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

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

$= \boxed{x^2 - 0.2x + 4}$

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

$= 0.952381k + 0.907029k$

$= \boxed{1.859410k}$

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

$$=1.020230x+0.987202x$$

$$=\boxed{2.007432x}$$

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

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

$= \boxed{3x^4 + 2x^3 - 16x^2 + 14x - 3}$

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

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

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

$= \boxed{5b^5 + 5b^4 + 15b^3 + 30b^2 - 10b - 10}$

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. $$\frac{2\mathrm{NC}}{\mathrm{P}(n+1)}=\frac{2\times52\times60}{1800(25+1)}=\frac{2\times52\times60}{1800\times26}=\boxed{0.1\dot{3}}$$

11. $$\mathrm{P}(1+rt)=\$880\left(1+0.12\times\frac{76}{365}\right)$$
$$=\$880(1+0.024986)=\$880(1.024986)=\boxed{\$901.99}$$

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

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

13.
$$\frac{\text{P}}{1-dt} = \frac{\$1253}{1-0.135\times\frac{284}{365}} = \frac{\$1253}{1-0.105041} = \frac{\$1253}{0.894959} = \boxed{\$1400.06}$$

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

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

$$= 3240\left[1+(0.125)\left(\frac{290}{365}\right)\right]$$
$$= 3240\ (1.099315)$$
$$= \boxed{3561.780822}$$

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

$$= (13\times125) - 875 - (4\times125)$$
$$= 1625 - 875 - 500$$
$$= \boxed{250}$$

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

$$= (1+0.0275)^2 - 1$$
$$= 1.055756 - 1$$
$$= \boxed{0.055756}$$

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

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

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

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

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

$$= \left[\frac{(10\ 000)(0.0075)}{(1+0.0075)^{20}-1}\right]$$
$$= \left(\frac{75}{0.161184}\right)$$
$$= \boxed{465.306319}$$

***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. $\boxed{-\dfrac{1}{64}}$

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

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. $425(1+0.16)^{-4} = 425(0.552291) = \boxed{234.723717}$

28. $\left(\frac{1500}{200}\right)^{0.5} - 1 = 2.738613 - 1 = \boxed{1.738613}$

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

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

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

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

11. $\boxed{2.158925}$

12. $\boxed{0.589664}$

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

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

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

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

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

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

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

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

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. $\log_3 \frac{1}{81} = -4$

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

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.

$$\text{Total amount invested} = \$1200$$

$$\begin{aligned}\text{Total number of shares purchased} &= 10 + 10.225 + 9.615 + 10.395 \\ &\quad + 9.524 + 9.302 + 10.132 + 9.302 \\ &\quad + 9.009 + 8.696 + 8.849 + 8.888 \\ &= 113.937\end{aligned}$$

$$\text{Average cost per share} = \frac{1200}{113.937} = \boxed{\$10.53}$$

$10.53 is less than the current $11.25 cost per share.

2.

Number of shares purchased		Share price		Amount invested
(a) 10 shares	×	$17	=	$170
(b) 15 shares	×	16	=	240
(c) 20 shares	×	16.50	=	330
				$740

$$\text{Average cost per share} = \frac{740}{45} = \boxed{\$16.44}$$

3.

Amount invested		Share price		Number of shares purchased
$5000	÷	$25	=	200
5000	÷	32	=	156.25
5000	÷	20	=	250
				606.25

$$\text{Average cost per share} = \frac{15\,000}{606.25} = \$24.74$$

The first $5000 allocation purchased 200 shares at $25 per share. The second $5000 allocation only bought 156.25 shares because the price rose to $32 per share in the second month. The third $5000 allocation bought 250 shares at $20 per share. After three months, the couple owned 606.25 shares at an average cost of $24.74. Their investment is worth $15 156.25. (i.e., 606.25 shares × $25 current value).

If they had invested $15 000 all at once, they would only have 600 shares. At the current share price, their investment would only be worth $15 000, the same as the original lump sum.

4. Answers will vary. However, markets tend to go up in the long term.

***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. $3x + 5 = 7x - 11$

$-4x = -16$

$\boxed{x = 4}$

$$\begin{aligned} \text{LS: } 3x + 5 &= 3(4) + 5 \\ &= 12 + 5 \\ &= 17 \end{aligned}$$

$$\begin{aligned} \text{RS: } 7x - 11 &= 7(4) - 11 \\ &= 28 - 11 \\ &= 17 \end{aligned}$$

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.

