

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

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

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

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

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

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) $6 + Y = 2X \Rightarrow Y - 2X = -6$
 $-3(Y - 2X = -6) \Rightarrow -3Y + 6X = 18$

$$\begin{array}{r} 3Y - 4X = 2 \\ -3Y + 6X = 18 \\ \hline 2X = 20 \quad 6 + Y = 2(10) \\ X = 10 \quad 6 + Y = 20 \\ \quad \quad \quad Y = 14 \end{array}$$

(10, 14)

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

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

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^{-8}

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

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

32C

- 1) 7×10^5
- 2) 7.6×10^{-3}
- 3) $\approx 40,000,000,000$ or 4×10^{10}
 $(5 \times 10^3)(8 \times 10^6)$
- 4) $(5 \times 8)(10^3 \times 10^6) = 40 \times 10^9$
- 5) 4×10^{10} (significant digits correct)
- 6) check with calculator
- 7) ≈ 500 or 5×10^2
 $(6.13 \times 10^4) \div (1.2 \times 10^2)$
- 8) $(6.13 \div 1.2)(10^4 \div 10^2) = 5.108 \times 10^2$
- 9) 5.1×10^2 (significant digits correct)
- 10) check with calculator
- 11) $(10^3)^{2/3} = 10^2$
 $10^2 \cdot 10^2 \cdot 10^{-3} = 10^1$ or 10
- 12) $(2^3)^{2/3} = 2^2$
 $2^2 \cdot 2^2 = 2^4 = 16$
- 13) $10^{1/3} \cdot 10^3 \cdot 10^{-1} = 10^{7/3}$
- 14) $A^{10/2} \cdot A^{-1/2} \cdot A^{-3/2} = A^3$

$$15) \frac{10 \cancel{\text{km}}}{1} \times \frac{1 \text{ mi.}}{1.61 \cancel{\text{km}}} = 6.21 \text{ miles}$$

$$16) \frac{75 \cancel{\text{g}}}{1} \times \frac{.035 \text{ oz.}}{1 \cancel{\text{g}}} = 2.625 \text{ oz.}$$

$$17) (3X - 3Y)(3X - 3Y) \\ 9X^2 - 18XY + 9Y^2$$

$$18) X^3 - X^2Y + 4XY^2 + X^2Y - 4XY^2 + Y = \\ X^3 + Y^3$$

$$19) X^2 + 4X + 5X + 20 = 0 \\ X^2 + 9X + 20 = 0 \\ (X + 4)(X + 5) = 0 \\ X = -4, X = -5$$

$$-4(-4 + 4) + 5(-4) + 3 = -17 \\ 0 + (-20) + 3 = -17 \\ -17 = -17$$

$$-5(-5 + 4) + 5(-5) + 3 = -17 \\ -5(-1) + (-25) + 3 = -17 \\ 5 - 25 + 3 = -17 \\ -17 = -17$$

$$20) X(2X - 9) = 0 \\ X = 0, X = 9/2$$

$$(0)[2(0) - 9] = 0 \\ 0 = 0$$

$$(9/2)[2(9/2) - 9] = 0 \\ 9/2(9 - 9) = 0 \\ 9/2(0) = 0 \\ 0 = 0$$

32D

- 1) 5.86×10^8
- 2) 5.95×10^{-4}
- 3) ≈ 126 or 1.26×10^2
 $(1.8 \times 10^4)(7.2 \times 10^{-3})$
- 4) $(1.8 \times 7.2)(10^4 \times 10^{-3}) = 12.96 \times 10^1$
- 5) 1.296×10^2 with significant digits 1.3×10^2
- 6) check with calculator
- 7) ≈ 4800 or 4.8×10^3
 $(1.45 \times 10^6) \div (2.9 \times 10^2)$
- 8) $(1.45 \div 2.9)(10^6 \div 10^2) = .5 \times 10^4$
- 9) 5.0×10^3 (significant digits correct)
- 10) check with calculator
- 11) $5^{-2} \cdot 5^0 \cdot 5^2 = 5^0 = 1$
- 12) $3^3 \cdot 3^3 \cdot 3^1 = 3^7$
- 13) $\frac{26 \cancel{\text{mi.}}}{1} \times \frac{1.6 \text{ km}}{1 \cancel{\text{mi.}}} = 41.6 \text{ km}$

$$14) \frac{500 \cancel{\text{g}}}{1} \times \frac{.035 \text{ oz.}}{1 \cancel{\text{g}}} = 17.5 \text{ oz.}$$

