

② $n-12=-6$
$+12 \quad +12$
$n=6$

③ $-3=n+5$
$-5 \quad -5$
$-8=n$

④ $2n-5=11$
$+5 \quad +5$
$2n=16$
$(1/2)(2n)=(1/2)(16)$
$n=8$

⑤ $3n+7=n+3$
$-n \quad -n$
$2n+7=3$
$-7 \quad -7$
$2n=-4$
$(1/2)(2n)=(1/2)(-4)$
$n=-2$

⑥ $10-2n=n-8$
$-n \quad -n$
$10-3n=-8$
$-10 \quad -10$
$-3n=-18$
$(-1/3)(-3n)=(-1/3)(-18)$
$n=6$

Equations & Inequalities

⑦ $4n - 2 = 3n + 1$
$n - 2 = 1$
$n = 3$

⑧ $5n - (2n + 3) = 9$
$5n - 2n - 3 = 9$
$3n - 3 = 9$
$3n = 12$
$(1/3)(3n) = (1/3)(12)$
$n = 4$

⑨ $3n - (n - 2) = -2$
$3n - n + 2 = -2$
$2n + 2 = -2$
$2n = -4$
$(1/2)(2n) = (1/2)(-4)$
$n = -2$

⑩ $2n + 3 = 4n - 15$
$-2n + 3 = -15$
$-2n = -18$
$(-1/2)(-2n) = (-1/2)(-18)$
$n = 9$

⑪ $4n - 5 = 6n + 3$
$-2n - 5 = 3$
$-2n = 8$
$(-1/2)(-2n) = (-1/2)(8)$
$n = -4$

⑫ $(2n + 2) - (4n - 3) = -7$
$2n + 2 - 4n + 3 = -7$
$-2n + 5 = -7$
$-2n = -12$
$(-1/2)(-2n) = (-1/2)(-12)$
$n = 6$

⑬ $(4n - 2) - (n + 5) = 2n + 11$
$4n - 2 - n - 5 = 2n + 11$
$3n - 7 = 2n + 11$
$n - 7 = 11$
$n = 18$

⑭ $(n - 6) - (3n - 3) = n + 12$
$n - 6 - 3n + 3 = n + 12$
$-2n - 3 = n + 12$
$-3n - 3 = 12$
$-3n = 15$
$(-1/3)(-3n) = (-1/3)(15)$
$n = -5$

⑮ $8n - (2n + 6) = 4n$
$8n - 2n - 6 = 4n$
$6n - 6 = 4n$
$-6 = -2n$
$(-1/2)(-6) = (-1/2)(-2n)$
$3 = n$

Equations & Inequalities

3. INEQUALITIES

① $2n - 3 < n - 9$
$n - 3 < -9$
$n < -6$

② $3x + 7 \geq x - 9$
$2x + 7 \geq -9$
$2x \geq -16$
$(\frac{1}{2})(2x) \geq (\frac{1}{2})(-16)$
$x \geq -8$

③ $2(x-4) > -10$
$2x - 8 > -10$
$2x > -2$
$(\frac{1}{2})(2x) > (\frac{1}{2})(-2)$
$x > -1$

④ $3(4n-1) \leq 9n+6$
$12n - 3 \leq 9n + 6$
$3n - 3 \leq 6$
$3n \leq 9$
$(\frac{1}{3})(3n) \leq (\frac{1}{3})(9)$
$n \leq 3$

⑤ $14 > 2(n-3) - n$
$14 > 2n - 6 - n$
$14 > n - 6$
$20 > n$
$n < 20$

⑥ $6^{-6} - x \geq 15^{-6}$
$-x \geq 9$
$x \leq -9$

⑦ $n - 3 < 2n + 7$
$-n - 3 < 7$
$-n < 10$
$n > -10$

⑧ $2n > 3(2n+4)$
$2n > 6n + 12$
$-4n > 12$
$(-\frac{1}{4})(-4n) < (-\frac{1}{4})(12)$
$n < -3$

⑨ $3(n-5) \leq 2(n+2)$
$3n - 15 \leq 2n + 4$
$n - 15 \leq 4$
$n \leq 19$

⑩ $5a - 7 > 9a - 11$
$-4a - 7 > -11$
$-4a > -4$
$(-\frac{1}{4})(-4a) < (-\frac{1}{4})(-4)$
$a < 1$