$$2-3x-9=2x-7+3x$$
$$-3x-7=5x-7$$
$$-8x=0$$
$$\boxed{x=0}$$

$$\text{LS:}=2-3x-9$$
$$=2-3(0)-9$$
$$=-7$$

$$\text{RS:}=2x-7+3x$$
$$=2(0)-7+3(0)$$
$$=-7$$

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

$$-5x-8=6+2x$$
$$-7x=14$$
$$\boxed{x=-2}$$

$$\text{LS:}=4x-8-9x$$
$$=4(-2)-8-9(-2)$$
$$=-8-8+18=2$$

$$\text{RS:}=10+2x-4$$
$$=10+2(-2)-4$$
$$=10-4-4=2$$

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

$$-x=-5$$
$$\boxed{x=5}$$

$$\text{LS:}=3x+14$$
$$=3(5)+14$$
$$=15+14=29$$

$$\text{RS:}=4x+9$$
$$=4(5)+9$$
$$=20+9=29$$

6.

$$16x - 12 = 6x - 32$$
$$10x = -20$$
$$\boxed{x = -2}$$
$$\text{LS:} = 16x - 12$$
$$= 16(-2) - 12$$
$$= -32 - 12 = -44$$
$$\text{RS:} = 6x - 32$$
$$= 6(-2) - 32$$
$$= -12 - 32 = -44$$

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

$$+4x - 5x = +12 - 25 - 5 - 3$$
$$-x = -21$$
$$\boxed{x = 21}$$
$$\text{LS:} = 5 + 3 + 4x$$
$$= 8 + 4(21)$$
$$= 8 + 84 = 92$$
$$\text{RS:} = 5x + 12 - 25$$
$$= 5(21) - 13$$
$$= 105 - 13 = 92$$

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

$$+2x - 5x = -36 + 14 + 3 - 5$$
$$-3x = -24$$
$$\boxed{x = 8}$$
$$\text{LS:} = -3 + 2x + 5$$
$$= -3 + 2(8) + 5$$
$$= -3 + 16 + 5$$
$$= 18$$
$$\text{RS:} = 5x - 36 + 14$$
$$= 5(8) - 36 + 14$$
$$= 40 - 36 + 14 = 18$$

9.

$$x - 50 = 100 + 0.34x + 0.21x$$
$$x - 50 = 100 + 0.55x$$
$$x - 0.55x = 150$$
$$(1 - 0.55)x = 150$$
$$0.45x = 150$$
$$\boxed{x = 333.\dot{3}}$$

CHECK:

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

$$\frac{x}{1 + 0.25 \times \frac{6}{12}} = \frac{2^3}{3^2}x$$
$$\frac{x}{1.125} = \frac{8}{9}x$$

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

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

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. $12x - 4(9x - 20) = 320$
$12x - 36x + 80 = 320$
$-24x = 240$
$\boxed{x = -10}$

$LS = 12(-10) - 4[9(-10) - 20]$
$= -120 - 4[-90 - 20]$
$= -120 + 440$
$= 320$
$RS = 320$

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

$$6x-15-4x+6=-15$$
$$2x-9=-15$$
$$2x=-6$$
$$\boxed{x=-3}$$

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

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

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

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

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

$$4x + 4x - 6 = 18$$
$$8x = 24$$
$$\boxed{x = 3}$$

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

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

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

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

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

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

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

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.

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

$$1.021370x=1225.64$$

$$x=1199.996245$$

$$\boxed{x=1200.00}$$

CHECK:

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

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

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

$$36-27x=12x+62$$

$$-39x=26$$

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

7. $$1-\frac{1}{3}x=15+\frac{2}{3}x$$

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

$$3-x=45+2x$$

$$-42=3x$$

$$\boxed{x=-14}$$

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

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

$$9x-6=10x-5$$

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

9.
$$\frac{21}{8}-\frac{2}{5}x=\frac{11}{4}x-\frac{1}{10}$$
$$40\left[\frac{21}{8}-\frac{2}{5}x\right]=40\left[\frac{11}{4}x-\frac{1}{10}\right]$$
$$105-16x=110x-4$$
$$109=126x$$
$$\boxed{x=\frac{109}{126}}$$

10.
$$-\frac{2}{3}x-\frac{1}{12}x=\frac{3}{4}+\frac{1}{24}x$$
$$24\left[-\frac{2}{3}x-\frac{1}{12}x\right]=24\left[\frac{3}{4}+\frac{1}{24}x\right]$$
$$-16x-2x=18+x$$
$$-18x=18+x$$
$$-18=19x$$
$$\boxed{x=\frac{-18}{19}}$$

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. $$\mathrm{PV} = \frac{\mathrm{PMT}}{i}$$

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

4. $$\mathrm{I} = \mathrm{P}rt$$

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

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

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

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

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

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

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

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

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

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

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

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

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

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

$$P + Prt = S$$

$$Prt = S - P$$

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

8.
$$N = L(1-d) \quad \text{for} \quad d$$
$$N = L - dL$$
$$dL = L - N$$
$$\boxed{d = \frac{L-N}{L}}$$

