

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

THE UNIVERSITY OF CHICAGO
DEPARTMENT OF CHEMISTRY

PHYSICAL CHEMISTRY
BY
ROBERT W. WOODWARD

LECTURE NOTES
FOR THE COURSE
PHYSICAL CHEMISTRY

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UNIT 9: ANSWER KEY

Foundation Skills

1. INTEGERS & EXPONENTS

- ① $(-8) + (-7) = -15$ ⑥ $(-14) + (-3) = -17$
 ② $(-4) + (9) = 5$ ⑦ $(-6)(-4) = 24$
 ③ $(-7) - (-4)$
 $(-7) + (4) = -3$ ⑧ $(12)(-3) = -36$
 ④ $(-12) - (8)$
 $(-12) + (-8) = -20$ ⑨ $(8) \div (-2) = -4$
 ⑤ $(6) - (-9)$
 $(6) + (9) = 15$ ⑩ $(27) \div (-3) = -9$
 ⑪ $(-18) \div (-9) = 2$
 ⑫ $(-4)(5) = -20$

..HOW CAN SO MANY
 PEOPLE GET TURNED ON
 BY A GAME WHERE
 LOVE MEANS NOTHING
 ??



- 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 $8^0 = 1$
 ㉙ $1^6 = 1$ ㉚ $(-2)^3 = -8$
 ㉛ $3^3 = 27$ ㉜ $(-4)^2 = 16$
 ㉝ $7^2 = 49$ ㉞ $(-1)^5 = -1$

UNIT 9: ANSWER KEY

Foundation Skills

$$\textcircled{35} (-3)^4 = 81$$

$$\textcircled{38} (-2)^5 = -32$$

$$\textcircled{36} (-5)^0 = 1$$

$$\textcircled{39} (-2)^2 = 4$$

$$\textcircled{37} 10^4 = 10,000$$

$$\textcircled{40} 5^3 = 125$$

2. ORDER OF OPERATIONS

$$\textcircled{1} (-3) + (-2)(-4) \\ (-3) + (8) = 5$$

$$\textcircled{2} (-8) - (6)(-2) \\ (-8) - (-12) \\ (-8) + (12) = 4$$

$$\textcircled{3} (-2) + (3 \times 4) \\ (-2) + (12) = 10$$

$$\textcircled{4} (-2) + (-8) \div (-2) \\ (-2) + (4) = 2$$

$$\textcircled{5} (-3) - (-6) \div (3) \\ (-3) - (-2) \\ (-3) + (2) = -1$$

$$\textcircled{6} (-4) + (-1)(5) - (-2) \\ (-4) + (-5) - (-2) \\ (-4) + (-5) + (-2) = -11$$

$$\textcircled{7} (-3) - (-4) \div (-2) - (-4) \\ (-3) - (2) - (-4) \\ (-3) + (-2) + (4) \\ (-5) + (4) = -1$$

$$\textcircled{8} (2) - (3 \times 2) \div (2) \\ (2) - (6) \div (2) \\ (2) - (3) \\ (2) + (-3) = -1$$

$$\textcircled{9} (-3) \times (-2) + (-4) - (-1) \\ (6) + (-4) - (-1) \\ (6) + (-4) + (1) \\ (7) + (-4) = -3$$

$$\textcircled{10} (6) \div (-3) - (-2)(-3) \\ (-2) - (6) \\ (-2) + (-6) = -8$$

$$\textcircled{11} (-2)^4 = 16$$

$$\textcircled{22} -7^2 = -49$$

$$\textcircled{12} -2^4 = -16$$

$$\textcircled{23} (-4)^3 = -64$$

$$\textcircled{13} -3^2 = -9$$

$$\textcircled{24} (-5)^2 = 25$$

$$\textcircled{14} (-3)^2 = 9$$

$$\textcircled{25} -3^4 = 81$$

$$\textcircled{15} (-3)^3 = -27$$

$$\textcircled{26} -1^8 = -1$$

$$\textcircled{16} -3^3 = -27$$

$$\textcircled{27} (-1)^0 = 1$$

$$\textcircled{17} -4^2 = -16$$

$$\textcircled{18} -5^0 = -1$$

$$\textcircled{19} (-5)^0 = 1$$

$$\textcircled{20} -2^5 = -32$$

$$\textcircled{21} (-2)^5 = -32$$

...if i HAD IT TO DO
ALL OVER AGAIN,
i'D PROBABLY
HAVE TO DO IT
ALL OVER AGAIN...



UNIT 9: ANSWER KEY

Foundation Skills

$$\textcircled{28} \quad -1^0 = -1$$

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

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

$$\textcircled{29} \quad \begin{aligned} &(-3)^2 - 2^3 \\ &(9) - 8 \\ &(9) + (-8) = 1 \end{aligned}$$

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

$$\textcircled{30} \quad \begin{aligned} &(-2)^0 - (-3)^2 \\ &(1) - (9) \\ &(1) + (-9) = -8 \end{aligned}$$

$$\textcircled{37} \quad \frac{(-2)^2 - (-3)^0}{-2^3}$$

$$\textcircled{31} \quad \begin{aligned} &(-3)^3 + (-2)^2 \\ &(-27) + (4) = -23 \end{aligned}$$

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

$$\textcircled{32} \quad \begin{aligned} &(-2)^4 - 2^2 \\ &(16) - 4 \\ &(16) + (-4) = 12 \end{aligned}$$

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

$$\textcircled{33} \quad \begin{aligned} &(-2)^2 - (-3)^2 - 3^2 \\ &(4) - (9) - 9 \\ &(4) + (-9) + (-9) \\ &(4) + (-18) = -14 \end{aligned}$$

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

$$\textcircled{34} \quad \begin{aligned} &(-5)^0 - 4^0 - (-2)^5 \\ &(1) - 1 - (-32) \\ &(1) + (-1) + (32) \\ &(33) + (-1) = 32 \end{aligned}$$

$$\textcircled{39} \quad \frac{-4^2 - (-2)^2 - (-5)^0}{-3}$$

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

$$\textcircled{35} \quad \frac{(-2) - (-4)}{(-3) + (5)}$$

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

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

$$\textcircled{40} \quad \frac{-3 - (-2)^3 - (-2)^2}{3 - 3^2}$$

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

$$\textcircled{36} \quad \frac{(-3) - (-3) - (4)}{(-3) - (-15)}$$

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



3. EVAL EXPR

$$\textcircled{1} \quad \begin{aligned} &a - 3b \\ &(-2) - 3(-1) \\ &(-2) - (-3) \\ &(-2) + (3) = -1 \end{aligned}$$

$$\textcircled{2} \quad \begin{aligned} &2b - 4c \\ &2(-1) - 4(3) \\ &(-2) - (12) \\ &(-2) + (-12) = -14 \end{aligned}$$

$$\textcircled{3} \quad \begin{aligned} &3ab + c \\ &3(-2)(-1) + (3) \\ &(6) + (3) = 9 \end{aligned}$$

$$\textcircled{4} \quad \begin{aligned} &4ac - b \\ &4(-2)(3) - (-1) \\ &(-24) - (-1) \\ &(-24) + (1) = -23 \end{aligned}$$

UNIT 9: ANSWER KEY

Foundation Skills

$$\begin{aligned} \textcircled{5} \quad ab - ac \\ (-2)(-1) - (-2)(3) \\ (2) - (-6) \\ (2) + (6) = 8 \end{aligned}$$

$$\begin{aligned} \textcircled{6} \quad abc - b \\ (-2)(-1)(3) - (-1) \\ (6) - (-1) \\ (6) + (1) = 7 \end{aligned}$$

$$\begin{aligned} \textcircled{7} \quad 3b + c - 2a \\ 3(-1) + (3) - 2(-2) \\ (-3) + (3) - (-4) \\ (-3) + (3) + (4) \\ (-3) + (7) = 4 \end{aligned}$$

$$\begin{aligned} \textcircled{8} \quad a + 3bc - b \\ (-2) + 3(-1)(3) - (-1) \\ (-2) + (-9) - (-1) \\ (-2) + (-9) + (1) \\ (-11) + (1) = -10 \end{aligned}$$

$$\begin{aligned} \textcircled{9} \quad 2ab - c + b \\ 2(-2)(-1) - (3) + (-1) \\ (4) - (3) + (-1) \\ (4) + (-3) + (-1) \\ (4) + (-4) = 0 \end{aligned}$$

$$\begin{aligned} \textcircled{10} \quad 3b - 2ab + c \\ 3(-1) - 2(-2)(-1) + (3) \\ (-3) - (4) + (3) \\ (-3) + (-4) + (3) \\ (-7) + (3) = -4 \end{aligned}$$

$$\begin{aligned} \textcircled{11} \quad a^2 - 2b^2 \\ (-2)^2 - 2(-1)^2 \end{aligned}$$

$$\begin{aligned} (4) - 2(1) \\ (4) - (2) \\ (4) + (-2) = 2 \end{aligned}$$

$$\begin{aligned} \textcircled{12} \quad a^3 + b^2c \\ (-2)^3 + (-1)^2(3) \\ (-8) + (1)(3) \\ (-8) + (3) = -5 \end{aligned}$$

$$\begin{aligned} \textcircled{13} \quad 3b - 2a^2 \\ 3(-1) - 2(-2)^2 \\ 3(-1) - 2(4) \\ (-3) - (8) \\ (-3) + (-8) = -11 \end{aligned}$$

$$\begin{aligned} \textcircled{14} \quad ab^3 - c^2 \\ (-2)(-1)^3 - (3)^2 \\ (-2)(-1) - (9) \\ (2) - (9) \\ (2) + (-9) = -7 \end{aligned}$$

$$\begin{aligned} \textcircled{15} \quad 2a^2b^2 - c \\ 2(-2)^2(-1)^2 - (3) \\ 2(4)(1) - (3) \\ (8) - (3) \\ (8) + (-3) = 5 \end{aligned}$$

$$\begin{aligned} \textcircled{16} \quad 3b^3 - abc \\ 3(-1)^3 - (-2)(-1)(3) \\ 3(-1) - (-2)(-1)(3) \\ (-3) - (6) \\ (-3) + (-6) = -9 \end{aligned}$$

$$\begin{aligned} \textcircled{17} \quad 4b^2 - 2a^3 \\ 4(-1)^2 - 2(-2)^3 \\ 4(1) - 2(-8) \end{aligned}$$

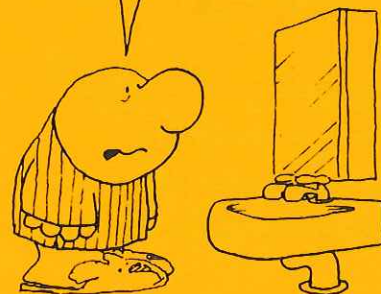
$$\begin{aligned} (4) - (-16) \\ (4) + (16) = 20 \end{aligned}$$

$$\begin{aligned} \textcircled{18} \quad 4ac + 2b^2c \\ 4(-2)(3) + 2(-1)^2(3) \\ 4(-2)(3) + 2(1)(3) \\ (-24) + (6) = -18 \end{aligned}$$

$$\begin{aligned} \textcircled{19} \quad a^3 - b^2 - c^2 \\ (-2)^3 - (-1)^2 - (3)^2 \\ (-8) - (1) - (9) \\ (-8) + (-1) + (-9) = -18 \end{aligned}$$

$$\begin{aligned} \textcircled{20} \quad a^2b^2c \\ (-2)^2(-1)^2(3) \\ (4)(1)(3) = 12 \end{aligned}$$

IF YOU HAVEN'T SHOWN UP IN FIVE MINUTES, I'M GOING TO WORK WITHOUT YOU!!



$$\begin{aligned} \textcircled{21} \quad 2a - (b + c) \\ 2(-2) - ((-1) + (3)) \\ 2(-2) - (2) \\ (-4) - (2) \\ (-4) + (-2) = -6 \end{aligned}$$

continued

UNIT 9: ANSWER KEY

Foundation Skills

$$\begin{aligned} \textcircled{22} \quad & (a+b) - 2b^2 \\ & ((-2)+(-1)) - 2(-1)^2 \\ & (-3) - 2(-1)^2 \\ & (-3) - 2(1) \\ & (-3) - (2) \\ & (-3) + (-2) = -5 \end{aligned}$$

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

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

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

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

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

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

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

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

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

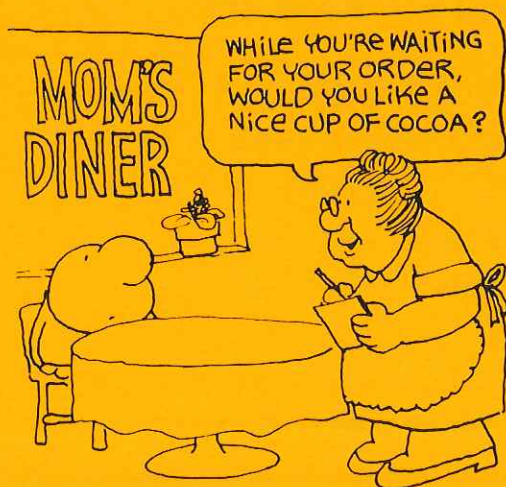
$$\frac{(-2)(1)(3)-(-2)}{4(1)-(-2)(-1)} = \frac{(-6)-(-2)}{(4)-(2)}$$

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

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

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

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



REVIEW & PRACTICE

$$\textcircled{1} \quad (-6) + (-8) = -14$$

$$\textcircled{4} \quad (-3) - (-7) \\ (-3) + (+7) = -10$$

$$\textcircled{2} \quad (-3) \times (-2) = 6$$

$$\textcircled{5} \quad (12) \div (-4) = -3$$

$$\textcircled{3} \quad (-4) - (-9) \\ (-4) + (+9) = 5$$

UNIT 9: ANSWER KEY

Foundation Skills

⑥ $(-8) \times (-7) = -56$

⑨ $(-3) + (11)$
8

⑦ $(-9) - (8)$
 $(-9) + (-8) = -17$

⑩ $(9) \div (-3)$
-3

⑧ $(-7) - (-4)$
 $(-7) + (4) = -3$



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 $4^2 = 16$

⑰ $(-1)^4 = 1$

⑯ $-2^3 = -8$

⑱ $-3^2 = -9$

⑲ $5^3 = 125$

⑳ $-5^2 = -25$

㉔ $(-3)^3 = -27$

㉕ $(-8)^0 = 1$

㉖ $(-2)^4 = 16$

㉗ $-3^3 = -27$

㉘ $7^0 = 1$

㉙ $(-2)^2 = 4$

㉚ $7^2 = 49$

㉛ $-3^4 = -81$

㉜ $-1^4 = -1$

⑳ $(-4) - (-7) \times (-4) - (8)$
 $(-4) - (28) - (8)$
 $(-4) + (-28) + (-8) = -40$

㉑ $(6) - (-4)(-2) - (-12) \div (3)$
 $(6) - (8) - (-12) \div (3)$
 $(6) - (8) - (-4)$
 $(6) + (-8) + (4)$
 $(10) + (-8) = 2$

㉒ $(-2) + (-3) \times (-4) - (-6) + (-1)$
 $(-2) + (12) - (-6) + (-1)$
 $(-2) + (12) + (6) + (-1)$
 $(-3) + (18) = 15$

㉓ $(-10) \div (-2) - (-3) + (-8) \div (2)$
 $(5) - (-3) + (-8) \div (2)$
 $(5) - (-3) + (-4)$
 $(5) + (3) + (-4)$
 $(8) + (-4) = 4$