⑪ $8 - 3x < -7$
$-3x < -15$
$(-\frac{1}{3})(-3x) > (-\frac{1}{3})(-15)$
$x > 5$

⑫ $17 \geq 4(n-3) + 1$
$17 \geq 4n - 12 + 1$
$17 \geq 4n - 11$
$28 \geq 4n$
$(\frac{1}{4})(28) \geq (\frac{1}{4})(4n)$
$7 \geq n$
$n \leq 7$

⑬ $2(n-3) - 3(n+2) \leq 7$
$2n - 6 - 3n - 6 \leq 7$
$-n - 12 \leq 7$
$-n \leq 19$
$n \geq -19$

⑭ $4x - 3(2x-2) > x - 5$
$4x - 6x + 6 > x - 5$
$-2x + 6 > x - 5$
$-3x + 6 > -5$
$-3x > -11$
$(-\frac{1}{3})(-3x) < (-\frac{1}{3})(-11)$
$x < 11/3$

Equations & Inequalities

⑮ $3+2a-5 \geq a-4(a-3)$
$3+2a-5 \geq a-4a+12$
$-2+2a \geq -3a+12$ (+3a)
$-2+5a \geq 12$ (+2)
$5a \geq 14$
$(1/5)(5a) \geq (1/5)(14)$
$a \geq 14/5$

⑯ $8n-2(3n+4) < 15-n$
$8n-6n-8 < 15-n$
$2n-8 < 15-n$ (+n)
$3n-8 < 15$ (+8)
$3n < 23$
$(1/3)(3n) < (1/3)(23)$
$n < 23/3$

4. NUMBER LINE GRAPHING

① $4n-3 = n-12$ (-n)
$3n-3 = -12$ (+3)
$3n = -9$
$(1/3)(3n) = (1/3)(-9)$
$n = -3$

② $5x-4 = 2(x+1)$
$5x-4 = 2x+2$ (-2x)
$3x-4 = +2$ (+4)
$3x = 6$
$(1/3)(3x) = (1/3)(6)$
$x = 2$

③ $3(n-4) < 4n-2$
$3n-12 < 4n-2$ (-4n)
$-n-12 < -2$ (+12)
$-n < 10$
$n > -10$

④ $2(3x-1) \geq 8x-10$
$6x-2 \geq 8x-10$ (-8x)
$-2x-2 \geq -10$ (+2)
$-2x \geq -8$
$(-1/2)(-2x) \leq (-1/2)(-8)$
$x \leq 4$

⑤ $4(x-3)-x \geq x-6$
$4x-12-x \geq x-6$
$3x-12 \geq x-6$ (-x)
$2x-12 \geq -6$ (+12)
$2x \geq 6$
$(1/2)(2x) \geq (1/2)(6)$
$x \geq 3$

Equations & Inequalities

⑥ $5n < 2n - 3 + n + 5$

$5n \overset{-3n}{<} 3n \overset{-3n}{+} 2$

$2n < 2$

$(\frac{1}{2})(2n) < (\frac{1}{2})(2)$

$n < 1$

⑦ $4n \overset{-8n}{-} 3 = 8n \overset{-8n}{-} 11$

$-4n - 3 \overset{+3}{=} -11 \overset{+3}{}$

$-4n = -8$

$(-\frac{1}{4})(-4n) = (-\frac{1}{4})(-8)$

$n = 2$

⑧ $3(2x-1) = 2(x-4) - 7$

$6x - 3 = 2x - 8 - 7$

$6x \overset{-2x}{-} 3 = 2x \overset{-2x}{-} 15$

$4x - 3 \overset{+3}{=} -15 \overset{+3}{}$

$4x = -12$

$(\frac{1}{4})(4x) = (\frac{1}{4})(-12)$

$x = -3$

⑨ $8 - 2(n-3) < n - 1$

$8 - 2n + 6 < n - 1$

$14 - 2n \overset{-n}{<} n \overset{-n}{-} 1$

$14 \overset{-14}{-} 3n < -1 \overset{-14}{}$

$-3n < -15$

$(-\frac{1}{3})(-3n) > (-\frac{1}{3})(-15)$

$n > 5$

⑩ $6 - 3(x+1) \geq 5 - x$

$6 - 3x - 3 \geq 5 - x$

$3 - 3x \overset{+x}{\geq} 5 - x \overset{+x}{}$

$3 \overset{-3}{-} 2x \geq 5 \overset{-3}{}$

$-2x \geq 2$

$(-\frac{1}{2})(-2x) \leq (-\frac{1}{2})(2)$

$x \leq -1$

⑪ $3(n-1) > -6$

$3n - 3 \overset{+3}{>} -6 \overset{+3}{}$

$3n > -3$

$(\frac{1}{3})(3n) > (\frac{1}{3})(-3)$

$n > -1$

⑫ $2x = 2(x-1) + 2$

$2x = 2x - 2 + 2$

$2x \overset{-2x}{} = 2x \overset{-2x}{}$

$0 = 0$

(true identity)

