

Friendship Jr. High School
Accelerated Math Program

*These
"fat jokes" are
really starting to
wear thin . . .*



Algebra

4

UNIT #10

Radicals

UNIT #11

Quadratic Functions & Equations

UNIT #12

Rational Expressions

10.1

Answer Key

$$\textcircled{1} \sqrt{36} = \boxed{6}$$

$$\textcircled{2} \sqrt{49} = \boxed{7}$$

$$\textcircled{3} -\sqrt{81} = \boxed{-9}$$

$$\textcircled{4} -\sqrt{64} = \boxed{-8}$$

$$\textcircled{5} \pm\sqrt{9} = \boxed{\pm 3}$$

$$\textcircled{6} \pm\sqrt{16} = \boxed{\pm 4}$$

$$\textcircled{7} \sqrt{4/9} = \boxed{2/3}$$

$$\textcircled{8} \sqrt{25/36} = \boxed{5/6}$$

$$\textcircled{9} \sqrt{24} = \sqrt{2 \cdot 2 \cdot 2 \cdot 3} = \boxed{2\sqrt{6}}$$

$$\textcircled{10} \sqrt{45} = \sqrt{3 \cdot 3 \cdot 5} = \boxed{3\sqrt{5}}$$

$$\textcircled{11} \sqrt{48} = \sqrt{2 \cdot 2 \cdot 2 \cdot 2 \cdot 3} = \boxed{4\sqrt{3}}$$

$$\textcircled{12} \sqrt{80} = \sqrt{2 \cdot 2 \cdot 2 \cdot 2 \cdot 5} = \boxed{4\sqrt{5}}$$

$$\textcircled{13} -\sqrt{150} = -\sqrt{2 \cdot 3 \cdot 5 \cdot 5} = \boxed{-5\sqrt{6}}$$

$$\textcircled{14} -\sqrt{162} = -\sqrt{2 \cdot 3 \cdot 3 \cdot 3 \cdot 3} = \boxed{-9\sqrt{2}}$$

$$\textcircled{15} \sqrt{8n} = \sqrt{2 \cdot 2 \cdot 2 \cdot n} = \boxed{2\sqrt{2n}}$$

$$\textcircled{16} \sqrt{20x} = \sqrt{2 \cdot 2 \cdot 5 \cdot x} = \boxed{2\sqrt{5x}}$$

$$\textcircled{17} \sqrt{40n^3} = \sqrt{2 \cdot 2 \cdot 2 \cdot 5 \cdot n^3} = \boxed{2n\sqrt{10n}}$$

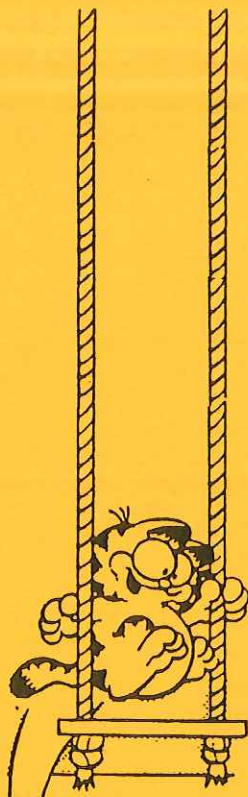
$$\textcircled{18} \sqrt{12a^3} = \sqrt{2 \cdot 2 \cdot 3 \cdot a^3} = \boxed{2a\sqrt{3a}}$$

$$\textcircled{19} \sqrt{75n^4} = \sqrt{3 \cdot 5 \cdot 5 \cdot n^4} = \boxed{5n^2\sqrt{3}}$$

$$\textcircled{20} \sqrt{60a^4b^4} = \sqrt{2 \cdot 2 \cdot 3 \cdot 5 \cdot a^4b^4} = \boxed{2a^2b^2\sqrt{15}}$$

$$\textcircled{21} \sqrt{18n^2} = \sqrt{2 \cdot 3 \cdot 3 \cdot n^2} = \boxed{3|n|\sqrt{2}}$$

$$\textcircled{22} \sqrt{54x^2} = \sqrt{2 \cdot 3 \cdot 3 \cdot 3 \cdot x^2} = \boxed{3|x|\sqrt{6}}$$



$$\textcircled{23} \sqrt{90a^3b^2} = \sqrt{2 \cdot 3 \cdot 3 \cdot 5 \cdot a^3b^2}$$