9.
$$f = (1+i)^m - 1 \quad \text{for} \quad i$$
$$(1+f) = (1+i)^m$$
$$(1+f)^{\frac{1}{m}} = ((1+i)^m)^{\frac{1}{m}}$$
$$(1+f)^{\frac{1}{m}} = 1+i$$
$$\boxed{i = (1+f)^{\frac{1}{m}} - 1}$$

10.
$$FV = PV(1+i)^n \quad \text{for} \quad n$$
$$\frac{FV}{PV} = (1+i)^n$$
$$\ln\left(\frac{FV}{PV}\right) = n \ln(1+i)$$
$$\boxed{n = \frac{\ln\left(\frac{FV}{PV}\right)}{\ln(1+i)}}$$

***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 $= \$\left(x + \frac{1}{8}x \right)$

   $$\therefore x + \frac{1}{8}x = 15.75$$
   $$8x + x = 126.00$$
   $$9x = 126.00$$
   $$x = 14.00$$

   The hourly wage before the increase was $\boxed{\$14.00.}$

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 $= \$(x + 18.40) \times 1.05 \times 2$

   $$\therefore (x + 18.40) \times 1.05 \times 2 = 345.24$$
   $$(x + 18.40) \times 2.10 = 345.24$$
   $$(x + 18.40) = 164.40$$
   $$x = 146.00$$

The cost per ticket is $\boxed{\$146.00.}$

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

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

Martina's investment

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

Total investment

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

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

$$x = 31\,500$$

$$\frac{2}{3} \times 31\,500 + 2500 = \boxed{\$23\,500.}$$

Martina's investment is

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

$$= \frac{4}{3}x - 60.$$

Number of chairs produced by the second shift

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

Total production

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

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

$$x = 1020$$

$$\frac{4}{3} \times 1020 - 60 = \boxed{1300.}$$

Production by the second shift is

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

$$= 60 - x.$$

Number of type B lights

$$= \$40x.$$

Value of type A lights

$$= \$(60 - x)50.$$

Value of type B lights

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

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

$$-10x = -420$$

$$x = 42$$

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.

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

His taxable income is \$46 780.

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

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

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

$0.03x + 135 - 0.045x = 128.25$

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

$x = \boxed{\$450 \text{ at } 3\%}$

$3000 - 450 = \boxed{\$2550 \text{ at } 4.5\%}$

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.

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

$4x - 12 = 196$

$4x = 208$

$x = \boxed{52}$ on the second shift

$2x = 2(52) = \boxed{104}$ on the first shift

$x - 12 = 52 - 12 = \boxed{40}$ 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: $421(360) + 22(540) + 7(1080) = \boxed{171\,000}$

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.

$$(50 + 50 + 64) + (40 + 192 + 20 + 20) = \boxed{436}$$

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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) $\ln(5.1) / \ln(1.015)$
$= 1.629241 / 0.014889$
$= \boxed{109.428635}$

(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)
$$\ln\left[375(1.01)\left(\frac{1-1.01^{-72}}{0.01}\right)\right] = \ln 375 + \ln 1.01 + \ln\,(1-1.01^{-72}) - \ln 0.01$$
$$= \ln 375 + \ln 1.01 + \ln\,(1-0.488496) - \ln 0.01$$
$$= \ln 375 + \ln 1.01 + \ln 0.511504 - \ln 0.01$$
$$= 5.926926 + 0.009950 - 0.670400 - (-4.605170)$$
$$= \boxed{9.871647}$$

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

$\boxed{x = -7}$

(b) $0.05x = 44$

$5x = 4400$

$\boxed{x = 880}$

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

$-x = 21$

$\boxed{x = -21}$

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

$$-27x + 72 - 72 + 56x = 5 + 36x + 44$$
$$29x = 49 + 36x$$
$$-7x = 49$$
$$\boxed{x = -7}$$

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

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

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

$$21x - 4 - 35x + 42 = 8x - 20x + 28$$
$$-14x + 38 = -12x + 28$$
$$-2x = -10$$
$$\boxed{x = 5}$$

$$= 21(5) - 4 - 7[5(5) - 6] = 105 - 4 - 7(19) = 101 - 133 = -32$$

Check LS

$$= 8(5) - 4[5(5) - 7] = 40 - 4(18) = 40 - 72 = -32$$

RS

(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)

$$\frac{4x}{3}+2=\frac{9}{8}-\frac{x}{6}$$

$$8(4x)+24(2)=3(9)-4(x)$$

$$32x+48=27-4x$$

$$36x=-21$$

$$\boxed{x=-\frac{7}{12}}$$

$$\text{Check LS}=\frac{4}{3}\left(-\frac{7}{12}\right)+2=-\frac{28}{36}+2=-\frac{7}{9}+\frac{18}{9}=\frac{11}{9}$$

$$\text{RS}=\frac{9}{8}-\frac{1}{6}\left(-\frac{7}{12}\right)=\frac{9}{8}+\frac{7}{72}=\frac{81+7}{72}=\frac{88}{72}=\frac{11}{9}$$

