

30E

$$1) \frac{25 \cancel{\text{mi}}}{1} \times \frac{.62 \text{ mi.}}{1 \cancel{\text{mi}}} = 15.5 \text{ mi.}$$

$$2) \frac{7 \cancel{\text{mi}}}{1} \times \frac{1.1 \text{ yd.}}{1 \cancel{\text{mi}}} = 7.7 \text{ yds.}$$

$$3) \frac{11 \cancel{\text{kg}}}{1} \times \frac{2.2 \text{ lbs.}}{1 \cancel{\text{kg}}} = 24.2 \text{ lbs.}$$

$$4) \frac{10 \cancel{\text{qt}}}{1} \times \frac{1.06 \text{ qt.}}{1 \cancel{\text{qt}}} = 10.6 \text{ qts.}$$

$$5) \begin{array}{r} 2X^2 + 3X + 8 \quad \text{R } 21 \\ 2X - 3 \overline{) 4X^3 + 0X^2 + 7X - 3} \\ \underline{-(4X^3 - 6X^2)} \\ 6X^2 + 7X \\ \underline{-(6X^2 - 9X)} \\ 16X - 3 \\ \underline{-(16X - 24)} \\ 21 \end{array}$$

$$6) \begin{array}{r} 2X^2 + 3X + 8 \\ 2X - 3 \overline{) -6X^2 - 9X - 24} \\ \underline{4X^3 + 6X^2 + 16X} \\ 4X^3 + 7X - 24 \\ + 21 \\ \hline 4X^3 + 7X - 3 \end{array}$$

$$7) 12$$

$$8) 5X^3$$

$$9) \frac{1.75 \cancel{\text{yd.}}}{1} \times \frac{9 \text{ ft.}^2}{1 \cancel{\text{yd.}}} = 15.75 \text{ ft.}^2$$

$$10) 25 \times 18 = 450 \text{ ft.}^2$$

$$\frac{450 \cancel{\text{ft.}^2}}{1} \times \frac{1 \text{ yd.}}{9 \cancel{\text{ft.}^2}} = 50 \text{ yards of carpet}$$

$$11) 221 < 224$$

$$12) 45 \text{ ft.}^2 < 50 \text{ ft.}^2$$

$$13) \begin{array}{l} (X-2)(X-2) = \\ X^2 - 4X + 4 \end{array}$$

$$14) \begin{array}{l} (X+4)(X+4) = \\ X^2 + 8X + 16 \end{array}$$

$$15) \begin{array}{l} X^2 + 7X - 60 = 0 \\ (X+12)(X-5) = 0 \\ X = -12, X = 5 \end{array}$$

$$16) \begin{array}{l} (-12)^2 + 7(-12) - 18 = 42 \\ 144 - 84 - 18 = 42 \\ 42 = 42 \\ (5)^2 + 7(5) - 18 = 42 \\ 25 + 35 - 18 = 42 \\ 42 = 42 \end{array}$$

$$17) T = 4 \div 6 = 4/6 = 2/3 \text{ hr. or } 40 \text{ min.}$$

$$18) T = 4 \div 3 = 4/3 = 1 \frac{1}{3} \text{ hr. or } 1 \text{ hr. } 20 \text{ min.}$$

$$19) \begin{array}{l} 2P - 2 + 7 + P - P \\ \text{simplified } 2P + 5 \end{array}$$