All Solutions

⑬ $8 + 2n > 2(n+3) + 4$

$8 + 2n > 2n + 6 + 4$

$8 + 2n \overset{-2n}{>} 2n \overset{-2n}{} + 10$

$8 > 10$

(false inequality)

No Solutions

⑭ $3n \overset{-5n}{-} 1 \leq 5n \overset{-5n}{} + 3$

$-2n - 1 \overset{+1}{\leq} 3 \overset{+1}{}$

$-2n \leq 4$

$(-\frac{1}{2})(-2n) \geq (-\frac{1}{2})(4)$

$n \geq -2$

⑮ $2(3x+1) = 6x - 2$

$6x \overset{-6x}{+} 2 = 6x \overset{-6x}{} - 2$

$2 = -2$

(false equation)

No Solutions

Equations & Inequalities

⑯ $3(n-1) \leq 2n-1+n$

$3n-3 \leq 2n-1+n$

$3n^{-3n}-3 \leq 3n^{-3n}-1$

$-3 \leq -1$ (true identity)

All Solutions

⑰ $x > 3(x-2)$

$x^{-3x} > 3x^{-3x}-6$

$-2x > -6$

$(-\frac{1}{2})(-2x) < (-\frac{1}{2})(-6)$

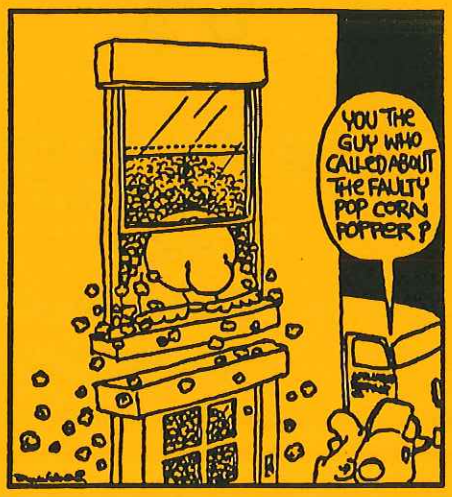
$x < 3$

⑱ $4(n-3) = 4n-3$

$4n^{-4n}-12 = 4n^{-4n}-3$

$-12 = -3$ (false equation)

No Solutions



⑲ $2(2a+4) > 5a+17$

$4a^{-5a}+8 > 5a^{-5a}+17$

$-a+8^{-8} > 17^{-8}$

$-a > 9$

$a < -9$

⑳ $3x-6 \leq 3(x-2)$

$3x^{-3x}-6 \leq 3x^{-3x}-6$

$-6 \leq -6$ (true identity)

REVIEW & PRACTICE

① $3x^{-4x}-2 = 4x^{-4x}-5$

$-x-2^{+2} = -5^{+2}$

$-x = -3$

$x = 3$

② $2(x-4) = -12$

$2x-8^{+8} = -12^{+8}$

$2x = -4$

$(\frac{1}{2})(2x) = (\frac{1}{2})(-4)$

$x = -2$

③ $3n-5+2n+4 = n+15$

$5n^{-n}-1 = n^{-n}+15$

UNIT 12: ANSWER KEY

Equations & Inequalities

$4n-1^{+1}=15^{+1}$
$4n=16$
$(1/4)(4n)=(1/4)(16)$
$n=4$

④ $n-6=3(n-2)+4$
$n-6=3n-6+4$
$n^{-3n}-6=3n^{-3n}-2$
$-2n-6^{+6}=-2^{+6}$
$-2n=4$
$(-1/2)(-2n)=(-1/2)(4)$
$n=-2$

⑤ $15=2(x-3)+1$
$15=2x-6+1$
$15^{+5}=2x-5^{+5}$
$20=2x$
$(1/2)(20)=(1/2)(2x)$
$10=x$
$x=10$