$3a|b|\sqrt{10a}$ "a" cannot be negative or original radicand will be negative. "b" is independent and can be negative.

$$\textcircled{24} \sqrt{50x^2y^5} = \sqrt{2 \cdot 5 \cdot 5 \cdot x^2y^5}$$

$5|x|y^2\sqrt{2y}$ "x" is independent and can be negative in the original radicand. "y" must be positive (odd exponent).

$$\textcircled{25} \sqrt{72a^3b^3} = \sqrt{2 \cdot 2 \cdot 2 \cdot 3 \cdot 3 \cdot a^3b^3}$$

$6ab\sqrt{2ab}$ "a" and "b" both have odd (3) exponents. They are dependent, both negative or both positive. If both are negative, no absolute value is needed.

$$\textcircled{26} \sqrt{32x^4y^3} = \sqrt{2 \cdot 2 \cdot 2 \cdot 2 \cdot x^4y^3}$$

$4x^2y\sqrt{2y}$ "y" cannot be negative or original radicand would be negative.

$$\textcircled{27} \sqrt{28a^6b^4} = \sqrt{2 \cdot 2 \cdot 7 \cdot a^6b^4}$$

$2b^2|a^3|\sqrt{7}$ "a" or "b" (or both) could be negative. The even exponent in the answer protects "b".

$$\textcircled{28} \sqrt{24n^3m^5} = \sqrt{2 \cdot 2 \cdot 2 \cdot 3 \cdot n^3m^5}$$

$2m^2|n|\sqrt{6nm}$ Variables both have odd exponents in original radicand, making them dependent (both must have same sign). If they are negative, "n" needs to be protected in the answer because of the odd exponent (1).

$$\textcircled{29} \sqrt{45a^4b^2} = \sqrt{3 \cdot 3 \cdot 5 \cdot a^4b^2}$$

$\boxed{3a^2|b|\sqrt{5}}$ The even exponents in the original radicand allow both variables to be positive or negative independent of each other. "b" has to be protected in the answer.

$$\textcircled{30} \sqrt{12x^3y^4} = \sqrt{2 \cdot 2 \cdot 3 \cdot x^3y^4}$$

$\boxed{2xy^2\sqrt{3x}}$ "x" cannot be negative. "y" is protected because of the even exponent (2) in answer.

$$\textcircled{31} \sqrt{20a^2b^4} = \sqrt{2 \cdot 2 \cdot 5 \cdot a^2b^4}$$

$\boxed{2b^2|a|\sqrt{5}}$ Variables are both independent (even exponents in original radicand), either could be negative. "a" needs protection.

$$\textcircled{32} \sqrt{8n^3m^2} = \sqrt{2 \cdot 2 \cdot 2 \cdot n^3m^2}$$

$\boxed{2n|m|\sqrt{2n}}$ "n" cannot be negative. "m" can be and must be protected.

$$\textcircled{33} \sqrt{80x^3y^3} = \sqrt{2 \cdot 2 \cdot 2 \cdot 5 \cdot x^3y^3}$$

$\boxed{4xy\sqrt{5xy}}$ Variables are dependent (both have same signs, odd exponents in original radicand). No absolute value signs needed if both are negative in answer.

$$\textcircled{34} \sqrt{44n^5m^2} = \sqrt{2 \cdot 2 \cdot 11 \cdot n^5m^2}$$

$\boxed{2n^2|m|\sqrt{11n}}$ "n" has odd exponent in original radicand and therefore cannot be negative. "m" can be (independent) and must be protected.

$$\textcircled{35} \sqrt{a^3b^5c^2} = \boxed{b^2|ac|\sqrt{ab}}$$

"c" is independent and must be protected (even exponent in

original radicand). "a" and "b" are dependent, both must have same sign. Even exponent in answer (2) protects "b".

$$\textcircled{36} \sqrt{x^4y^6z^3} = \boxed{x^2z|y^3|\sqrt{z}}$$

"x" and "y" are independent. "y" must be protected in answer due to odd exponent (3). "z" cannot be negative (only odd exponent in original radicand).

