# *Placement Test – Level II – Answer Key*

**Directions:** Each problem is worth one point. When you are done grading, add the points for the number of correct answers together. If you scored from 0 – 39, then you placed into Elementary Algebra. If you scored from 40 – 60, then you placed into the Intermediate Algebra course.

1. Translate the phrase into an algebraic expression and simplify.

Translation: $\underbrace{\boxed{\frac{8x}{4x}}}_{\text{the quotient of 8x and 4x}}$

$$\frac{\cancel{8}^{2}\cancel{x}}{\cancel{4}_{1}\cancel{x}} = \boxed{2}$$

2. Solve. $12 + 2(4 - 3y) = -5(y - 2) + 1$

$$12 + 8 - 6y = -5y + 10 + 1$$

$$20 - 6y = -5y + 11$$

$$+6y \qquad +6y$$

$$20 = y + 11$$

$$-11 \qquad -11$$

$$\boxed{9 = y}$$

3. Solve and classify the equation as a conditional equation, an identity, or a contradiction.

$$12(5-2x) = -12(x-4) - 12x$$

$$60 - 24x = -12x + 48 - 12x$$

$$60 - 24\cancel{x} = -24\cancel{x} + 48$$

$$\underline{+24\cancel{x}} \quad \underline{+24\cancel{x}}$$

$$60 = 48$$

False ⇒ $\boxed{\text{The equation is a contradiction and there is no solution.}}$

4. Solve. $60\left(\frac{1}{3}x + \frac{2}{5}x\right) = \left(7 - \frac{3}{4}x\right)60$

LCD: 60

$$\cancel{60}^{20}\left(\frac{1x}{\cancel{3}_1}\right) + \cancel{60}^{12}\left(\frac{2x}{\cancel{5}_1}\right) = 420 - \cancel{60}^{15}\left(\frac{3}{\cancel{4}_1}x\right)$$

$$20x + 24x = 420 - 45\cancel{x}$$

$$\underline{+45x} \quad \underline{+45x}$$

$$20x + 69x = 420$$

$$\frac{\cancel{89}x}{\cancel{89}} = \frac{420}{89}$$

$$\boxed{x = \frac{420}{89}}$$

5. Solve the formula for y. $5x + 9y = -2$

$$\underline{-5x} \quad \underline{-5x}$$

$$\frac{9y}{9} = \frac{-5x}{9} - \frac{2}{9}$$

$$\boxed{y = -\frac{5}{9}x - \frac{2}{9}}$$

6. Solve the inequality, graph the solution on a number line, and write the solution in interval notation.

$$3m + 4(2m - 5) \leq 6m - 9$$

$3m + 8m - 20 \leq 6m - 9$

$11m - 20 \leq 6m - 9$

$-6m \quad -6m$

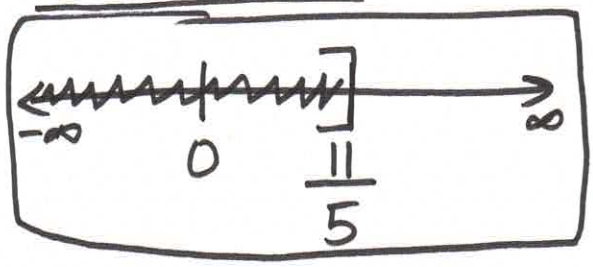
$5m - 20 \leq -9$

$+20 \quad +20$

$\frac{5m}{5} \leq \frac{11}{5}$

$\boxed{m \leq \frac{11}{5}}$

Number Line:




Interval Notation:

$\boxed{(-\infty, \frac{11}{5}]}$

7. One number is four more than seven times another. Their sum is 20. Find the numbers.

let $x$ = another number

$4 + 7x$ = one number

$x + 4 + 7x = 20$

$x + 4 + 7x = 20$

$8x + 4 = 20$

$-4 \quad -4$

$\frac{8x}{8} = \frac{16}{8}$

$\boxed{x = 2}$

$4 + 7x$

$= 4 + 7(2)$

$= 4 + 14$

$= \boxed{18}$

$\boxed{2 \text{ and } 18}$

8. 70 is what percent of 130?