$$20) \begin{array}{l} 2P + 5 = 11 \\ 2P = 6, P = 3 \end{array}$$

31A

$$1) \sqrt{16} = 4 \quad 4^3 = 64$$

$$2) 2^2 = 4$$

$$3) \sqrt{100} = 10$$

$$4) \sqrt[3]{8} = 2 \quad 2^2 = 4$$

$$5) X^{5/10} = X^{1/2}$$

$$6) Y^{1/15}$$

$$7) (Y^8)^{1/4} = Y^2$$

$$8) \sqrt[4]{16} = 2 \quad 2^3 = 8$$

$$9) \sqrt[3]{27} = 3 \quad 3^4 = 81$$

$$10) \sqrt[3]{8} = 2 \quad 2 \times 16 = 32$$

$$11) \sqrt{64} = 8 \quad 8^{2/3} = 2^2 = 4$$

$$12) (X^{12})^{1/2} = X^6$$

$$13) (M^{7/6})^6 = M^7$$

$$14) (X^{15} \cdot X^5) = (X^{20})^{1/2} = X^{10}$$

$$15) (X^{10/3})^{1/6} = X^{5/9}$$

$$16) (M^4)^{3/4} = M^3$$

31B

$$1) \sqrt[5]{32} = 2 \quad 2^2 = 4$$

$$2) 9^3 = 729$$

$$3) \sqrt{81} = 9$$

$$4) \sqrt[4]{625} = 5 \quad 5^3 = 125$$

$$5) X^{6/3} = X^2$$

$$6) Y^{1/14}$$

$$7) (Y^{10})^{1/5} = Y^2$$

$$8) \sqrt[3]{27} = 3 \quad 3^2 = 9$$

$$9) \sqrt[4]{81} = 3 \quad 3^5 = 243$$

$$10) \sqrt[3]{64} = 4 \quad 4 \times 4 = 16$$

$$11) 16^{3/12} = 16^{1/4} = 2$$

$$12) (X^8)^{1/4} = X^2$$

$$13) (Y^{5/4})^4 = Y^5$$

$$14) (X \cdot X^4)^{1/5} = (X^5)^{1/5} = X$$

$$15) (X^{12/5})^{1/6} = X^{2/5}$$

$$16) (Y^{14})^{1/2} = Y^7$$

31C

1) $\sqrt[3]{8} = 2$

2) $\sqrt{9} = 3$

3) $5^3 = 125$

4) $\sqrt[3]{1000} = 10$ $10^2 = 100$

5) $X^{6/2} = X^3$

6) $2^{1/3} \cdot 2^2 = 2^{7/3}$

7) $Y^{8/12} \cdot Y^{3/12} = Y^{11/12}$

8) $5^{3/12} \cdot 5^{8/12} = 5^{11/12}$

9) $\frac{8 \cancel{\text{in.}}}{1} \times \frac{2.5 \text{ cm}}{1 \cancel{\text{in.}}} = 20 \text{ cm}$

10) $\frac{30 \cancel{\text{qt.}}}{1} \times \frac{.95 \text{ l}}{1 \cancel{\text{qt.}}} = 28.5 \text{ liters}$

11) $5616 < 5625$

12) $\frac{1200 \cancel{\text{acres}}}{1} \times \frac{43,560 \text{ ft.}^2}{1 \cancel{\text{acre}}} = 52,272,000 \text{ ft.}^2$

$$\frac{2 \cancel{\text{mi.}}^2}{1} \times \frac{5280 \text{ ft.}}{1 \cancel{\text{mi.}}} \times \frac{5280 \text{ ft.}}{1 \cancel{\text{mi.}}} = 55,756,800 \text{ ft.}^2$$

$$2 \text{ mi.}^2 > 1,200 \text{ acres}$$

13) $(A+B)(A+B) = A^2 + 2AB + B^2$

14) $X^3 + 2X^2 + XY^2 - 2X^2 - 4X - 2Y^2 = X^3 + XY^2 - 4X - 2Y^2$

15) $(X+8)(X+3)$

16) $-4Y - 4X = 20 \Rightarrow Y + X = -5$
 $Y = -5 - X$

$$5(-5 - X) + 3X = 10$$

$$-25 - 5X + 3X = 10 \quad Y = -5 - (-35/2)$$

$$-2X = 35 \quad Y = -10/2 + 35/2$$

$$X = -35/2 \quad Y = 25/2$$

$$(-35/2, 25/2)$$

17) Answers for next two questions will vary.
The example is for Pennsylvania.

$$\frac{44,832 \cancel{\text{mi.}}^2}{1} \times \frac{27,878,400 \text{ ft.}^2}{1 \cancel{\text{mi.}}}$$

$$= 1,249,844,400,000 \text{ ft.}^2$$

(Number of square feet in a mile is obtained by multiplying 5,280 by 5,280.)

18) $1,249,844,400,000 \div 6,000,000,000 = 208 \text{ ft.}^2$
(Answers for other states will be different)

19) $452 \times 62 = 28,024 \text{ lbs.}$

20) $\frac{28,025 \cancel{\text{lbs.}}}{1} \times \frac{1 \text{ ton}}{2000 \cancel{\text{lbs.}}} = 14 \text{ tons}$

31D

1) $\sqrt{4} = 2$ $2^3 = 8$

2) $\sqrt{81} = 9$

3) $7^2 = 49$

4) $\sqrt[3]{64} = 4$

5) $Y^{3/4}$

6) $10^{1/3} \cdot 10^3 = 10^{1/3} \cdot 10^{9/3} = 10^{10/3}$

7) $A^{4/4} = A^1$ or A

8) $X^{6/4} = X^{3/2}$

9) $\frac{50 \cancel{\text{mi.}}}{1} \times \frac{1.6 \text{ km}}{1 \cancel{\text{mi.}}} = 80 \text{ km}$

10) $\frac{100 \cancel{\text{oz.}}}{1} \times \frac{28 \text{ g}}{1 \cancel{\text{oz.}}} = 2800 \text{ g}$