$$\textcircled{37} \sqrt{x^5y^3z^4} = \boxed{x^2z^2|y|\sqrt{xy}}$$

"z" is independent but even exponent in answer (2) protects it. "x" and "y" are dependent, both must have same signs. "x" is protected (even exponent in answer). "y" needs absolute value bars.

$$\textcircled{38} \sqrt{a^3b^3c^3} = \boxed{abc\sqrt{abc}}$$

Because all variables have odd exponents in original radicand, either they are all positive or exactly two of them are negative. If two are negative, the answer is positive and needs no absolute value bars.

$$\textcircled{39} \sqrt{n^2m^3p} = \boxed{|nm|\sqrt{mp}}$$

"n" is independent, could be negative. "m" and "p" are dependent (must have same sign). Since "n" or "m" could be negative, both must be protected.

$$\textcircled{40} \sqrt{x^3y^2z^3} = \boxed{xz|y|\sqrt{xz}}$$

"y" is independent (even exponent in original radicand) and must be protected in the final answer. "x" and "z" are dependent, must have same sign. Even if negative, $xz = a$ positive and needs no absolute value bars.

10.2

Answer Key



$$\textcircled{1} (\sqrt{2})(\sqrt{3}) = \sqrt{6}$$

$$\textcircled{2} (\sqrt{5})(\sqrt{7}) = \sqrt{35}$$

$$\textcircled{3} (\sqrt{6})(\sqrt{2}) = \sqrt{12} = 2\sqrt{3}$$

$$\textcircled{4} (\sqrt{8})(\sqrt{3}) = \sqrt{24} = 2\sqrt{6}$$

$$\textcircled{5} \sqrt{2}(\sqrt{3}+\sqrt{8}) = \sqrt{6} + \sqrt{16} = \sqrt{6+4}$$

$$\textcircled{6} \sqrt{3}(\sqrt{3}-\sqrt{2}) = \sqrt{9}-\sqrt{6} = 3-\sqrt{6}$$

$$\textcircled{7} 2\sqrt{2}+\sqrt{18} = 2\sqrt{2}+3\sqrt{2} = 5\sqrt{2}$$

$$\textcircled{8} 4\sqrt{3}-2\sqrt{12} = 4\sqrt{3}-4\sqrt{3} = 0$$

$$\textcircled{9} 2\sqrt{50}-3\sqrt{32} = 10\sqrt{2}-12\sqrt{2} = -2\sqrt{2}$$

$$\textcircled{10} 3\sqrt{7}-5\sqrt{48} = 9\sqrt{3}-20\sqrt{3} = -11\sqrt{3}$$

$$\textcircled{11} 3\sqrt{28}-8\sqrt{63} = 6\sqrt{7}-24\sqrt{7} = -18\sqrt{7}$$

$$\textcircled{12} 3\sqrt{2}(2\sqrt{6}-\sqrt{24}) \quad \textcircled{13} 2\sqrt{3}(\sqrt{15}+2\sqrt{3})$$

$$6\sqrt{12}-3\sqrt{48}$$

$$2\sqrt{45}+4\sqrt{9}$$

$$12\sqrt{3}-12\sqrt{3}$$

$$6\sqrt{15}+4(3)$$

$$0$$

$$6\sqrt{15}+12$$

$$\textcircled{14} 2\sqrt{2}-3\sqrt{18}+2\sqrt{6}$$

$$2\sqrt{2}-9\sqrt{2}+2\sqrt{6} = -7\sqrt{2}+2\sqrt{6}$$

$$\textcircled{15} 4\sqrt{3}+2\sqrt{8}-3\sqrt{12}$$

$$4\sqrt{3}+4\sqrt{2}-6\sqrt{3} = 4\sqrt{2}-2\sqrt{3}$$

$$\textcircled{16} -\sqrt{8x^3y^4} = -2xy^2\sqrt{2x}$$

"y" is independent, can be negative but is protected by even exponent (2) in the answer. "x" cannot be negative (odd exponent in original radicand)

$$\textcircled{17} \sqrt{12a^5b^3c^2} = 2a^2|bc|\sqrt{3ab}$$

"c" is independent, could be negative and needs protection in the answer. "a" and "b" are dependent, must have same sign, "b" must be protected.

