Chapter 2 Review of Basic Algebra

Exercise 2.1

A. 1. $\boxed{19a}$

2. $\boxed{3m}$

3. $\boxed{-a-10}$

4. $\boxed{-3a-14}$

5. $\boxed{-2x-4y}$

6. $\boxed{3p+q}$

7. $\boxed{14f-4v}$

8. $\boxed{2c-3d}$

9. $\boxed{0.8x}$

10. $\boxed{1.06x}$

11. $\boxed{1.4x}$

12. $\boxed{0.98x}$

13. $\boxed{2.79x}$

14. $\boxed{4.05y}$

15. $\boxed{-x^2-x-8}$

16. $\boxed{-ax+x-2}$

17. $2x-3y-x-4y=\boxed{x-7y}$

18. $-4+5a+2-3a=\boxed{2a-2}$

19. $12b+4c+9+8-8b-2c-15=\boxed{4b+2c+2}$

20. $a^2-ab+b^2-3a^2-5ab+4b^2=\boxed{-2a^2-6ab+5b^2}$

21. $-3m^2+4m+5-4+2m+2m^2=\boxed{-m^2+6m+1}$

22. $6-4x+3y-1-5x-2y+9=\boxed{14-9x+y}$

23. $7a-5b+3a-4b-5b=\boxed{10a-14b}$

24. $3f-f^2+fg-f+3f^2+2fg=\boxed{2f+2f^2+3fg}$

25. $4b^4d+2ac^7-(-5b^4d)-3ac$

$=\boxed{9b^4d+2ac^7-3ac}$

26. $(8t^2-6t-9)-(7t^2-6t+7)$

$=8t^2-6t-9-7t^2+6t-7$

$=\boxed{t^2-16}$

27. $\frac{18y}{2}-\frac{12}{5}+3\frac{1}{4}y$

$=9y-2.4+3.25y$

$=\boxed{12.25y-2.4}$

28. $1.3x+x^2+\frac{x}{2}-2x+4$

$=x^2+(1.3+0.5-2)x+4$

$=\boxed{x^2-0.2x+7}$

29. $\frac{k}{(1+0.05)}+\frac{k}{(1+0.05)^2}$

$=0.952381k+0.907029k$

$=\boxed{1.859410k}$

30. $x\left(1+0.052\times\frac{142}{365}\right)+\frac{x}{\left(1+0.052\times\frac{91}{365}\right)}$

$=1.020230x+0.993806x$

$=\boxed{2.014036x}$

B. 1. $\boxed{-12x}$

2. $\boxed{-56a}$

3. $\boxed{-10ax}$

4. $\boxed{27ab}$

5. $\boxed{-2x^2}$

6. $\boxed{24m^2}$

7. $\boxed{60xy}$

8. $\boxed{-24abc}$

9. $\boxed{-2x+4y}$

10. $\boxed{10x-20}$

11. $\boxed{2ax^2-3ax-a}$

12. $\boxed{-24x+12bx+6b^2x}$

13. $20x-24-6+15x=\boxed{35x-30}$

14. $-24a+3b+14a-18b=\boxed{-10a-15b}$

15. $-15ax+3a+5a-2ax-3ax-3a=\boxed{-20ax+5a}$

16. $24y-32-4y+2-1+y=\boxed{21y-31}$

17. $3x^2-x+6x-2=\boxed{3x^2+5x-2}$

18. $5m^2-2mn-15mn+6n^2=\boxed{5m^2-17mn+6n^2}$

19. $x^3-x^2y+xy^2+x^2y-xy^2+y^3=\boxed{x^3+y^3}$

20. $a^3-2a^2+a-a^2+2a-1=\boxed{a^3-3a^2+3a-1}$

21. $10x^2-8x-5x+4-3x^2+21x-5x+35=\boxed{7x^2+3x+39}$

22. $2(2a^2-2a-3a+3)-3(3a^2-2a+3a-2)$

$=4a^2-10a+6-9a^2-3a+6$

$=\boxed{-5a^2-13a+12}$

23. $3x^2(x^2+2x-3)-4x(x^2+2x-3)+(x^2+2x-3)$

$=3x^4+6x^3-9x^2-4x^3-8x^2+12x+x^2+2x-3$

$=3x^4+2x^3-16x^2+14x-3$

24. $(5b^2+5b-5)(b^3+4b+2)$

$=5b^2(b^3+4b+2)+5b(b^3+4b+2)-5(b^3+4b+2)$

$=5b^5+20b^3+10b^2+5b^4+20b^2+10b-5b^3-20b-10$

$=5b^5+5b^4+15b^3+30b^2-10b-10$

25. $\boxed{4ab}$

26. $\boxed{-5y}$

27. $\boxed{4x}$

28. $\boxed{-6}$

29. $\boxed{10m-4}$

30. $\boxed{-2x+3}$

31. $\boxed{-2x^2+3x+6}$

32. $\boxed{a^2+4a+3}$

C. 1. $3x-2y-3=3(-4)-2(-5)-3=-12+10-3=\boxed{-5}$

2. $$\frac{1}{2}(3x^2-x-1)-\frac{1}{4}(5-2x-x^2)$$
$$=\frac{1}{2}[3(-3)^2-(-3)-1]-\frac{1}{4}[5-2(-3)-(-3)^2]$$
$$=\frac{1}{2}(27+3-1)-\frac{1}{4}(5+6-9)$$
$$=\frac{1}{2}(29)-\frac{1}{4}(2)$$
$$=14.5-0.5$$
$$=\boxed{14}$$

3. $(pq-vq)-f=(p-v)q-f=(12-7)2000-4500=10\ 000-4500=\boxed{5500}$

4. $F/C=13\ 000/0.65=\boxed{20\ 000}$

5. $(1-d1)(1-d2)(1-d3)=(1-0.35)(1-0.08)(1-0.02)=(0.65)(0.92)(0.98)=\boxed{0.58604}$

6. $C+0.38C=0.24C=(1+0.38+0.24)C=1.62C=1.62(\$25.00)=\boxed{\$40.50}$

7. $$\frac{RP(n+1)}{2\mathrm{N}}=\frac{0.21\times\$1200\times(77+1)}{2\times26}=\boxed{\$378}$$

8. $$\frac{\mathrm{I}}{\mathrm{Pt}}=\frac{63}{840\times\frac{219}{365}}=\frac{63}{840\times0.60}=\boxed{0.125}$$

9. $$\frac{\mathrm{I}}{\mathrm{rt}}=\frac{\$198}{0.165\times\frac{146}{365}}=\frac{\$198}{0.165\times0.40}=\boxed{\$3000}$$

10. $\dfrac{2\text{NC}}{\text{P}(n+1)} = \dfrac{2\times 52\times 60}{1800(25+1)} = \dfrac{2\times 52\times 60}{1800\times 26} = \boxed{0.1\dot{3}}$

11. $\text{P}(1+rt) = \$880\left(1+0.12\times\dfrac{76}{365}\right)$

$= \$880(1+0.024986) = \$880(1.024986) = \boxed{\$901.99}$

12. $\text{FV}(1-rt) = \$1200\left(1-0.175\times\dfrac{256}{365}\right)$

$= \$1200(1-0.122740) = \$1200(0.877260) = \boxed{\$1052.71}$

13. $\dfrac{\text{P}}{1-dt} = \dfrac{\$1253}{1-0.135\times\frac{284}{365}} = \dfrac{\$1253}{1-0.083219} = \dfrac{\$1253}{0.916781} = \boxed{\$1400.06}$

14. $\dfrac{\text{S}}{1+rt} = \dfrac{\$1752}{1+0.152\times\frac{228}{365}} = \dfrac{\$1752}{1+0.094948} = \dfrac{\$1752}{1.094948} = \boxed{\$1600.08}$

15. $S\left[1 + r \times \dfrac{t}{365}\right]$ for $S = 3240,\ r = 0.125,\ t = 290$

$= 3240\left[1+(0.125)\left(\dfrac{290}{365}\right)\right]$

$= 3240\ (1.099315)$

$= \boxed{3561.780822}$

16. $(SP\times X) - FC - (VC\times X)$ for $SP = 13,\ X = 125,\ FC = 875,\ VC = L$

$= (13\times 125) - 875 - (4\times 125)$

$= 1625 - 875 - 500$

$= \boxed{250}$

17. $(1+i)^m - 1$ for $i = 0.0275,\quad m = 2$

$= (1+0.0275)^2 - 1$

$= 1.055756 - 1$

$= \boxed{0.055756}$

18. $\text{PmT}\left[\dfrac{(1+i)^n-1}{i}\right]$ for $\text{PmT}=500,\ i=0.025,\ n=2$

$$=500\left[\frac{(1+0.025)^2-1}{0.025}\right]$$
$$=500\left[\frac{0.050625}{0.025}\right]$$
$$=500(2.025)$$
$$=\boxed{1012.50}$$

19. $1-[(1-d_1)(1-d_2)]$ for $d_1=0.15,\ d_2=0.04$

$$=1-[(1-0.15)(1-0.04)]$$
$$=1-[(0.85)(0.96)]$$
$$=1-(0.816)$$
$$=\boxed{0.184}$$

20. $\left[\dfrac{(FV)(i)}{(1+i)^n-1}\right]$ for $FV=10\ 000,\ i=0.0075,\ n=20$

$$=\left[\frac{(10\ 000)(0.0075)}{(1+0.0075)^{20}-1}\right]$$
$$=\left(\frac{750}{0.0161184}\right)$$
$$=\boxed{4653.063194}$$