11) $2021 < 2025$

12) $\frac{.25 \cancel{\text{acres}}}{1} \times \frac{43,560 \text{ ft.}^2}{1 \cancel{\text{acre}}} = 10,890 \text{ ft.}^2$

$$10,890 \text{ ft.}^2 < 12,000 \text{ ft.}^2$$

13) $(X-A)(X-A) = X^2 - 2AX + A^2$

14) $X^3 - 2X^2 + 4X + 2X^2 - 4X + 8 = X^3 + 8$

15) $X^2 - 7X + 6$

16) $Y - (-4) = 0$
 $Y = -4$
 $(-4, -4)$

17) $\frac{262,400 \cancel{\text{mi.}}^2}{1} \times \frac{27,878,400 \text{ ft.}^2}{1 \cancel{\text{mi.}}}$
 $= 7,315,292,160,000 \text{ ft.}^2$

18) $7,315,292,160,000 \div 6,000,000,000 = 1,219 \text{ ft.}^2$

19) $706 \times 62 = 43,772 \text{ lbs.}$

20) $\frac{43,772 \cancel{\text{lbs.}}}{1} \times \frac{1 \text{ ton}}{2000 \cancel{\text{lbs.}}} = 22 \text{ tons}$

31E

1) $10^4 = 10,000$

2) $\sqrt{25} = 5$ $5^3 = 125$

3) $13^1 = 13$

4) $\sqrt{16} = 4$ $4^3 = 64$

5) $A^{3/3} = A^1$ or A

6) $3^{1/2} \cdot 3^3 = 3^{7/2}$

7) $X^{5/6} \cdot X^{3/6} = X^{8/6} = X^{4/3}$

8) $2^{2/3} \cdot 2^{3/6} \cdot 2^{7/6} = 2^{12/6} = 2^2 = 4$

9) $\frac{10\cancel{\text{m}}}{1} \times \frac{1.1\text{ yd.}}{1\cancel{\text{m}}} = 11\text{ yd.}$

10) $\frac{20\cancel{\text{kg}}}{1} \times \frac{2.2\text{ lbs.}}{1\cancel{\text{kg}}} = 44\text{ lbs.}$

11) $\frac{2\cancel{\text{ft.}}}{1} \times \frac{12\text{ in.}}{1\cancel{\text{ft.}}} \times \frac{12\text{ in.}}{1\cancel{\text{ft.}}} \times \frac{12\text{ in.}}{1\cancel{\text{ft.}}}$
 $= 3,456\text{ in.}^3$

12) $\frac{14\cancel{\text{yd.}}^3}{1} \times \frac{3\text{ ft.}}{1\cancel{\text{yd.}}} \times \frac{3\text{ ft.}}{1\cancel{\text{yd.}}} \times \frac{3\text{ ft.}}{1\cancel{\text{yd.}}}$
 $= 378\text{ ft.}^3$

13) $(5A + 5B)(5A + 5B) =$
 $25A^2 + 50AB + 25B^2$

14) $X^3 + X^2Y + XY^2 - X^2Y - XY^2 - Y^3 =$
 $X^3 - Y^3$

15) $4X^2 + 10X + 6$

16) $6 + Y = 2X \Rightarrow Y - 2X = -6$
 $-3(Y - 2X = -6) \Rightarrow -3Y + 6X = 18$
 $3Y - 4X = 2$
 $-3Y + 6X = 18$ $6 + Y = 2(10)$
 $2X = 20$ $6 + Y = 20$
 $X = 10$ $Y = 14$
 $(10, 14)$

17) $\frac{586,400\cancel{\text{mi.}}^2}{1} \times \frac{27,878,400\text{ ft.}^2}{1\cancel{\text{mi.}}}$
 $= 16,347,893,760,000\text{ ft.}^2$

18) $16,347,893,760,000 \div 6,000,000,000 =$
 $2,724.6\text{ ft.}^2$

19) $100 \times 100 \times 50 = 500,000\text{ ft.}^3$

$500,000 \times 62 = 31,000,000\text{ lbs.}$

20) $\frac{31,000,000\cancel{\text{lbs.}}}{1} \times \frac{1\text{ ton}}{2000\cancel{\text{lbs.}}}$
 $= 15,500\text{ tons}$

32A

1) 5×10^5

2) 3.56×10^8

3) 5.48×10^7

4) 9.6×10^{-4}

5) 4.68×10^{-3}

6) 9.13×10^{-8}

7) $\approx 1.2 \times 10^{12}$
 $(1.9 \times 10^5)(6 \times 10^6)$
 $(1.9 \times 6)(10^5 \times 10^6) = 11.4 \times 10^{11} =$
 $1 \times 10^{12} \checkmark$

8) $\approx 8 \times 10^{14}$
 $(1.815 \times 10^5)(4.16 \times 10^9)$
 $(1.815 \times 4.16)(10^5 \times 10^9) = 7.5504 \times 10^{14} \approx$
 $7.55 \times 10^{14} \checkmark$