$70 = (x)(130)$

$\frac{70}{130} = \frac{130x}{130}$

$0.53846 = x$

$\boxed{x = 53.8\%}$

9. Joseph has $4.20 in quarters and nickels in his coin jar. He has twice as many nickels as quarters. Find the number of each type of coin.

let $x$ = the number of quarters

$2x$ = the number of nickels

$.05(2x) + .25x = 4.20$

$.10x + .25x = 4.20$

$\frac{.35x}{.35} = \frac{4.20}{.35}$

$\boxed{x = 12 \text{ quarters}}$

$2x = 2(12)$

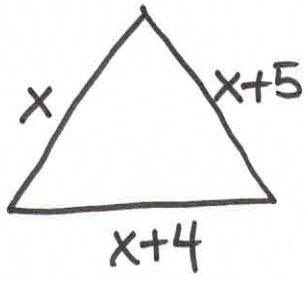
$= \boxed{24 \text{ nickels}}$

10. The perimeter of a triangle is 39 feet. One side of the triangles is five feet longer than the second side. The third side is four feet longer than the second side. Find the length of each side.

let $x$ = length of the second side

$x+5$ = length of the "one side"

$x+4$ = length of the third side




$x + x + 5 + x + 4 = 39$

$3x + 9 = 39$

$-9 \quad -9$

$\frac{3x}{3} = \frac{30}{3}$

$x = 10$

$x = 10$

$x+5 = 10+5 = 15$

$x+4 = 10+4 = 14$

$\boxed{10, 14, \text{ and } 15}$

11. Two cars leave a rest area on the interstate at the same time. One car travels east and the other travels west. The car traveling east travels at 50 mph and the car traveling west travels at 60 mph. How long will they travel before they are 240 miles apart?

| | r | • t | = d |
|---|---|---|---|
| East | 50 | t | 50t |
| West | 60 | t | 60t |
| | | Total: | 240 |

$50t + 60t = 240$

$110t = 240$

$\frac{\cancel{110}t}{\cancel{110}} = \frac{240}{110}$

$t = 2.1818\ldots$

$t \approx 2.2$ hours

12. Piper's phone plan costs $18.50 per months plus $0.05 per text message. What is the maximum number of text messages Pipers can use so the phone bill is no more than $26?

let x = the number of text messages used

$18.\cancel{50} + .05x \leq 26$

$-\cancel{18.50} \qquad -18.50$

$\frac{\cancel{.05}x}{\cancel{.05}} \leq \frac{7.5}{.05}$

$x \leq 150$

The maximum number of text messages she can use is 150.