Exercise 2.2

A. 1. $\boxed{81}$

2. $\boxed{1}$

3. $\boxed{16}$

4. $\boxed{1}$

5. $\boxed{\dfrac{16}{81}}$

6. $\boxed{\dfrac{625}{1296}}$

7. $\boxed{-\frac{1}{64}}$

8. $\boxed{-\frac{8}{27}}$

9. $\boxed{0.25}$

10. $\boxed{113.379904}$

11. $\boxed{-0.001}$

12. $\boxed{-335.544320}$

13. $\boxed{1}$

14. $\boxed{1}$

15. $\boxed{\frac{1}{9}}$

16. $\boxed{512}$

17. $\boxed{-\frac{1}{125}}$

18. $\boxed{\frac{1}{167.9616}}$

19. $\boxed{125}$

20. $\boxed{\frac{81}{16}}$

21. $\boxed{\frac{1}{1.01}}$

22. $\boxed{1}$

23. $\boxed{-11.526683}$

24. $\frac{1}{(1.07)^0} = \frac{1}{1} = \boxed{1}$

25. $\frac{1}{(1+0.025)^{10}} = \frac{1}{1.280085} = \boxed{0.781198}$

26. $100(1+0.0225)^{7} = 100(1.168539) = \boxed{116.853901}$

27. $425(1+0.16)^{-4} = 425(0.938480) = \boxed{398.85413}$

28. $\left(\dfrac{1500}{200}\right)^{0.5} - 1 = 1.105995 - 1 = \boxed{0.105995}$

29. $\dfrac{(1+0.03)^{25}}{0.03} = \dfrac{2.093778}{0.03} = \boxed{69.792598}$

30. $\left[\dfrac{1-(1.01)^{-20}}{0.01}\right] = \dfrac{1-0.819544}{0.01} = \dfrac{0.180456}{0.01} = \boxed{18.045553}$

B. 1. $2^5 \times 2^3 = 2^{5+3} = \boxed{2^8}$

2. $(-4)^3 \times (-4) = (-4)^{3+1} = \boxed{(-4)^4}$

3. $4^7 \div 4^4 = 4^{7-4} = \boxed{4^3}$

4. $(-3)^9 \div (-3)^7 = (-3)^{9-7} = \boxed{(-3)^2}$

5. $(2^3)^5 = 2^{3\times 5} = \boxed{2^{15}}$

6. $\left[(-4)^3\right]^6 = (-4)^{3\times 6} = \boxed{(-4)^{18}}$

7. $a^4 \times a^{10} = a^{4+10} = \boxed{a^{14}}$

8. $m^{12} \div m^7 = m^{12-7} = \boxed{m^5}$

9. $3^4 \times 3^6 \times 3 = 3^{4+6+1} = \boxed{3^{11}}$

10. $(-1)^3(-1)^7(-1)^5 = (-1)^{3+7+5} = \boxed{(-1)^{15}}$

11. $\dfrac{6^7 \times 6^3}{6^9} = 6^{7+3-9} = \boxed{6}$

12. $\dfrac{(x^4)(x^5)}{x^7} = x^{4+5-7} = \boxed{x^2}$

13. $\left(\dfrac{3}{5}\right)^4 \left(\dfrac{3}{5}\right)^7 = \left(\dfrac{3}{5}\right)^{4+7} = \boxed{\dfrac{3^{11}}{5^{11}}}$

14. $\left(\dfrac{1}{6}\right)^5 \div \left(\dfrac{1}{6}\right)^3 = \left(\dfrac{1}{6}\right)^{5-3} = \boxed{\dfrac{1}{6^2}}$

15. $\left(-\frac{3}{2}\right)\left(-\frac{3}{2}\right)^6\left(-\frac{3}{2}\right)^4 = \left(-\frac{3}{2}\right)^{1+6+4} = \boxed{\frac{(-3)^{11}}{2^{11}}}$

16. $\left(-\frac{3}{4}\right)^8 \div \left(-\frac{3}{4}\right)^7 = \left(-\frac{3}{4}\right)^{8-7} = \boxed{-\frac{3}{4}}$

17. $(1.025)^{80}(1.025)^{70} = (1.025)^{80+70} = \boxed{1.025^{150}}$

18. $1.005^{240} \div 1.005^{150} = 1.005^{240-150} = \boxed{1.005^{90}}$

19. $\left[1.04^{20}\right]^4 = 1.04^{20\times 4} = \boxed{1.04^{80}}$

20. $\left[\left(-\frac{3}{7}\right)^5\right]^3 = \left(-\frac{3}{7}\right)^{5\times 3} = \boxed{\frac{-3^{15}}{7^{15}}}$

21. $(1+i)^{100}(1+i)^{100} = (1+i)^{100+100} = \boxed{(1+i)^{200}}$

22. $(1-r)^2(1-r)^2(1-r)^2 = (1-r)^{2+2+2} = \boxed{(1-r)^6}$

23. $\left[(1+i)^{80}\right]^2 = (1+i)^{80\times 2} = \boxed{(1+i)^{160}}$

24. $\left[(1-r)^{40}\right]^3 = (1-r)^{40\times 3} = \boxed{(1-r)^{120}}$

25. $(ab)^5 = \boxed{a^5b^5}$

26. $(2xy)^4 = \boxed{16x^4y^4}$

27. $(m^3n)^8 = \boxed{m^{24}n^8}$

28. $\left(\frac{a^3b^2}{x}\right)^4 = \boxed{\frac{a^{12}b^8}{x^4}}$

29. $2^3 \times 2^5 \times 2^{-4} = 2^{3+5-4} = \boxed{2^4}$

30. $5^2 \div 5^{-3} = 5^{2-(-3)} = \boxed{5^5}$

31. $\left(\frac{a}{b}\right)^{-8} = \boxed{\frac{b^8}{a^8}}$

32. $\left(\frac{1+i}{i}\right)^{-n} = \boxed{\frac{i^n}{(1+i)^n}}$

Exercise 2.3

A. 1. $\sqrt{5184} = \boxed{72.0000}$

2. $\sqrt{205.9225} = \boxed{14.3500}$

3. $\sqrt[7]{2187} = \boxed{3.0000}$

4. $\sqrt[10]{1.1046221} = \boxed{1.0100}$

5. $\sqrt[20]{4.3184} = 1.075886 = \boxed{1.0759}$

6. $\sqrt[16]{0.00001526} = 0.500002 = \boxed{0.5000}$

7. $\sqrt[6]{1.0825} = \boxed{1.0133}$

8. $\sqrt[12]{1.15} = 1.011715 = \boxed{1.0117}$

B. 1. $3025^{\frac{1}{2}} = \boxed{55}$

2. $2401^{\frac{1}{4}} = \boxed{7}$

3. $525.21875^{\frac{2}{5}} = \boxed{12.25}$

4. $21.6^{\frac{4}{3}} = \boxed{60.154991}$

5. $\sqrt[12]{1.125^7} = \boxed{1.071122}$

6. $\sqrt[6]{1.095} = \boxed{1.015241}$

7. $4^{\left(\frac{1}{3}\right)} = \dfrac{1}{4^{\frac{1}{3}}} = \dfrac{1}{1.587401} = \boxed{0.629961}$

8. $1.06^{\left(-\frac{1}{12}\right)} = \dfrac{1}{1.06^{\frac{1}{12}}} = \dfrac{1}{1.004868} = \boxed{0.995156}$

9. $\dfrac{1.03^{60} - 1}{0.03} = \dfrac{5.891603 - 1}{0.03} = \boxed{163.053437}$

10. $\dfrac{1 - 1.05^{-36}}{0.05} = \dfrac{1 - 0.172657}{0.05} = \boxed{16.546852}$

11. $\boxed{2.158925}$

12. $\boxed{0.589664}$

13. $26.50(1.043)\left(\dfrac{3.536138-1}{0.043}\right) = 26.50(1.043)(58.979962) = \boxed{1630.176673}$

14. $350.00(1.05)\left(\dfrac{2.653298-1}{0.05}\right) = 350.00(1.05)(33.065954) = \boxed{12\ 151.73813}$

15. $133.00\left(\dfrac{1-0.520035}{0.056}\right) = 133.00\,(8.570795) = \boxed{1139.915716}$

16. $270.00\left(\dfrac{1-0.759412}{0.035}\right) = 270.00\,(6.873956) = \boxed{1855.967995}$

17. $5000.00\,(0.581251) + 137.50\left(\dfrac{1-0.581251}{0.0275}\right)$

$= 2906.252832 + 137.50\,(15.227252) = 2906.252832 + 2093.747168 = \boxed{5000.00}$

18. $1000.00\,(0.623167) + 300.00\left(\dfrac{1-0.623167}{0.03}\right)$

$= 623.166939 + 300.00\,(12.561102) = 623.166939 + 3768.330608 = \boxed{4391.497547}$

19. $112.55 = 100.00\,(1+i)^4$

$(1+i)^4 = 1.1255$

$(1+i) = 1.1255^{0.25}$

$(1+i) = 1.029998$

$i = \boxed{0.029998}$

20. $380.47 = 300.00\,(1+i)^{12}$

$(1+i)^{12} = 1.268233$

$(1+i) = 1.268233^{0.083}$

$(1+i) = 1.019999$

$i = \boxed{0.019999}$

21. $3036.77 = 2400.00\,(1+i)^6$

$(1+i)^6 = 1.265321$

$(1+i) = 1.265321^{0.16}$

$(1+i) = 1.04$

$i = \boxed{0.04}$

22. $1453.36 = 800.00(1+i)^{60}$

$(1+i)^{60} = 1.8167$

$(1+i) = 1.8167^{0.016\dot{6}}$

$(1+i) = 1.01$

$i = \boxed{0.01}$

Exercise 2.4

A. 1. $2^9 = 512$

$\boxed{9 = \log_2 512}$

2. $3^7 = 2187$

$\boxed{7 = \log_3 2187}$

3. $5^{-3} = \dfrac{1}{125}$

$\boxed{-3 = \log_5 \dfrac{1}{125}}$

4. $10^{-5} = 0.00001$

$\boxed{-5 = \log_{10} 0.00001}$

5. $e^{2j} = 18$

$2j = \log_e 18$

or $\boxed{2j = \ln 18}$

6. $e^{-3x} = 12$

$-3x = \log_e 12$

or $\boxed{-3x = \ln 12}$

B. 1. $\log_2 32 = 5$

$\boxed{2^5 = 32}$

2. $\log_3 \dfrac{1}{81} = -4$

$\boxed{3^{-4} = \dfrac{1}{81}}$

3. $\log_{10} 10 = 1$

   $\boxed{10^1 = 10}$

4. $\ln e^2 = 2$

   $\boxed{e^2 = e^2}$

C. 1. $\ln 2 = \boxed{0.693147}$

2. $\ln 200 = \boxed{5.298317}$

3. $\ln 0.105 = \boxed{-2.253795}$

4. $$\ln\left[300(1.10^{15})\right] = \ln 300 + \ln 1.10^{15}$$
$$= \ln 300 + 15(\ln 1.10)$$
$$= 5.703782 + 15(0.095310)$$
$$= 5.703782 + 1.429653$$
$$= \boxed{7.133435}$$

5. $$\ln\left[\frac{2000}{1.09^9}\right] = \ln 2000 - \ln 1.09^9$$
$$= \ln 2000 - 9(\ln 1.09)$$
$$= 7.600902 - 9(0.086178)$$
$$= 7.600902 - 0.775599$$
$$= \boxed{6.825303}$$

6. $$\ln 850\left[\frac{1.01^{-120}}{0.01}\right] = \ln 850 + \ln 1.01^{-120} - \ln 0.01$$
$$= \ln 850 - 120(\ln 1.01) - \ln 0.01$$
$$= 6.745236 - 120(0.009950) - (-4.605170)$$
$$= 6.745236 - 1.194040 + 4.605170$$
$$= \boxed{10.156367}$$

Business Math News Box

1. The IOC distributes 90% of broadcast revenue to other organizations in the Olympic Movement. It retains 10% to cover operational and administrative costs.