⑥ $3n-2-n-7=n-9$
$2n^{-n}-9=n^{-n}-9$
$n-9^{+9}=-9^{+9}$
$n=0$

⑦ $n+5^{-5}=-7^{-5}$
$n=-12$

⑧ $2n-8^{+8}=2^{+8}$
$2n=10$
$(1/2)(2n)=(1/2)(10)$
$n=5$

⑨ $(3n+3)-(2n+2)=2n-1$
$3n+3-2n-2=2n-1$
$n^{-2n}+1=2n^{-2n}-1$
$-n+1^{-1}=-1^{-1}$
$-n=-2$
$n=2$

⑩ $5n-(2n-3)=n-1$
$5n-2n+3=n-1$
$3n^{-n}+3=n^{-n}-1$
$2n+3^{-3}=-1^{-3}$
$2n=-4$
$(1/2)(2n)=(1/2)(-4)$
$n=-2$

⑪ $(4n+2)-(n-1)=4n+1$
$4n+2-n+1=4n+1$
$3n^{-4n}+3=4n^{-4n}+1$
$-n+3^{-3}=1^{-3}$
$-n=-2$
$n=2$

⑫ $5n-6n=n+12$
$-n^{-n}=n^{-n}+12$
$-2n=12$
$(-1/2)(-2n)=(-\frac{1}{2})(12)$
$n=-6$

⑬ $2n^{-n}<n^{-n}-7$
$n<-7$

⑭ $3(2x-4)\geq x+3$
$6x^{-x}-12\geq x^{-x}+3$
$5x-12^{+12}\geq 3^{+12}$
$5x\geq 15$
$(1/5)(5x)\geq(1/5)(15)$
$x\geq 3$

⑮ $a+5>4(a-1)$
$a^{-4a}+5>4a^{-4a}-4$
$-3a+5^{-5}>-4^{-5}$
$-3a>-9$
$(-1/3)(-3a)<(-1/3)(-9)$
$a<3$

⑯ $4x-2+5-6x\leq 7$
$-2x+3^{-3}\leq 7^{-3}$
$-2x\leq 4$
$(-\frac{1}{2})(-2x)\geq(-\frac{1}{2})(4)$
$x\geq -2$

Equations & Inequalities

(17) $2n-5>3(2n-1)+6$

$2n-5>6n-3+6$

$2n-6n-5>6n-6n+3$

$-4n-5+5>3+5$

$-4n>8$

$(-\frac{1}{4})(-4n)<(-\frac{1}{4})(8)$

$n<-2$

(18) $3(x-3)-2(x+1)\leq 4$

$3x-9-2x-2\leq 4$

$x-11+11\leq 4+11$

$x\leq 15$

(19) $4x-2x-7=2x-2x+5$

$2x-7+7=5+7$

$2x=12$

$(\frac{1}{2})(2x)=(\frac{1}{2})(12)$

$x=6$

(20) $3(2n-1)<6n-2$

$6n-6n-3<6n-6n-2$

$-3<-2$ (true identity)

(21) $2(4x-3)=8x+6$

$8x-8x-6=8x-8x+6$

$-6=+6$ (false equation)

(22) $n+3\geq 3(n-1)$

$n-3n+3\geq 3n-3n-3$

$-2n+3-3\geq -3-3$

$-2n\geq -6$

$(-\frac{1}{2})(-2n)\leq(-\frac{1}{2})(-6)$

$n\leq 3$

(23) $16<2(x-3)$

$16+6<2x-6+6$

$22<2x$

$(\frac{1}{2})(22)<(\frac{1}{2})(2x)$

$11<x$

$x>11$

(24) $3(n+2)-n<8$

$3n+6-n<8$

$2n+6-6<8-6$

$2n<2$

$(\frac{1}{2})(2n)<(\frac{1}{2})(2)$

$n<1$

UNIT 12: ANSWER KEY

Equations & Inequalities

PRACTICE TEST #1

① $2(n-5)=14$
$2n-10=14$ (+10)
$2n=24$
$\frac{1}{2}(2n)=\frac{1}{2}(24)$
$n=12$

② $4x-3<7x-12$ (−7x)
$-3x-3<-12$ (+3)
$-3x<-9$
$(-\frac{1}{3})(-3x)>(-\frac{1}{3})(-9)$
$x>3$