$$\textcircled{18} \pm\sqrt{20n^3m^3} = \pm 2nm\sqrt{5nm}$$

Both variables have odd exponents in original radicand. They are dependent, same sign. No bars needed since both are positive or both are negative.

$$\textcircled{19} \sqrt{x^2y^2z^3} = |z|xy\sqrt{z}$$

"z" cannot be negative (only odd exponent in original radicand). "x" and "y" are independent. Since one or the other could be negative, both need to be protected.

$$\textcircled{20} \sqrt{a^3b^4c^5} = b^2c^2|a|\sqrt{ac}$$

"b" and "c" are protected by even exponents in the answer. "a" can be negative if "c" is negative, but "a" must be protected (odd exponent in answer).

10.3

Answer Key



$$\textcircled{1} \frac{\sqrt{8}}{\sqrt{3}} \cdot \frac{\sqrt{3}}{\sqrt{3}} = \frac{\sqrt{24}}{3} = \frac{2\sqrt{6}}{3}$$

$$\textcircled{2} \frac{\sqrt{10}}{\sqrt{2}} \cdot \frac{\sqrt{2}}{\sqrt{2}} = \frac{\sqrt{20}}{2} = \frac{2\sqrt{5}}{2} = \sqrt{5}$$

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

$$\textcircled{4} \frac{3\sqrt{6}}{\sqrt{3}} \cdot \frac{\sqrt{3}}{\sqrt{3}} = \frac{3\sqrt{18}}{3} = \sqrt{18} = \boxed{3\sqrt{2}}$$

$$\textcircled{5} \frac{3\sqrt{2}}{\sqrt{6}} \cdot \frac{\sqrt{6}}{\sqrt{6}} = \frac{3\sqrt{12}}{6} = \frac{6\sqrt{3}}{6} = \boxed{\sqrt{3}}$$

$$\textcircled{6} \frac{2\sqrt{3}}{\sqrt{8}} \cdot \frac{\sqrt{8}}{\sqrt{8}} = \frac{2\sqrt{24}}{8} = \frac{4\sqrt{6}}{8} = \boxed{\frac{\sqrt{6}}{2}}$$

$$\textcircled{7} \frac{1}{6+\sqrt{3}} \cdot \frac{6-\sqrt{3}}{6-\sqrt{3}} = \frac{6-\sqrt{3}}{36-3} = \boxed{\frac{6-\sqrt{3}}{33}}$$

$$\textcircled{8} \frac{1}{7-\sqrt{2}} \cdot \frac{7+\sqrt{2}}{7+\sqrt{2}} = \frac{7+\sqrt{2}}{49-2} = \boxed{\frac{7+\sqrt{2}}{47}}$$

$$\textcircled{9} \frac{\sqrt{3}}{2-\sqrt{3}} \cdot \frac{2+\sqrt{3}}{2+\sqrt{3}} = \frac{2\sqrt{3}+3}{4-3} = \boxed{2\sqrt{3}+3}$$

$$\textcircled{10} \frac{\sqrt{5}}{5+\sqrt{5}} \cdot \frac{5-\sqrt{5}}{5-\sqrt{5}} = \frac{5\sqrt{5}-5}{25-5}$$

$$\frac{5\sqrt{5}-5}{20} = \boxed{\frac{\sqrt{5}-1}{4}}$$



$$\textcircled{11} \sqrt{6} + \sqrt{\frac{2}{3}} \quad \frac{\sqrt{2}}{\sqrt{3}} \cdot \frac{\sqrt{3}}{\sqrt{3}} = \frac{\sqrt{6}}{3}$$

$$\sqrt{6} + \frac{\sqrt{6}}{3} = \frac{3\sqrt{6}}{3} + \frac{\sqrt{6}}{3} = \boxed{\frac{4\sqrt{6}}{3}}$$

$$\textcircled{12} \sqrt{7} + \sqrt{\frac{1}{7}} \quad \frac{\sqrt{1}}{\sqrt{7}} \cdot \frac{\sqrt{7}}{\sqrt{7}} = \frac{\sqrt{7}}{7}$$