㉔ $(-3)^2 + (-2)^3$
 $(9) + (-8) = 1$

UNIT 9: ANSWER KEY

Foundation Skills

$$\begin{aligned} (35) \quad & (-1)^3 - (-4)^0 \\ & (-1) - (1) \\ & (-1) + (-1) = -2 \end{aligned}$$

$$\begin{aligned} (36) \quad & (-2) - 3^2 - (-3)^3 \\ & (-2) - 9 - (-27) \\ & (-2) + (-9) + (27) \\ & (-11) + (27) = 16 \end{aligned}$$

$$\begin{aligned} (37) \quad & -6^0 - (-2)^4 - 2^3 \\ & -1 - (16) - 8 \\ & -1 + (-16) + (-8) = -25 \end{aligned}$$

$$\begin{aligned} (38) \quad & -2^2 - (-2)^2 - (-2)^0 \\ & -4 - (4) - (1) \\ & -4 + (-4) + (-1) = -9 \end{aligned}$$

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

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

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

$$\begin{aligned} (41) \quad & 2a - b \\ & 2(-1) - (-3) \\ & (-2) - (-3) \\ & (-2) + (3) = 1 \end{aligned}$$

$$\begin{aligned} (43) \quad & ab - 3c \\ & (-1)(-3) - 3(-2) \\ & (3) - (-6) \\ & (3) + (6) = 9 \end{aligned}$$

$$\begin{aligned} (42) \quad & 3a + 2c \\ & 3(-1) + 2(-2) \\ & (-3) + (-4) = -7 \end{aligned}$$

$$\begin{aligned} (44) \quad & 4a - b - c \\ & 4(-1) - (-3) - (-2) \\ & (-4) - (-3) - (-2) \\ & (-4) + (3) + (2) = 1 \end{aligned}$$

$$\begin{aligned} (45) \quad & 2ac + b \\ & 2(-1)(-2) + (-3) \\ & (4) + (-3) = 1 \end{aligned}$$

$$\begin{aligned} (46) \quad & ac - abc \\ & (-1)(-2) - (-1)(-3)(-2) \\ & (2) - (-6) \\ & (2) + (6) = 8 \end{aligned}$$

$$\begin{aligned} (47) \quad & a^2 + b^2 \\ & (-1)^2 + (-3)^2 \\ & (1) + (9) = 10 \end{aligned}$$

UPCREEK AIRLINES
SPECIAL ROUNDTRIP FARE
\$98⁰⁰

...TO BE ELIGIBLE FOR THE SPECIAL FARE YOU MUST PAY THIRTY DAYS IN ADVANCE FOR THE MIDNIGHT FLIGHT ON THE SECOND THURSDAY OF ANY OCTOBER...



$$\begin{aligned} (48) \quad & 2a - c^3 \\ & 2(-1) - (-2)^3 \\ & 2(-1) - (-8) \\ & (-2) - (-8) \\ & (-2) + (8) = 6 \end{aligned}$$

$$\begin{aligned} (49) \quad & 3ab^2 - 2a^2 \\ & 3(-1)(-3)^2 - 2(-1)^2 \\ & 3(-1)(9) - 2(1) \end{aligned} \quad \begin{aligned} & (-27) - (2) \\ & (-27) + (-2) = -29 \end{aligned}$$

UNIT 9: ANSWER KEY

Foundation Skills

$$\begin{aligned} 50) \quad & a^2c - 2b \\ & (-1)^2(-2) - 2(-3) \\ & (1)(-2) - 2(-3) \\ & (-2) - (-6) \\ & (-2) + (6) = 4 \end{aligned}$$

$$\begin{aligned} 51) \quad & a^3 - b^2 + c^3 \\ & (-1)^3 - (-3)^2 + (-2)^3 \\ & (-1) - (9) + (-8) \\ & (-1) + (-9) + (-8) = -18 \end{aligned}$$

$$\begin{aligned} 52) \quad & a^2bc^3 \\ & (-1)^2(-3)(-2)^3 \\ & (1)(-3)(-8) = 24 \end{aligned}$$

$$\begin{aligned} 53) \quad & 2a + 3b - (b + c) \\ & 2(-1) + 3(-3) - ((-3) + (-2)) \\ & 2(-1) + 3(-3) - (-5) \\ & (-2) + (-9) - (-5) \\ & (-2) + (-9) + (5) \\ & (-11) + (5) = -6 \end{aligned}$$

$$\begin{aligned} 54) \quad & 2(a+b) - c^3 \\ & 2((-1) + (-3)) - (-2)^3 \\ & 2(-4) - (-2)^3 \\ & 2(-4) - (-8) \\ & (-8) - (-8) \\ & (-8) + (8) = 0 \end{aligned}$$

$$\begin{aligned} 55) \quad & 3(a+c) - a^2 + c^2 \\ & 3((-1) + (-2)) - (-1)^2 + (-2)^2 \\ & 3(-3) - (-1)^2 + (-2)^2 \\ & 3(-3) - (1) + (4) \\ & (-9) - (1) + (4) \\ & (-9) + (-1) + (4) \\ & (-10) + (4) = -6 \end{aligned}$$

$$\begin{aligned} 56) \quad & (a+b) + a^2b \\ & (-1) + (-3) + (-1)^2(-3) \\ & (-4) + (1)(-3) \\ & (-4) + (-3) = -7 \end{aligned}$$

$$\begin{aligned} 57) \quad & \frac{a^2bc}{a-b} = \frac{(-1)^2(-3)(-2)}{(-1) - (-3)} = \frac{(1)(-3)(-2)}{(-1) + (3)} \\ & \frac{6}{2} = 3 \end{aligned}$$

$$\begin{aligned} 58) \quad & \frac{2a - ac^2}{a^2 - 2c} = \frac{2(-1) - (-1)(-2)^2}{(-1)^2 - 2(-2)} \\ & \frac{2(-1) - (-1)(4)}{(1) - 2(-2)} = \frac{(-2) - (-4)}{(1) - (-4)} = \frac{(-2) + (4)}{(1) + (4)} = \frac{2}{5} \end{aligned}$$

$$\begin{aligned} 59) \quad & a^2 + \frac{2b}{3a} - ac^2 \\ & (-1)^2 + \frac{2(-3)}{3(-1)} - (-1)(-2)^2 \\ & (1) + \frac{(-6)}{(-3)} - (-1)(4) \\ & (1) + (2) - (-4) \\ & (3) + (4) = 7 \end{aligned}$$



$$\begin{aligned} 60) \quad & ab - \frac{c^3}{2a} + b^2 \\ & (-1)(-3) - \frac{(-2)^3}{2(-1)} + (-3)^2 \\ & (-1)(-3) - \frac{(-8)}{(-2)} + (9) \\ & (3) - (4) + (9) \\ & (3) + (-4) + (9) = 8 \end{aligned}$$



UNIT 9: ANSWER KEY

Foundation Skills

PRACTICE TEST #1

$$\textcircled{1} \begin{aligned} (-12) - (+9) \\ (-12) + (-9) = -21 \end{aligned}$$

$$\textcircled{2} -3^4 = -81$$

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

$$\textcircled{4} \begin{aligned} -2^2 - (-2)^3 - (-5)^0 \\ -4 - (-8) - (+1) \\ -4 + (+8) + (-1) = 3 \end{aligned}$$

$$\textcircled{5} \begin{aligned} 3y^2 - 2xz^4 \\ 3(-2)^2 - 2(-3)(-1)^4 \\ 3(4) - 2(-3)(1) \\ (12) - (-6) \\ (12) + (+6) = 18 \end{aligned}$$

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

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

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

PRACTICE TEST #2

$$\textcircled{1} \begin{aligned} (-14) - (-8) \\ (-14) + (+8) = -6 \end{aligned}$$

$$\textcircled{2} (-5)^2 = 25$$

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

$$\textcircled{4} \begin{aligned} (-3)^2 - (-2)^0 - (-1)^4 - 2^2 \\ (+9) - (+1) - (+1) - 4 \\ (9) + (-1) + (-1) + (-4) = 3 \end{aligned}$$

$$\textcircled{5} \begin{aligned} 3a^2b^3 - 2ab \\ 3(-1)^2(-2)^3 - 2(-1)(-2) \\ 3(1)(-8) - 2(-1)(-2) \\ (-24) - (+4) \\ (-24) + (-4) = -28 \end{aligned}$$

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

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

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

Simplifying Expressions

1. COMBINING TERMS

- ① $x + 3x + 2 + 5 = 4x + 7$
- ② $3y + 7 + 2 + 4y = 7y + 9$
- ③ $6x - 5 + 2x + 5 - x = 7x - 2$
- ④ $4a + 3b - 2a + b - 7 + 5 = 2a + 4b - 4$
- ⑤ $3b - 4a - 2b - 1 - 5a = b - 9a - 1$
- ⑥ $12 - 4b - 3a - 6 + 5a - 6 = 6 - 5b + 2a$
- 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 $xy - 2x^2 + 5 - 4xy - x^2 + 2x$
 $-3xy - 3x^2 + 3 + 2x$
- 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 $x - 2x - xy - 3x^2 + xy + x - 3$
 $1 - x - 3x^2$
- 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 $4m - 3n - mn + 2n - mn - 1 + m$
 $5m - 2n - 2mn$
- ㉑ $3a^2 + 2ab - a^2 + 5 - ab + 2$
 $2a^2 + ab + 7$

JUST IN CASE YOU DONT
COME BACK, YOU'VE BEEN
A WONDERFUL SOCK!



UNIT 10: ANSWER KEY

Simplifying Expressions

$$(22) \quad \begin{array}{l} 8 - 3ab + a^2 - 5 + ab + 2a^2 - x \\ 2 - 2ab + 3a^2 \end{array}$$

$$(23) \quad \begin{array}{l} 4a - 2a + a - 3 + 5 + x - 3a \\ 3 \end{array}$$

$$(24) \quad \begin{array}{l} x - 2xy + 3x^2 - xy + x - x^2 \\ 2x - 3xy + 2x^2 \end{array}$$

$$(25) \quad \begin{array}{l} 3xy - 2x^2y + x^2 - xy - x^2y \\ 2xy - 3x^2y + x^2 \end{array}$$

$$(26) \quad \begin{array}{l} 5a^2b - ab^2 - 2 + a^2 - 3ab^2 - 2a^2b \\ 3a^2b - 4ab^2 - 2 + a^2 \end{array}$$

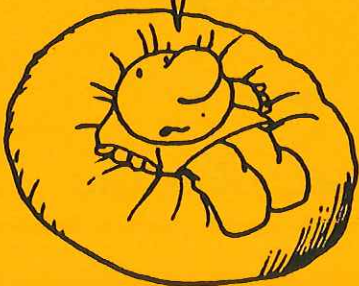
$$(27) \quad \begin{array}{l} 4x - 2x^3 - x^2 - 3x^3 + x - 2x^2 \\ 5x - 5x^3 - 3x^2 \end{array}$$

$$(28) \quad \begin{array}{l} 6n^2 - n - 2n^3 - n^2 - 3n^3 - 5 - 2n^3 \\ 5n^2 - n - 7n^3 - 5 \end{array}$$

$$(29) \quad \begin{array}{l} x^2y - xy^2 - 2xy^2 + 3x^2y - 2xy \\ 4x^2y - 3xy^2 - 2xy \end{array}$$

$$(30) \quad \begin{array}{l} 4a - ab + 2abc - 3ab + 2a - abc \\ 6a - 4ab + abc \end{array}$$

...AN OVERSTUFFED CHAIR IS ANY CHAIR I HAPPEN TO SIT IN !..



2. DISTRIBUTIVE PROPERTY

$$(1) \quad 2(x+y) = 2x+2y$$

$$(2) \quad 3(a+b) = 3a+3b$$

$$(3) \quad 4(3a-b) = 12a-4b$$

$$(4) \quad 3(x-4y) = 3x-12y$$

$$(5) \quad 2a(a+b) = 2a^2+2ab$$

$$(6) \quad 3x(x-2y) = 3x^2-6xy$$

$$(7) \quad -5(3x-2) = -15x+10$$

$$(8) \quad -2(a-7) = -2a+14$$

$$(9) \quad -x(3x-2) = -3x^2+2x$$

$$(10) \quad -b(4a+b) = -4ab-b^2$$

$$(11) \quad \begin{array}{l} 3(x-2y) - 2x + 3y \\ 3x - 6y - 2x + 3y \\ x - 3y \end{array}$$

$$(12) \quad \begin{array}{l} 2(a+3b) + 3a + 2b \\ 2a + 6b + 3a + 2b \\ 5a + 8b \end{array}$$

$$(13) \quad \begin{array}{l} -3(x-2) - 8 + 3x - 4 \\ -3x + 6 - 8 + 3x - 4 = -6 \end{array}$$

$$(14) \quad \begin{array}{l} -4(n+5) - 2n + 7 + n + 13 \\ -4n - 20 - 2n + 7 + n + 13 = -5n \end{array}$$

UNIT 10: ANSWER KEY

Simplifying Expressions

$$\begin{aligned} (15) \quad & 2x - 3(x-4) - 2x + 5 \\ & 2x - 3x + 12 - 2x + 5 \\ & -3x + 17 \end{aligned}$$

$$\begin{aligned} (16) \quad & 3 - 2(2x+1) - x + 7 - 3x \\ & 3 - 4x - 2 - x + 7 - 3x \\ & 8 - 8x \end{aligned}$$

$$\begin{aligned} (17) \quad & 2x(x-3y) - 3(x^2-2) + xy \\ & 2x^2 - 6xy - 3x^2 + 6 + xy \\ & -x^2 - 5xy + 6 \end{aligned}$$

$$\begin{aligned} (18) \quad & a(2a+b) - 3(ab+a^2) - ab \\ & 2a^2 + ab - 3ab - 3a^2 - ab \\ & -a^2 - 3ab \end{aligned}$$

$$\begin{aligned} (19) \quad & 2a(3a+4b) - 2b(a+4) \\ & 6a^2 + 8ab - 2ab - 8b \\ & 6a^2 + 6ab - 8b \end{aligned}$$

$$\begin{aligned} (20) \quad & 3x(4x-3y) - 2y(3x+4y) - 2y^2 \\ & 12x^2 - 9xy - 6xy - 8y^2 - 2y^2 \\ & 12x^2 - 15xy - 10y^2 \end{aligned}$$

$$\begin{aligned} (21) \quad & 12a - 3ab - 2a(4-3b) - 5a + ab \\ & 12a - 3ab - 8a + 6ab - 5a + ab \\ & -a + 4ab \end{aligned}$$