(e)

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

$$56(6x-7)-15(7x+15)=40(25)$$

$$336x-392-105x-225=1000$$

$$231x-617=1617$$

$$\boxed{x=7}$$

$$\text{Check LS}=\frac{7}{5}[6(7)-7]-\frac{3}{8}[7(7)+15]$$

$$=\frac{7}{5}(35)-\frac{3}{8}(64)=7(7)-24=49-24=25$$

$$\text{RS}=25$$

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

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

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

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

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

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

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

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

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

$$D = rL$$

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

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

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

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

$$\therefore x + \frac{2}{7}x = 346\ 162.50$$
$$\frac{9}{7}x = 346\ 162.50$$
$$\frac{1}{7}x = 38\ 462.50$$
$$x = 269\ 237.50$$

$\therefore$ Last year's average value was $\boxed{\$269\ 237.50.}$

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
$$= \$x + \frac{1}{3}x - 2000$$

$$\therefore x + \frac{1}{3}x - 2000 = 790\ 000$$
$$\frac{4}{3}x = 792\ 000$$
$$\frac{1}{3}x = 198\ 000$$
$$x = 594\ 000$$

The value assigned to land is
$$\$(790\ 000 - 594\ 000) = \boxed{\$196\ 000.}$$

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 $\frac{5}{6}(25+17)=\boxed{35 \text{ minutes.}}$

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

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

Value of superlight poles $= \$130x$

Value of ordinary poles $= \$56(72 - x)$

Total value of all poles $= \$130x + 56(72 - x)$

$$130x + 56(72 - x) = \$6030$$
$$130x + 4032 - 56x = 6030$$
$$74x = 1998$$
$$x = 27$$

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 $4(25 + 16) = 164.$

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 $0.24x$.

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

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

$x = \$50\ 000\ 000$

$0.24(50\ 000\ 000) = \boxed{\$12\ 000\ 000}$

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)
$$\begin{aligned} & -2(3a - 4) - 5(2a + 3) \\ &= -6a + 8 - 10a - 15 \\ &= \boxed{-16a - 7} \end{aligned}$$

(d)
$$\begin{aligned} & -6(x - 2)(x + 1) \\ &= -6(x^2 - 2x + x - 2) \\ &= -6(x^2 - x - 2) \\ &= \boxed{-6x^2 + 6x + 12} \end{aligned}$$

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

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

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

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

(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, $d = 0.125$, $t = \dfrac{240}{365}$

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

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

$$\begin{aligned}\frac{\text{S}}{1+rt} &= \frac{1566}{1 + 0.10 \times \frac{292}{365}}\\ &= \frac{1566}{1 + 0.08}\\ &= \boxed{1450}\end{aligned}$$

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

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

$$= \ln 600 - \ln 1.06^{11}$$
$$= \ln 600 - 11 \ln 1.06$$
$$= 6.396930 - 11(0.058269)$$
$$= 6.396930 - 0.640958$$
$$= \boxed{5.755972}$$

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

$$= \ln 250 + \ln (1.07^5 - 1) - \ln 0.07$$
$$= \ln 250 + \ln 0.402552 - \ln 0.07$$
$$= 5.521461 - 0.909932 - (-2.659260)$$
$$= 5.521461 - 0.909932 + 2.659260$$
$$= \boxed{7.270789}$$

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

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

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

Since the bases are common

$4 = n - 2$

$\boxed{n = 6}$

(b)
$$\frac{5}{2} = 40\left(\frac{1}{2}\right)^{n-1}$$
$$\frac{1}{2} = 8\left(\frac{1}{2}\right)^{n-1}$$
$$\frac{1}{16} = \left(\frac{1}{2}\right)^{n-1}$$
$$\left(\frac{1}{2}\right)^{4} = \left(\frac{1}{2}\right)^{n-1}$$
$$4 = n-1$$
$$\boxed{n = 5}$$

$$-\frac{2}{3}x = 24$$

6. (a)
$$x = 24\left(-\frac{3}{2}\right)$$
$$\boxed{x = -36}$$

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

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

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

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

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

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

$$\boxed{d = \frac{S-P}{St}}$$

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 $= 5(95 - x)$

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

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

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 toonie as a loonie understates the total by \$1.00; for x toonies, the total must be increased by \$1.00x.

   The total adjustment $= -0.20x + 1.00x = -\$0.80x$

   The clerk must increase the total by \$0.80x.

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 × \$250 = \$60 000.
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 salar