$$\sqrt{7} + \frac{\sqrt{7}}{7} = \frac{7\sqrt{7}}{7} + \frac{\sqrt{7}}{7} = \boxed{\frac{8\sqrt{7}}{7}}$$

$$\textcircled{13} 14\sqrt{\frac{3}{2}} + 9\sqrt{\frac{2}{3}} \quad \frac{\sqrt{3}}{\sqrt{2}} \cdot \frac{\sqrt{2}}{\sqrt{2}} = \frac{\sqrt{6}}{2}$$

$$14\left(\frac{\sqrt{6}}{2}\right) + 9\left(\frac{\sqrt{6}}{3}\right) \quad \frac{\sqrt{2}}{\sqrt{3}} \cdot \frac{\sqrt{3}}{\sqrt{3}} = \frac{\sqrt{6}}{3}$$

$$7\sqrt{6} + 3\sqrt{6} = \boxed{10\sqrt{6}}$$

$$\textcircled{14} 3\sqrt{\frac{7}{4}} - 10\sqrt{\frac{1}{7}} \quad \frac{\sqrt{7}}{\sqrt{4}} = \frac{\sqrt{7}}{2}$$

$$3\left(\frac{\sqrt{7}}{2}\right) - 10\left(\frac{\sqrt{7}}{7}\right) \quad \frac{\sqrt{1}}{\sqrt{7}} \cdot \frac{\sqrt{7}}{\sqrt{7}} = \frac{\sqrt{7}}{7}$$

$$\left(\frac{3\sqrt{7}}{2}\right) \cdot \frac{7}{7} - \left(\frac{10\sqrt{7}}{7}\right) \cdot \frac{2}{2} \quad \text{establish a common denominator}$$

$$\frac{21\sqrt{7}}{14} - \frac{20\sqrt{7}}{14} = \boxed{\frac{\sqrt{7}}{14}}$$

$$\textcircled{15} \sqrt{12a^2b^2} = \boxed{2|ab|\sqrt{3}}$$

Both variables are independent, could be negative. Since only one could be negative, both need to be protected.

$$\textcircled{16} -\sqrt{n^3m^5p} = \boxed{-m^2|n|\sqrt{nmp}}$$

All three variables in the original radicand have odd exponents which means all are positive or exactly two are negative. In the solution, m^2 is protected (even exponent). " n " could be negative and needs bars. The negative sign is attached at the very end.

$$\textcircled{17} -\sqrt{8x^2y^3z^6} = \boxed{-2y|xz^3|\sqrt{2y}}$$

" x " and " z " are independent (even exponents in original radicand). Both can be negative (or neither or only one). Both must be protected in the answer. " y " cannot be negative (only odd exponent in original radicand).

$$\textcircled{18} \sqrt{a^5b^6c^2} = \boxed{a^2|b^3c|\sqrt{a}}$$

" b " and " c " are independent (even exponents in original radicand). Both can be negative (or neither or only one). Since both have odd exponents in the answer, both need to be protected. " a " cannot be negative (only odd exponent in original radicand).

10.4

Answer Key



$$\begin{array}{r} \textcircled{1} \quad \sqrt{264.0000} \\ 16.24 \\ \underline{26} \\ 156 \\ \underline{322} \\ 644 \\ \underline{3247} \\ 12976 \end{array}$$

$$\boxed{\approx 16.2}$$

$$\begin{array}{r} \textcircled{4} \quad \sqrt{1963.0000} \\ 44.30 \\ \underline{84} \\ 336 \\ \underline{883} \\ 2700 \\ 2649 \\ \underline{8860} \\ 5100 \\ 0 \end{array}$$

$$\boxed{\approx 44.3}$$

$$\begin{array}{r} \textcircled{2} \quad \sqrt{586.0000} \\ 24.20 \\ \underline{4} \\ 186 \\ \underline{482} \\ 176 \\ \underline{4840} \\ 964 \\ \underline{4840} \\ 3600 \\ 0 \end{array}$$