$$15) D^3 + 5D^2 + 25D - 5D^2 - 25D - 125 = \\ D^3 - 125$$

$$16) A^2 - AT + T^2$$

$$17) X(5X - 10) = 0 \\ X = 0, X = 2$$

$$(0)[5(0) - 10] = 0 \\ 0 = 0$$

$$(2)[5(2) - 10] = 0 \\ 2(10 - 10) = 0 \\ 2(0) = 0 \\ 0 = 0$$

$$18) X^2 + 7X - 60 = 0 \\ (X + 12)(X - 5) = 0 \\ X = -12, X = 5$$

$$(-12)^2 + 7(-12) - 18 = 42 \\ 144 - 84 - 18 = 42 \\ 42 = 42$$

$$(5)^2 + 7(5) - 18 = 42 \\ 25 + 35 - 18 = 42 \\ 42 = 42$$

10) check with calculator

$$19) 10N + 2(N + 2) - 4(N + 4) + 8 = 3(N + 4) - 11 \\ 10N + 2N + 4 - 4N - 16 + 8 = 3N + 12 - 11 \\ 8N - 4 = 3N + 1 \\ 5N = 5 \\ N = 1 \quad 1, 3, 5$$

$$20) .10D + .05N = 1.35 \quad D + N = 16$$

$$10D + 5N = 135 \\ -5D - 5N = -80$$

$$\frac{5D}{5} = \frac{55}{5} \quad (11) + N = 16 \\ D = 11 \quad N = 5$$

32E

1) 2.38×10^7

2) 1.12×10^{-7}

3) $\approx 600,000$ or 6×10^5
 $(9.2 \times 10^{-1})(6.4 \times 10^5)$

4) $(9.2 \times 6.4)(10^{-1} \times 10^5) = 58.88 \times 10^4$

5) 5.888×10^5 with significant digits 5.9×10^5

6) check with calculator

7) ≈ 100 or 1×10^2
 $(4 \times 10^{-1})(2.5 \times 10^{-1}) \div (1 \times 10^{-3})$

8) $(4 \times 2.5 \div 1)(10^{-1} \times 10^{-1} \div 10^{-3}) = 10 \times 10^1$

9) 1×10^2 (significant digits correct)

10) check with calculator

11) $A^{9/12} \cdot A^{16/12} = A^{25/12}$

12) $3^1 \cdot 3^2 \cdot 3^4 = 3^7$

13) $\frac{100 \cancel{\text{m}}}{1} \times \frac{1.1 \text{ yds.}}{1 \cancel{\text{m}}} = 110 \text{ yds.}$

14) $\frac{2 \cancel{\text{qt.}}}{1} \times \frac{1.06 \text{ qts.}}{1 \cancel{\text{qt.}}} = 2.12 \text{ qts.}$

15) $(X - B)(X + B)$

16) $4X(X^4 - 81)$
 $4X(X^2 - 9)(X^2 + 9)$
 $4X(X - 3)(X + 3)(X^2 + 9)$

17) $X^2 + X - 72 = 0$
 $(X + 9)(X - 8) = 0$
 $X = -9, X = 8$
 $(-9)^2 + (-9) - 12 = 60$
 $81 - 9 - 12 = 60$
 $60 = 60$
 $(8)^2 + (8) - 12 = 60$
 $64 + 8 - 12 = 60$
 $60 = 60$

18) $(2 - A)(2 + A) = 0$
 $A = 2, A = -2$

$4 - (-2)^2 = 0$
 $4 - 4 = 0$
 $4 - (2)^2 = 0$
 $4 - 4 = 0$

19) $\frac{9.5 \times 10^6 \cancel{\text{m}^2}}{1} \times \frac{5.28 \times 10^3 \text{ ft.}}{1 \cancel{\text{m.}}} \times \frac{5.28 \times 10^3 \text{ ft.}}{1 \cancel{\text{m.}}}$

$= 265 \times 10^{12} = 2.65 \times 10^{14} \text{ sq. ft.}$

with significant digits $2.6 \times 10^{14} \text{ sq. ft.}$ or
 $2.7 \times 10^{14} \text{ sq. ft.}$ depending on when
rounding was done.