   IOC retains 0.10(1 496 000 000) = $\boxed{\$149\ 600\ 000\ (C\$149.6\ million)}$

2. IOC distribution (C$ millions) = $\boxed{C\$133.9 \times 10^6}$

3. Estimate for total Vancouver Winter Games revenue = Revenue from broadcast partnerships / 0.50 = 1 339 000 000 / 0.50 = $2 678 000 000

   Answer expressed in exponent form = $\boxed{\text{C\$2678} \times 10^6 \text{ million}}$

   Estimate for total Sochi Winter Games revenue = Revenue from broadcast partnerships / 0.50 = 1 496 000 000 / 0.50 = $2 992 000 000

   Answer expressed in exponent form = $\text{C\$2992} \times 10^6$ million

4. Annual growth rate in broadcast revenue since Lake Placid = $(1.496 \text{ billion}/21.7 \text{ million})^{1/34} - 1$ = 0.132590 = $\boxed{13.26\% \text{ per year}}$

Exercise 2.5

A. 1. $15x = 45$

$\boxed{x = 3}$

2. $-7x = 35$

$\boxed{x = -5}$

3. $0.9x = 72$

$\boxed{x = 80}$

4. $0.02x = 13$

$\boxed{x = 650}$

5. $\frac{1}{6}x = 3$

$\boxed{x = 18}$

6. $-\frac{1}{8}x = 7$

$\boxed{x = -56}$

7. $\frac{3}{5}x = -21$

$\frac{1}{5}x = -7$

$\boxed{x = -35}$

8. $-\frac{4}{3}x = -32$

$\frac{1}{3}x = 8$

$\boxed{x = 24}$

9. $x-3=-7$

$\boxed{x=-4}$

10. $-2x=7-3x$

$\boxed{x=7}$

11. $x+6=-2$

$\boxed{x=-8}$

12. $3x=9+2x$

$\boxed{x=9}$

13. $4-x=9-2x$

$\boxed{x=5}$

14. $2x+7=x-5$

$\boxed{x=-12}$

15. $x+0.6x=32$

$1.6x=32$

$\boxed{x=20}$

16. $x-0.3x=210$

$0.7x=210$

$\boxed{x=300}$

17. $x-0.04x=192$

$0.96x=192$

$\boxed{x=200}$

18. $x+0.07x=64.20$

$1.07x=64.20$

$\boxed{x=60}$

B. 1. $3x+5=7x-11$

$-4x=-16$

$\boxed{x=4}$

LS: $3x+5 = 3(4)+5$

$= 12+5$

$= 17$

RS: $7x-11 = 7(4)-11$

$= 28-11$

$= 17$

2. $5-4x=-4-x$

$-3x=-9$

$\boxed{x=3}$

LS: $5-4x=5-(4)(3)$

$=5-12$

$=-7$

RS: $=-4-x$

$=-4-3$

$=-7$

3. $2-3x-9=2x-7+3x$

$-3x-7=5x-7$

$-8x=0$

$\boxed{x=0}$

LS: $=2-3x-9$

$=2-3(0)-9$

$=-7$

RS: $=2x-7+3x$

$=2(0)-7+3(0)$

$=-7$

4. $4x-8-9x=10+2x-4$

$-5x-8=6+2x$

$-7x=14$

$\boxed{x=-2}$

LS: $=4x-8-9x$

$=4(-2)-8-9(-2)$

$=-8-8+18=2$

RS: $=10+2x-4$

$=10+2(-2)-4$

$=10-4-4=2$

5. $3x+14=4x+9$

$-x=-5$

$\boxed{x=5}$

LS: $=3x+14$

$=3(5)+14$

$=15+14=29$

RS: $=4x+9$

$=4(5)+9$

$=20+9=29$

6. $16x-12=6x-32$

$10x=-20$

$\boxed{x=-2}$

LS: $=16x-12$

$=16(-2)-12$

$=-32-12=-44$

RS: $=6x-32$

$=6(-2)-32$

$=-12-32=-44$

7. $5+3+4x=5x+12-25$

$+4x-5x=+12-25-5-3$

$-x=-21$

$\boxed{x=21}$

LS: $=5+3+4x$

$=8+4(21)$

$=8+84=92$

RS: $=5x+12-25$

$=5(21)-13$

$=105-13=92$

8. $-3+2x+5=5x-36+14$

$+2x-5x=-36+14+3-5$

$-3x=-24$

$\boxed{x=8}$

LS: $=-3+2x+5$

$=-3+2(8)+5$

$=-3+16+5$

$=18$

RS: $=5x-36+14$

$=5(8)-36+14$

$=40-36+14=18$

$x-50=100+0.34x+0.21x$

$x-50=100+0.55x$

9. $x-0.55x=150$

$(1-0.55)x=150$

$0.45x=150$

$\boxed{x=333.\dot{3}}$

CHECK:

L.S.	R.S.
$333.\dot{3}-50$	$100+0.34(333.\dot{3})+0.21(333.3)$
$=283.\dot{3}$	$=100+113.\dot{3}+70$
	$=283.\dot{3}$

10.
$$\frac{x}{1+0.25\times\frac{6}{12}}=\frac{2^3}{3^2}x$$

$$\frac{x}{1.125}=\frac{8}{9}x$$

$$0.\overline{8}\,x-0.\overline{8}\,x=0$$

$$\boxed{x=\text{all real numbers}}$$

CHECK:

L.S.	R.S.
$\frac{1}{1+0.25\times\frac{6}{12}}$	$\frac{2^3}{3^2}(1)$
$=\frac{1}{1.125}$	$=\frac{8}{9}(1)$
$=0.\overline{8}$	$=0.\overline{8}$

***Exercise* 2.6**

A. 1. $12x-4(9x-20)=320$

$12x-36x+80=320$

$-24x=240$

$\boxed{x=-10}$

$\text{LS}=12(-10)-4[9(-10)-20]$

$=-120-4[-90-20]$

$=-120+440$

$=320$

$\text{RS}=320$

2. $5(x-4)-3(2-3x)=-54$

$5x-20-6+9x=-54$

$14x-26=-54$

$14x=-28$

$\boxed{x=-2}$

$\text{LS}=5[-2-4]-3[2-3(-2)]$

$=5(-6)-3(2+6)$

$=-30-24$

$=-54$

$\text{RS}=-54$

3. $3(2x-5)-2(2x-3)=-15$

$$\begin{aligned} 6x-15-4x+6&=-15\\ 2x-9&=-15\\ 2x&=-6\\ \boxed{x=-3}& \end{aligned}$$

$$\begin{aligned} \text{LS}&=3[2(-3)-5]-2[2(-3)-3]\\ &=3[-65]-2[-6-3]\\ &=3(-11)-2(-9)\\ &=-33+18\\ &=-15\\ \text{RS}&=-15 \end{aligned}$$

4. $17-3(2x-7)=7x-3(2x-1)$

$$\begin{aligned} 17-6x+21&=7x-6x+3\\ -6x+38&=x+3\\ -7x&=-35\\ \boxed{x=5}& \end{aligned}$$

$$\begin{aligned} \text{LS}&=17-3[2(5)-7]\\ &=17-3[10-7]\\ &=17-9=8\\ \text{RS}&=7(5)-3[2(5)-1]\\ &=35-3[10-1]\\ &=35-27=8 \end{aligned}$$

5. $4x+2(2x-3)=18$

$$\begin{aligned} 4x+4x-6&=18\\ 8x&=24\\ \boxed{x=3}& \end{aligned}$$

$$\begin{aligned} \text{LS}&=4(3)+2[2(3)-3]\\ &=12+2[6-3]\\ &=12+6\\ &=18\\ \text{RS}&=18 \end{aligned}$$

6. $-3(1-11x)+(8x-15)=187$

$$-3+33x+8x-15=187$$
$$33x+8x=187+3+15$$
$$41x=205$$
$$\boxed{x=5}$$

$$\text{LS}=-3[(1-11(5)]+[8(5)-15]$$
$$=-3[-54]+25$$
$$=162+25$$
$$=187$$
$$\text{RS}=187$$

7. $10x-4(2x-1)=32$

$$10x-8x+4=32$$
$$2x=28$$
$$\boxed{x=14}$$

$$\text{LS}=10(14)-4[2(14)-1]$$
$$=140-4[27]$$
$$=140-108$$
$$=32$$
$$\text{RS}=32$$

8. $-2(x-4)+12(3-2x)=-8$

$$-2x+8+36-24x=-8$$
$$-2x-24x=-8-8-36$$
$$-26x=-52$$
$$\boxed{x=2}$$

$$\text{LS}=-2(2-4)+12[3-2(2)]$$
$$=-4+8+36-48$$
$$=-8$$
$$\text{RS}=-8$$

9. $x\left(1+0.12\times\dfrac{65}{365}\right)=1225.64$

$$1.021370x=1225.64$$
$$x=1199.996245$$
$$\boxed{x=1200.00}$$

CHECK:

L.S.	R.S.
$1200\left(1+0.12\times\frac{65}{365}\right)$ $=1200(1.021370)$ $=1225.643836$	1225.64