13. Determine if the given ordered pair is a solution to the equation.

$$4x - 3y = 8 \quad ; \quad (-2, 1)$$

x y

$4(-2) - 3(1) = 8$

$-8 - 3 = 8$

$-11 = 8$

False ⇒ $\boxed{\text{No, the ordered pair is not a solution.}}$

14. Graph the equation. $3x - 4y = 12$

| x | y |
|---|---|
| 0 | -3 |
| 4 | 0 |

$\underline{x=0}$: $3(0) - 4y = 12$

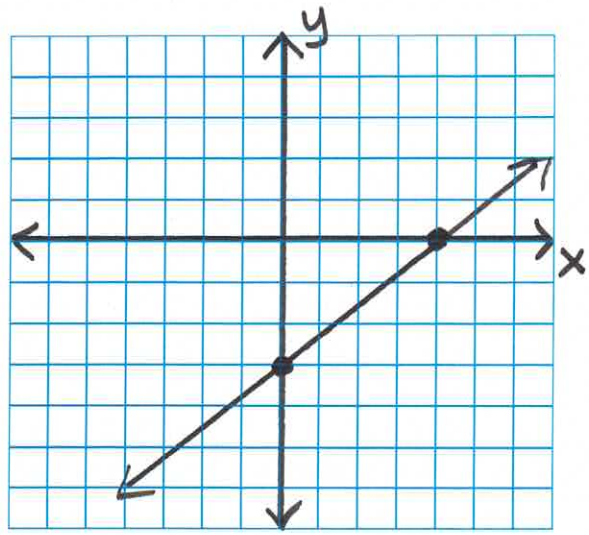
$\frac{-4y}{-4} = \frac{12}{-4}$

$y = -3$

$\underline{y=0}$: $3x - 4(0) = 12$

$\frac{3x}{3} = \frac{12}{3}$

$x = 4$




15. Find the x- and y-intercepts of the line.

$$-x + 3y = 6$$

| x | y |
|---|---|
| 0 | 2 |
| -6 | 0 |

$\underline{x=0}$: $-0 + 3y = 6$

$\frac{3y}{3} = \frac{6}{3}$

$y = 2$

$\boxed{\underline{\text{y-intercept}}: (0, 2)}$

$\underline{y=0}$: $-x + 3(0) = 6$

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

$x = -6$

$\boxed{\underline{\text{x-intercept}}: (-6, 0)}$

16. Find the slope of the line containing the following points. The slope formula is $m = \frac{y_2 - y_1}{x_2 - x_1}$.

(-3, 5) and (-4, -2)

$x_1\ y_1 \quad x_2\ y_2$

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

$m = \frac{-7}{-4+3}$

$m = \frac{-7}{-1}$

$\boxed{m = 7}$

17. Determine if the lines are parallel, perpendicular, or neither.

1. $4x - 2y = 5$ ; 2. $3x + 6y = 11$

1. $4x - 2y = 5$

$-4x \quad -4x$

$\frac{-2y}{-2} = \frac{-4x}{-2} + \frac{5}{-2}$

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

$m = 2$

2. $3x + 6y = 11$

$-3x \quad -3x$

$\frac{6y}{6} = \frac{-3x}{6} + \frac{11}{6}$

$y = -\frac{1}{2}x + \frac{11}{6}$

$m = -\frac{1}{2}$

Slopes are opposite reciprocals, so these lines are perpendicular.

18. Find the equation of the line with the given slope and passing through the given point. The point-slope equation is $y - y_1 = m(x - x_1)$.

$m = -\frac{1}{3}$ ; (-1, 4)