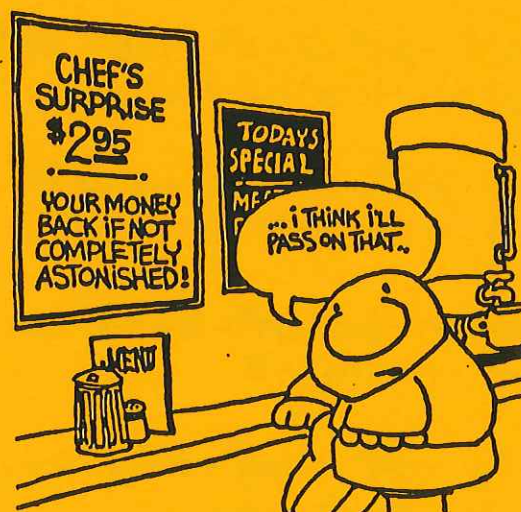
$$\begin{aligned} (22) \quad & 14x - 2xy - x(3y-2) + xy - 2x \\ & 14x - 2xy - 3xy + 2x + xy - 2x \\ & 14x - 4xy \end{aligned}$$

$$\begin{aligned} (23) \quad & 3xy(x-2y) - 4x(y^2+2xy) - 2x^2y \\ & 3x^2y - 6xy^2 - 4xy^2 - 8x^2y - 2x^2y \\ & -7x^2y - 10xy^2 \end{aligned}$$

$$\begin{aligned} (24) \quad & 4ab(a+3b) - 2b(ab-2a^2) + ab^2 \\ & 4a^2b + 12ab^2 - 2ab^2 + 4a^2b + ab^2 \\ & 8a^2b + 11ab^2 \end{aligned}$$

$$\begin{aligned} (25) \quad & 2a(a^2-3a) + a^2(4a-3) - 5a^3 \\ & 2a^3 - 6a^2 + 4a^3 - 3a^2 - 5a^3 \\ & a^3 - 9a^2 \end{aligned}$$

$$\begin{aligned} (26) \quad & 2n(4n-n^2) - 2n^2(5-3n) + n^2 \\ & 8n^2 - 2n^3 - 10n^2 + 6n^3 + n^2 \\ & -n^2 + 4n^3 \end{aligned}$$



REVIEW & PRACTICE

$$\textcircled{1} \quad 3a + 5 + 6a + 2 = 9a + 7$$

$$\textcircled{2} \quad 4 + 3n + 1 + 8n + 1 = 12 + 7n$$

$$\textcircled{3} \quad 5x - 1 - 3x - 2 = 2x - 9$$

$$\textcircled{4} \quad 8c + 4 - 12c - 6 = -4c - 2$$

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 $xy - 2y + 3x + 4 - 6xy + y - x + x$
 $-5xy - y + 4x + 3$

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

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

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

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

$$\begin{aligned} (27) \quad & 2(3x-y) - 3(x+4y) \\ & 6x - 2y - 3x - 12y \\ & 3x - 14y \end{aligned}$$

$$\begin{aligned} (28) \quad & 3(2n+4m) - 4(n+2m) \\ & 6n + 12m - 4n - 8m \\ & 2n + 4m \end{aligned}$$

$$\begin{aligned} (29) \quad & a(2a-b) - b(3a+2) - 4b \\ & 2a^2 - ab - 3ab - 2b - 4b \\ & 2a^2 - 4ab - 6b \end{aligned}$$

$$\begin{aligned} (30) \quad & 4x(x-y) - x(3x+2y) \\ & 4x^2 - 4xy - 3x^2 - 2xy \\ & x^2 - 6xy \end{aligned}$$

$$\begin{aligned} (31) \quad & 2x(3x-5y) + 4(xy-3x^2) \\ & 6x^2 - 10xy + 4xy - 12x^2 \\ & -6x^2 - 6xy \end{aligned}$$

$$\begin{aligned} (32) \quad & -3a(a-2b) - 4(2ab+a^2) \\ & -3a^2 + 6ab - 8ab - 4a^2 \\ & -7a^2 - 2ab \end{aligned}$$

$$\begin{aligned} (33) \quad & 2x^2y - 3xy^2 - x^2y + 4x^2 + 5xy^2 \\ & x^2y + 2xy^2 + 4x^2 \end{aligned}$$

$$\begin{aligned} (34) \quad & 2ab - 3a^2b + 4ab - 2ab^2 - a^2b \\ & 6ab - 4a^2b - 2ab^2 \end{aligned}$$

$$\begin{aligned} (35) \quad & 3x(xy-2y^2) - 2y(y-2x^2) \\ & 3x^2y - 6xy^2 - 2y^2 + 4x^2y \\ & 7x^2y - 6xy^2 - 2y^2 \end{aligned}$$

$$\begin{aligned} (36) \quad & 2a(4ab+b^2) - 3b(2b+4a^2) \\ & 8a^2b + 2ab^2 - 6b^2 - 12a^2b \\ & -4a^2b + 2ab^2 - 6b^2 \end{aligned}$$

$$\begin{aligned} (37) \quad & 2ab(a^2-3b) - 4a^2(ab+2) - a^2 \\ & 2a^3b - 6ab^2 - 4a^3b - 8a^2 - a^2 \\ & -2a^3b - 6ab^2 - 9a^2 \end{aligned}$$

$$\begin{aligned} (38) \quad & 3xy(2x-y) - y^2(x+2) - x^2y \\ & 6x^2y - 3xy^2 - xy^2 - 2y^2 - x^2y \\ & 5x^2y - 4xy^2 - 2y^2 \end{aligned}$$



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 $4x - 3xy + 8x - y + 5y + 4xy$
 $12x + xy + 4y$

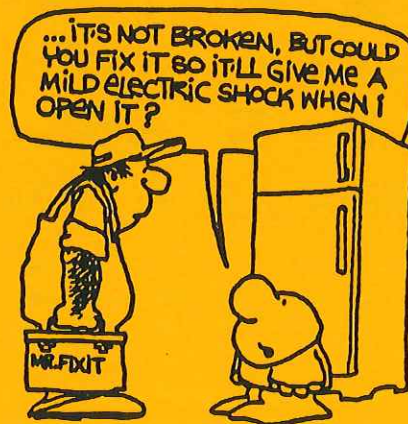
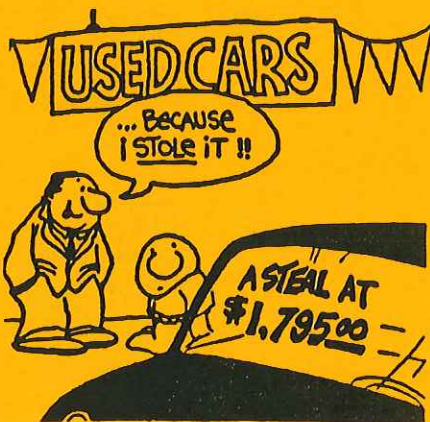
② $12 - 4x^2 - 2 - x^2 + 5 + 3x^2$
 $15 - 2x^2$

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



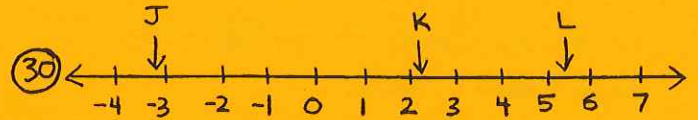
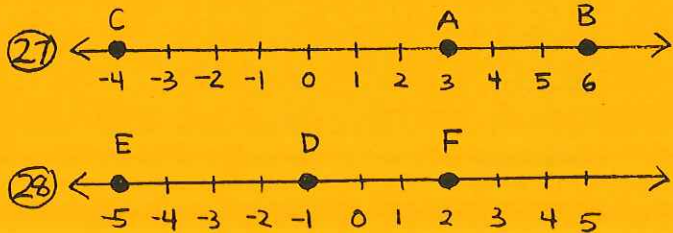
UNIT 11: ANSWER KEY

Radical Operations

1. RADICAL VALUES

- | | |
|---------------------|-----------------------|
| ① $\sqrt{49} = 7$ | ⑧ $-\sqrt{121} = -11$ |
| ② $\sqrt{144} = 12$ | ⑨ $\sqrt{169} = 13$ |
| ③ $\sqrt{25} = 5$ | ⑩ $\sqrt{400} = 20$ |
| ④ $\sqrt{1} = 1$ | ⑪ $\sqrt{16} = 4$ |
| ⑤ $-\sqrt{1} = -1$ | ⑫ $-\sqrt{9} = -3$ |
| ⑥ $-\sqrt{81} = -9$ | ⑬ $-\sqrt{196} = -14$ |
| ⑦ $-\sqrt{4} = -2$ | ⑭ $\sqrt{225} = 15$ |

- | | |
|---|---------------------------|
| ⑮ $\sqrt{9} < \sqrt{15} < \sqrt{16}$ | $3 < \sqrt{15} < 4$ |
| ⑯ $\sqrt{36} < \sqrt{37} < \sqrt{49}$ | $6 < \sqrt{37} < 7$ |
| ⑰ $-\sqrt{16} < -\sqrt{11} < -\sqrt{9}$ | $-4 < -\sqrt{11} < -3$ |
| ⑱ $-\sqrt{36} < -\sqrt{26} < -\sqrt{25}$ | $-6 < -\sqrt{26} < -5$ |
| ⑲ $\sqrt{81} < \sqrt{97} < \sqrt{100}$ | $9 < \sqrt{97} < 10$ |
| ⑳ $\sqrt{81} < \sqrt{85} < \sqrt{100}$ | $9 < \sqrt{85} < 10$ |
| ㉑ $-\sqrt{49} < -\sqrt{40} < -\sqrt{36}$ | $-7 < -\sqrt{40} < -6$ |
| ㉒ $-\sqrt{81} < -\sqrt{70} < -\sqrt{64}$ | $-9 < -\sqrt{70} < -8$ |
| ㉓ $\sqrt{49} < \sqrt{55} < \sqrt{64}$ | $7 < \sqrt{55} < 8$ |
| ㉔ $\sqrt{1} < \sqrt{2} < \sqrt{4}$ | $1 < \sqrt{2} < 2$ |
| ㉕ $-\sqrt{25} < -\sqrt{20} < -\sqrt{16}$ | $-5 < -\sqrt{20} < -4$ |
| ㉖ $-\sqrt{121} < -\sqrt{105} < -\sqrt{100}$ | $-11 < -\sqrt{105} < -10$ |



2. SIMPLIFYING RADICALS

- | | |
|---|---|
| ① $\sqrt{96}$
$\frac{2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 3}{2 \cdot 2 \sqrt{2 \cdot 3}}$
$4\sqrt{6}$ | ④ $\sqrt{216}$
$\frac{2 \cdot 2 \cdot 2 \cdot 3 \cdot 3 \cdot 3}{2 \cdot 3 \sqrt{2 \cdot 3}}$
$6\sqrt{6}$ |
| ② $\sqrt{54}$
$\frac{\sqrt{2 \cdot 3 \cdot 3 \cdot 3}}{3 \sqrt{2 \cdot 3}}$
$3\sqrt{6}$ | ⑤ $\sqrt{50}$
$\frac{\sqrt{2 \cdot 5 \cdot 5}}{5 \sqrt{2}}$ |
| ③ $\sqrt{120}$
$\frac{\sqrt{2 \cdot 2 \cdot 2 \cdot 3 \cdot 5}}{2 \sqrt{2 \cdot 3 \cdot 5}}$
$2\sqrt{30}$ | ⑥ $\sqrt{112}$
$\frac{\sqrt{2 \cdot 2 \cdot 2 \cdot 2 \cdot 7}}{2 \cdot 2 \sqrt{7}}$
$4\sqrt{7}$ |

UNIT 11: ANSWER KEY

Radical Operations

$$\begin{aligned} \textcircled{7} \quad & \sqrt{48} \\ & \sqrt{2 \cdot 2 \cdot 2 \cdot 2 \cdot 3} \\ & 2 \cdot 2 \sqrt{3} \\ & 4\sqrt{3} \end{aligned}$$

$$\begin{aligned} \textcircled{8} \quad & \sqrt{80} \\ & \sqrt{2 \cdot 2 \cdot 2 \cdot 2 \cdot 5} \\ & 2 \cdot 2 \sqrt{5} \\ & 4\sqrt{5} \end{aligned}$$

$$\begin{aligned} \textcircled{9} \quad & \sqrt{90} \\ & \sqrt{2 \cdot 3 \cdot 3 \cdot 5} \\ & 3\sqrt{2 \cdot 5} \\ & 3\sqrt{10} \end{aligned}$$

$$\begin{aligned} \textcircled{10} \quad & \sqrt{24} \\ & \sqrt{2 \cdot 2 \cdot 2 \cdot 3} \\ & 2\sqrt{2 \cdot 3} \\ & 2\sqrt{6} \end{aligned}$$

$$\begin{aligned} \textcircled{11} \quad & \sqrt{12} \\ & \sqrt{2 \cdot 2 \cdot 3} \\ & 2\sqrt{3} \end{aligned}$$

$$\begin{aligned} \textcircled{12} \quad & \sqrt{98} \\ & \sqrt{2 \cdot 7 \cdot 7} \\ & 7\sqrt{2} \end{aligned}$$

$$\begin{aligned} \textcircled{13} \quad & \sqrt{15} \\ & \sqrt{3 \cdot 5} \\ & \sqrt{15} \end{aligned}$$

$$\begin{aligned} \textcircled{14} \quad & \sqrt{240} \\ & \sqrt{2 \cdot 2 \cdot 2 \cdot 2 \cdot 3 \cdot 5} \\ & 2 \cdot 2 \sqrt{3 \cdot 5} \\ & 4\sqrt{15} \end{aligned}$$

$$\begin{aligned} \textcircled{15} \quad & \sqrt{14} \\ & \sqrt{2 \cdot 7} \\ & \sqrt{14} \end{aligned}$$

$$\begin{aligned} \textcircled{16} \quad & \sqrt{6} \\ & \sqrt{2 \cdot 3} \\ & \sqrt{6} \end{aligned}$$

$$\begin{aligned} \textcircled{17} \quad & 3\sqrt{40} \\ & 3\sqrt{2 \cdot 2 \cdot 2 \cdot 5} \\ & 3 \cdot 2 \sqrt{2 \cdot 5} \\ & 6\sqrt{10} \end{aligned}$$

$$\begin{aligned} \textcircled{18} \quad & 2\sqrt{32} \\ & 2\sqrt{2 \cdot 2 \cdot 2 \cdot 2 \cdot 2} \\ & 2 \cdot 2 \cdot 2 \sqrt{2} \\ & 8\sqrt{2} \end{aligned}$$

$$\begin{aligned} \textcircled{19} \quad & 5\sqrt{18} \\ & 5\sqrt{2 \cdot 3 \cdot 3} \\ & 5 \cdot 3 \sqrt{2} \\ & 15\sqrt{2} \end{aligned}$$

$$\begin{aligned} \textcircled{20} \quad & 3\sqrt{162} \\ & 3\sqrt{2 \cdot 3 \cdot 3 \cdot 3 \cdot 3} \\ & 3 \cdot 3 \cdot 3 \sqrt{2} \\ & 27\sqrt{2} \end{aligned}$$

$$\begin{aligned} \textcircled{21} \quad & 2\sqrt{250} \\ & 2\sqrt{2 \cdot 5 \cdot 5 \cdot 5} \\ & 2 \cdot 5 \sqrt{2 \cdot 5} \\ & 10\sqrt{10} \end{aligned}$$

$$\begin{aligned} \textcircled{22} \quad & 7\sqrt{8} \\ & 7\sqrt{2 \cdot 2 \cdot 2} \end{aligned}$$

$$\begin{aligned} & 7 \cdot 2 \sqrt{2} \\ & 14\sqrt{2} \end{aligned}$$

$$\begin{aligned} \textcircled{23} \quad & 9\sqrt{75} \\ & 9\sqrt{3 \cdot 5 \cdot 5} \\ & 9 \cdot 5 \sqrt{3} \\ & 45\sqrt{3} \end{aligned}$$

$$\begin{aligned} \textcircled{24} \quad & 2\sqrt{60} \\ & 2\sqrt{2 \cdot 2 \cdot 3 \cdot 5} \\ & 2 \cdot 2 \sqrt{3 \cdot 5} \\ & 4\sqrt{15} \end{aligned}$$

$$\begin{aligned} \textcircled{25} \quad & 3\sqrt{56} \\ & 3\sqrt{2 \cdot 2 \cdot 2 \cdot 7} \\ & 3 \cdot 2 \sqrt{2 \cdot 7} \\ & 6\sqrt{14} \end{aligned}$$

$$\begin{aligned} \textcircled{26} \quad & 3\sqrt{450} \\ & 3\sqrt{2 \cdot 3 \cdot 3 \cdot 5 \cdot 5} \\ & 3 \cdot 3 \cdot 5 \sqrt{2} \\ & 45\sqrt{2} \end{aligned}$$

$$\begin{aligned} \textcircled{27} \quad & 7\sqrt{288} \\ & 7\sqrt{2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 3 \cdot 3} \\ & 7 \cdot 2 \cdot 2 \cdot 3 \sqrt{2} \\ & 84\sqrt{2} \end{aligned}$$

$$\begin{aligned} \textcircled{28} \quad & 4\sqrt{432} \\ & 4\sqrt{2 \cdot 2 \cdot 2 \cdot 2 \cdot 3 \cdot 3 \cdot 3} \\ & 4 \cdot 2 \cdot 2 \cdot 3 \sqrt{3} \\ & 48\sqrt{3} \end{aligned}$$

$$\begin{aligned} \textcircled{29} \quad & 2\sqrt{200} \\ & 2\sqrt{2 \cdot 2 \cdot 2 \cdot 5 \cdot 5} \\ & 2 \cdot 2 \cdot 5 \sqrt{2} \\ & 20\sqrt{2} \end{aligned}$$

$$\begin{aligned} \textcircled{30} \quad & 5\sqrt{243} \\ & 5\sqrt{3 \cdot 3 \cdot 3 \cdot 3 \cdot 3} \\ & 5 \cdot 3 \cdot 3 \sqrt{3} \\ & 45\sqrt{3} \end{aligned}$$