10. $x+\frac{x}{1.25}+\frac{x}{(1.25)^2}=3148+\frac{1000}{(1.25)^3}$

$x+0.80x+0.64x=3148+512$

$2.44x=3660$

$\boxed{x=1500}$

CHECK:

L.S.	
$1500+\frac{1500}{1.25}+\frac{1500}{(1.25)^2}$ $=1500+1200+960$ $=3660$	3660

B. 1. $x-\frac{1}{4}x=15$

$4x-x=60$

$3x=60$

$\boxed{x=20}$

2. $x+\frac{5}{8}x=26$

$8x+5x=208$

$13x=208$

$\boxed{x=16}$

3. $\frac{2}{3}x-\frac{1}{4}=-\frac{7}{4}-\frac{5}{6}x$

$8x-3=-21-10x$

$18x=-18$

$\boxed{x=-1}$

4. $\frac{5}{3}-\frac{2}{5}x=\frac{1}{6}x-\frac{1}{30}$

$50-12x=5x-1$

$-17x=-51$

$\boxed{x=3}$

5. $\frac{3}{4}x+4=\frac{113}{24}-\frac{2}{3}x$

$18x+96=113-16x$

$34x=17$

$\boxed{x=\frac{1}{2}}$

6. $2-\frac{3}{2}x=\frac{2}{3}x+\frac{31}{9}$

$36-27x=12x+62$

$-39x=26$

$\boxed{x=-\frac{2}{3}}$

$1-\frac{1}{3}x=15+\frac{2}{3}x$

7. $3\left[1-\frac{1}{3}x\right]=3\left[15+\frac{2}{3}x\right]$

$3-x=45+2x$

$-42=3x$

$\boxed{x=-14}$

$\frac{3x-2}{5}=\frac{2x-1}{3}$

8. $3(3x-2)=5(2x-1)$

$9x-6=10x-5$

$\boxed{x=-1}$

$$\frac{21}{8}-\frac{2}{5}x=\frac{11}{4}x-\frac{1}{10}$$

9. $40\left[\frac{21}{8}-\frac{2}{5}x\right]=40\left[\frac{11}{4}x-\frac{1}{10}\right]$

$$105-16x=110x-4$$

$$109=126x$$

$$\boxed{x=\frac{109}{126}}$$

$$-\frac{2}{3}x-\frac{1}{12}x=\frac{3}{4}+\frac{1}{24}x$$

10. $24\left[-\frac{2}{3}x-\frac{1}{12}x\right]=24\left[\frac{3}{4}+\frac{1}{24}x\right]$

$$-16x-2x=18+x$$

$$-18x=18+x$$

$$-18=19x$$

$$\boxed{x=\frac{-18}{19}}$$

C. 1. $\frac{3}{4}(2x-1)-\frac{1}{3}(5-2x)=-\frac{55}{12}$

$$9(2x-1)-4(5-2x)=-55$$

$$18x-9-20+8x=-55$$

$$26x-29=-55$$

$$26x=-26$$

$$\boxed{x=-1}$$

2. $\frac{4}{5}(4-3x)+\frac{53}{40}=\frac{3}{10}x-\frac{7}{8}(2x-3)$

$$32(4-3x)+53=12x-35(2x-3)$$

$$128-96x+53=12x-70x+105$$

$$-96x+181=-58x+105$$

$$-38x=-76$$

$$\boxed{x=2}$$

3. $\frac{2}{3}(2x-1)-\frac{3}{4}(3-2x)=2x-\frac{20}{9}$

$$24(2x-1)-27(3-2x)=72x-80$$
$$48x-24-81+54x=72x-80$$
$$102x-105=72x-80$$
$$30x=25$$
$$\boxed{x=\frac{5}{6}}$$

4. $\frac{4}{3}(3x-2)-\frac{3}{5}(4x-3)=\frac{11}{60}+3x$

$$80(3x-2)-36(4x-3)=11+180x$$
$$240x-160-144x+108=11+180x$$
$$96x-52=11+180x$$
$$-84x=63$$
$$\boxed{x=-\frac{3}{4}}$$

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

$$15\left[\frac{2}{3}(5x-1)\right]=15\left[-\frac{3}{5}(x+2)\right]$$
$$10(5x-1)=-9(x+2)$$
$$50x-10=-9x-18$$
$$59x=-8$$
$$\boxed{x=\frac{-8}{59}}$$

D. 1. $y=mx+b$

$$y-b=mx$$
$$\boxed{x=\frac{y-b}{m}}$$

2. $r=\frac{M}{S}$

$$Sr=M$$
$$\boxed{S=\frac{M}{r}}$$

3. $\text{PV} = \dfrac{\text{PMT}}{i}$

$$\boxed{\text{PMT} = \text{PV}i}$$

4. $\text{I} = \text{P}\,rt$

$$\boxed{t = \frac{\text{I}}{\text{P}\,r}}$$

5. $\text{S} = \text{P}(1 + rt)$

$$\frac{\text{S}}{\text{P}} = 1 + rt$$

$$\frac{\text{S}}{\text{P}} - 1 = rt$$

$$r = \frac{\dfrac{\text{S}}{\text{P}} - 1}{t}$$

$$r = \frac{\dfrac{\text{S} - \text{P}}{\text{P}}}{t}$$

$$\boxed{r = \frac{\text{S} - \text{P}}{\text{P}t}}$$

6. $\text{PV} = \text{FV}(1 + i)^{-n}$

$$\frac{\text{PV}}{\text{FV}} = (1 + i)^{-n}$$

$$\left[\frac{\text{PV}}{\text{FV}}\right]^{-\frac{1}{n}} = 1 + i$$

$$\left[\frac{\text{FV}}{\text{PV}}\right]^{\frac{1}{n}} = 1 + i$$

$$\boxed{i = \left[\frac{\text{FV}}{\text{PV}}\right]^{\frac{1}{n}} - 1}$$

7. $P = \dfrac{S}{(1 + rt)}$ for t

$$P(1 + rt) = S$$

$$P + Prt = S$$

$$Prt = S - P$$

$$\boxed{t = \frac{S - P}{Pr}}$$

$N = L(1-d)$ for d

8. $N = L - dL$

$dL = L - N$

$$\boxed{d = \frac{L-N}{L}}$$

$f = (1+i)^m - 1$ for i

9. $(1+f) = (1+i)^m$

$(1+f)^{\frac{1}{m}} = ((1+i)^m)^{\frac{1}{m}}$

$(1+f)^{\frac{1}{m}} = 1+i$

$$\boxed{i = (1+f)^{\frac{1}{m}} - 1}$$

$FV = PV(1+i)^n$ for n

10. $\frac{FV}{PV} = (1+i)^n$

$\ln\left(\frac{FV}{PV}\right) = n \ln(1+i)$

$$\boxed{n = \frac{\ln\left(\frac{FV}{PV}\right)}{\ln(1+i)}}$$

***Exercise* 2.7**

1. Let the cost be \$$x$.

Selling price $= \$\left(x + \frac{3}{4}x\right)$

$\therefore x + \frac{3}{4}x = 49.49$

$4x + 3x = 197.96$

$7x = 197.96$

$x = 28.28$

The cost was $\boxed{\$28.28.}$

2. Let the regular selling price be $\$x$.

   Sale price $= \$\left(x - \frac{1}{3}x\right)$

   $$\therefore x - \frac{1}{3}x = 576$$
   $$3x - x = 1728$$
   $$2x = 1728$$
   $$x = 864$$

   The regular selling price was $\boxed{\$864.}$

3. Let the price be $\$x$.

   Total $= \$x + 0.05x$

   $$\therefore x + 0.05x = \$36.75$$
   $$1.05x = \$36.75$$
   $$x = 35.00$$

   The price was $\boxed{\$35.00.}$

4. Let the regular price be $\$x$.

   Sale price $= \$(x - 0.40x)$

   $$\therefore x - 0.40x = 11.34$$
   $$0.60x = 11.34$$
   $$x = 18.90$$

   The regular selling price was $\boxed{\$18.90.}$

5. Let the last month's index be x.

   This month's index $= x - \frac{1}{12}x$

   $$\therefore x - \frac{1}{12}x = 176$$
   $$12x - x = 2112$$
   $$11x = 2112$$
   $$x = 192$$

   Last month the index was $\boxed{192.}$

6. Let the original hourly wage be $\$x$.

   New hourly wage $= \$\left(x + \frac{1}{8}x\right)$

   $$\therefore x + \frac{1}{8}x = 12.78$$
   $$8x + x = 102.24$$
   $$9x = 102.24$$
   $$x = 11.36$$

   The hourly wage before the increase was $\boxed{\$11.36.}$

7. Let Vera's sales be $\$x$.

   Tai's sales $= \$(3x - 140)$

   Total sales $= \$(x + 3x - 140)$

   $$\therefore x + 3x - 140 = 940$$
   $$4x = 1080$$
   $$x = 270$$

   Tai's sales $= 3(270) - 140 = \boxed{\$670.}$

8. Let the shorter piece be x cm.

   Length of longer piece $= (2x + 15)$ cm.

   Total length $= (x + 2x + 15)$ cm

   $$\therefore x + 2x + 15 = 90$$
   $$3x = 75$$
   $$x = 25$$

   The longer piece is 2(25) cm + 15 cm $= \boxed{65 \text{ cm.}}$

9. Let the cost of a ticket be $\$x$.

   Total $= \$(x + 5.00) \times 1.05 \times 2$

   $$\therefore (x + 5.00) \times 1.05 \times 2 = 197.40$$
   $$(x + 5.00) \times 2.10 = 197.40$$
   $$(x + 5.00) = 94.00$$
   $$x = 89.00$$

   The cost per ticket is $\boxed{\$89.00.}$

10. Let Ken's investment be $\$x$.

Martina's investment $= \$\left(\frac{2}{3}x + 2500\right)$

Total investment $= \$\left(x + \frac{2}{3}x + 2500\right)$

$$\therefore x + \frac{2}{3}x + 2500 = 55\,000$$

$$\frac{5x}{3} = 52\,500$$

$$x = 31\,500$$

Martina's investment is $\frac{2}{3} \times 31\,500 + 2500 = \boxed{\$23\,500.}$

11. Let the number of chairs produced by the first shift be x.

Number of chairs produced by the second shift $= \frac{4}{3}x - 60.$

Total production $= x + \frac{4}{3}x - 60 = 2320.$

$$\therefore x + \frac{4}{3}x - 60 = 2320$$

$$\frac{7}{3}x = 2380$$

$$x = 1020$$

Production by the second shift is $\frac{4}{3} \times 1020 - 60 = \boxed{1300.}$

12. Let the number of type A lights be x.

Number of type B lights $= 60 - x.$

Value of type A lights $= \$40x.$

Value of type B lights $= \$(60 - x)50.$

$$\therefore 40x + 50(60 - x) = 2580$$

$$40x + 3000 - 50x = 2580$$

$$-10x = -420$$

$$x = 42$$

The number of type B lights is $\boxed{18.}$

13. Let the number of units of Product A be x;

then the number of units of Product B is $60 - x$.