$$\boxed{\approx 24.2}$$

$$\begin{array}{r} \textcircled{5} \quad \sqrt{3620.0000} \\ 60.16 \\ \underline{120} \\ 20 \\ 0 \\ \underline{1201} \\ 2000 \\ 1201 \\ \underline{12026} \\ 79900 \\ 72156 \end{array}$$

$$\boxed{\approx 60.2}$$

$$\begin{array}{r} \textcircled{3} \quad \sqrt{2924.0000} \\ 54.07 \\ \underline{104} \\ 424 \\ 416 \\ \underline{1080} \\ 800 \\ 0 \\ \underline{10807} \\ 80000 \\ 75649 \end{array}$$

$$\boxed{\approx 54.1}$$

$$\begin{array}{r} \textcircled{6} \quad \sqrt{4126.0000} \\ 64.23 \\ \underline{128} \\ 526 \\ 496 \\ \underline{1282} \\ 3000 \\ 2564 \\ \underline{12843} \\ 43600 \\ 38529 \end{array}$$

$$\boxed{\approx 64.2}$$

$$\textcircled{7} \quad \sqrt{32a^2b^3} = \boxed{4b|a|\sqrt{2b}}$$

"a" is independent, could be negative, must be protected in answer.

$$\textcircled{8} \quad \sqrt{24x^3y^3z^2} = \boxed{2xy|z|\sqrt{6xy}}$$

"z" is independent, could be negative, must be protected in answer. "x" and "y" are dependent (same sign). If both negative, no bars needed.

$$\textcircled{9} \quad 4\sqrt{2}(\sqrt{8} - 3\sqrt{18})$$

$$4\sqrt{16} - 12\sqrt{36}$$

$$4(4) - 12(6) = \boxed{-56}$$

$$\textcircled{10} \quad \frac{\sqrt{6}}{2-\sqrt{3}} \cdot \frac{2+\sqrt{3}}{2+\sqrt{3}} = \frac{2\sqrt{6}+\sqrt{18}}{4-3}$$

$$\boxed{2\sqrt{6}+3\sqrt{2}}$$

$$\textcircled{11} \quad \frac{2\sqrt{2}}{\sqrt{8}-2} \cdot \frac{\sqrt{8}+2}{\sqrt{8}+2} = \frac{2\sqrt{16}+4\sqrt{2}}{4}$$

$$\frac{2(4)+4\sqrt{2}}{4} = \frac{8+4\sqrt{2}}{4}$$

$$\boxed{2+\sqrt{2}}$$



10.5

Answer Key



$$\begin{aligned} \textcircled{1} \quad 27 &= \sqrt{729} \\ &\quad \sqrt{739} \\ 28 &= \sqrt{784} \end{aligned} \left. \vphantom{\begin{aligned} 27 \\ 28 \end{aligned}} \right\} 55 \left. \vphantom{\begin{aligned} 55 \\ 27 \\ 28 \end{aligned}} \right\} 10$$

$$27 \frac{10}{55}$$

$$\boxed{27 \frac{2}{11}}$$

$$\begin{aligned} \textcircled{2} \quad 34 &= \sqrt{1156} \\ &\quad \sqrt{1179} \\ 35 &= \sqrt{1225} \end{aligned} \left. \vphantom{\begin{aligned} 34 \\ 35 \end{aligned}} \right\} 69 \left. \vphantom{\begin{aligned} 69 \\ 34 \\ 35 \end{aligned}} \right\} 23$$

$$34 \frac{23}{69}$$

$$\boxed{34 \frac{1}{3}}$$

$$\begin{aligned} \textcircled{3} \quad 37 &= \sqrt{1369} \\ &\quad \sqrt{1419} \\ 38 &= \sqrt{1444} \end{aligned} \left. \vphantom{\begin{aligned} 37 \\ 38 \end{aligned}} \right\} 75 \left. \vphantom{\begin{aligned} 75 \\ 37 \\ 38 \end{aligned}} \right\} 50$$

$$37 \frac{50}{75}$$

$$\boxed{37 \frac{2}{3}}$$

$$\begin{aligned} \textcircled{4} \quad 17 &= \sqrt{289} \\ &\quad \sqrt{314} \\ 18 &= \sqrt{324} \end{aligned} \left. \vphantom{\begin{aligned} 17 \\ 18 \end{aligned}} \right\} 35 \left. \vphantom{\begin{aligned} 35 \\ 17 \\ 18 \end{aligned}} \right\} 25$$