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 $3\sqrt{2} + \sqrt{18} - \sqrt{50}$
 $3\sqrt{2} + \sqrt{2(3 \cdot 3)} - \sqrt{2(5 \cdot 5)}$
 $3\sqrt{2} + 3\sqrt{2} - 5\sqrt{2} = \sqrt{2}$
- 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 $3\sqrt{3} - 2\sqrt{45} + \sqrt{108} + 6\sqrt{5}$
 $3\sqrt{3} - 2\sqrt{3 \cdot 3 \cdot 5} + \sqrt{2 \cdot 2 \cdot 3 \cdot 3 \cdot 3} + 6\sqrt{5}$
 $3\sqrt{3} - 6\sqrt{5} + 6\sqrt{3} + 6\sqrt{5} = 9\sqrt{3}$

...THE ALPHABET SOUP IS QUITE
THOUGHT-PROVOKING TODAY!



UNIT 11: ANSWER KEY

Radical Operations

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

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

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

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



HOW BAD IS IT?... LET ME PUT IT THIS WAY... I WOULDN'T PUT THAT BACK IN YOUR MOUTH IF I WERE YOU...



4. MULTIPLYING RADICALS

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

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

$$\begin{aligned} (5) \quad & (\sqrt{6})(\sqrt{2}) \\ & \sqrt{12} = \sqrt{2\cdot2\cdot3} \\ & 2\sqrt{3} \end{aligned}$$

$$\begin{aligned} (6) \quad & (\sqrt{5})(\sqrt{10}) \\ & \sqrt{50} = \sqrt{2\cdot5\cdot5} \\ & 5\sqrt{2} \end{aligned}$$

$$\begin{aligned} (7) \quad & (\sqrt{3})^2 \\ & \sqrt{9} = 3 \end{aligned}$$

$$\begin{aligned} (8) \quad & (\sqrt{6})^2 \\ & \sqrt{36} = 6 \end{aligned}$$

$$\begin{aligned} (9) \quad & (2\sqrt{5})^2 \\ & 4\sqrt{25} \\ & (4)(5) = 20 \end{aligned}$$

$$\begin{aligned} (10) \quad & (3\sqrt{2})^2 \\ & 9\sqrt{4} \\ & (9)(2) = 18 \end{aligned}$$

$$\begin{aligned} (11) \quad & (4\sqrt{10})(3\sqrt{6}) \\ & 12\sqrt{60} \\ & 12\sqrt{2\cdot2\cdot3\cdot5} \\ & 24\sqrt{15} \end{aligned}$$

$$\begin{aligned} (12) \quad & (3\sqrt{3})(6\sqrt{15}) \\ & 18\sqrt{45} \\ & 18\sqrt{3\cdot3\cdot5} \\ & 54\sqrt{5} \end{aligned}$$

$$\begin{aligned} (13) \quad & (2\sqrt{3})(\sqrt{2})(\sqrt{6}) \\ & 2\sqrt{36} \\ & (2)(6) \\ & 12 \end{aligned}$$

$$\begin{aligned} (14) \quad & (\sqrt{5})(2\sqrt{3})(\sqrt{6}) \\ & 2\sqrt{90} \\ & 2\sqrt{2\cdot3\cdot3\cdot5} \\ & 6\sqrt{10} \end{aligned}$$

$$\begin{aligned} (15) \quad & (3\sqrt{2})(4\sqrt{14}) \\ & 12\sqrt{28} \\ & 12\sqrt{2\cdot2\cdot7} \\ & 24\sqrt{7} \end{aligned}$$

$$\begin{aligned} (16) \quad & (2\sqrt{5})(5\sqrt{10}) \\ & 10\sqrt{50} \\ & 10\sqrt{2\cdot5\cdot5} \\ & 50\sqrt{2} \end{aligned}$$

$$\begin{aligned} (17) \quad & (\sqrt{6})(\sqrt{2})(\sqrt{10}) \\ & \sqrt{120} \\ & \sqrt{2\cdot2\cdot2\cdot3\cdot5} \\ & 2\sqrt{30} \end{aligned}$$

$$\begin{aligned} (18) \quad & (\sqrt{3})(2\sqrt{6})(\sqrt{2}) \\ & 2\sqrt{36} \\ & (2)(6) = 12 \end{aligned}$$

$$\begin{aligned} (19) \quad & 3(2\sqrt{5} - \sqrt{3}) \\ & 6\sqrt{5} - 3\sqrt{3} \end{aligned}$$

$$\begin{aligned} (20) \quad & 2\sqrt{3}(\sqrt{2} - 1) \\ & 2\sqrt{6} - 2\sqrt{3} \end{aligned}$$

$$\begin{aligned} (21) \quad & 3\sqrt{5}(2\sqrt{10} - \sqrt{5}) \\ & 6\sqrt{50} - 3\sqrt{25} \\ & 6\sqrt{2\cdot5\cdot5} - 3\sqrt{5\cdot5} \end{aligned}$$

$$\begin{aligned} & 30\sqrt{2} - 3(5) \\ & 30\sqrt{2} - 15 \end{aligned}$$

UNIT 11: ANSWER KEY

Radical Operations

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

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

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

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

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

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

$$6(2) - 2(6)$$

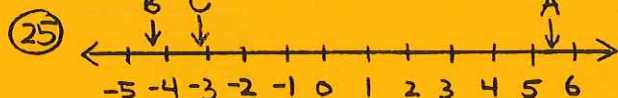
$$12 - 12 = 0$$

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

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

$$4(6) - 2(3)$$

$$24 - 6 = 18$$



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

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

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

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

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

$$4\sqrt{2 \cdot 3 \cdot 3} - \sqrt{5 \cdot 5 \cdot 5} + \sqrt{2 \cdot 2 \cdot 2 \cdot 2} + \sqrt{5}$$

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

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

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

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

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

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

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

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

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

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

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

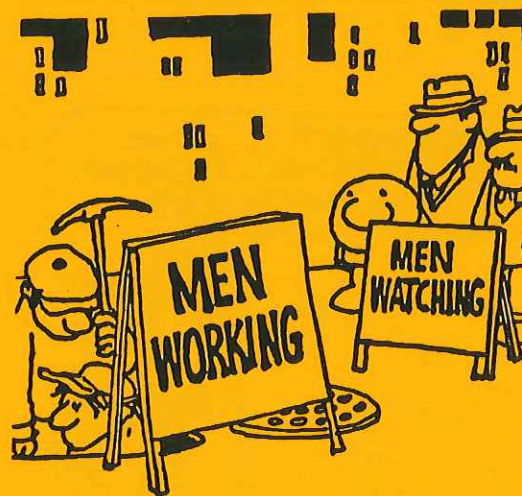
$$3\sqrt{2} - 6 - 3\sqrt{2} = -6$$

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

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

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

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



REVIEW & PRACTICE

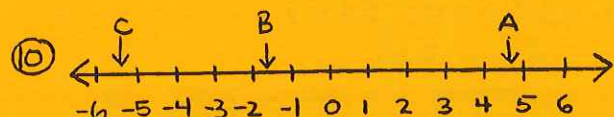
- ① $\sqrt{144} = 12$
- ② $-\sqrt{64} = -8$
- ③ $-\sqrt{81} = -9$
- ④ $\sqrt{169} = 13$
- ⑤ $-\sqrt{49} = -7$
- ⑥ $\sqrt{1} = 1$
- ⑦ $\sqrt{121} < \sqrt{125} < \sqrt{144}$
 $11 < \sqrt{125} < 12$

UNIT 11: ANSWER KEY

Radical Operations

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

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



⑫ $\sqrt{160}$
 $\sqrt{2 \cdot 2 \cdot 2 \cdot 2 \cdot 5}$
 $2 \cdot 2 \sqrt{2 \cdot 5}$
 $4\sqrt{10}$

⑰ $4\sqrt{360}$
 $4\sqrt{2 \cdot 2 \cdot 2 \cdot 3 \cdot 3 \cdot 5}$
 $4 \cdot 2 \cdot 3 \sqrt{2 \cdot 5}$
 $24\sqrt{10}$

⑬ $\sqrt{84}$
 $\sqrt{2 \cdot 2 \cdot 3 \cdot 7}$
 $2\sqrt{3 \cdot 7}$
 $2\sqrt{21}$

⑱ $3\sqrt{12}$
 $3\sqrt{2 \cdot 2 \cdot 3}$
 $3 \cdot 2 \sqrt{3}$
 $6\sqrt{3}$

⑭ $\sqrt{180}$
 $\sqrt{2 \cdot 2 \cdot 3 \cdot 3 \cdot 5}$
 $2 \cdot 3 \sqrt{5}$
 $6\sqrt{5}$

⑲ $5\sqrt{126}$
 $5\sqrt{2 \cdot 3 \cdot 3 \cdot 7}$
 $5 \cdot 3 \sqrt{2 \cdot 7}$
 $15\sqrt{14}$

⑮ $\sqrt{150}$
 $\sqrt{2 \cdot 3 \cdot 5 \cdot 5}$
 $5\sqrt{2 \cdot 3}$
 $5\sqrt{6}$

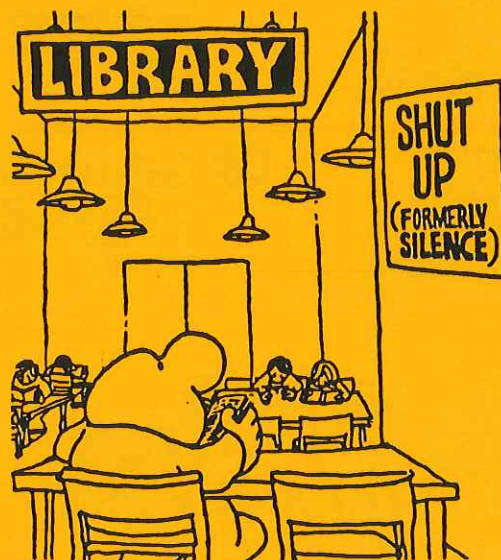
⑳ $3\sqrt{375}$
 $3\sqrt{3 \cdot 5 \cdot 5 \cdot 5}$
 $3 \cdot 5 \sqrt{3 \cdot 5}$
 $15\sqrt{15}$

⑯ $2\sqrt{96}$
 $2\sqrt{2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 3}$
 $2 \cdot 2 \cdot 2 \sqrt{2 \cdot 3}$
 $8\sqrt{6}$

㉑ $4\sqrt{196}$
 $4\sqrt{2 \cdot 2 \cdot 7 \cdot 7}$
 $4 \cdot 2 \cdot 7$
 56

㉒ $2\sqrt{27}$
 $2\sqrt{3 \cdot 3 \cdot 3}$
 $2 \cdot 3 \sqrt{3}$
 $6\sqrt{3}$

㉓ $3\sqrt{128}$
 $3\sqrt{2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2}$
 $3 \cdot 2 \cdot 2 \cdot 2 \sqrt{2}$
 $24\sqrt{2}$



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 $(\sqrt{5})(2\sqrt{15})$
 $2\sqrt{75}$
 $2\sqrt{3 \cdot 5 \cdot 5}$

㉜ $(3\sqrt{2})(\sqrt{6})$
 $3\sqrt{12}$
 $3\sqrt{2 \cdot 2 \cdot 3}$
 $6\sqrt{3}$

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

UNIT 11: ANSWER KEY

Radical Operations

$$\begin{aligned} 34 \quad (3\sqrt{2})^2 \\ 9\sqrt{4} \\ (9)(2) = 18 \end{aligned}$$

$$\begin{aligned} 37 \quad (\sqrt{7})^2 \\ \sqrt{49} = 7 \end{aligned}$$

$$\begin{aligned} 45 \quad \sqrt{200} - 3\sqrt{108} + 2\sqrt{50} \\ \sqrt{2 \cdot 2 \cdot 2 \cdot 5 \cdot 5} - 3\sqrt{2 \cdot 2 \cdot 3 \cdot 3 \cdot 3} + 2\sqrt{2 \cdot 5 \cdot 5} \\ 10\sqrt{2} - 18\sqrt{3} + 10\sqrt{2} = 20\sqrt{2} - 18\sqrt{3} \end{aligned}$$

$$\begin{aligned} 35 \quad (2\sqrt{5})^2 \\ 4\sqrt{25} \\ (4)(5) = 20 \end{aligned}$$

$$\begin{aligned} 38 \quad (\sqrt{6})(\sqrt{8}) \\ \sqrt{48} \\ \sqrt{2 \cdot 2 \cdot 2 \cdot 2 \cdot 3} \\ 4\sqrt{3} \end{aligned}$$

$$\begin{aligned} 46 \quad \sqrt{3}(2\sqrt{6} - 3\sqrt{3}) \\ 2\sqrt{18} - 3\sqrt{9} \\ 2\sqrt{2 \cdot 3 \cdot 3} - 3(3) = 6\sqrt{2} - 9 \end{aligned}$$

$$\begin{aligned} 36 \quad (3\sqrt{6})^2 \\ 9\sqrt{36} \\ (9)(6) = 54 \end{aligned}$$

$$\begin{aligned} 39 \quad (3\sqrt{2})(4\sqrt{12}) \\ 12\sqrt{24} = 12\sqrt{2 \cdot 2 \cdot 2 \cdot 3} \\ 24\sqrt{6} \end{aligned}$$

$$\begin{aligned} 47 \quad \sqrt{2}(\sqrt{8} - 2\sqrt{2}) \\ \sqrt{16} - 2\sqrt{4} \\ 4 - 2(2) = 0 \end{aligned}$$

$$\begin{aligned} 40 \quad 2\sqrt{12} - 3\sqrt{3} + 4\sqrt{75} \\ 2\sqrt{2 \cdot 2 \cdot 3} - 3\sqrt{3} + 4\sqrt{3 \cdot 5 \cdot 5} \\ 4\sqrt{3} - 3\sqrt{3} + 20\sqrt{3} = 21\sqrt{3} \end{aligned}$$

$$\begin{aligned} 48 \quad 3\sqrt{3}(\sqrt{6} - 5\sqrt{2}) \\ 3\sqrt{18} - 15\sqrt{6} \\ 3\sqrt{2 \cdot 3 \cdot 3} - 15\sqrt{6} = 9\sqrt{2} - 15\sqrt{6} \end{aligned}$$

$$\begin{aligned} 41 \quad \sqrt{8} + 3\sqrt{18} - 4\sqrt{50} \\ \sqrt{2 \cdot 2 \cdot 2} + 3\sqrt{2 \cdot 3 \cdot 3} - 4\sqrt{2 \cdot 5 \cdot 5} \\ 2\sqrt{2} + 9\sqrt{2} - 20\sqrt{2} = -9\sqrt{2} \end{aligned}$$