The number of hours for Product A is $4x$;

The number of hours for Product B is $3(60 - x)$.

$$\therefore 4x + 3(60 - x) = 200$$
$$4x + 180 - 3x = 200$$
$$x = 20$$

Production of Product A is $\boxed{20 \text{ units.}}$

14. Let the number of dimes be x.

Number of nickels $= 3x - 4$

Number of quarters $= \frac{3}{4}x + 1$

Value of the dimes $= 10x$ cents

Value of nickels $= 5(3x - 4)$ cents

Value of quarters $= 25\left(\frac{3}{4}x + 1\right)$ cents

$$\therefore 10x + 5(3x - 4) + 25\left(\frac{3}{4}x + 1\right) = 880$$
$$10x + 15x - 20 + \frac{75}{4}x + 25 = 880$$
$$25x + \frac{75}{4}x = 875$$
$$175x = 3500$$
$$x = 20$$

Alick has $\boxed{20 \text{ dimes, 56 nickels, and 16 quarters.}}$

15. Let the number of \$12 tickets be x.

Number of \$8 tickets $= 3x + 10$

Number of \$15 tickets $= \frac{4}{5}x - 3$

Value of the \$12 tickets $= \$12x$

Value of the \$8 tickets $= \$8(3x + 10)$

Value of the \$15 tickets $= \$15\left(\frac{4}{5}x - 3\right)$

$$\therefore 12x + 8(3x + 10) + 15\left(\frac{4}{5}x - 3\right) = 1475$$
$$12x + 24x + 80 + 12x - 45 = 1475$$
$$48x = 1440$$
$$x = 30$$

Sales were

30	\$12 tickets,
100	\$ 8 tickets,
and 21	\$15 tickets.

16. Let the number of medium pizzas be x.

Number of large pizzas $= 3x - 1$

Number of small pizzas $= 2x + 1$

Value of medium pizzas $= \$15x$

Value of large pizzas $= \$18(3x - 1)$

Value of small pizzas $= \$11(2x + 1)$

$$\therefore 15x + 18(3x - 1) + 11(2x + 1) = 539$$
$$15x + 54x - 18 + 22x + 11 = 539$$
$$91x = 546$$
$$x = 6$$

Sales were

6	medium pizzas,
17	large pizzas,
and 13	small pizzas.

17. Let the taxable income (in dollars) be x.

Then x – 44 701 is the amount by which his income exceeds \$44 701.

$$6705.15 + 0.22\,(x - 44701) = 7162.53$$
$$6705.15 + 0.22x - 9834.22 = 7162.53$$
$$0.22x = 10\,291.60$$
$$x = \$46\,780$$

His taxable income is \$46 780.

18. Let the amount invested at 3% be $\$x$.

    Then the amount invested at 4.5% is $(3000 - x)$.

    $0.03x + 0.045\,(3000 - x) = 128.25$

    $0.03x + 135 - 0.045x = 128.25$

    $-0.015x = \boxed{-6.75}$

    $x = \$450$ at 3%

    $3000 - 450 = \$\$2550$ at 4.5%

19. Let x be the number on the second shift.

    Then $2x$ is the number on the second shift.

    And $x - 12$ is the number on the third shift.

    $x + 2x + (x - 12) = 196$

    $4x - 12 = 196$

    $4x = 208$

    $x = 52$ on the second shift

    $2x = 2(52) = 104$ on the first shift

    $x - 12 = 52 - 12 = 40$ on the third shift

20. Let x be the number of options received by each employee.

    Then $1.5x$ is the number received by each team leader.

    And $3x$ is the number received by each senior manager.

    $421x + 22(1.5x) + 7(3x) =$

    $421x + 33x + 21x =$

    $475x = 171\,000$

    $x = 360$ options for each employee

    $1.5x = 1.5(360) = 540$ options for each team leader

    $(2)(540) = 1080$ options for each senior manager

    Check: $421(360) + 22(540) + 7(1080) = 171\,000$

21. Let the amount of money spent on recreational players be $\$x$.

    If twice as much money was spent on rep players, then the amount spent on recreational players can be determined by

    $$\$x + \$2x = \$4320$$

    $$\$3x = \$4320$$

    $$\$x = \$1440$$

    And therefore, the amount spent on rep players was $\$4320 - \$1440 = \$2880$.

Let the number of Youth Large shirts purchased for recreational players be y.

$$\$10y + \$8(50) + \$8(50) = \$1440$$
$$\$10y + \$400 + \$400 = \$1440$$
$$\$10y = \$640$$
$$y = 64$$

64 Youth Large shirts were purchased for recreational players.

Let the number of Adult Small and Adult Medium shirts be z.

For rep players, the cost of shirts is given by

$$\$8(50 - 10) + \$10(3 \times 64) + \$16z + \$16z = \$2880$$

Therefore, the number of shirts of each Adult size ordered can be calculated as

$$\$320 + \$1920 + \$16(2z) = \$2880$$
$$\$2240 + \$16(2z) = \$2880$$
$$\$16(2z) = \$640$$
$$2z = 40$$
$$z = 20$$

20 Adult Small and 20 Adult Medium shirts were purchased for rep players.

$$(50 + 50 + 64) + (40 + 192 + 20 + 20) = 436$$

There are a total of 436 players in the organization.

Review Exercise

1. (a) $3x - 4y - 3y - 5x = \boxed{-2x - 7y}$

   (b) $2x - 0.03x = \boxed{1.97x}$

   (c) $(5a - 4) - (3 - a) = 5a - 4 - 3 + a = \boxed{6a - 7}$

   (d) $-(2x - 3y) - (-4x + y) + (y - x) = -2x + 3y + 4x - y + y - x = \boxed{x + 3y}$

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

   $= 5a^2 - 2b - c - 3c - 2b + 4a^2 = \boxed{9a^2 - 4b - 4c}$

   (f) $-(2x - 3) - (x^2 - 5x + 2) = -2x + 3 - x^2 + 5x - 2 = \boxed{-x^2 + 3x + 1}$

2. (a) $3(-5a) = \boxed{-15a}$

   (b) $-7m(-4x) = \boxed{28mx}$

   (c) $14m \div (-2m) = \boxed{-7}$

(d) $(-15a^2b) \div (5a) = \boxed{-3ab}$

(e) $-6(-3x)(2y) = \boxed{36xy}$

(f) $4(-3a)(b)(-2c) = \boxed{24abc}$

(g) $-4(3x - 5y - 1) = \boxed{-12x + 20y + 4}$

(h) $x(1 - 2x - x^2) = \boxed{x - 2x^2 - x^3}$

(i) $(24x - 16) \div (-4) = \boxed{-6x + 4}$

(j) $(21a^2 - 12a) \div 3a = \boxed{7a - 4}$

(k) $4(2a - 5) - 3(3 - 6a)$

$= 8a - 20 - 9 + 18a$

$= \boxed{26a - 29}$

(l) $2a(x - a) - a(3x + 2) - 3a(-5x - 4)$

$= 2ax - 2a^2 - 3ax - 2a + 15ax + 12a$

$= \boxed{14ax - 2a^2 + 10a}$

(m) $(m - 1)(2m - 5)$

$= 2m^2 - 2m - 5m + 5$

$= \boxed{2m^2 - 7m + 5}$

(n) $(3a - 2)(a^2 - 2a - 3)$

$= 3a^3 - 2a^2 - 6a^2 + 4a - 9a + 6$

$= \boxed{3a^3 - 8a^2 - 5a + 6}$

(o) $3(2x - 4)(x - 1) - 4(x - 3)(5x + 2)$

$= 3(2x^2 - 4x - 2x + 4) - 4(5x^2 - 15x + 2x - 6)$

$= 6x^2 - 18x + 12 - 20x^2 + 52x + 24$

$= \boxed{-14x^2 + 34x + 36}$

(p) $-2a(3m - 1)(m - 4) - 5a(2m + 3)(2m - 3)$

$= -2a(3m^2 - m - 12m + 4) - 5a(4m^2 + 6m - 6m - 9)$

$= -6am^2 + 26am - 8a - 20am^2 + 45a$

$= \boxed{-26am^2 + 26am + 37a}$

3. (a) for $x = -2,\ y = 5,$

$$3xy - 4x - 5y = 3(-2)(5) - 4(-2) - 5(5) = -30 + 8 - 25 = \boxed{-47}$$

(b) for $a = -\frac{1}{4},\ b = \frac{2}{3},$

$$\begin{aligned} & -5(2a - 3b) - 2(a + 5b) \\ &= -10a + 15b - 2a - 10b \\ &= -12a + 5b \\ &= -12\left(-\frac{1}{4}\right) + 5\left(\frac{2}{3}\right) = 3 + 3\frac{1}{3} = \boxed{6\frac{1}{3}} \end{aligned}$$

(c) for $\mathrm{N} = 12,\ \mathrm{C} = 432,\ \mathrm{P} = 1800,\ n = 35,$

$$\frac{2\mathrm{NC}}{\mathrm{P}(n+1)} = \frac{\overset{1}{2} \times 12 \times \overset{48}{432}}{\underset{100}{\overset{900}{1800}} \times (35+1)} = \frac{\overset{1}{12} \times \overset{16}{48}}{100 \times \underset{1}{\overset{3}{36}}} = \frac{16}{100} = \boxed{0.16}$$