③ $4n-(2n-3)=15$
$4n-2n+3=15$
$2n+3=15$ (−3)
$2n=12$
$(\frac{1}{2})(2n)=(\frac{1}{2})(12)$
$n=6$

④ $3(4x-1)=12x-1$
$12x-3=12x-1$ (−12x)
$-3=-1$ false eq.
No Solutions

⑤ $5a\geq 3(3a-8)$
$5a\geq 9a-24$ (−9a)
continued

$-4a\geq -24$
$(-\frac{1}{4})(-4a)\leq(-\frac{1}{4})(-24)$
$a\leq 6$

⑥ $(2n-3)-(4n+5)=2n$
$2n-3-4n-5=2n$
$-2n-8=2n$ (−2n)
$-4n-8=0$ (+8)
$-4n=8$
$(-\frac{1}{4})(-4n)=(-\frac{1}{4})(8)$
$n=-2$

PRACTICE TEST #2

① $3(2x+7)=x+6$
$6x+21=x+6$ (−x)
$5x+21=6$ (−21)
$5x=-15$
$(\frac{1}{5})(5x)=(\frac{1}{5})(-15)$
$x=-3$

② $2n\geq 5(n-3)$
$2n\geq 5n-15$ (−5n)
$-3n\geq -15$
$(-\frac{1}{3})(-3n)\leq(-\frac{1}{3})(-15)$
$n\leq 5$

③ $(n+3)-3n=n+9$
$n+3-3n=n+9$
$-2n+3=n+9$ (−n)
$-3n+3=9$ (−3)
$-3n=6$
$(-\frac{1}{3})(-3n)=(-\frac{1}{3})(6)$
$n=-2$

④ $2(n-5)=3(n-7)$
$2n-10=3n-21$ (−3n)
$-n-10=-21$ (+10)
$-n=-11$ $\quad n=11$

⑤ $a-5<3(a-3)$
$a-5<3a-9$ (−3a)
$-2a-5<-9$ (+5)
$-2a<-4$
$(-\frac{1}{2})(-2a)>(-\frac{1}{2})(-4)$
$a>2$