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

$$\begin{aligned} 42 \quad 3\sqrt{125} - 2\sqrt{8} + 3\sqrt{5} \\ 3\sqrt{5 \cdot 5 \cdot 5} - 2\sqrt{2 \cdot 2 \cdot 2} + 3\sqrt{5} \\ 15\sqrt{5} - 4\sqrt{2} + 3\sqrt{5} = 18\sqrt{5} - 4\sqrt{2} \end{aligned}$$

$$\begin{aligned} 43 \quad 4\sqrt{27} + 2\sqrt{45} - 3\sqrt{12} \\ 4\sqrt{3 \cdot 3 \cdot 3} + 2\sqrt{3 \cdot 3 \cdot 5} - 3\sqrt{2 \cdot 2 \cdot 3} \\ 12\sqrt{3} + 6\sqrt{5} - 6\sqrt{3} = 6\sqrt{3} + 6\sqrt{5} \end{aligned}$$

$$\begin{aligned} 44 \quad \sqrt{18} - \sqrt{32} + \sqrt{98} \\ \sqrt{2 \cdot 3 \cdot 3} - \sqrt{2 \cdot 2 \cdot 2 \cdot 2 \cdot 2} + \sqrt{2 \cdot 7 \cdot 7} \\ 3\sqrt{2} - 4\sqrt{2} + 7\sqrt{2} \\ 6\sqrt{2} \end{aligned}$$



UNIT 11: ANSWER KEY

Radical Operations

PRACTICE TEST #1



② $\sqrt{180} = \sqrt{2 \cdot 2 \cdot 3 \cdot 3 \cdot 5} = 6\sqrt{5}$

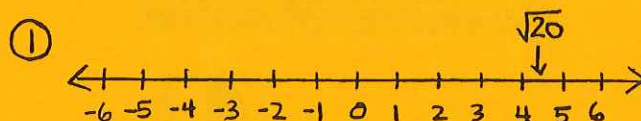
③ $4\sqrt{400} = 4\sqrt{2 \cdot 2 \cdot 2 \cdot 2 \cdot 5 \cdot 5}$
 $4 \cdot 2 \cdot 2 \cdot 5 = 80$

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

⑤ $(3\sqrt{10})(5\sqrt{2}) = 15\sqrt{20}$
 $15\sqrt{2 \cdot 2 \cdot 5} = 15 \cdot 2\sqrt{5} = 30\sqrt{5}$

⑥ $\sqrt{12} - 4\sqrt{3} - 3\sqrt{75}$
 $\sqrt{2 \cdot 2 \cdot 3} - 4\sqrt{3} - 3\sqrt{3 \cdot 5 \cdot 5}$
 $2\sqrt{3} - 4\sqrt{3} - 15\sqrt{3} = -17\sqrt{3}$

PRACTICE TEST #2



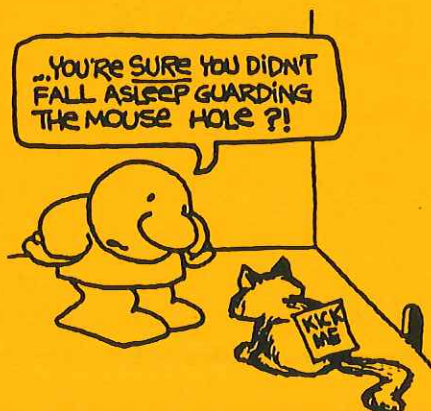
② $\sqrt{250} = \sqrt{2 \cdot 5 \cdot 5 \cdot 5} = 5\sqrt{10}$

③ $3\sqrt{128} = 3\sqrt{2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2}$
 $3 \cdot 2 \cdot 2 \cdot 2 \sqrt{2} = 24\sqrt{2}$

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

⑤ $(\sqrt{3})(2\sqrt{6})(3\sqrt{5}) = 6\sqrt{90}$
 $6\sqrt{2 \cdot 3 \cdot 3 \cdot 5} = 6 \cdot 3\sqrt{10} = 18\sqrt{10}$

⑥ $\sqrt{125} - 4\sqrt{5} + 2\sqrt{45}$
 $\sqrt{5 \cdot 5 \cdot 5} - 4\sqrt{5} + 2\sqrt{3 \cdot 3 \cdot 5}$
 $5\sqrt{5} - 4\sqrt{5} + 6\sqrt{5} = 7\sqrt{5}$



UNIT 11: ANSWER KEY

Radical Operations

WE INTERRUPT THIS PROGRAM
FOR A SPECIAL BULLETIN FROM THE
FOOD AND DRUG ADMINISTRATION
.....DON'T EAT OR DRINK
ANYTHING UNTIL FURTHER NOTICE!



THE PYTHAGOREAN THEOREM

$$\begin{aligned} \textcircled{1} \quad a^2 + b^2 &= c^2 \\ (4)^2 + (8)^2 &= c^2 \\ 16 + 64 &= c^2 \\ 80 &= c^2 \\ c &= \sqrt{80} = \sqrt{2 \cdot 2 \cdot 2 \cdot 2 \cdot 5} = 4\sqrt{5} \text{ km} \end{aligned}$$

$$\begin{aligned} \textcircled{2} \quad a^2 + b^2 &= c^2 \\ (2\sqrt{2})^2 + b^2 &= (6)^2 \\ (2\sqrt{2})(2\sqrt{2}) + b^2 &= 36 \\ (4\sqrt{4}) + b^2 &= 36 \\ 8 + b^2 &= 36 \\ b^2 &= 36 - 8 \\ b^2 &= 28 \\ b &= \sqrt{28} = \sqrt{2 \cdot 2 \cdot 7} = 2\sqrt{7} \text{ ft.} \end{aligned}$$

$$\begin{aligned} \textcircled{3} \quad a^2 + b^2 &= c^2 \\ (3\sqrt{2})^2 + (6\sqrt{2})^2 &= c^2 \\ (3\sqrt{2})(3\sqrt{2}) + (6\sqrt{2})(6\sqrt{2}) &= c^2 \\ (9\sqrt{4}) + (36\sqrt{4}) &= c^2 \end{aligned}$$

$$\begin{aligned} (18) + (72) &= c^2 \\ 90 &= c^2 \\ c &= \sqrt{90} = \sqrt{2 \cdot 3 \cdot 3 \cdot 5} = 3\sqrt{10} \text{ ft.} \end{aligned}$$

$\textcircled{4}$ If the diameter of the cone's base is 8, the radius is 4

$$\begin{aligned} a^2 + b^2 &= c^2 \\ (4)^2 + b^2 &= (8)^2 \\ 16 + b^2 &= 64 \\ b^2 &= 64 - 16 \\ b^2 &= 48 \\ b &= \sqrt{48} = \sqrt{2 \cdot 2 \cdot 2 \cdot 2 \cdot 3} = 4\sqrt{3} \text{ in} \end{aligned}$$

$$\begin{aligned} \textcircled{5} \quad a^2 + b^2 &= c^2 \\ (100)^2 + b^2 &= (125)^2 \\ (10,000) + b^2 &= (15,625) \\ b^2 &= 15,625 - 10,000 \\ b^2 &= 5,625 \\ b &= \sqrt{5,625} = 75 \text{ m} \end{aligned}$$

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

$$\begin{aligned} \textcircled{6} \quad a^2 + b^2 &= c^2 \\ (6)^2 + (8)^2 &= c^2 \\ 36 + 64 &= c^2 \\ c^2 &= 100 \\ c &= \sqrt{100} = 10 \text{ ft.} \end{aligned}$$

UNIT 11: ANSWER KEY

Radical Operations

$$\begin{aligned} \textcircled{7} \quad a^2 + b^2 &= c^2 \\ (3)^2 + (6)^2 &= c^2 \\ 9 + 36 &= c^2 \\ c^2 &= 45 \\ c &= \sqrt{45} = \sqrt{3 \cdot 3 \cdot 5} = 3\sqrt{5} \text{ m} \end{aligned}$$

$$\begin{aligned} \textcircled{10} \quad a^2 + b^2 &= c^2 \\ (4)^2 + b^2 &= (10)^2 \\ 16 + b^2 &= 100 \\ b^2 &= 100 - 16 \\ b^2 &= 84 \\ b &= \sqrt{84} = \sqrt{2 \cdot 2 \cdot 3 \cdot 7} = 2\sqrt{21} \text{ ft.} \end{aligned}$$

$$\begin{aligned} \textcircled{8} \quad a^2 + b^2 &= c^2 \\ (8)^2 + (12)^2 &= c^2 \\ 64 + 144 &= c^2 \\ c^2 &= 208 \\ c &= \sqrt{208} = \sqrt{2 \cdot 2 \cdot 2 \cdot 2 \cdot 13} = 4\sqrt{13} \text{ ft.} \end{aligned}$$

$$\begin{aligned} \textcircled{11} \quad a^2 + b^2 &= c^2 \\ (4\sqrt{2})^2 + b^2 &= (4\sqrt{10})^2 \\ (4\sqrt{2})(4\sqrt{2}) + b^2 &= (4\sqrt{10})(4\sqrt{10}) \\ (16\sqrt{4}) + b^2 &= (16\sqrt{100}) \\ 32 + b^2 &= 160 \\ b^2 &= 160 - 32 \\ b^2 &= 128 \\ b &= \sqrt{128} = \sqrt{2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2} = 8\sqrt{2} \text{ m} \end{aligned}$$

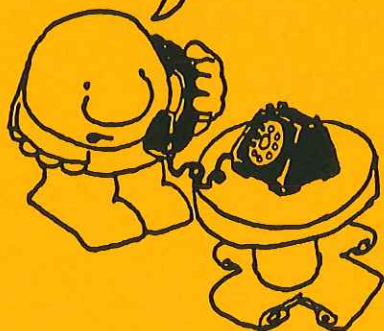
$\textcircled{9}$ If the base of the roof is 24 ft, half the base is 12 ft.

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

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

$$\begin{aligned} a^2 + b^2 &= c^2 \\ (3\sqrt{3})^2 + b^2 &= (9)^2 \\ (9\sqrt{9}) + b^2 &= 81 \\ 27 + b^2 &= 81 \\ b^2 &= 81 - 27 \\ b^2 &= 54 \\ b &= \sqrt{54} = \sqrt{2 \cdot 3 \cdot 3 \cdot 3} = 3\sqrt{6} \text{ in} \end{aligned}$$

NO, I'M NOT A RECORDING !!!
.....ARE YOU ??



UNITS 9-11: ANSWER KEY

Cumulative Review

$$\textcircled{1} (-3) + (+7) = 4$$

$$\textcircled{2} (-8) \times (-3) = 24$$

$$\textcircled{3} \begin{array}{l} (-7) - (-5) \\ (-7) + (+5) = -2 \end{array}$$

$$\textcircled{4} (-4) \div (+4) = -1$$

$$\textcircled{5} \begin{array}{l} (-3) + (-4) - (-7) + (-6) - (+8) \\ (-3) + (-4) + (+7) + (-6) + (-8) \\ (+7) + (-21) = -14 \end{array}$$

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

$$\textcircled{7} -5^2 = -25$$

$$\textcircled{8} (-5)^2 = 25$$

$$\textcircled{9} (-4)^0 = 1$$

$$\textcircled{10} (-3)^3 = -27$$

$$\textcircled{11} \begin{array}{l} (-6) - \boxed{(-2) \times (-3)} + (+4) \\ (-6) - (+6) + (+4) \\ (-6) + (-6) + (+4) = -8 \end{array}$$

$$\textcircled{12} \begin{array}{l} \boxed{(-4) \div (-1)} - \boxed{(-2) \times (+5)} \\ (+4) - (-10) \\ (+4) + (+10) = 14 \end{array}$$

$$\textcircled{13} \begin{array}{l} (-2)^3 - (-3)^2 \\ (-8) - (+9) \\ (-8) + (-9) = -17 \end{array}$$

$$\textcircled{14} \begin{array}{l} (-3)^0 - 3^2 + (-2)^4 \\ (+1) - 9 + (+16) \\ (+1) + (-9) + (+16) = 8 \end{array}$$

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

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

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

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

$$\textcircled{17} \begin{array}{l} 2a - 3b + c \\ 2(-3) - 3(-2) + (-1) \\ (-6) - (-6) + (-1) \\ (-6) + (+6) + (-1) = -1 \end{array}$$

$$\textcircled{18} \begin{array}{l} ab^2 - 2bc^3 \\ (-3)(-2)^2 - 2(-2)(-1)^3 \\ (-3)(+4) - 2(-2)(-1) \\ (-12) - (+4) \\ (-12) + (-4) = -16 \end{array}$$

$$\textcircled{19} \begin{array}{l} -3(a+b) - c^2 \\ -3((-3) + (-2)) - (-1)^2 \\ -3(-5) - (+1) \\ (-15) + (-1) = -16 \end{array}$$