(d) for $\mathrm{I} = 600,\ r = 0.15,\ \mathrm{P} = 7300,$

$$\frac{365\,\mathrm{I}}{r\mathrm{P}} = \frac{\overset{1}{365} \times \overset{2}{\overset{30}{600}}}{\underset{1}{\overset{15}{0.15}} \times \underset{0.01}{7300}} = \frac{2}{0.01} = \boxed{200}$$

(e) for $\mathrm{A} = \$720,\ \mathrm{d} = 0.135,\ \mathrm{t} = \frac{280}{365},$

$$\mathrm{A}(1 - dt) = \$720\left(1 - 0.135 \times \frac{280}{365}\right) = \$720(1 - 0.103562) = 645.435616 = \boxed{\$645.44}$$

(f) for $\mathrm{S} = 2755,\ r = 0.17,\ t = \frac{219}{365},$

$$\frac{\mathrm{S}}{1 + rt} = \frac{2755}{1 + 0.17 \times \frac{219}{365}} = \frac{2755}{1 + 0.034 \times 3} = \frac{2755}{1 + 0.102} = \boxed{2500}$$

4. (a) $(-3)^5 = \boxed{-243}$

(b) $\left(\frac{2}{3}\right)^4 = \boxed{\frac{16}{81}}$

(c) $(-5)^0 = \boxed{1}$

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

(e) $\left(\frac{2}{5}\right)^{-4} = \left(\frac{5}{2}\right)^{4} = \boxed{\frac{625}{16}}$

(f) $(1.01)^{0} = \boxed{1}$

(g) $(-3)^{5}(-3)^{4} = (-3)^{9} = \boxed{-19\,683}$

(h) $4^{7} \div 4^{2} = 4^{5} = \boxed{1024}$

(i) $\left[(-3)^{2}\right]^{5} = (-3)^{10} = \boxed{59\,049}$

(j) $(m^{3})^{4} = \boxed{m^{12}}$

(k) $\left(\frac{2}{3}\right)^{3}\left(\frac{2}{3}\right)^{7}\left(\frac{2}{3}\right)^{-6} = \left(\frac{2}{3}\right)^{4} = \boxed{\frac{16}{81}}$

(l) $\left(-\frac{5}{4}\right)^{5} \div \left(-\frac{5}{4}\right)^{3} = \left(-\frac{5}{4}\right)^{2} = \boxed{\frac{25}{16}}$

(m) $(1.03^{50})(1.03^{100}) = \boxed{1.03^{150}}$

(n) $(1+i)^{180} \div (1+i)^{100} = \boxed{(1+i)^{80}}$

(o) $\left[(1.05)^{30}\right]^{5} = \boxed{1.05^{150}}$

(p) $(-2xy)^{4} = \boxed{16x^{4}y^{4}}$

(q) $\left(\frac{a^{2}b}{3}\right)^{-4} = \left(\frac{3}{a^{2}b}\right)^{4} = \boxed{\frac{81}{a^{8}b^{4}}}$

(r) $(1+i)^{-n} = \boxed{\frac{1}{(1+i)^{n}}}$

5. (a) $\sqrt{0.9216} = \boxed{0.96}$

(b) $\sqrt[6]{1.075} = \boxed{1.012126}$

(c) $14.974458^{1/40} = \boxed{1.07}$

(d) $1.08^{-5/12} = \dfrac{1}{1.08^{5/12}} = \boxed{0.968442}$

(e) $\ln 3 = \boxed{1.098612}$

(f) $\ln 0.05 = \boxed{-2.995732}$

(g) $\ln(5.1) / \ln(1.015)$
$= 1.629241 / 0.014889$
$= 109.428635$

(h) $\ln\left(\dfrac{5500}{1.10^{16}}\right) = \ln 5500 - \ln 1.10^{16}$

$= \ln 5500 - 16 \ln 1.10$
$= 8.612503 - 16(0.095310)$
$= 8.612503 - 1.524963$
$= \boxed{7.087540}$

(i) $\ln\left[375(1.01)\left(\dfrac{1-1.01^{-72}}{0.01}\right)\right] = \ln 375 + \ln 1.01 + \ln (1-1.01^{-72}) - \ln 0.01$

$= \ln 375 + \ln 1.01 + \ln (1 - 0.488496) - \ln 0.01$
$= \ln 375 + \ln 1.01 + \ln 0.511504 - \ln 0.01$
$= 5.926926 + 0.009950 - 0.670400 - (-4.605170)$
$= \boxed{9.871647}$

6. (a) $9x = -63$

$\boxed{x = -7}$

(b) $0.05x = 44$

$5x = 4400$

$\boxed{x = 880}$

(c) $-\dfrac{1}{7}x = 3$

$-x = 21$

$\boxed{x = -21}$

(d) $\frac{5}{6}x = -15$

$\frac{1}{6}x = -3$

$\boxed{x = -18}$

(e) $x - 8 = -5$

$x - 8 + 8 = -5 + 8$

$\boxed{x = 3}$

(f) $x + 9 = -2$

$x + 9 - 9 = -2 - 9$

$\boxed{x = -11}$

(g) $x + 0.02x = 255$

$1.02x = 255$

$\boxed{x = 250}$

(h) $x - 0.1x = 36$

$0.9x = 36$

$9x = 360$

$\boxed{x = 40}$

(i) $4x - 3 = 9x + 2$

$-5x = 5$

$\boxed{x = -1}$

(j) $9x - 6 - 3x = 15 + 4x - 7$

$6x - 6 = 8 + 4x$

$2x = 14$

$\boxed{x = 7}$

(k) $x - \frac{1}{3}x = 26$

$\frac{2}{3}x = 26$

$\frac{1}{3}x = 13$

$\boxed{x = 39}$

(l) $x + \frac{3}{8}x = 77$

$$\frac{11}{8}x = 77$$

$$\frac{1}{8}x = 7$$

$$\boxed{x = 56}$$

7. (a) $-9(3x-8) - 8(9-7x) = 5 + 4(9x+11)$

$$-27x + 72 - 72 + 56x = 5 + 36x + 44$$

$$29x = 49 + 36x$$

$$-7x = 49$$

$$\boxed{x = -7}$$

$$\text{Check LS} = -9[3(-7)-8] - 8[9-7(-7)] = -9(-29) - 8(58) = -203$$

$$\text{RS} = 5 + 4[9(-7)+11] = 5 + 4(-52) = 5 - 208 = -203$$

(b) $21x - 4 - 7(5x-6) = 8x - 4(5x-7)$

$$21x - 4 - 35x + 42 = 8x - 20x + 28$$

$$-14x + 38 = -12x + 28$$

$$-2x = -10$$

$$\boxed{x = 5}$$

$$\text{Check LS} = 21(5) - 4 - 7[5(5)-6] = 105 - 4 - 7(19) = 101 - 133 = -32$$

$$\text{RS} = 8(5) - 4[5(5)-7] = 40 - 4(18) = 40 - 72 = -32$$

(c) $\frac{5}{7}x + \frac{1}{2} = \frac{5}{14} + \frac{2}{3}x$

$$42\left(\frac{5}{7}x\right) + 42\left(\frac{1}{2}\right) = 42\left(\frac{5}{14}\right) + 42\left(\frac{2}{3}x\right)$$

$$6(5x) + 21(1) = 3(5) + 14(2x)$$

$$30x + 21 = 15 + 28x$$

$$2x = -6$$

$$\boxed{x = -3}$$

$$\text{Check LS} = \frac{5}{7}(-3) + \frac{1}{2} = \frac{-30+7}{14} = -\frac{23}{14}$$

$$\text{RS} = \frac{5}{14} + \frac{2}{3}(-3) = \frac{5}{14} - 2 = -\frac{23}{14}$$

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

$$8(4x)+24(2)=3(9)-4(x)$$
$$32x+48=27-4x$$
$$36x=-21$$
$$\boxed{x=-\frac{7}{12}}$$

$$\text{Check LS}=\frac{4}{3}\left(-\frac{7}{12}\right)+2=-\frac{28}{36}+2=-\frac{7}{9}+\frac{18}{9}=\frac{11}{9}$$
$$\text{RS}=\frac{9}{8}-\frac{1}{6}\left(-\frac{7}{12}\right)=\frac{9}{8}+\frac{7}{72}=\frac{81+7}{72}=\frac{88}{72}=\frac{11}{9}$$

(e) $\dfrac{7}{5}(6x-7)-\dfrac{3}{8}(7x+15)=25$

$$56(6x-7)-15(7x+15)=40(25)$$
$$336x-392-105x-225=1000$$
$$231x-617=1617$$
$$\boxed{x=7}$$

$$\text{Check LS}=\frac{7}{5}[6(7)-7]-\frac{3}{8}[7(7)+15]$$
$$=\frac{7}{5}(35)-\frac{3}{8}(64)=7(7)-24=49-24=25$$
$$\text{RS}=25$$

(f) $\dfrac{5}{9}(7-6x)-\dfrac{3}{4}(3-15x)=\dfrac{1}{12}(3x-5)-\dfrac{1}{2}$

$$20(7-6x)-27(3-15x)=3(3x-5)-18$$
$$140-120x-81+405x=9x-15-18$$
$$285x+59=9x-33$$
$$276x=-92$$
$$\boxed{x=-\frac{1}{3}}$$

$$\text{Check LS} = \frac{5}{9}\left[7-6\left(-\frac{1}{3}\right)\right]-\frac{3}{4}\left[3-15\left(-\frac{1}{3}\right)\right]$$
$$= \frac{5}{9}(7+2)-\frac{3}{4}(3+5)$$
$$= 5-6=-1$$
$$\text{RS} = \frac{1}{12}\left[3\left(-\frac{1}{3}\right)-5\right]-\frac{1}{2}$$
$$= \frac{1}{12}(-6)-\frac{1}{2}$$
$$= -\frac{1}{2}-\frac{1}{2}=-1$$