$x_1\ y_1$

$y - 4 = -\frac{1}{3}(x - (-1))$

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

$y - 4 = -\frac{1}{3}x - \frac{1}{3}$

$+4 \qquad +4$

$y = -\frac{1}{3}x - \frac{1}{3} + 4 \cdot \frac{3}{3}$

$y = -\frac{1}{3}x - \frac{1}{3} + \frac{12}{3}$

$\boxed{y = -\frac{1}{3}x + \frac{11}{3}}$

19. Graph the linear inequality.

$x + 2y > 8$ dashed line

$x+2y=8$

| x | y |
|---|---|
| 0 | 4 |
| 8 | 0 |

$x=0$: $\frac{2y}{2}=\frac{8}{2}$, $y=4$

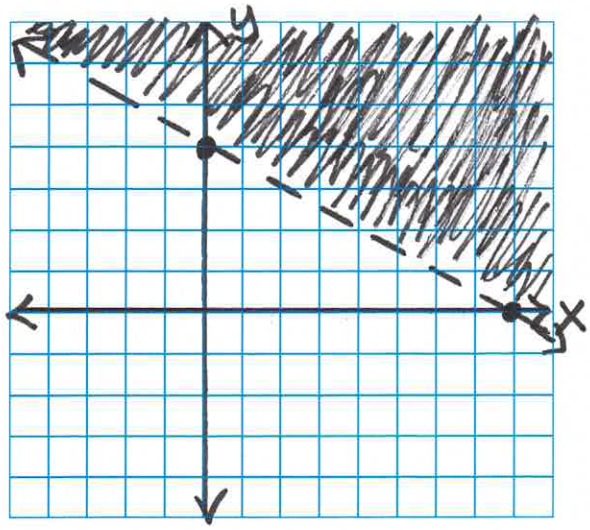
$y=0$: $x+2(0)=8$, $x=8$

Test point: $(0,0)$

$0+2(0)>8$

$0>8$

False




20. Determine the number of solutions to the system of equations.

1. $3x - 5y = 20$
2. $y = \frac{3}{5}x + 10$

$3x-5\left(\frac{3}{5}x+10\right)=20$

$3x-\cancel{5}\left(\frac{3}{\cancel{5}}x\right)-50=20$

$3x-3x-50=20$

$-50=20$

False $\Rightarrow$

$\boxed{\text{There are no solutions to this system.}}$

21. Solve the system of equations using the substitution method.

1. $x + y = 4$
2. $2x + 3y = 7$

$\boxed{(5,-1)}$

1. $\cancel{x}+y=4$
$\quad -\cancel{x} \quad -x$
$y=4-x$

$2x+3(4-x)=7$

$2x+12-3x=7$

$-x+12=7$
$\quad -12 \quad -12$

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

$\boxed{x=5}$

$x+y=4$

$5+y=4$
$-5 \quad -5$

$\boxed{y=-1}$

22. Solve the system of equations using the elimination method.

$(3x + y = 9)(2) \rightarrow 6x + 2y = 18$

$4x - 2y = 12 \rightarrow + \; 4x - 2y = 12$

$\frac{10x}{10} = \frac{30}{10}$

$x = 3$

$3x + y = 9$

$3(3) + y = 9$

$9 + y = 9$

$-9 \quad -9$

$y = 0$

$\boxed{(3, 0)}$

23. Tickets to the county fair cost $25 for adults and $10 for children. The total receipts for 358 tickets was $5,485. How many adult and how many child tickets were sold?