UNITS 9-11: ANSWER KEY

Cumulative Review

$$\begin{aligned} \textcircled{20} \quad & 2ab - abc \\ & 2(-3)(-2) - (-3)(-2)(-1) \\ & (+12) - (-6) \\ & (+12) + (+6) = 18 \end{aligned}$$

$$\begin{aligned} \textcircled{21} \quad & \frac{a^2 b^2 c}{2b} = \frac{(-3)^2 (-2)^2 (-1)}{2(-2)} \\ & \frac{(+9)(+4)(-1)}{2(-2)} = \frac{-36}{-4} = 9 \end{aligned}$$

$$\begin{aligned} \textcircled{22} \quad & \frac{3a+2b}{b^2 c^3} = \frac{3(-3)+2(-2)}{(-2)^2 (-1)^3} \\ & \frac{3(-3)+2(-2)}{(+4)(-1)} = \frac{(-9)+(-4)}{(-4)} = \frac{-13}{-4} = \frac{13}{4} \end{aligned}$$

$$\textcircled{23} \quad 4x - 3 + 2x + 7 = 6x + 4$$

$$\begin{aligned} \textcircled{24} \quad & n - 3m + 4 - 2n + m - 3 \\ & -n - 2m + 1 \end{aligned}$$

$$\begin{aligned} \textcircled{25} \quad & -a^2 - ab + 3ab - 2a^2 - 4ab \\ & -3a^2 - 2ab \end{aligned}$$

$$\begin{aligned} \textcircled{26} \quad & n^2 - 2nm + 3n^2 - 4 + 5nm \\ & 4n^2 + 3nm - 4 \end{aligned}$$

$$\begin{aligned} \textcircled{27} \quad & 3(x-2y) - 4(2x+y) \\ & 3x - 6y - 8x - 4y \\ & -5x - 10y \end{aligned}$$

$$\begin{aligned} \textcircled{28} \quad & 2(a+b) - 3(2a-3b) \\ & 2a+2b-6a+9b = -4a+11b \end{aligned}$$

$$\begin{aligned} \textcircled{29} \quad & a(a-b) + 3a^2 - 2ab \\ & a^2 - ab + 3a^2 - 2ab = 4a^2 - 3ab \end{aligned}$$

$$\begin{aligned} \textcircled{30} \quad & 2x(x-3y) + y(x-3y) \\ & 2x^2 - 6xy + xy - 3y^2 = 2x^2 - 5xy - 3y^2 \end{aligned}$$

$$\begin{aligned} \textcircled{31} \quad & 2a(a-b^2) - b(ab-2) \\ & 2a^2 - 2ab^2 - ab^2 + 2b \\ & 2a^2 - 3ab^2 + 2b \end{aligned}$$

$$\begin{aligned} \textcircled{32} \quad & 4(2x-y^2) - y(x+3y) + 2x \\ & 8x - 4y^2 - xy - 3y^2 + 2x \\ & 10x - 7y^2 - xy \end{aligned}$$



$$\textcircled{33} \quad \sqrt{108} = \sqrt{2 \cdot 2 \cdot 3 \cdot 3 \cdot 3} = 6\sqrt{3}$$

$$\textcircled{34} \quad \sqrt{40} = \sqrt{2 \cdot 2 \cdot 2 \cdot 5} = 2\sqrt{10}$$

$$\textcircled{35} \quad \sqrt{245} = \sqrt{5 \cdot 7 \cdot 7} = 7\sqrt{5}$$

$$\textcircled{36} \quad 2\sqrt{27} = 2\sqrt{3 \cdot 3 \cdot 3} = 6\sqrt{3}$$

$$\textcircled{37} \quad -3\sqrt{96} = -3\sqrt{2 \cdot 2 \cdot 2 \cdot 2 \cdot 3} = -12\sqrt{6}$$

$$\textcircled{38} \quad 2\sqrt{80} = 2\sqrt{2 \cdot 2 \cdot 2 \cdot 2 \cdot 5} = 8\sqrt{5}$$

UNITS 9-11: ANSWER KEY

Cumulative Review

$$\begin{aligned} (39) \quad (\sqrt{3})(2\sqrt{6}) &= 2\sqrt{18} \\ 2\sqrt{2 \cdot 3 \cdot 3} &= 6\sqrt{2} \end{aligned}$$

$$\begin{aligned} (40) \quad (3\sqrt{2})(4\sqrt{10}) &= 12\sqrt{20} \\ 12\sqrt{2 \cdot 2 \cdot 5} &= 24\sqrt{5} \end{aligned}$$

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

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

$$\begin{aligned} (43) \quad 2\sqrt{3}(4\sqrt{3} - \sqrt{6}) \\ (8)(3) - (2)(\sqrt{18}) \\ 24 - 2\sqrt{2 \cdot 3 \cdot 3} &= 24 - 6\sqrt{2} \end{aligned}$$

$$\begin{aligned} (44) \quad \sqrt{2}(3\sqrt{10} - \sqrt{6}) \\ 3\sqrt{20} - \sqrt{12} \\ 3\sqrt{2 \cdot 2 \cdot 5} - \sqrt{2 \cdot 2 \cdot 3} &= 6\sqrt{5} - 2\sqrt{3} \end{aligned}$$

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

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

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

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

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

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

PRACTICE TEST

$$\begin{aligned} (1) \quad (-3) + (-4) - (-5) - (+4) \\ (-3) + (-4) + (+5) + (-4) \\ (+5) + (-11) &= -6 \end{aligned}$$

$$(2) \quad (-20) \div (-4) = 5$$

$$(3) \quad (-3)^2 = 9$$

$$(4) \quad -3^2 = -9$$

$$\begin{aligned} (5) \quad (-4)^0 - (-2)^3 \\ (+1) - (-8) = (+1) + (+8) &= 9 \end{aligned}$$

UNITS 9-11: ANSWER KEY

Cumulative Review

$$\begin{aligned} \textcircled{6} & (-3)^2 - \boxed{(-4)(+3)} + (-2) \\ & (+9) - (-12) + (-2) \\ & (+9) + (+12) + (-2) = 19 \end{aligned}$$

$$\begin{aligned} \textcircled{7} & -2a - 3b \\ & -2(3) - 3(-2) \\ & (-6) - (-6) \\ & (-6) + (+6) = 0 \end{aligned}$$

$$\begin{aligned} \textcircled{8} & a - b^3 + 2c^2 \\ & (3) - (-2)^3 + 2(-1)^2 \\ & (3) - (-8) + 2(+1) \\ & (3) - (-8) + (+2) \\ & (3) + (+8) + (+2) = 13 \end{aligned}$$

$$\begin{aligned} \textcircled{9} & 2a(b+c)^2 \\ & 2(3)(-2+(-1))^2 \\ & 2(3)(-3)^2 \\ & 2(3)(9) = 54 \end{aligned}$$

$$\begin{aligned} \textcircled{10} & 3a + 2b - 4a - 3b \\ & -a - b \end{aligned}$$

$$\begin{aligned} \textcircled{11} & 2a^2 - 3ab + 4 - 5ab - 3a^2 \\ & -a^2 - 8ab + 4 \end{aligned}$$

$$\begin{aligned} \textcircled{12} & 2(a+b) - 3a + 4b \\ & 2a + 2b - 3a + 4b \\ & -a + 6b \end{aligned}$$

$$\begin{aligned} \textcircled{13} & 3a(a-b) - 2b(b+3) \\ & 3a^2 - 3ab - 2b^2 - 6b \end{aligned}$$

$$\begin{aligned} \textcircled{14} & 4a(a+b^2) - 2a^2(3-2b) \\ & 4a^2 + 4ab^2 - 6a^2 + 4a^2b \\ & -2a^2 + 4ab^2 + 4a^2b \end{aligned}$$

$$\textcircled{15} \sqrt{60} = \sqrt{2 \cdot 2 \cdot 3 \cdot 5} = 2\sqrt{15}$$

$$\textcircled{16} 3\sqrt{72} = 3\sqrt{2 \cdot 2 \cdot 2 \cdot 3 \cdot 3} = 18\sqrt{2}$$

$$\textcircled{17} (3\sqrt{5})^2 = (9)(5) = 45$$

$$\begin{aligned} \textcircled{18} & (2\sqrt{3})(4\sqrt{21}) \\ & 8\sqrt{63} = 8\sqrt{3 \cdot 3 \cdot 7} = 24\sqrt{7} \end{aligned}$$

$$\begin{aligned} \textcircled{19} & \sqrt{12} - 2\sqrt{108} + 2\sqrt{48} \\ & \sqrt{2 \cdot 2 \cdot 3} - 2\sqrt{2 \cdot 2 \cdot 3 \cdot 3 \cdot 3} + 2\sqrt{2 \cdot 2 \cdot 2 \cdot 3} \\ & 2\sqrt{3} - 12\sqrt{3} + 8\sqrt{3} \\ & -2\sqrt{3} \end{aligned}$$

$$\begin{aligned} \textcircled{20} & 3\sqrt{20} - \sqrt{45} + 2\sqrt{25} \\ & 3\sqrt{2 \cdot 2 \cdot 5} - \sqrt{3 \cdot 3 \cdot 5} + 2(5) \\ & 6\sqrt{5} - 3\sqrt{5} + 10 \\ & 3\sqrt{5} + 10 \end{aligned}$$



UNIT 12: ANSWER KEY

Equations & Inequalities

1. SOLVING EQUATIONS

$$\textcircled{1} \quad x - 3^{+3} = 12^{+3}$$

$$x = 15$$

$$\textcircled{2} \quad 12^{-12} + n = -5^{-12}$$

$$n = -17$$

$$\textcircled{3} \quad 7^{-15} = 15^{-15} - a$$

$$-8 = -a$$

$$a = 8$$

$$\textcircled{4} \quad 13^{-13} - n = -1^{-13}$$

$$-n = -14$$

$$n = 14$$

$$\textcircled{5} \quad 2n - 5^{+5} = 11^{+5}$$

$$2n = 16$$

$$\left(\frac{1}{2}\right)(2n) = \left(\frac{1}{2}\right)(16)$$

$$n = 8$$

$$\textcircled{6} \quad 8^{-8} - 3n = 20^{-8}$$

$$-3n = 12$$

$$\left(-\frac{1}{3}\right)(-3n) = \left(-\frac{1}{3}\right)(12)$$

$$n = -4$$

$$\textcircled{7} \quad -14^{+4} = 5x - 4^{+4}$$

$$-10 = 5x$$

$$\left(\frac{1}{5}\right)(-10) = \left(\frac{1}{5}\right)(5x)$$

$$-2 = x$$

$$x = -2$$

$$\textcircled{8} \quad 4^{-4} - 6a = -8^{-4}$$

$$-6a = -12$$

$$\left(-\frac{1}{6}\right)(-6a) = \left(-\frac{1}{6}\right)(-12)$$

$$a = 2$$

$$\textcircled{9} \quad 4n - 3 - n + 7 = 2n + 3$$

$$3n + 4 = 2n + 3$$

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

$$n = -1$$

$$\textcircled{10} \quad 9 - x + 3 + 5x = x - 4 + 7x - 4$$

$$4x + 12 = 8x - 8$$

$$-4x + 12 = -8^{-12}$$

$$-4x = -20$$

$$\left(-\frac{1}{4}\right)(-4x) = \left(-\frac{1}{4}\right)(-20)$$

$$x = 5$$

$$\textcircled{11} \quad a - 2a - 3a + 1 = 2 - 2a + 3$$

$$-4a + 1 = 5 - 2a^{+2a}$$

$$-2a + 1 = 5^{-1}$$

$$-2a = 4$$

$$\left(-\frac{1}{2}\right)(-2a) = \left(-\frac{1}{2}\right)(4)$$

$$a = -2$$

$$\textcircled{12} \quad -3 + 4n - 5 - 7n = n + 7 - 2n - 1$$

$$-8 - 3n = -n + 6$$

$$-8 - 2n = 6^{+8}$$

$$-2n = 14$$

$$\left(-\frac{1}{2}\right)(-2n) = \left(-\frac{1}{2}\right)(14)$$

$$n = -7$$

$$\textcircled{13} \quad 2(4n - 3) = 5n + 15$$

$$8n - 6 = 5n + 15$$

$$3n - 6 = 15^{+6}$$

$$3n = 21$$

$$\left(\frac{1}{3}\right)(3n) = \left(\frac{1}{3}\right)(21)$$

$$n = 7$$

$$\textcircled{14} \quad 10 - 3(x - 4) = x + 2$$

$$10 - 3x + 12 = x + 2$$

$$22 - 3x = x + 2$$

$$22^{-22} - 4x = 2^{-22}$$

$$-4x = -20$$

$$\left(\frac{1}{4}\right)(-4x) = \left(-\frac{1}{4}\right)(-20)$$

$$x = 5$$

$$\textcircled{15} \quad 4 - 2(3a + 5) = 3(a - 4) - 3$$

$$4 - 6a - 10 = 3a - 12 - 3$$

$$-6 - 6a = 3a - 15$$

$$-6^{+6} - 9a = -15^{+6}$$

$$-9a = -9$$

$$\left(-\frac{1}{9}\right)(-9a) = \left(-\frac{1}{9}\right)(-9)$$

$$a = 1$$

continued

UNIT 12: ANSWER KEY

Equations & Inequalities

$$\begin{aligned} \textcircled{16} \quad 2 - 3(n-4) &= 2(3n-1) - 2 \\ 2 - 3n + 12 &= 6n - 2 - 2 \\ 14 - 3n &= 6n - 4 \\ 14 - 9n &= -4 \\ -9n &= -18 \\ (-\frac{1}{9})(-9n) &= (-\frac{1}{9})(-18) \\ n &= 2 \end{aligned}$$

$$\begin{aligned} \textcircled{17} \quad 2(n+4) - 3(2n-4) &= 8 \\ 2n + 8 - 6n + 12 &= 8 \\ -4n + 20 &= 8 \\ -4n &= -12 \\ (-\frac{1}{4})(-4n) &= (-\frac{1}{4})(-12) \\ n &= 3 \end{aligned}$$

$$\begin{aligned} \textcircled{18} \quad 3(4x-2) - 2(5x+3) &= 6x \\ 12x - 6 - 10x - 6 &= 6x \\ 2x - 12 &= 6x \\ -12 &= 4x \\ (\frac{1}{4})(-12) &= (\frac{1}{4})(4x) \\ -3 &= x \\ x &= -3 \end{aligned}$$

$$\begin{aligned} \textcircled{19} \quad n - 2(4n-5) &= 2n - 3 \\ n - 8n + 10 &= 2n - 3 \\ -7n + 10 &= 2n - 3 \\ -9n + 10 &= -3 \\ -9n &= -13 \\ (-\frac{1}{9})(-9n) &= (-\frac{1}{9})(-13) \\ n &= \frac{13}{9} \end{aligned}$$

$$\begin{aligned} \textcircled{20} \quad 7 - 3(4x-2) + x &= -3 \\ 7 - 12x + 6 + x &= -3 \\ -11x + 13 &= -3 \\ -11x &= -16 \\ (-\frac{1}{11})(-11x) &= (-\frac{1}{11})(-16) \\ x &= \frac{16}{11} \end{aligned}$$



2. PROBLEM SOLVING

$$\textcircled{1} \quad n + 4^{-4} = 13^{-4} \\ n = 9$$

$$n = 8$$

$$\textcircled{2} \quad n - 12^{+12} = -6^{+12} \\ n = 6$$

$$\textcircled{5} \quad 3n^{-n} + 7 = n^{-n} + 3 \\ 2n + 7^{-7} = 3^{-7}$$

$$2n = -4$$

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

$$n = -2$$

$$\textcircled{3} \quad -3^{-5} = n + 5^{-5} \\ -8 = n$$

$$\textcircled{6} \quad 10 - 2n^{-n} = n^{-n} - 8 \\ 10^{-10} - 3n = -8^{-10}$$

$$-3n = -18$$

$$(-\frac{1}{3})(-3n) = (-\frac{1}{3})(-18)$$

$$n = 6$$

$$\textcircled{4} \quad 2n - 5^{+5} = 11^{+5} \\ 2n = 16 \\ (\frac{1}{2})(2n) = (\frac{1}{2})(16)$$