(g) $\frac{5}{6}(4x-3)-\frac{2}{5}(3x+4)=5x-\frac{16}{15}(1-3x)$

$$25(4x-3)-12(3x+4)=150x-32(1-3x)$$
$$100x-75-36x-48=150x-32+96x$$
$$64x-123=246x-32$$
$$-182x=91$$
$$\boxed{x=-\frac{1}{2}}$$

$$\text{Check LS} = \frac{5}{6}\left[4\left(-\frac{1}{2}\right)-3\right]-\frac{2}{5}\left[3\left(-\frac{1}{2}\right)+4\right]$$
$$= \frac{5}{6}(-2-3)-\frac{2}{5}\left[-\frac{3}{2}+4\right]$$
$$= \frac{5}{6}(-5)-\frac{2}{5}\left(\frac{5}{2}\right)=-\frac{25}{6}-1=-\frac{31}{6}$$
$$\text{RS} = 5\left(-\frac{1}{2}\right)-\frac{16}{15}\left[1-3\left(-\frac{1}{2}\right)\right]$$
$$= -\frac{5}{2}-\frac{16}{15}\left(1+\frac{3}{2}\right)=-\frac{5}{2}-\frac{16}{15}\left(\frac{5}{2}\right)$$
$$= -\frac{5}{2}-\frac{8}{3}=\frac{-15-16}{6}=-\frac{31}{6}$$

8. (a) $\text{I} = \text{P}rt$

$$\boxed{r=\frac{\text{I}}{\text{P}t}}$$

(b) $S = P(1+rt)$

$$\frac{S}{P} = 1 + rt$$

$$\frac{S}{P} - 1 = rt$$

$$t = \frac{\frac{S}{P} - 1}{r}$$

$$t = \frac{\frac{S-P}{P}}{r}$$

$$\boxed{t = \frac{S-P}{Pr}}$$

$D = rL$

(c) $\boxed{r = \frac{D}{L}}$

$$FV = PMT\left[\frac{(1+p)^n - 1}{p}\right]$$

(d) $$\boxed{PMT = \left[\frac{FVp}{(1+p)^n - 1}\right]}$$

9. Let the size of the workforce be x.

Number laid off $= \frac{1}{6}x$

Number after the layoff $= x - \frac{1}{6}x$

$$\therefore x - \frac{1}{6}x = 690$$

$$\frac{5}{6}x = 690$$

$$5x = 4140$$

$$x = 828$$

$\therefore$ the number laid off is $\frac{1}{6} \times 828 = \boxed{138.}$

10. Let last year's average property value be $\$x$.

Current average value $= \$\left(x + \frac{2}{7}x \right)$

$$\therefore x + \frac{2}{7}x = 81\ 450$$
$$\frac{9}{7}x = 81\ 450$$
$$\frac{1}{7}x = 9050$$
$$x = 63\ 350$$

$\therefore$ Last year's average value was $\boxed{\$63\ 350.}$

11. Let the quoted price be $\$x$.

$$\therefore x + \frac{1}{20}x = 2457$$
$$\frac{21}{20}x = 2457$$
$$\frac{1}{20}x = 117$$
$$x = 2340$$

$\therefore$ The gratuities $= \frac{1}{20}$ of $2340 = \boxed{\$117.}$

12. Let the value of the building be $\$x$.

Value of the land $= \$\frac{1}{3}x - 2000$

Total value of the property $= \$x + \frac{1}{3}x - 2000$

$$\therefore x + \frac{1}{3}x - 2000 = 184\ 000$$
$$\frac{4}{3}x = 186\ 000$$
$$\frac{1}{3}x = 46\ 500$$
$$x = 139\ 500$$

The value assigned to land is $\$(184\ 000 - 139\ 500) = \boxed{\$44\ 500.}$

13. Let the cost of power be $\$x$.

Cost of heat $= \$\left(\frac{3}{4}x + 22\right)$

Cost of water $= \$\left(\frac{1}{3}x - 11\right)$

Total cost $= x + \frac{3}{4}x + 22 + \frac{1}{3}x - 11 = 2010 + 10\%\text{ of }2010.$

$$12x + 9x + 4x = 12(2010 + 201 - 11)$$
$$25x = 26\,400$$
$$x = 1056$$

Cost of heat $= \frac{3}{4} \times 1056 + 22 = \boxed{\$814}$

Cost of power $= \boxed{\$1056}$

Cost of water $= \frac{1}{3} \times 1056 - 11 = \boxed{\$341}$

14. Let the amount allocated to newspaper advertising be $\$x$.

Amount allocated to TV advertising $= \$(3x + 1000)$

Amount allocated to direct selling $= \frac{3}{4}[x + 3x + 1000]$

$$\therefore x + 3x + 1000 + \frac{3}{4}[4x + 1000] = 87\,500$$
$$4x + \frac{3}{4}[4x + 1000] = 86\,500$$
$$16x + 12x + 3000 = 346\,000$$
$$28x = 343\,000$$
$$x = 12\,250$$

The amount allocated to newspaper advertising is \$12 250; the amount allocated to TV advertising is \$37 750; the amount allocated to direct selling is $\boxed{\$37\,500}$

15. Let the number of minutes on Machine B be x.

Time on Machine A $= \frac{4}{5}x - 3$ minutes

Time on Machine C $= \frac{5}{6}\left(x + \frac{4}{5}x - 3\right)$ minutes

Total time $= x + \frac{4}{5}x - 3 + \frac{5}{6}\left(x + \frac{4}{5}x - 3 \right)$ minutes

$$\therefore x + \frac{4}{5}x - 3 + \frac{5}{6}\left(x + \frac{4}{5}x - 3 \right) = 77$$

$$30x + 24x - 90 + 25\left(x + \frac{4}{5}x - 3 \right) = 30(77)$$

$$54x - 90 + 25x + 20x - 75 = 2310$$

$$99x - 165 = 2310$$

$$99x = 2475$$

$$x = 25$$

Time on Machine B is 25 minutes; time on Machine A is $\frac{4}{5}(25) - 3 = 17$ minutes; time on Machine C is $\frac{5}{6}(25 + 17) =$ 35 minutes.

16. Let the number of pairs of superlight poles be x.

Number of pairs of ordinary poles $= 72 - x$

Value of superlight poles $= \$30x$

Value of ordinary poles $= \$16(72 - x)$

Total value of all poles $= \$30x + 16(72 - x)$

$$30x + 16(72 - x) = 1530$$

$$30x + 1152 - 16x = 1530$$

$$14x = 378$$

$$x = 27$$

The number of pairs of superlight poles is 27; the number of pairs of ordinary poles is 45.

17. Let the number of \$2 coins be x.

Number of \$1 coins $= \frac{3}{5}x + 1$

Number of quarters $= 4\left(x + \frac{3}{5}x + 1 \right)$

Value of the \$2 coins $= \$2x$

Value of the \$1 coins $= \$\left[\frac{3}{5}x + 1 \right]$

Value of the quarters $= \$\frac{1}{4}(4)\left(x + \frac{3}{5}x + 1 \right) = x + \frac{3}{5}x + 1$

$$\text{Total value} = 2x + \frac{3}{5}x + 1 + x + \frac{3}{5}x + 1 = 107$$
$$10x + 3x + 5 + 5x + 3x + 5 = 535$$
$$21x + 10 = 535$$
$$21x = 525$$
$$x = 25$$

The number of \$2 coins is 25; the number of \$1 coins is $\left(\frac{3}{5} \times 25 + 1\right) = 16;$ the number of quarters is $4(25 + 16) = \boxed{164.}$

18. Let \$$x$ represent Jaime's monthly savings.

Jaime has \$975 after paying for school and transportation.

$0.30(975) + 600 + x = 975$

$892.50 + x = 975$

$x = 82.50$

Jamie saves \$82.50 per month.

19. Let x represent the total valuation of Baldwin Industries.

Then Inspire Inc.'s stake is $0.49x$ and Crown Company's stake is $0.24x$.

$0.80(0.49x) = \$19\ 600\ 000$

$0.392x = \$19\ 600\ 000$

$x = \$50\ 000\ 000$

$0.24(50\ 000\ 000) = \$12\ 000\ 000$

Crown Company's stake in Baldwin Industries is worth \$12 Million.

Self-Test

1. (a) $4 - 3x - 6 - 5x = \boxed{-2 - 8x}$

(b) $(5x - 4) - (7x + 5) = 5x - 4 - 7x - 5 = \boxed{-2x - 9}$

(c) $-2(3a - 4) - 5(2a + 3)$

$= -6a + 8 - 10a - 15$

$= \boxed{-16a - 7}$

(d) $-6(x - 2)(x + 1)$

$$= -6(x^2 - 2x + x - 2)$$
$$= -6(x^2 - x - 2)$$
$$= \boxed{-6x^2 + 6x + 12}$$

2. (a) For $x = -3,\ y = 5$

$$2x^2 - 5xy - 4y^2$$
$$= 2(-3)^2 - 5(-3)(5) - 4(5)^2$$
$$= 18 + 75 - 100$$
$$= \boxed{-7}$$

(b) For $a = \frac{2}{3},\ b = -\frac{3}{4}$

$$3(7a - 4b) - 4(5a + 3b)$$
$$= 21a - 12b - 20a - 12b$$
$$= a - 24b$$
$$= \frac{2}{3} - 24\left(-\frac{3}{4}\right)$$
$$= \frac{2}{3} + 18$$
$$= \boxed{18\frac{2}{3}}$$

(c) For N = 12, C = 400, P = 2000, $n = 24$

$$\frac{2\text{NC}}{\text{P}(n+1)} = \frac{(2)(12)(400)}{2000(24+1)} = \frac{2(12)(400)}{2000(25)} = \boxed{0.192}$$

(d) For I = 324, P = 5400, $r = 0.15$

$$\frac{\text{I}}{\text{P}\,r} = \frac{324}{5400 \times 0.15} = \boxed{0.4}$$

(e) For S = 1606, $d = 0.125$, $t = \frac{240}{365}$

$$\text{S}(1 - dt) = 1606\left(1 - 0.125 \times \frac{240}{365}\right)$$
$$= 1606(1 - 0.082192)$$
$$= 1606(0.917808)$$
$$= \boxed{1474}$$

(f) For S = 1566, $r = 0.10$, $t = \dfrac{292}{365}$

$$\frac{S}{1+rt} = \frac{1566}{1+0.10\times\frac{292}{365}}$$
$$= \frac{1566}{1+0.08}$$
$$= \boxed{1450}$$