⑥ $(n+5)-(3n-2)=2-3n$
$n+5-3n+2=2-3n$
$-2n+7=2-3n$ (+3n)
$n+7=2$ (−7)
$n=-5$

UNIT 13: ANSWER KEY

Working With Monomials

1. MULTIPLYING MONOMIALS

① $(m^2)(m^3) = m^5$

② $(x^3)(x^4) = x^7$

③ $(m^3n)(mn^2) = m^4n^3$

④ $(r^3t^4)(r^4t^4) = r^7t^8$

⑤ $(3a^2b)(2ab^5) = 6a^3b^6$

⑥ $(4x^2y^3)(2xy^6) = 8x^3y^9$

⑦ $(-2x^2y)(-6x^4y^7) = 12x^6y^8$

⑧ $(-3x^5y)(2x^4) = -6x^9y$

⑨ $(-2n^4y^3)(3ny^4) = -6n^5y^7$

⑩ $(ab)(ac)(bc) = a^2b^2c^2$

⑪ $(m^2n)(am)(an^2) = a^2m^3n^3$

⑫ $(3y^3z)(7y^4) = 21y^7z$

⑬ $(x^2)^3 = x^6$

⑭ $(a^3)^4 = a^{12}$

⑮ $(3y)^2 = 9y^2$

⑯ $(2m^2)^3 = 8m^6$

⑰ $(-y^3)^6 = y^{18}$

⑱ $(-m^5)^2 = m^{10}$

⑲ $(a^3x^2)^4 = a^{12}x^8$

⑳ $(2a^2b)^2 = 4a^4b^2$

㉑ $(3x^2y)^2(2xy^2)^3$
$(9x^4y^2)(8x^3y^6) = 72x^7y^8$

㉒ $(2a^2b^3)^4(a^3b)^2$
$(16a^8b^{12})(a^6b^2) = 16a^{14}b^{14}$

㉓ $(-3a^3x^5)^2(ax^2)^3$
$(9a^6x^{10})(a^3x^6) = 9a^9x^{16}$

㉔ $(-4x^2y^3)^3(xy)^2$
$(-64x^6y^9)(x^2y^2) = -64x^8y^{11}$

㉕ $(4ab)^2(a^3b)^4$
$(16a^2b^2)(a^{12}b^4) = 16a^{14}b^6$

UNIT 13: ANSWER KEY

Working With Monomials

(26) $(-3x^2y)^2(-2x)^3$
$(9x^4y^2)(-8x^3) = -72x^7y^2$

(27) $a^2(ab^2)^3(-a^2)^3$
$a^2(a^3b^6)(-a^6) = -a^{11}b^6$

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

(29) $2x^2(-xy^2)^3$
$2x^2(-x^3y^6) = -2x^5y^6$

(30) $-3a^2(-ab^2)^4$
$-3a^2(a^4b^8) = -3a^6b^8$

2. DIVIDING MONOMIALS

① $\frac{n^4}{n^3} = n$

② $\frac{x^7}{x^4} = x^3$

③ $\frac{5n^2}{n^6} = \frac{5}{n^4}$

④ $\frac{x^2}{x^3} = \frac{1}{x}$

⑤ $\frac{ab^2}{a^2b^2} = \frac{1}{a}$

⑥ $\frac{9a^4bc^5}{6a^2b^2c} = \frac{3a^2c^4}{2b}$

⑦ $\frac{12x^3y^2z}{6xy^3z} = \frac{2x^2}{y}$

⑧ $\frac{20a^3bc^4}{12ab^3c^2} = \frac{5a^2c^2}{3b^2}$

⑨ $\frac{3nm^2}{6n^2m^3} = \frac{1}{2nm}$

⑩ $\frac{4x^2y}{2x^2y} = 2$

⑪ $\frac{x^3y}{3xy^3} = \frac{x^2}{3y^2}$

⑫ $\frac{4mn^2p^5}{12mnp} = \frac{np^4}{3}$

⑬ $\frac{8a^5b^2c^2}{6ab^3c^2} = \frac{4a^4}{3b}$

UNIT 13: ANSWER KEY

Working With Monomials

(14) $\frac{x^3y^3z^3}{x^2y^5z^4} = \frac{x}{y^2z}$

(15) $\frac{2m^2n^5}{mn^3p^2} = \frac{2mn^2}{p^2}$

(16) $\frac{abc}{a^2bc^3} = \frac{1}{ac^2}$

(17) $(x^2)(xy^3) = x^3y^3$

(18) $2a(a^2b)(b^3c) = 2a^3b^4c$

(19) $(-3a^2b)^2 = 9a^4b^2$

(20) $(-2xy^2)^3 = -8x^3y^6$

(21) $(2ab^2c)^4(-a^2b)^2$
$(16a^4b^8c^4)(a^4b^2) = 16a^8b^{10}c^4$

(22) $(-3x^2y^3)^2(-xy)^3$
$(9x^4y^6)(-x^3y^3) = -9x^7y^9$

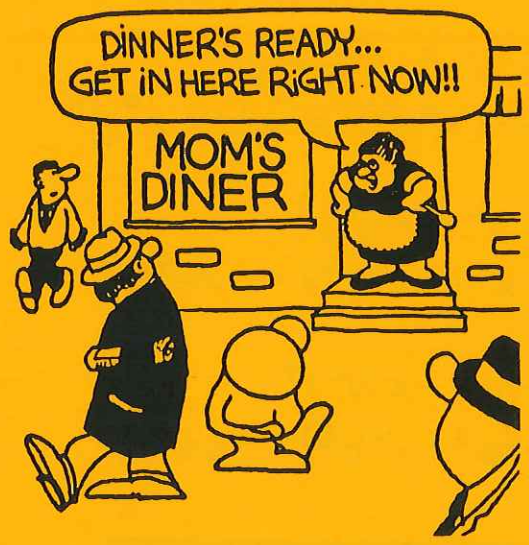
(23) $(ab)(b^2c)(a^2c)^3$
$(ab)(b^2c)(a^6c^3) = a^7b^3c^4$