let x = the number of adult tickets sold
y = the number of child tickets sold

1. $x + y = 358$
2. $25x + 10y = 5{,}485$

1. $x + y = 358$

$-x \quad -x$

$y = 358 - x$

$25x + 10(358 - x) = 5{,}485$

$25x + 3580 - 10x = 5485$

$15x + 3580 = 5485$

$-3580 \quad -3580$

$\frac{15x}{15} = \frac{1905}{15}$

$\boxed{x = 127}$

$y = 358 - x$

$y = 358 - 127$

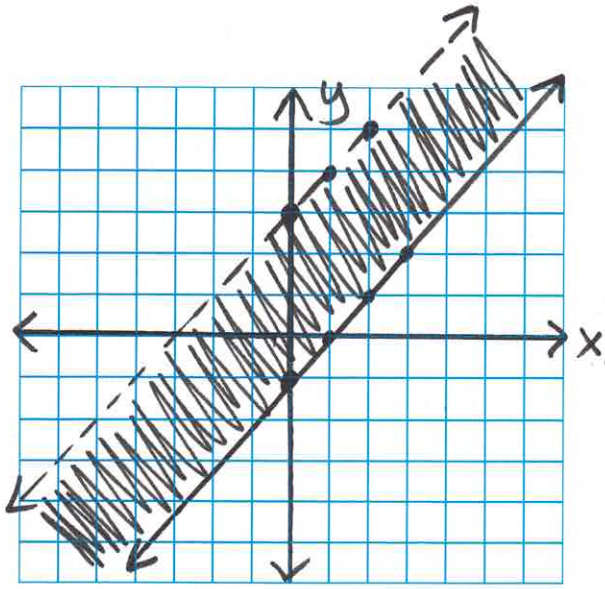
$\boxed{y = 231}$

$\boxed{(127, 231)}$ adult child

24. Solve the system of inequalities by graphing.

① $y < x + 3$

② $y \geq x - 1$




① $y = x + 3$

$m = 1 \quad b = 3$

dashed line

Test: $(0,0)$

$0 < 0 + 3$

$0 < 3$

True

② $y = x - 1$

$m = 1 \quad b = -1$

solid line

Test: $(0,0)$

$0 \geq 0 - 1$

$0 \geq -1$

True

25. Find the difference. $(9x^2 + 7x - 3) - (4x^2 - 6x + 1)$

$9x^2 + 7x - 3 - 4x^2 + 6x - 1$

$= \boxed{5x^2 + 13x - 4}$

26. Evaluate the polynomial for the given values.

$$8x^2y + 5x - 4y \; ; \quad x = -2, y = 3$$

$8(-2)^2(3) + 5(-2) - 4(3)$

$= 8(4)(3) - 10 - 12$

$= 96 - 22$

$= \boxed{74}$

27. Simplify. $r^2 \cdot r^7 \cdot r^3$

$= r^{2+7+3}$

$= \boxed{r^{12}}$

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

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

$= \boxed{2x^3 + x^2 - 2x + 8}$

29. Multiply. $(n+11)^2$

$= (n+11)(n+11)$

$= n^2 + 11n + 11n + 121$

$= \boxed{n^2 + 22n + 121}$

30. Simplify. $\left(\frac{z^3}{z^7}\right)^2$

$= \frac{(z^3)^2}{(z^7)^2} = \frac{z^{3\cdot 2}}{z^{7\cdot 2}} = \frac{z^6}{z^{14}} = z^{6-14}$

$= z^{-8}$

$= \boxed{\frac{1}{z^8}}$

31. Divide. $(45w^4 - 20w^2 + 10w) \div (5w)$

$= \frac{45w^4}{5w} - \frac{20w^2}{5w} + \frac{10w}{5w}$

$= \boxed{9w^3 - 4w + 2}$

32. Divide. $(y^2 + 13y + 40) \div (y + 8)$

$$\begin{array}{r} y+5 \\ y+8 \overline{\big) y^2+13y+40} \\ y(y+8) \rightarrow \underline{-y^2 \mp 8y} \\ 5y+40 \\ 5(y+8) \rightarrow \underline{-5y \mp 40} \\ 0 \end{array}$$

$\frac{y^2}{y} = y$

$\frac{5y}{y} = 5$

$(y^2+13y+40) \div (y+8) = \boxed{y+5}$

33. Simplify. $(-4c^{-5}d^3)(9c^2d^7)$ $= -36c^{-5+2}d^{3+7}$

$= -36c^{-3}d^{10}$

$= \boxed{\frac{-36d^{10}}{c^3}}$

34. Factor completely. $x^3 + x^2 + 5x + 5$

$= x^2(x+1) + 5(x+1)$

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

35. Factor completely. $x^2 + 11xy + 30y^2$

$= \boxed{(x+5y)(x+6y)}$

36. Factor completely. $30x^2 - 5x - 10$

$= 5(6x^2 - x - 2)$

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

37. Factor completely. The difference of squares formula is: $a^2 - b^2 = (a-b)(a+b)$.

$144w^2 - 25z^2$

$= (12w)^2 - (5z)^2$

$a = 12w \quad b = 5z$

$= \boxed{(12w-5z)(12w+5z)}$

38. Factor completely. The sum of cubes formula is: $a^3 + b^3 = (a+b)(a^2 - ab + b^2)$.

$8c^3 + 125d^3$

$= 2^3c^3 + 5^3d^3$

$= (2c)^3 + (5d)^3$

$a = 2c \quad b = 5d$

$= (2c+5d)((2c)^2 - (2c)(5d) + (5d)^2)$

$= \boxed{(2c+5d)(4c^2 - 10cd + 25d^2)}$

39. Solve. $27x^2 - 3x - 4 = 0$

$$(9x-4)(3x+1)=0$$

$$9x-4=0 \qquad 3x+1=0$$

$$+4 \quad +4 \qquad -1 \quad -1$$

$$\frac{9x}{9}=\frac{4}{9} \qquad \frac{3x}{3}=\frac{-1}{3}$$

$$\boxed{x=\frac{4}{9}} \qquad \boxed{x=\frac{-1}{3}}$$

40. Simplify. $\frac{x^2+x-20}{x^2-16}$

$$= \frac{\cancel{(x-4)}(x+5)}{\cancel{(x-4)}(x+4)}$$

$$= \boxed{\frac{x+5}{x+4}}$$

41. Divide. $\frac{x^2-3x}{x^2+x-12} \div \frac{x}{x+4}$

$$= \frac{x^2-3x}{x^2+x-12} \cdot \frac{x+4}{x}$$

$$= \frac{\cancel{x}\cancel{(x-3)}}{\cancel{(x-3)}\cancel{(x+4)}} \cdot \frac{\cancel{x+4}}{\cancel{x}}$$