20) $(2.65 \times 10^{14} \text{ sq. ft.}) \div (6 \times 10^9 \text{ people}) =$
 $(2.65 \div 6)(10^{14} \div 10^9) = .44 \times 10^5 =$
 $4.4 \times 10^4 \text{ sq. ft. per person}$

1 acre $\approx 4.4 \times 10^4 \text{ sq. ft.}$ so 1 acre per person

33A

1) $3^3 = 27$

$$\begin{array}{r} 2 \\ 27 \overline{) 80} \\ \underline{54} \\ 26 \end{array} \quad \begin{array}{r} 2 \\ 9 \overline{) 26} \\ \underline{18} \\ 8 \end{array} \quad \begin{array}{r} 2 \\ 3 \overline{) 8} \\ \underline{6} \\ 2 \end{array} \quad \begin{array}{r} 2 \\ 1 \overline{) 2} \\ \underline{2} \\ 0 \end{array}$$

2222_3

2) $5^2 = 25$

$$\begin{array}{r} 3 \\ 25 \overline{) 80} \\ \underline{75} \\ 5 \end{array} \quad \begin{array}{r} 1 \\ 5 \overline{) 5} \\ \underline{5} \\ 0 \end{array} \quad \begin{array}{r} 0 \\ 1 \overline{) 0} \\ \underline{0} \\ 0 \end{array}$$

310_5

3) $4^3 = 64$

$$\begin{array}{r} 1 \\ 64 \overline{) 80} \\ \underline{64} \\ 16 \end{array} \quad \begin{array}{r} 1 \\ 16 \overline{) 16} \\ \underline{16} \\ 0 \end{array} \quad \begin{array}{r} 0 \\ 4 \overline{) 0} \\ \underline{0} \\ 0 \end{array} \quad \begin{array}{r} 0 \\ 1 \overline{) 0} \\ \underline{0} \\ 0 \end{array}$$

1100_4

4) $6^2 = 36$

$$\begin{array}{r} 2 \\ 36 \overline{) 100} \\ \underline{72} \\ 28 \end{array} \quad \begin{array}{r} 4 \\ 6 \overline{) 28} \\ \underline{24} \\ 4 \end{array} \quad \begin{array}{r} 4 \\ 1 \overline{) 4} \\ \underline{4} \\ 0 \end{array}$$

244_6

5) $8^3 = 512$

$$\begin{array}{r} 2 \\ 512 \overline{) 1352} \\ \underline{1024} \\ 328 \end{array} \quad \begin{array}{r} 5 \\ 64 \overline{) 328} \\ \underline{320} \\ 8 \end{array} \quad \begin{array}{r} 1 \\ 8 \overline{) 8} \\ \underline{8} \\ 0 \end{array} \quad \begin{array}{r} 0 \\ 1 \overline{) 0} \\ \underline{0} \\ 0 \end{array}$$

2510_8

6) $6^4 = 1296$

$$\begin{array}{r} 1 \\ 1296 \overline{) 1352} \\ \underline{1296} \\ 56 \end{array} \quad \begin{array}{r} 0 \\ 216 \overline{) 56} \\ \underline{56} \\ 0 \end{array} \quad \begin{array}{r} 1 \\ 36 \overline{) 36} \\ \underline{36} \\ 0 \end{array} \quad \begin{array}{r} 3 \\ 6 \overline{) 20} \\ \underline{18} \\ 2 \end{array}$$

10132_6

10132_6

7) $5 \times 7^2 + 6 \times 7^1 + 3 \times 7^0$

$5(49) + 6(7) + 3(1) =$
 $245 + 42 + 3 = 290$

8) $4 \times 5^2 + 4 \times 5^1 + 1 \times 5^0$

$4(25) + 4(5) + 1(1) =$
 $100 + 20 + 1 = 121$

9) $2 \times 3^3 + 1 \times 3^2 + 2 \times 3^1 + 1 \times 3^0$

$2(27) + 1(9) + 2(3) + 1(1) =$
 $54 + 9 + 6 + 1 = 70$

10) $3 \times 5^3 + 4 \times 5^2 + 2 \times 5^1 + 1 \times 5^0$

$3(125) + 4(25) + 2(5) + 1(1) =$
 $375 + 100 + 10 + 1 = 486$

11) $6 \times (12)^2 + 10 \times (12)^1 + 8 \times (12)^0$

$6(144) + 10(12) + 8(1) =$
 $864 + 120 + 8 = 992$

12) $11 \times (13)^2 + 8 \times (13)^1 + 1 \times (13)^0$

$11(169) + 8(13) + 1(1) =$
 $1859 + 104 + 1 = 1964$

Problem in Student Text was rewritten after first printing.
This is a solution for E81₁₃ = _____ 10