9) $\approx 3 \times 10^{13}$
 $(8.6 \times 10^5)(3.64 \times 10^7)$
 $(8.6 \times 3.64)(10^5 \times 10^7) = 31.304 \times 10^{12} =$
 $3.1304 \times 10^{13} \approx 3.1 \times 10^{13} \checkmark$

10) $\approx 8 \times 10^5$
 $(8.5 \times 10^{-5})(9 \times 10^9)$
 $(8.5 \times 9)(10^{-5} \times 10^9) = 76.5 \times 10^4 =$
 $7.65 \times 10^5 = 8 \times 10^5 \checkmark$

11) $\approx 5 \times 10^1$
 $(9.3 \times 10^{-4})(5 \times 10^4)$
 $(9.3 \times 5)(10^{-4} \times 10^4) = 46.5 \times 10^0 =$
 $4.65 \times 10^1 = 5 \times 10^1 \checkmark$

12) $\approx 8 \times 10^{-7}$
 $(2.1 \times 10^{-3})(3.50 \times 10^{-4})$
 $(2.1 \times 3.50)(10^{-3} \times 10^{-4}) = 7.35 \times 10^{-7} \approx$
 $7.4 \times 10^{-7} \checkmark$

13) $\approx 1 \times 10^{-4}$
 $(5.6 \times 10^5) \div (4 \times 10^9)$
 $(5.6 \div 4)(10^5 \div 10^9) = 1.4 \times 10^{-4} =$
 $1 \times 10^{-4} \checkmark$

14) ≈ 4
 $(9.8 \times 10^6) \div (2.45 \times 10^6)$
 $(9.8 \div 2.45)(10^6 \div 10^6) = 4.0 \times 10^0 =$
 $4.0 \checkmark$

15) $\approx 3 \times 10^{-1}$
 $(3.6 \times 10^{-3}) \div (1.2 \times 10^{-2})$
 $(3.6 \div 1.2)(10^{-3} \div 10^{-2}) = 3.0 \times 10^{-1} \checkmark$

32B

1) 6×10^5

2) 8.54×10^8

3) 6.28×10^7

4) 9.5×10^{-5}

5) 5.28×10^{-3}

6) 9.21×10^{-7}

7) $\approx 9 \times 10^{11}$
 $(1.8 \times 10^5)(5 \times 10^6)$
 $(1.8 \times 5)(10^5 \times 10^6) = 9.0 \times 10^{11} =$
 $9 \times 10^{11} \checkmark$

8) $\approx 3 \times 10^{12}$
 $(9.15 \times 10^5)(3 \times 10^6)$
 $(9.15 \times 3)(10^5 \times 10^6) = 27.45 \times 10^{11} =$
 $3 \times 10^{12} \checkmark$

9) $\approx 4 \times 10^{12}$
 $(9.6 \times 10^4)(4.36 \times 10^7)$
 $(9.6 \times 4.36)(10^4 \times 10^7) = 41.856 \times 10^{11} =$
 $4.1856 \times 10^{12} \approx 4.2 \times 10^{12} \checkmark$

10) $\approx 7 \times 10^5$
 $(7.5 \times 10^{-5})(9 \times 10^9)$
 $(7.5 \times 9)(10^{-5} \times 10^9) = 67.5 \times 10^4 =$
 $6.75 \times 10^5 = 7 \times 10^5 \checkmark$

11) $\approx 5 \times 10^0$
 $(7.9 \times 10^{-5})(6.25 \times 10^4)$
 $(7.9 \times 6.25)(10^{-5} \times 10^4) = 49.375 \times 10^{-1} =$
 $4.9375 \times 10^0 \approx 4.9 \times 10^0$ or $4.9 \checkmark$

12) $\approx 1 \times 10^{-10}$
 $(3.1 \times 10^{-4})(4 \times 10^{-7})$
 $(3.1 \times 4)(10^{-4} \times 10^{-7}) = 12.4 \times 10^{-11} =$
 $1.24 \times 10^{-10} \approx 1 \times 10^{-10} \checkmark$

13) $\approx 1 \times 10^{-3}$
 $(5.2 \times 10^4) \div (4 \times 10^7)$
 $(5.2 \div 4)(10^4 \div 10^7) = 1.3 \times 10^{-3} =$
 $1 \times 10^{-3} \checkmark$

14) $\approx 4 \times 10^{-4}$
 $(2.4 \times 10^7) \div (6 \times 10^{10})$
 $(2.4 \div 6)(10^7 \div 10^{10}) = .4 \times 10^{-3} =$
 $4 \times 10^{-4} \checkmark$

15) $\approx 5 \times 10^{-2}$
 $(3.5 \times 10^{-4}) \div (7 \times 10^{-3})$
 $(3.5 \div 7)(10^{-4} \div 10^{-3}) = .5 \times 10^{-1}$
 $5 \times 10^{-2} \checkmark$