$$17 \frac{25}{35}$$

$$\boxed{17 \frac{5}{7}}$$

$$\begin{aligned} \textcircled{5} \quad 61 &= \sqrt{3721} \\ &\quad \sqrt{3754} \\ 62 &= \sqrt{3844} \end{aligned} \left. \vphantom{\begin{aligned} 61 \\ 62 \end{aligned}} \right\} 123 \left. \vphantom{\begin{aligned} 123 \\ 61 \\ 62 \end{aligned}} \right\} 33$$

$$61 \frac{33}{123}$$

$$\boxed{61 \frac{11}{41}}$$

$$\begin{aligned} \textcircled{6} \quad 19 &= \sqrt{361} \\ &\quad \sqrt{374} \\ 20 &= \sqrt{400} \end{aligned} \left. \vphantom{\begin{aligned} 19 \\ 20 \end{aligned}} \right\} 39 \left. \vphantom{\begin{aligned} 39 \\ 19 \\ 20 \end{aligned}} \right\} 13$$

$$19 \frac{13}{39}$$

$$\boxed{19 \frac{1}{3}}$$

$$\begin{aligned} \textcircled{7} \quad 22 &= \sqrt{484} \\ &\quad \sqrt{509} \\ 23 &= \sqrt{529} \end{aligned} \left. \vphantom{\begin{aligned} 22 \\ 23 \end{aligned}} \right\} 45 \left. \vphantom{\begin{aligned} 45 \\ 22 \\ 23 \end{aligned}} \right\} 25$$

$$22 \frac{25}{45}$$

$$\boxed{22 \frac{5}{9}}$$

$$\begin{aligned} \textcircled{8} \quad 67 &= \sqrt{4489} \\ &\quad \sqrt{4579} \\ 68 &= \sqrt{4624} \end{aligned} \left. \vphantom{\begin{aligned} 67 \\ 68 \end{aligned}} \right\} 135 \left. \vphantom{\begin{aligned} 135 \\ 67 \\ 68 \end{aligned}} \right\} 90$$

$$67 \frac{90}{135}$$

$$\boxed{67 \frac{2}{3}}$$

$$\textcircled{9} \quad \sqrt{8n^3m^5p^2} = \boxed{2m^2|np|\sqrt{2nm}}$$

"p" is independent, could be negative, needs to be protected. "n" and "m" are dependent. If both are negative, "m" is protected by an even exponent in the solution; "n" is not.

$$\textcircled{10} \quad \sqrt{12a^5b^6c^3} = \boxed{2a^2|b^3c|\sqrt{3ac}}$$

"b" is independent, could be negative, needs protection (odd exponent in solution). "a" and "c" are dependent. If both are negative, "c" needs protection (odd exponent in solution).

$$\textcircled{11} \quad 2\sqrt{3}(3\sqrt{12}-\sqrt{8})$$

$$6\sqrt{36}-2\sqrt{24}$$

$$6(6)-2(2\sqrt{6}) = \boxed{36-4\sqrt{6}}$$

$$\textcircled{12} \quad 4\sqrt{2}-4\sqrt{20}+3\sqrt{18}$$

$$4\sqrt{2}-4(2\sqrt{5})+3(3\sqrt{2})$$

$$4\sqrt{2}-8\sqrt{5}+9\sqrt{2} = \boxed{13\sqrt{2}-8\sqrt{5}}$$

$$\textcircled{13} \quad \frac{3\sqrt{3}}{\sqrt{6}} \cdot \frac{\sqrt{6}}{\sqrt{6}} = \frac{3\sqrt{18}}{6} = \frac{3(3\sqrt{2})}{6}$$

$$\frac{9\sqrt{2}}{6} = \boxed{\frac{3\sqrt{2}}{2}}$$

$$\textcircled{14} \quad \frac{3\sqrt{2}}{3-2\sqrt{2}} \cdot \frac{3+2\sqrt{2}}{3+2\sqrt{2}} = \frac{9\sqrt{2}+6(2)}{9-4(2)}$$