$$= \boxed{1}$$

42. Subtract. $\frac{x^2}{5x-30} - \frac{5x+6}{5x-30} = \frac{x^2-(5x+6)}{5x-30}$

$$= \frac{x^2-5x-6}{5x-30} = \frac{(x+1)\cancel{(x-6)}}{5\cancel{(x-6)}}$$

$$= \boxed{\frac{x+1}{5}}$$

43. Add. $\frac{(m-5)}{(m-5)} \cdot \frac{8}{m+9} + \frac{12m}{m^2+4m-45}$

LCD: $(m+9)(m-5)$ $\quad (m+9)(m-5)$

$$= \frac{8(m-5)}{(m-5)(m+9)} + \frac{12m}{(m+9)(m-5)}$$

$$= \frac{8m-40+12m}{(m-5)(m+9)}$$

$$= \boxed{\frac{20m-40}{(m-5)(m+9)}}$$

OR

$$= \boxed{\frac{20(m-2)}{(m-5)(m+9)}}$$

44. Simplify. $\left(\frac{\frac{1}{x}+\frac{1}{y}}{\frac{1}{x^2}-\frac{1}{y^2}}\right)\frac{x^2y^2}{x^2y^2} = \frac{x^{\cancel{2}\,1}y^2\left(\frac{1}{\cancel{x}}\right)+x^2y^{\cancel{2}\,1}\left(\frac{1}{\cancel{y}}\right)}{\cancel{x^2}y^2\left(\frac{1}{\cancel{x^2}}\right)-x^2\cancel{y^2}\left(\frac{1}{\cancel{y^2}}\right)}$

LCD: $x^2y^2$

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

$$= \boxed{\frac{xy}{y-x}}$$

45. Solve. $\frac{x^2}{x^2-4} = \frac{x}{x+2} - \frac{(2x)}{2-x}\frac{(-1)}{(-1)}$

$(x-2)(x+2)$

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

LCD: $(x-2)(x+2)$

$$x^2 = x(x-2) + 2x(x+2)$$

$$x^2 = x^2 - 2x + 2x^2 + 4x$$

$$x^2 = 3x^2 + 2x$$

$$-x^2 \quad -x^2$$

$$2x^2 + 2x = 0$$

$$2x(x+1) = 0$$

$$2x = 0 \quad x+1 = 0$$

$$\boxed{x=0} \quad \boxed{x=-1}$$

46. Charlotte loves to drink fruit smoothies. A 16 ounce serving of smoothie has 185 calories. If she drinks 22 ounces of smoothies, how many calories of smoothie is she consuming?

$$\frac{16 \text{ oz.}}{185 \text{ calories}} = \frac{22 \text{ oz.}}{x \text{ calories}}$$

$$16x = (185)(22)$$

$$16x = 4070$$

$$\frac{16x}{16} = \frac{4070}{16}$$

$$\boxed{x = 254.375 \text{ calories}}$$

47. Find an equation of variation in which y varies directly as the square of x and y = 10 when x = 2.

$$y = kx^2$$

$$10 = k(2)^2$$

$$\frac{10}{4} = \frac{4k}{4}$$

$$\frac{5}{2} = k$$

$$\boxed{y = \frac{5}{2}x^2}$$

48. Simplify. $\sqrt{300x^7y^{12}}$ $= \sqrt{10^2 \cdot 3 \cdot x^2 \cdot x^2 \cdot x^2 \cdot x \cdot y^2 \cdot y^2 \cdot y^2 \cdot y^2 \cdot y^2 \cdot y^2}$