UNIT 12: ANSWER KEY

Equations & Inequalities

$$\begin{aligned} \textcircled{7} \quad 4n^{-3n} - 2 &= 3n^{-3n} + 1 \\ n^{-2} &= 1^{+2} \\ n &= 3 \end{aligned}$$

$$\begin{aligned} \textcircled{8} \quad 5n - (2n + 3) &= 9 \\ 5n - 2n - 3 &= 9 \\ 3n - 3^{+3} &= 9^{+3} \\ 3n &= 12 \\ (\frac{1}{3})(3n) &= (\frac{1}{3})(12) \\ n &= 4 \end{aligned}$$

$$\begin{aligned} \textcircled{9} \quad 3n - (n - 2) &= -2 \\ 3n - n + 2 &= -2 \\ 2n + 2^{-2} &= -2^{-2} \\ 2n &= -4 \\ (\frac{1}{2})(2n) &= (\frac{1}{2})(-4) \\ n &= -2 \end{aligned}$$

$$\begin{aligned} \textcircled{10} \quad 2n^{-4n} + 3 &= 4n^{-4n} - 15 \\ -2n + 3^{-3} &= -15^{-3} \\ -2n &= -18 \\ (-\frac{1}{2})(-2n) &= (-\frac{1}{2})(-18) \\ n &= 9 \end{aligned}$$

$$\begin{aligned} \textcircled{11} \quad 4n^{-6n} - 5 &= 6n^{-6n} + 3 \\ -2n - 5^{+5} &= 3^{+5} \\ -2n &= 8 \\ (-\frac{1}{2})(-2n) &= (-\frac{1}{2})(8) \\ n &= -4 \end{aligned}$$

$$\begin{aligned} \textcircled{12} \quad (2n + 2) - (4n - 3) &= -7 \\ 2n + 2 - 4n + 3 &= -7 \\ -2n + 5^{-5} &= -7^{-5} \\ -2n &= -12 \\ (-\frac{1}{2})(-2n) &= (-\frac{1}{2})(-12) \\ n &= 6 \end{aligned}$$

$$\begin{aligned} \textcircled{13} \quad (4n - 2) - (n + 5) &= 2n + 11 \\ 4n - 2 - n - 5 &= 2n + 11 \\ 3n^{-2n} - 7 &= 2n^{-2n} + 11 \\ n - 7^{+7} &= 11^{+7} \\ n &= 18 \end{aligned}$$

$$\begin{aligned} \textcircled{14} \quad (n - 6) - (3n - 3) &= n + 12 \\ n - 6 - 3n + 3 &= n + 12 \\ -2n - 3 &= n + 12 \\ -3n - 3^{+3} &= 12^{+3} \\ -3n &= 15 \\ (-\frac{1}{3})(-3n) &= (-\frac{1}{3})(15) \\ n &= -5 \end{aligned}$$

$$\begin{aligned} \textcircled{15} \quad 8n - (2n + 6) &= 4n \\ 8n - 2n - 6 &= 4n \\ 6n^{-6n} - 6 &= 4n^{-6n} \\ -6 &= -2n \\ (-\frac{1}{2})(-6) &= (-\frac{1}{2})(-2n) \\ 3 &= n \end{aligned}$$

UNIT 12: ANSWER KEY

Equations & Inequalities

3. INEQUALITIES

$$\begin{aligned} \textcircled{1} \quad 2n^{-n} - 3 &< n^{-n} - 9 \\ n - 3^{+3} &< -9^{+3} \\ n &< -6 \end{aligned}$$

$$\begin{aligned} \textcircled{2} \quad 3x^{-x} + 7 &\geq x^{-x} - 9 \\ 2x + 7^{-7} &\geq -9^{-7} \\ 2x &\geq -16 \\ (\frac{1}{2})(2x) &\geq (\frac{1}{2})(-16) \\ x &\geq -8 \end{aligned}$$

$$\begin{aligned} \textcircled{3} \quad 2(x-4) &> -10 \\ 2x - 8^{+8} &> -10^{+8} \\ 2x &> -2 \\ (\frac{1}{2})(2x) &> (\frac{1}{2})(-2) \\ x &> -1 \end{aligned}$$

$$\begin{aligned} \textcircled{4} \quad 3(4n-1) &\leq 9n+6 \\ 12n^{-9n} - 3 &\leq 9n^{-9n} + 6 \\ 3n - 3^{+3} &\leq 6^{+3} \\ 3n &\leq 9 \\ (\frac{1}{3})(3n) &\leq (\frac{1}{3})(9) \\ n &\leq 3 \end{aligned}$$

$$\begin{aligned} \textcircled{5} \quad 14 &> 2(n-3) - n \\ 14 &> 2n - 6 - n \\ 14^{+6} &> n - 6^{+6} \\ 20 &> n \\ n &< 20 \end{aligned}$$

$$\begin{aligned} \textcircled{6} \quad 6^{-6} - x &\geq 15^{-6} \\ -x &\geq 9 \\ x &\leq -9 \end{aligned}$$

$$\begin{aligned} \textcircled{7} \quad n^{-2n} - 3 &< 2n^{-2n} + 7 \\ -n - 3^{+3} &< 7^{+3} \\ -n &< 10 \\ n &> -10 \end{aligned}$$

$$\begin{aligned} \textcircled{8} \quad 2n &> 3(2n+4) \\ 2n^{-6n} &> 6n^{-6n} + 12 \\ -4n &> 12 \\ (-\frac{1}{4})(-4n) &< (-\frac{1}{4})(12) \\ n &< -3 \end{aligned}$$

$$\begin{aligned} \textcircled{9} \quad 3(n-5) &\leq 2(n+2) \\ 3n^{-2n} - 15 &\leq 2n^{-2n} + 4 \\ n - 15^{+15} &\leq 4^{+15} \\ n &\leq 19 \end{aligned}$$

$$\begin{aligned} \textcircled{10} \quad 5a^{-9a} - 7 &> 9a^{-9a} - 11 \\ -4a - 7^{+7} &> -11^{+7} \\ -4a &> -4 \\ (-\frac{1}{4})(-4a) &< (-\frac{1}{4})(-4) \\ a &< 1 \end{aligned}$$

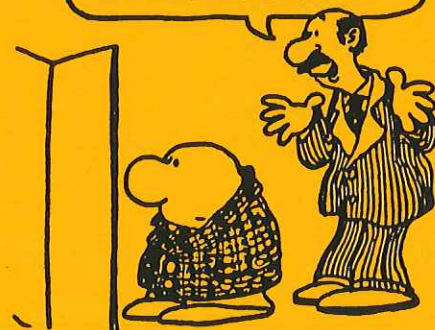
$$\begin{aligned} \textcircled{11} \quad 8^{-8} - 3x &< -7^{-8} \\ -3x &< -15 \\ (-\frac{1}{3})(-3x) &> (-\frac{1}{3})(-15) \\ x &> 5 \end{aligned}$$

$$\begin{aligned} \textcircled{12} \quad 17 &\geq 4(n-3) + 1 \\ 17 &\geq 4n - 12 + 1 \\ 17^{+11} &\geq 4n - 11^{+11} \\ 28 &\geq 4n \\ (\frac{1}{4})(28) &\geq (\frac{1}{4})(4n) \\ 7 &\geq n \\ n &\leq 7 \end{aligned}$$

$$\begin{aligned} \textcircled{13} \quad 2(n-3) - 3(n+2) &\leq 7 \\ 2n - 6 - 3n - 6 &\leq 7 \\ -n - 12^{+12} &\leq 7^{+12} \\ -n &\leq 19 \\ n &\geq -19 \end{aligned}$$

$$\begin{aligned} \textcircled{14} \quad 4x - 3(2x-2) &> x-5 \\ 4x - 6x + 6 &> x - 5 \\ -2x + 6 &> x - 5 \\ -3x + 6^{-6} &> -5^{-6} \\ -3x &> -11 \\ (-\frac{1}{3})(-3x) &< (-\frac{1}{3})(-11) \\ x &< 11/3 \end{aligned}$$

...OF COURSE IT'S OUT OF STYLE,
BEING OUT OF STYLE IS
THE LATEST THING !!




UNIT 12: ANSWER KEY

Equations & Inequalities

$$\begin{aligned} \textcircled{15} \quad & 3 + 2a - 5 \geq a - 4(a - 3) \\ & 3 + 2a - 5 \geq a - 4a + 12 \\ & -2 + 2a \geq -3a + 12 \\ & -2 + 5a \geq 12 \\ & 5a \geq 14 \\ & (\frac{1}{5})(5a) \geq (\frac{1}{5})(14) \\ & a \geq 14/5 \end{aligned}$$

$$\begin{aligned} \textcircled{16} \quad & 8n - 2(3n + 4) < 15 - n \\ & 8n - 6n - 8 < 15 - n \\ & 2n - 8 < 15 - n \\ & 3n - 8 < 15 \\ & 3n < 23 \\ & (\frac{1}{3})(3n) < (\frac{1}{3})(23) \\ & n < 23/3 \end{aligned}$$

4. NUMBER LINE GRAPHING

$$\begin{aligned} \textcircled{1} \quad & 4n - 3 = n - 12 \\ & 3n - 3 = -12 \\ & 3n = -9 \\ & (\frac{1}{3})(3n) = (\frac{1}{3})(-9) \\ & n = -3 \end{aligned}$$


$$\begin{aligned} \textcircled{2} \quad & 5x - 4 = 2(x + 1) \\ & 5x - 4 = 2x + 2 \end{aligned}$$

$$\begin{aligned} 3x - 4 &= +2 \\ 3x &= 6 \\ (\frac{1}{3})(3x) &= (\frac{1}{3})(6) \\ x &= 2 \end{aligned}$$



$$\begin{aligned} \textcircled{3} \quad & 3(n - 4) < 4n - 2 \\ & 3n - 12 < 4n - 2 \\ & -n - 12 < -2 \\ & -n < 10 \\ & n > -10 \end{aligned}$$



$$\begin{aligned} \textcircled{4} \quad & 2(3x - 1) \geq 8x - 10 \\ & 6x - 2 \geq 8x - 10 \\ & -2x - 2 \geq -10 \\ & -2x \geq -8 \\ & (-\frac{1}{2})(-2x) \leq (-\frac{1}{2})(-8) \\ & x \leq 4 \end{aligned}$$



$$\begin{aligned} \textcircled{5} \quad & 4(x - 3) - x \geq x - 6 \\ & 4x - 12 - x \geq x - 6 \\ & 3x - 12 \geq x - 6 \\ & 2x - 12 \geq -6 \\ & 2x \geq 6 \\ & (\frac{1}{2})(2x) \geq (\frac{1}{2})(6) \end{aligned}$$



UNIT 12: ANSWER KEY

Equations & Inequalities

⑥ $5n < 2n - 3 + n + 5$

$$5n < 3n + 2$$

$$2n < 2$$

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

$$n < 1$$



⑦ $4n - 3 = 8n - 11$

$$-4n - 3 = -11 + 3$$

$$-4n = -8$$

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

$$n = 2$$



⑧ $3(2x - 1) = 2(x - 4) - 7$

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

$$6x - 3 = 2x - 15$$

$$4x - 3 = -15 + 3$$

$$4x = -12$$

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

$$x = -3$$



⑨ $8 - 2(n - 3) < n - 1$

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

$$14 - 2n < n - 1$$

$$14 - 3n < -1 + 4$$

$$-3n < -15$$

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

$$n > 5$$



⑩ $6 - 3(x + 1) \geq 5 - x$

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

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

$$3 - 2x \geq 5 - 3$$

$$-2x \geq 2$$

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

$$x \leq -1$$



⑪ $3(n - 1) > -6$

$$3n - 3 > -6 + 3$$

$$3n > -3$$

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

$$n > -1$$



⑫ $2x = 2(x - 1) + 2$

$$2x = 2x - 2 + 2$$

$$2x = 2x$$

$$0 = 0$$

(true identity)

All Solutions



⑬ $8 + 2n > 2(n + 3) + 4$

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

$$8 + 2n > 2n + 10$$

$$8 > 10$$

(false inequality)

No Solutions



⑭ $3n - 1 \leq 5n + 3$

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

$$-2n \leq 4$$

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

$$n \geq -2$$



TODAY IS THE
FIRST DAY OF
THE REST OF
YOUR LIFE
(... ONLY ONE TO
A CUSTOMER!)



⑮ $2(3x + 1) = 6x - 2$

$$6x + 2 = 6x - 2$$

$$2 = -2$$

(false equation)

No Solutions



UNIT 12: ANSWER KEY

Equations & Inequalities

⑩ $3(n-1) \leq 2n-1+n$

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

$$3n-3 \leq 3n-1$$

$$-3 \leq -1 \text{ (true identity)}$$



All Solutions

⑪ $x > 3(x-2)$

$$x > 3x-6$$

$$-2x > -6$$

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

$$x < 3$$



⑫ $4(n-3) = 4n-3$

$$4n-12 = 4n-3$$

$$-12 = -3 \text{ (false equation)}$$



No Solutions



⑬ $2(2a+4) > 5a+17$

$$4a+8 > 5a+17$$

$$-a+8 > 17$$

$$-a > 9$$

$$a < -9$$



⑭ $3x-6 \leq 3(x-2)$

$$3x-6 \leq 3x-6$$

$$-6 \leq -6 \text{ (true identity)}$$



REVIEW & PRACTICE

① $3x-2 = 4x-5$

$$-x-2 = -5$$

$$-x = -3$$

$$x = 3$$

② $2(x-4) = -12$

$$2x-8 = -12$$

$$2x = -4$$

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

$$x = -2$$

③ $3n-5+2n+4 = n+15$

$$5n-1 = n+15$$

UNIT 12: ANSWER KEY

Equations & Inequalities

$$4n - 1^{+1} = 15^{+1}$$

$$4n = 16$$

$$(1/4)(4n) = (1/4)(16)$$

$$n = 4$$

$$\textcircled{4} n - 6 = 3(n - 2) + 4$$

$$n - 6 = 3n - 6 + 4$$

$$n^{-3n} - 6 = 3n^{-3n} - 2$$

$$-2n - 6^{+6} = -2^{+6}$$

$$-2n = 4$$

$$(-1/2)(-2n) = (-1/2)(4)$$

$$n = -2$$

$$\textcircled{5} 15 = 2(x - 3) + 1$$

$$15 = 2x - 6 + 1$$

$$15^{+5} = 2x - 5^{+5}$$

$$20 = 2x$$

$$(1/2)(20) = (1/2)(2x)$$

$$10 = x$$

$$x = 10$$

$$\textcircled{6} 3n - 2 - n - 7 = n - 9$$

$$2n^{-9} - 9 = n^{-9} - 9$$

$$n - 9^{+9} = -9^{+9}$$

$$n = 0$$

$$\textcircled{7} n + 5^{-5} = -7^{-5}$$

$$n = -12$$

$$\textcircled{8} 2n - 8^{+8} = 2^{+8}$$

$$2n = 10$$

$$(1/2)(2n) = (1/2)(10)$$

$$n = 5$$

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

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

$$n^{-2n} + 1 = 2n^{-2n} - 1$$

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

$$-n = -2$$

$$n = 2$$

$$\textcircled{10} 5n - (2n - 3) = n - 1$$

$$5n - 2n + 3 = n - 1$$

$$3n^{-n} + 3 = n^{-n} - 1$$

$$2n + 3^{-3} = -1^{-3}$$

$$2n = -4$$

$$(1/2)(2n) = (1/2)(-4)$$

$$n = -2$$

$$\textcircled{11} (4n + 2) - (n - 1) = 4n + 1$$

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

$$3n^{-4n} + 3 = 4n^{-4n} + 1$$

$$-n + 3^{-3} = 1^{-3}$$

$$-n = -2$$

$$n = 2$$

$$\textcircled{12} 5n - 6n = n + 12$$

$$-n^{-n} = n^{-n} + 12$$

$$-2n = 12$$

$$(-1/2)(-2n) = (-1/2)(12)$$

$$n = -6$$

$$\textcircled{13} 2n^{-n} < n^{-n} - 7$$

$$n < -7$$

$$\textcircled{14} 3(2x - 4) \geq x + 3$$

$$6x^{-x} - 12 \geq x^{-x} + 3$$

$$5x - 12^{+12} \geq 3^{+12}$$

$$5x \geq 15$$

$$(1/5)(5x) \geq (1/5)(15)$$

$$x \geq 3$$

$$\textcircled{15} a + 5 > 4(a - 1)$$

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

$$-3a + 5^{-5} > -4^{-5}$$

$$-3a > -9$$

$$(-1/3)(-3a) < (-1/3)(-9)$$

$$a < 3$$

$$\textcircled{16} 4x - 2 + 5 - 6x \leq 7$$

$$-2x + 3^{-3} \leq 7^{-3}$$

$$-2x \leq 4$$

$$(-1/2)(-2x) \geq (-1/2)(4)$$

$$x \geq -2$$

UNIT 12: ANSWER KEY

Equations & Inequalities

$$\begin{aligned} (17) \quad 2n - 5 &> 3(2n-1) + 6 \\ 2n - 5 &> 6n - 3 + 6 \\ 2n - 5 &> 6n + 3 \\ -4n - 5 &> 3 + 5 \\ -4n &> 8 \\ (-\frac{1}{4})(-4n) &< (-\frac{1}{4})(8) \\ n &< -2 \end{aligned}$$