(24) $(-xy)(-x^2y)^3$
$(-xy)(-x^6y^3) = x^7y^4$

(25) $-2a(a^2b)^3$
$-2a(a^6b^3) = -2a^7b^3$

(26) $3mn(m^2n)(n^3)^2$
$3mn(m^2n)(n^6) = 3m^3n^8$

(27) $-2xy(x^2y)^2(-y)^2$
$-2xy(x^4y^2)(y^2) = -2x^5y^5$



3. NEGATIVE EXPONENTS

① $\frac{1}{a^{-3}} = a^3$

② $\frac{x^2}{y^{-2}} = x^2y^2$

③ $\frac{n^2m^{-3}}{p^3} = \frac{n^2}{m^3p^3}$

④ $\frac{3x^2y^{-4}}{z} = \frac{3x^2}{y^4z}$

⑤ $\frac{2x^2y^{-3}}{x^5y} = \frac{2}{x^3y^4}$

⑥ $\frac{-3a^5bc^{-1}}{a^2c^2} = \frac{-3a^3b}{c^3}$

⑦ $\frac{-2mn^{-4}}{6m^{-3}n} = \frac{-m^4}{3n^5}$

⑧ $\frac{10a^{-1}b^{-2}}{15a^{-3}} = \frac{2a^2}{3b^2}$

UNIT 13: ANSWER KEY

Working With Monomials

(9) $\frac{-x^3y^{-2}}{x^2y} = \frac{-x}{y^3}$

(10) $\frac{-8a^{-3}b}{6a^{-5}b^2} = \frac{-4a^2}{3b}$

(11) $\frac{xyz^{-1}}{x^2y^3} = \frac{1}{xy^2z}$

(12) $\frac{12a^{-2}b^{-3}cd}{8ab^{-2}cd^{-1}} = \frac{3d^2}{2a^3b}$

(13) $\frac{-n^{-3}m^{-2}p^3}{nmp^{-1}} = \frac{-p^4}{n^4m^3}$

(14) $\frac{4ab^{-1}c^{-2}}{a^{-3}b^2c} = \frac{4a^4}{b^3c^3}$

(15) $\frac{-3x^{-2}y^{-3}}{x^{-5}y^{-1}} = \frac{-3x^3}{y^2}$

(16) $\frac{-5n^{-3}m^{-1}}{10n^{-4}m^{-3}} = \frac{-nm^2}{2}$

(17) $(xy^2)^{-2}(2xy^2)^3$

$(x^{-2}y^{-4})(8x^3y^6)$

$8xy^2$

(18) $(ab)^{-3}(a^2b)^3 = (a^{-3}b^{-3})(a^6b^3) =$

$a^3b^0 = a^3$

(19) $(-2x^2y)^2(x^{-3}y^2)^{-2} = (4x^4y^2)(x^6y^{-4}) =$

$4x^{10}y^{-2} = \frac{4x^{10}}{y^2}$

(20) $(-a^2b^{-2})^3(abc^2)^{-2}$

$(-a^6b^{-6})(a^{-2}b^{-2}c^{-4})$

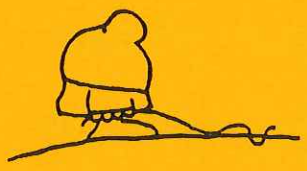
$-a^4b^{-8}c^{-4}$

$\frac{-a^4}{b^8c^4}$

(21) $-3x(xy^2)^{-1}(x^3y)$

$-3x(x^{-1}y^{-2})(x^3y)$

$-3x^3y^{-1} = \frac{-3x^3}{y}$



(22) $ab^{-2}(ab^{-3})^2 = ab^{-2}(a^2b^{-6}) = a^3b^{-8} = \frac{a^3}{b^8}$

(23) $(nxy^{-2})^{-2}(2x^3) = (n^{-2}x^{-2}y^4)(2x^3) =$

$2n^{-2}xy^4 = \frac{2xy^4}{n^2}$

(24) $abc(-3a^2b^{-3})^2 = abc(9a^4b^{-6}) =$

$9a^5b^{-5}c = \frac{9a^5c}{b^5}$

UNIT 13: ANSWER KEY

Working With Monomials

(25) $x^{-1}y(-2xy^{-2}) = -2x^0y^{-1} = \frac{-2}{y}$

(26) $a^{-2}b^{-3}(-ab^2)^2 = a^{-2}b^{-3}(a^2b^4)$

$a^0b = b$

REVIEW & PRACTICE

(1) $(x^3)(x^5) = x^8$

(2) $(n^2)(n^3)(n^4) = n^9$

(3) $(2ab)(3a^2b^3) = 6a^3b^4$

(4) $(-2a^2)(ab^3c) = -2a^3b^3c$

(5) $(n^3)^2 = n^6$