3. (a) $(-2)^3 = \boxed{-8}$

(b) $\left(-\dfrac{2}{3}\right)^2 = \boxed{\dfrac{4}{9}}$

(c) $(4)^0 = \boxed{1}$

(d) $(3)^2(3)^5 = (3)^7 = \boxed{2187}$

(e) $\left(\dfrac{4}{3}\right)^{-2} = \dfrac{1}{\left(\frac{4}{3}\right)^2} = \dfrac{1}{\frac{16}{9}} = \boxed{\dfrac{9}{16}}$

(f) $(-x^3)^5 = \boxed{-x^{15}}$

4. (a) $\sqrt[10]{1.35} = 1.35^{\frac{1}{10}} = 1.35^{0.10} = \boxed{1.030465}$

(b) $\dfrac{1-1.03^{-40}}{0.03} = \dfrac{1-0.306557}{0.03} = \dfrac{0.693443}{0.03} = \boxed{23.114772}$

(c) $\ln 1.025 = \boxed{0.024693}$

(d) $\ln (3.00e^{-0.2})$

$= \ln 3.00 + \ln e^{-0.2}$
$= \ln 3.00 - 0.2 \ln e$
$= 1.098612 - 0.2$
$= \boxed{0.898612}$

(e) $\ln\left(\dfrac{600}{1.06^{11}}\right)$

$= \ln 600 - \ln 1.06^{11}$

$= \ln 600 - 11\ln 1.06$

$= 6.396930 - 11(0.058269)$

$= 6.396930 - 0.640958$

$= \boxed{5.755972}$

(f) $\ln\left[250\left(\dfrac{1.07^5 - 1}{0.07}\right)\right]$

$= \ln 250 + \ln (1.07^5 - 1) - \ln 0.07$

$= \ln 250 + \ln 0.402552 - \ln 0.07$

$= 5.521461 - 0.909932 - (-2.659260)$

$= 5.521461 - 0.909932 + 2.659260$

$= \boxed{7.270789}$

5. (a) $\dfrac{1}{81} = \left(\dfrac{1}{3}\right)^{n-2}$

$\dfrac{1}{3^4} = \left(\dfrac{1}{3}\right)^{n-2}$

$\left(\dfrac{1}{3}\right)^4 = \left(\dfrac{1}{3}\right)^{n-2}$

Since the bases are common

$4 = n - 2$

$\boxed{n = 6}$

(b) $\dfrac{5}{2} = 40\left(\dfrac{1}{2}\right)^{n-1}$

$\dfrac{1}{2} = 8\left(\dfrac{1}{2}\right)^{n-1}$

$\dfrac{1}{16} = \left(\dfrac{1}{2}\right)^{n-1}$

$\left(\dfrac{1}{2}\right)^4 = \left(\dfrac{1}{2}\right)^{n-1}$

$4 = n - 1$

$\boxed{n = 5}$

6. (a) $-\frac{2}{3}x = 24$

$$x = 24\left(-\frac{3}{2}\right)$$

$$\boxed{x = -36}$$

(b) $x - 0.06x = 8.46$

$$0.94x = 8.46$$

$$\boxed{x = 9}$$

(c) $0.2x - 4 = 6 - 0.3x$

$$0.5x = 10$$

$$\boxed{x = 20}$$

(d) $(3 - 5x) - (8x - 1) = 43$

$$3 - 5x - 8x + 1 = 43$$

$$-13x = 39$$

$$\boxed{x = -3}$$

(e) $4(8x - 2) - 5(3x + 5) = 18$

$$32x - 8 - 15x - 25 = 18$$

$$17x - 33 = 18$$

$$17x = 51$$

$$\boxed{x = 3}$$

(f) $x + \frac{3}{10}x + \frac{1}{2} + x + \frac{3}{5}x + 1 = 103$

$$2x + \frac{3}{10}x + \frac{3}{5}x + \frac{3}{2} = 103$$

$$20x + 3x + 6x + 15 = 1030$$

$$29x = 1015$$

$$\boxed{x = 35}$$

(g) $x + \frac{4}{5}x - 3 + \frac{5}{6}\left(x + \frac{4}{5}x - 3\right) = 77$

$$30x + 24x - 90 + 25\left(x + \frac{4}{5}x - 3\right) = 30(77)$$

$$54x - 90 + 25x + 20x - 75 = 2310$$
$$99x - 165 = 2310$$
$$99x = 2475$$
$$\boxed{x = 25}$$

(h) $\frac{2}{3}(3x-1) - \frac{3}{4}(5x-3) = \frac{9}{8}x - \frac{5}{6}(7x-9)$

$$16(3x-1) - 18(5x-3) = 27x - 20(7x-9)$$
$$48x - 16 - 90x + 54 = 27x - 140x + 180$$
$$-42x + 38 = -113x + 180$$
$$71x = 142$$
$$\boxed{x = 2}$$

7. (a) $\mathrm{I} = \mathrm{P}rt$

$$\boxed{\mathrm{P} = \frac{\mathrm{I}}{rt}}$$

(b) $\mathrm{S} = \frac{P}{1-dt}$

$$\frac{\mathrm{S}}{P} = \frac{1}{1-dt}$$
$$\frac{P}{\mathrm{S}} = 1 - dt$$
$$dt = 1 - \frac{P}{\mathrm{S}}$$
$$d = \frac{1 - \frac{P}{\mathrm{S}}}{t}$$
$$d = \frac{\frac{\mathrm{S} - P}{\mathrm{S}}}{t}$$
$$\boxed{d = \frac{\mathrm{S} - P}{\mathrm{S}t}}$$

8. Let the regular selling price be $\$x$.

   Reduction in price $= \$\frac{1}{5}x$

   $$\therefore x - \frac{1}{5}x = 192$$
   $$\frac{4}{5}x = 192$$
   $$x = 240$$

   The regular selling price is $\boxed{\$240.}$

9. Let the floor space occupied by shipping be x.

   Floor space occupied by weaving $= 2x + 400$

   Total floor space $= x + 2x + 400$

   $$\therefore x + 2x + 400 = 6700$$
   $$3x = 6300$$
   $$x = 2100$$

   The floor space occupied by weaving is $2(2100) + 400 = \boxed{4600 \text{ square metres.}}$

10. Let the number of units of Product A be x.

    Number of units of Product B $= 95 - x$

    Number of hours for Product A $= 3x$

    Number of hours for Product B $= 5(95 - x)$

    $$\therefore 3x + 5(95 - x) = 395$$
    $$3x + 475 - 5x = 395$$
    $$-2x = -80$$
    $$x = 40$$

    The number of units of Product B is $95 - 40 = \boxed{55.}$

11. Let the sum of money invested in the bank be $\$x$.

    Sum of money invested in the credit union $= \$\frac{2}{3}x + 500$

    Yield on the bank investment $= \$\frac{1}{12}x$

    Yield on the credit union investment $= \$\frac{1}{9}\left(\frac{2}{3}x + 500\right)$

$$\therefore \frac{1}{12}x + \frac{1}{9}\left(\frac{2}{3}x + 500\right) = 1000$$

$$3x + 4\left(\frac{2}{3}x + 500\right) = 36\,000$$

$$3x + \frac{8}{3}x + 2000 = 36\,000$$

$$\frac{17x}{3} = 34\,000$$

$$17x = 102\,000$$

$$x = 6000$$

The sum of money invested in the credit union certificate is

$$\$\left(\frac{2}{3} \times 6000 + 500\right) = \boxed{\$4500.}$$

Challenge Problems

1. Counting a nickel as a quarter overstates the total by \$0.20; for x nickels, the total must be reduced by \$0.20x.

   Counting a dime as a penny understates the total by \$0.09; for x dimes, the total must be increased by \$0.09x.

   The total adjustment $= -0.20x + 0.09x = -\$0.11x$

   The clerk must reduce the total by \$0.11x.

2. There are 5 tires, so each tire is idle at some point. Therefore, the number of rotations is 5.

   The distance per rotation $= \frac{4000}{5} = 800$ km;

   each tire will be used for four rotations for a total distance of 3200 km. (See table below.)

Rotation	*Tire A*	*Tire B*	*Tire C*	*Tire D*	*Tire E*	*Distance travelled*
1	800	800	800	800	—	800
2	800	800	800	—	800	800
3	800	800	—	800	800	800
4	800	—	800	800	800	800
5	—	800	800	800	800	800
Total	3200	3200	3200	3200	3200	4000

3. The lowest possible two-digit number is 10;

   the highest possible two-digit number is 99.

   For a difference in value of \$17.82, the two-digit numbers must differ by 18, such as 10 and 28, 11 and 29, etc.

   The lowest possible correct value of the cheque is \$10.28;

   the largest possible correct value of the cheque is \$81.99.

   In either case the difference between is \$17.82.

   (a) FALSE In the possible correct cheque value \$81.99, the x-value 81 is greater than 70.

   (b) TRUE In the possible correct cheque value \$18.36, the y-value 36 equals $2x$.

   (c) TRUE A cheque cannot have zero cents.

   (d) FALSE Let the correct amount be \$A;

   then the incorrect amount is \$2A;

   the difference is \$A;

   $$A = 17.82$$

   For the correct value \$17.82, the incorrect cheque value \$82.17 is unequal to 2(\$17.82).

   (e) FALSE In the possible correct amount \$10.28, the sum of the digits is $1+0+2+8=11$, which is not divisible by 9.

Case Study

1. \$73 566 – \$49 355 = \$24 211
2. The contributions continue until the 65th year. Therefore, total contributions (65 – 45) × 12 months per year × \$100 = \$24 000.
3. The contributions continue until the 65th year.
   a. Total contributions (65 – 45) × 12 months per year × \$100 = \$24 000. Total value of TFSA = \$29 529. Therefore, interest earned is \$29 529 – 24 000 = \$5529.
   b. Total contributions (65 – 45) × 12 months per year × \$250 = \$60 000. Total value of TFSA = \$73 566. Therefore, interest earned is \$73 566 – 60 000 = \$13 566.
4. Annual salary of \$48 000/12 months = \$4000.00 per month.
   a. \$150/\$4000 = 0.0375 or 3.75% of salary
   b. \$250/\$4000 = 0.0625 = 6.25% of salary