$$-6 = +6 \text{ (false equation)}$$

←—————→
No Solutions

$$\begin{aligned} (22) \quad n + 3 &\geq 3(n-1) \\ n + 3 &\geq 3n - 3 \\ -2n + 3 &\geq -3 \\ -2n &\geq -6 \\ (-\frac{1}{2})(-2n) &\leq (-\frac{1}{2})(-6) \\ n &\leq 3 \end{aligned}$$



$$\begin{aligned} (18) \quad 3(x-3) - 2(x+1) &\leq 4 \\ 3x - 9 - 2x - 2 &\leq 4 \\ x - 11 &\leq 4 + 11 \\ x &\leq 15 \end{aligned}$$

$$\begin{aligned} (23) \quad 16 &< 2(x-3) \\ 16 &< 2x - 6 \\ 22 &< 2x \\ (\frac{1}{2})(22) &< (\frac{1}{2})(2x) \\ 11 &< x \\ x &> 11 \end{aligned}$$



$$\begin{aligned} (19) \quad 4x - 7 &= 2x + 5 \\ 2x - 7 &= 5 + 7 \\ 2x &= 12 \\ (\frac{1}{2})(2x) &= (\frac{1}{2})(12) \\ x &= 6 \end{aligned}$$



$$\begin{aligned} (24) \quad 3(n+2) - n &< 8 \\ 3n + 6 - n &< 8 \\ 2n + 6 &< 8 \\ 2n &< 2 \\ (\frac{1}{2})(2n) &< (\frac{1}{2})(2) \\ n &< 1 \end{aligned}$$



$$\begin{aligned} (20) \quad 3(2n-1) &< 6n - 2 \\ 6n - 3 &< 6n - 2 \\ -3 &< -2 \text{ (true identity)} \end{aligned}$$

←—————→
All Solutions

$$\begin{aligned} (21) \quad 2(4x-3) &= 8x + 6 \\ 8x - 6 &= 8x + 6 \end{aligned}$$

UNIT 12: ANSWER KEY

Equations & Inequalities

PRACTICE TEST #1

$$\begin{aligned} \textcircled{1} \quad 2(n-5) &= 14 \\ 2n - 10 &= 14 \\ 2n &= 24 \\ \frac{1}{2}(2n) &= \frac{1}{2}(24) \\ n &= 12 \end{aligned}$$

$$\begin{aligned} \textcircled{2} \quad 4x - 3 &< 7x - 12 \\ -3x - 3 &< -12 \\ -3x &< -9 \\ \left(-\frac{1}{3}\right)(-3x) &> \left(-\frac{1}{3}\right)(-9) \\ x &> 3 \end{aligned}$$

$$\begin{aligned} \textcircled{3} \quad 4n - (2n - 3) &= 15 \\ 4n - 2n + 3 &= 15 \\ 2n + 3 &= 15 \\ 2n &= 12 \\ \left(\frac{1}{2}\right)(2n) &= \left(\frac{1}{2}\right)(12) \\ n &= 6 \end{aligned}$$

$$\begin{aligned} \textcircled{4} \quad 3(4x - 1) &= 12x - 1 \\ 12x - 3 &= 12x - 1 \\ -3 &= -1 \quad \text{false eq.} \\ \text{No Solutions} & \\ \longleftarrow & \longrightarrow \end{aligned}$$

$$\begin{aligned} \textcircled{5} \quad 5a &\geq 3(3a - 8) \\ 5a &\geq 9a - 24 \\ \text{continued} & \end{aligned}$$

$$\begin{aligned} -4a &\geq -24 \\ \left(-\frac{1}{4}\right)(-4a) &\leq \left(-\frac{1}{4}\right)(-24) \\ a &\leq 6 \\ \longleftarrow & \bullet \longrightarrow \\ & 6 \end{aligned}$$

$$\begin{aligned} \textcircled{6} \quad (2n - 3) - (4n + 5) &= 2n \\ 2n - 3 - 4n - 5 &= 2n \\ -2n - 8 &= 2n \\ -4n - 8 &= 0 \\ -4n &= 8 \\ \left(-\frac{1}{4}\right)(-4n) &= \left(-\frac{1}{4}\right)(8) \\ n &= -2 \end{aligned}$$

PRACTICE TEST #2

$$\begin{aligned} \textcircled{1} \quad 3(2x + 7) &= x + 6 \\ 6x + 21 &= x + 6 \\ 5x + 21 &= 6 \\ 5x &= -15 \\ \left(\frac{1}{5}\right)(5x) &= \left(\frac{1}{5}\right)(-15) \\ x &= -3 \end{aligned}$$

$$\begin{aligned} \textcircled{2} \quad 2n &\geq 5(n - 3) \\ 2n &\geq 5n - 15 \\ -3n &\geq -15 \\ \left(-\frac{1}{3}\right)(-3n) &\leq \left(-\frac{1}{3}\right)(-15) \\ n &\leq 5 \end{aligned}$$

$$\begin{aligned} \textcircled{3} \quad (n + 3) - 3n &= n + 9 \\ n + 3 - 3n &= n + 9 \\ -2n + 3 &= n + 9 \\ -3n + 3 &= 9 \\ -3n &= 6 \\ \left(-\frac{1}{3}\right)(-3n) &= \left(-\frac{1}{3}\right)(6) \\ n &= -2 \end{aligned}$$

$$\begin{aligned} \textcircled{4} \quad 2(n - 5) &= 3(n - 7) \\ 2n - 10 &= 3n - 21 \\ -n - 10 &= -21 \\ -n &= -11 \quad n = 11 \\ \longleftarrow & \bullet \longrightarrow \\ & 11 \end{aligned}$$

$$\begin{aligned} \textcircled{5} \quad a - 5 &< 3(a - 3) \\ a - 5 &< 3a - 9 \\ -2a - 5 &< -9 \\ -2a &< -4 \\ \left(-\frac{1}{2}\right)(-2a) &> \left(-\frac{1}{2}\right)(-4) \\ a &> 2 \end{aligned}$$

$$\longleftarrow \circ \longrightarrow \\ 2$$

$$\begin{aligned} \textcircled{6} \quad (n + 5) - (3n - 2) &= 2 - 3n \\ n + 5 - 3n + 2 &= 2 - 3n \\ -2n + 7 &= 2 - 3n \\ n + 7 &= 2 \\ n &= -5 \end{aligned}$$

Working With Monomials

1. MULTIPLYING MONOMIALS

$$\textcircled{1} (m^2)(m^3) = m^5$$

$$\textcircled{2} (x^3)(x^4) = x^7$$

$$\textcircled{3} (m^3n)(mn^2) = m^4n^3$$

$$\textcircled{4} (r^3t^4)(r^4t^4) = r^7t^8$$

$$\textcircled{5} (3a^2b)(2ab^5) = 6a^3b^6$$

$$\textcircled{6} (4x^2y^3)(2xy^6) = 8x^3y^9$$

$$\textcircled{7} (-2x^2y)(-6x^4y^7) = 12x^6y^8$$

$$\textcircled{8} (-3x^5y)(2x^4) = -6x^9y$$

$$\textcircled{9} (-2n^4y^3)(3ny^4) = -6n^5y^7$$

$$\textcircled{10} (ab)(ac)(bc) = a^2b^2c^2$$

$$\textcircled{11} (m^2n)(am)(an^2) = a^2m^3n^3$$

$$\textcircled{12} (3y^3z)(7y^4) = 21y^7z$$

$$\textcircled{13} (x^2)^3 = x^6$$

$$\textcircled{14} (a^3)^4 = a^{12}$$

$$\textcircled{15} (3y)^2 = 9y^2$$

$$\textcircled{16} (2m^2)^3 = 8m^6$$

$$\textcircled{17} (-y^3)^6 = y^{18}$$

$$\textcircled{18} (-m^5)^2 = m^{10}$$

$$\textcircled{19} (a^3x^2)^4 = a^{12}x^8$$

$$\textcircled{20} (2a^2b)^2 = 4a^4b^2$$



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

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

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

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

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

UNIT 13: ANSWER KEY

Working With Monomials

$$\textcircled{26} \quad (-3x^2y)^2(-2x)^3 \\ (9x^4y^2)(-8x^3) = -72x^7y^2$$

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

$$\textcircled{28} \quad x^3(x^2y)^2(-xy)^2 \\ x^3(x^4y^2)(x^2y^2) = x^9y^4$$

$$\textcircled{29} \quad 2x^2(-xy^2)^3 \\ 2x^2(-x^3y^6) = -2x^5y^6$$

$$\textcircled{30} \quad -3a^2(-ab^2)^4 \\ -3a^2(a^4b^8) = -3a^6b^8$$



2. DIVIDING MONOMIALS

$$\textcircled{1} \quad \frac{n^4}{n^3} = n$$

$$\textcircled{2} \quad \frac{x^7}{x^4} = x^3$$

$$\textcircled{3} \quad \frac{5n^2}{n^6} = \frac{5}{n^4}$$

$$\textcircled{5} \quad \frac{ab^2}{a^2b^2} = \frac{1}{a}$$

$$\textcircled{4} \quad \frac{x^2}{x^3} = \frac{1}{x}$$

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

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

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

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

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

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

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

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

Working With Monomials

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

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

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

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

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

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

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

$$(21) (2ab^2c)^4(-a^2b)^2$$

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

$$(22) (-3x^2 y^3)^2 (-xy)^3$$

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

$$(23) (ab)(b^2 c)(a^2 c)^3$$

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

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

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

$$(25) -2a(a^2 b)^3$$

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

$$(26) 3mn(m^2 n)(n^3)^2$$

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

$$(27) -2xy(x^2 y)^2(-y)^2$$

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



3. NEGATIVE EXPONENTS

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

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

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

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

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

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

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

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

Working With Monomials

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

$$\textcircled{18} (ab)^{-3}(a^2b)^3 = (a^{-3}b^{-3})(a^6b^3) = a^3b^0 = a^3$$

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

$$\textcircled{19} (-2x^2y)^2(x^{-3}y^2)^{-2} = (4x^4y^2)(x^6y^{-4}) = 4x^{10}y^{-2} = \frac{4x^{10}}{y^2}$$

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

$$\textcircled{20} (-a^2b^{-2})^3(abc^2)^{-2} \\ (-a^6b^{-6})(a^{-2}b^{-2}c^{-4}) \\ -a^4b^{-8}c^{-4} \\ \frac{-a^4}{b^8c^4}$$



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

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

$$\textcircled{21} -3x(xy^2)^{-1}(x^3y) \\ -3x(x^{-1}y^{-2})(x^3y) \\ -3x^3y^{-1} = \frac{-3x^3}{y}$$



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

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

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

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

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

$$\textcircled{24} abc(-3a^2b^{-3})^2 = abc(9a^4b^{-6}) = 9a^5b^{-5}c = \frac{9a^5c}{b^5}$$

$$\textcircled{17} (xy^2)^{-2}(2xy^2)^3 \\ (x^{-2}y^{-4})(8x^3y^6) \\ 8xy^2$$

Working With Monomials

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

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

$$a^0b = b$$

REVIEW & PRACTICE

$$\textcircled{1} \quad (x^3)(x^5) = x^8$$

$$\textcircled{2} \quad (n^2)(n^3)(n^4) = n^9$$

$$\textcircled{3} \quad (2ab)(3a^2b^3) = 6a^3b^4$$

$$\textcircled{4} \quad (-2a^2)(ab^3c) = -2a^3b^3c$$

$$\textcircled{5} \quad (n^3)^2 = n^6$$

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

$$\textcircled{7} \quad (-2x^3)^3 = -8x^9$$

$$\textcircled{8} \quad (-3y)^2 = 9y^2$$

$$\textcircled{9} \quad (-x^2y)^3(2xy)^2 \\ (-x^6y^3)(4x^2y^2) = -4x^8y^5$$

$$\textcircled{10} \quad (-2ab^2c)^2(ab^2)^3 \\ (4a^2b^4c^2)(a^3b^6) = 4a^5b^{10}c^2$$

$$\textcircled{11} \quad ab(-ab^2)^4(-b^2)^3 \\ ab(a^4b^8)(-b^6) = -a^5b^{15}$$

$$\textcircled{12} \quad 2n^2(-nm^2)^2 = 2n^2(n^2m^4) = 2n^4m^4$$

$$\textcircled{13} \quad \frac{x^5}{x^2} = x^3$$

$$\textcircled{14} \quad \frac{n^2}{n^3m^2} = \frac{1}{nm^2}$$

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

$$\textcircled{16} \quad \frac{18x^5y^2}{6x^2y} = 3x^3y$$

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

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

..HOW DO I KNOW YOUR CHECK IS ANY GOOD?



Working With Monomials

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

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

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

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

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

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

$$(25) (ab)^{-1} (2a^{-2} b) \\ (a^{-1} b^{-1}) (2a^{-2} b) \\ 2a^{-3} b^0 = \frac{2}{a^3}$$

$$(26) x^2 (-3xy^{-2}) \\ -3x^3 y^{-2} = \frac{-3x^3}{y^2}$$

$$(27) -3a (ab^2 c)^{-3} \\ -3a (a^{-3} b^{-6} c^{-3})$$

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

$$(28) -2xy (-x^{-2} y)^{-2} \\ -2xy (x^4 y^{-2})$$

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

$$(29) abc (-a^2 b)^{-3} \\ abc (-a^{-6} b^{-3})$$

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

$$(30) x^{-2} y^{-3} (-xy^{-2})^{-2} \\ x^{-2} y^{-3} (x^{-2} y^4) \\ x^{-4} y = \frac{y}{x^4}$$



UNIT 13: ANSWER KEY

Working With Monomials

PRACTICE TEST #1

① $(x^5)(x^7) = x^{12}$

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

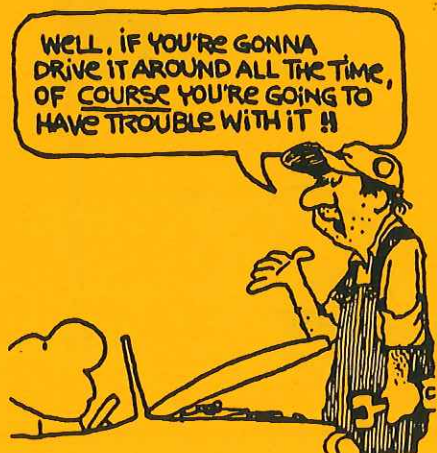
③ $(-3a^2b^4)^2 = 9a^4b^8$

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