(6) $(a^2)^5 = a^{10}$

(7) $(-2x^3)^3 = -8x^9$

(8) $(-3y)^2 = 9y^2$

(9) $(-x^2y)^3(2xy)^2$

$(-x^6y^3)(4x^2y^2) = -4x^8y^5$

(10) $(-2ab^2c)^2(ab^2)^3$

$(4a^2b^4c^2)(a^3b^6) = 4a^5b^{10}c^2$

(11) $ab(-ab^2)^4(-b^2)^3$

$ab(a^4b^8)(-b^6) = -a^5b^{15}$

(12) $2n^2(-nm^2)^2 = 2n^2(n^2m^4) = 2n^4m^4$

(13) $\frac{x^5}{x^2} = x^3$

(14) $\frac{n^2}{n^3m^2} = \frac{1}{nm^2}$

(15) $\frac{8a^2b^4c}{6abc^2} = \frac{4ab^3}{3c}$

(16) $\frac{18x^5y^2}{6x^2y} = 3x^3y$

(17) $\frac{-2a^3bc^2}{8ab^3c^3} = \frac{-a^2}{4b^2c}$

(18) $\frac{-3x^4y^2z}{12xy^5z^3} = \frac{-x^3}{4y^3z^2}$

Working With Monomials

(19) $\frac{x^{-4}}{y^2} = \frac{1}{x^4y^2}$

(20) $\frac{a^{-3}b^2}{ab^{-3}} = \frac{b^5}{a^4}$

(21) $\frac{-2x^{-2}y^{-3}z}{4x^{-4}yz^{-2}} = \frac{-x^2z^3}{2y^4}$

(22) $\frac{-9ab^{-3}c^{-5}}{6a^{-2}bc^2} = \frac{-3a^3}{2b^4c^7}$

(23) $\frac{x^{-3}y^{-3}z}{x^{-2}yz^{-1}} = \frac{z^2}{xy^4}$

(24) $\frac{-8ab^{-2}c}{10ab^{-3}c^{-1}} = \frac{-4bc^2}{5}$

(25) $(ab)^{-1}(2a^{-2}b)$

$(a^{-1}b^{-1})(2a^{-2}b)$

$2a^{-3}b^0 = \frac{2}{a^3}$

(26) $x^2(-3xy^{-2})$

$-3x^3y^{-2} = \frac{-3x^3}{y^2}$

(27) $-3a(ab^2c)^{-3}$

$-3a(a^{-3}b^{-6}c^{-3})$

$-3a^{-2}b^{-6}c^{-3} = \frac{-3}{a^2b^6c^3}$

(28) $-2xy(-x^{-2}y)^{-2}$

$-2xy(x^4y^{-2})$

$-2x^5y^{-1} = \frac{-2x^5}{y}$

(29) $abc(-a^2b)^{-3}$

$abc(-a^{-6}b^{-3})$

$-a^{-5}b^{-2}c = \frac{-c}{a^5b^2}$

(30) $x^{-2}y^{-3}(-xy^{-2})^{-2}$

$x^{-2}y^{-3}(x^{-2}y^4)$

$x^{-4}y = \frac{y}{x^4}$

UNIT 13: ANSWER KEY

Working With Monomials

PRACTICE TEST #1

① $(x^5)(x^7) = x^{12}$

② $(4x^3y)(2xy^2z)^3$
$(4x^3y)(8x^3y^6z^3) = 32x^6y^7z^3$

③ $(-3a^2b^4)^2 = 9a^4b^8$

④ $\frac{x^2y^3z^4}{x^5y^3z} = \frac{z^3}{x^3}$

⑤ $\frac{-14ab^{-2}c^{-1}d^3}{6a^2bc^{-3}d^2}$

$\frac{-7c^3d}{3abb^2c} = \frac{-7c^2d}{3ab^3}$

⑥ $xy^{-3}(-x^{-2}y)^3$
$xy^{-3}(-x^{-6}y^3) = -x^{-5}y^0 = \frac{-1}{x^5}$

PRACTICE TEST #2

① $(n^5)(n^5) = n^{10}$

② $(4a^2b)(2ab^3)^3$
$(4a^2b)(8a^3b^9) = 32a^5b^{10}$

③ $(-2xy^3z^2)^3 = -8x^3y^9z^6$

④ $\frac{2ab^3cd^2}{a^2bc^4d^2} = \frac{2b^2}{ac^3}$

⑤ $\frac{18xy^{-3}z^{-2}}{9x^{-2}y^{-5}z}$

$\frac{2xx^2y^5}{y^3zz^2} = \frac{2x^3y^2}{z^3}$

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