300

100 3

$10^2$

$= \boxed{10x^3y^6\sqrt{3x}}$

49. Simplify. $\sqrt{\frac{108z^6}{49}}$ $= \frac{\sqrt{108z^6}}{\sqrt{49}} = \frac{\sqrt{2^2 \cdot 3^2 \cdot 3 \cdot z^2 \cdot z^2 \cdot z^2}}{\sqrt{7^2}}$

108

4 27

$2^2$ 9 3

$3^2$

$= \frac{2 \cdot 3 \cdot z^3\sqrt{3}}{7}$

$= \boxed{\frac{6z^3\sqrt{3}}{7}}$

50. Subtract. $\sqrt{45} - \sqrt{20}$

$\sqrt{9 \cdot 5} - \sqrt{4 \cdot 5}$

$= \sqrt{9}\sqrt{5} - \sqrt{4}\sqrt{5}$

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

$= (3-2)\sqrt{5}$

$= \boxed{1\sqrt{5}}$

51. Multiply. $(8 + 2\sqrt{3})(1 - 4\sqrt{3})$

$= 8 - 32\sqrt{3} + 2\sqrt{3} - 8\sqrt{9}$

$= 8 - 30\sqrt{3} - 8(3)$

$= 8 - 30\sqrt{3} - 24$

$= \boxed{-16 - 30\sqrt{3}}$

52. Simplify and rationalize the denominator. $\sqrt{\frac{8}{45}} = \frac{\sqrt{4\cdot 2}}{\sqrt{9\cdot 5}} = \frac{2\sqrt{2}}{3\sqrt{5}}$

$$\frac{2\sqrt{2}}{3\sqrt{5}}\cdot\frac{\sqrt{5}}{\sqrt{5}} = \frac{2\sqrt{10}}{3\sqrt{25}}$$

$$= \frac{2\sqrt{10}}{3(5)} = \boxed{\frac{2\sqrt{10}}{15}}$$

53. Solve. $x = \sqrt{2x+7} - 2$

$$\underline{+2} \qquad \underline{+\cancel{2}}$$

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

$$(x+2)(x+2) = 2x+7$$

$$x^2+4x+4 = 2x+7$$

$$\underline{-2x} \quad \underline{-7} \quad \underline{-2x-7}$$

$$x^2+2x-3=0$$

$$(x-1)(x+3)=0$$

$$x-\cancel{1}=0 \qquad x+\cancel{3}=0$$

$$\underline{+\cancel{1}} \quad \underline{+1} \qquad \underline{-\cancel{3}} \quad \underline{-3}$$

$$\boxed{x=1} \qquad \cancel{x=-3}$$

Check:

$x=1$:

$$1=\sqrt{2(1)+7}-2$$

$$1=\sqrt{9}-2$$

$$1=3-2$$

$$1=1 \checkmark$$

$x=-3$:

$$-3=\sqrt{2(-3)+7}-2$$

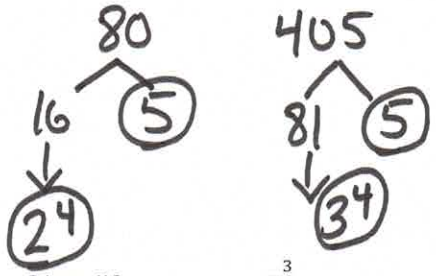
$$-3=\sqrt{1}-2$$

$$-3=1-2$$

$$-3 \cancel{=} -1$$

False

54. Add. $\sqrt[4]{80} + \sqrt[4]{405}$ $= \sqrt[4]{2^4 \cdot 5} + \sqrt[4]{3^4 \cdot 5}$




$= 2\sqrt[4]{5} + 3\sqrt[4]{5}$

$= \boxed{5\sqrt[4]{5}}$

55. Simplify. $9^{-\frac{3}{2}}$

$= \frac{1}{9^{+\frac{3}{2}}} = \frac{1}{(3^2)^{\frac{3}{2}}} = \frac{1}{3^{\cancel{2}\cdot\frac{3}{\cancel{2}}}} = \frac{1}{3^3} = \boxed{\frac{1}{27}}$

56. Solve. $\sqrt{x^2} = \sqrt{75}$

$x = \pm\sqrt{75}$

$x = \pm\sqrt{5^2 \cdot 3}$

$\boxed{x = \pm 5\sqrt{3}}$

57. What number would need to be added to this expression to complete the square to make a perfect square trinomial?

$z^2 + 3z$

$b = 3$

$\left(\frac{1}{2}\right)(3) = \frac{3}{2}$

$\left(\frac{3}{2}\right)^2 = \boxed{\frac{9}{4}}$

58. Solve. The quadratic formula is $x = \frac{-b \pm \sqrt{b^2-4ac}}{2a}$.

$$x^2 - 6x - 4 = 0$$

$a=1 \quad b=-6 \quad c=-4$

$$x = \frac{-(-6) \pm \sqrt{(-6)^2-4(1)(-4)}}{2(1)}$$

$$x = \frac{6 \pm \sqrt{36+16}}{2}$$

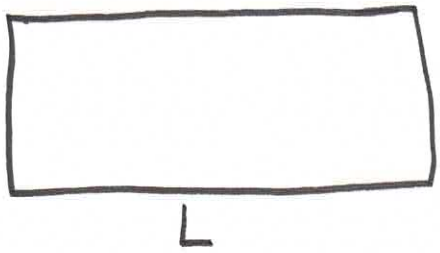
$$x = \frac{6 \pm \sqrt{52}}{2}$$

$$x = \frac{6 \pm \sqrt{4 \cdot 13}}{2}$$

$$x = \frac{6 \pm 2\sqrt{13}}{2}$$

$$\boxed{x = 3 \pm \sqrt{13}}$$

59. The width of a rectangular flower bed is 7 feet less than the length. The area is 18 feet squared. Find the length and the width.




$W = L - 7$

$A = L \cdot W$

$18 = L \cdot (L-7)$

$18 = L^2 - 7L$

$-18 \qquad -18$

$0 = L^2 - 7L - 18$

$0 = (L+2)(L-9)$

$L+2=0 \qquad L-9=0$

$-2 \quad -2 \qquad +9 \quad +9$

$L = -2 \qquad \boxed{L = 9\text{ ft.}}$

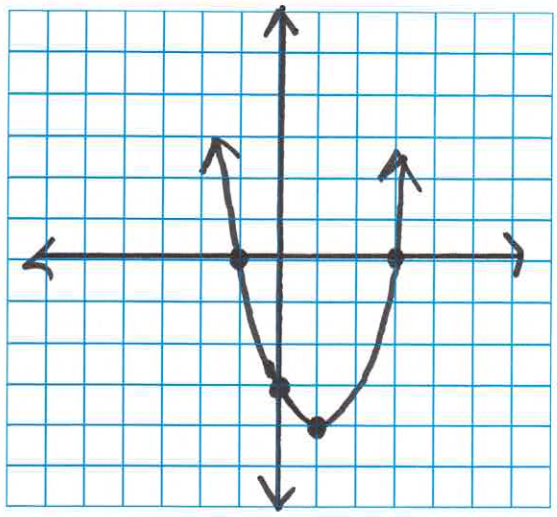
$W = L - 7$

$W = 9 - 7$

$\boxed{W = 2\text{ ft.}}$

60. Graph the parabola.

$$y = x^2 - 2x - 3$$



* Concave up

$a=1 \quad b=-2 \quad c=-3$

vertex: $x = \frac{-b}{2a}$

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

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

$x = 1$

$y = (1)^2 - 2(1) - 3$

$y = 1 - 2 - 3$

$y = 1 - 5$

$y = -4$

vertex: $(1, -4)$

y-int: $y = 0^2 - 2(0) - 3$

$y = -3$

$(0, -3)$

x-int:

$0 = x^2 - 2x - 3$

$0 = (x+1)(x-3)$

$x + 1 = 0 \qquad x - 3 = 0$

$-1 \quad -1 \qquad +3 \quad +3$

$x = -1 \qquad x = 3$

$(-1, 0) \qquad (3, 0)$