$$\frac{9\sqrt{2}+12}{9-8} = \boxed{9\sqrt{2}+12}$$

$$\textcircled{15} \quad \frac{\sqrt{2}-3}{\sqrt{8}} = \frac{\sqrt{2}-3}{2\sqrt{2}} \cdot \frac{\sqrt{2}}{\sqrt{2}} = \boxed{\frac{2-3\sqrt{2}}{4}}$$

$$\begin{array}{r} 16) \quad \sqrt{1230.0000} \\ \underline{65} \quad 330 \\ \quad \underline{325} \\ \quad 700 \quad 500 \\ \quad \quad \underline{0} \\ 700 \quad 7 \quad \underline{150000} \\ \quad \quad \quad 49049 \end{array}$$

≈ 35.1

$$\begin{aligned} 9) \quad \sqrt{n} &= 3\sqrt{5} \\ n &= (3\sqrt{5})^2 \\ n &= (9)(5) \\ n &= 45 \end{aligned}$$

$$\begin{aligned} 10) \quad 3\sqrt{7} &= \sqrt{c} \\ (3\sqrt{7})^2 &= c \\ (9)(7) &= c \\ c &= 63 \end{aligned}$$

$$\begin{aligned} 11) \quad 5\sqrt{2n^2-28} &= 20 \\ \sqrt{2n^2-28} &= 4 \\ 2n^2-28 &= 16 \\ 2n^2 &= 44 \\ n^2 &= 22 \\ n &= \pm\sqrt{22} \end{aligned}$$

$$\begin{aligned} 12) \quad 4\sqrt{3x^2-15} &= 12 \\ \sqrt{3x^2-15} &= 3 \\ 3x^2-15 &= 9 \\ 3x^2 &= 24 \\ x^2 &= 8 \\ x &= \pm 2\sqrt{2} \end{aligned}$$

10.6

Answer Key

$$\begin{aligned} 1) \quad \sqrt{n} &= 7 \\ n &= 49 \end{aligned} \quad \begin{aligned} 2) \quad \sqrt{x} &= 8 \\ x &= 64 \end{aligned}$$

$$\begin{aligned} 3) \quad \sqrt{4x+1} &= 3 \\ 4x+1 &= 9 \\ 4x &= 8 \\ x &= 2 \end{aligned} \quad \begin{aligned} 4) \quad \sqrt{2x+7} &= 5 \\ 2x+7 &= 25 \\ 2x &= 18 \\ x &= 9 \end{aligned}$$

$$\begin{aligned} 5) \quad \sqrt{2n+1} &= 0 \\ \sqrt{2n} &= -1 \\ \text{no real solutions} \end{aligned} \quad \begin{aligned} 6) \quad \sqrt{a+3} &= 1 \\ \sqrt{a} &= -2 \\ \text{no real solutions} \end{aligned}$$

$$\begin{aligned} 7) \quad \sqrt{8x+1} - 5 &= 0 \\ \sqrt{8x+1} &= 5 \\ 8x+1 &= 25 \\ 8x &= 24 \\ x &= 3 \end{aligned} \quad \begin{aligned} 8) \quad \sqrt{2n-5} + 1 &= 6 \\ \sqrt{2n-5} &= 5 \\ 2n-5 &= 25 \\ 2n &= 30 \\ n &= 15 \end{aligned}$$

$$\begin{aligned} 13) \quad \sqrt{n+2} &= n-4 \\ n+2 &= (n-4)^2 \\ n+2 &= n^2-8n+16 \\ 0 &= n^2-9n+14 \\ (n-7)(n-2) &= 0 \\ n &= 7 \quad \& \end{aligned}$$

2 does not check

$$\begin{aligned} 14) \quad \sqrt{1-2x} &= 1+x \\ 1-2x &= (1+x)^2 \\ 1-2x &= 1+2x+x^2 \\ 0 &= x^2+4x \\ x(x+4) &= 0 \\ x &= 0 \quad \& \end{aligned}$$

-4 does not check

$$\begin{aligned} 15) \quad 4 + \sqrt{x-2} &= x \\ \sqrt{x-2} &= x-4 \\ x-2 &= (x-4)^2 \\ x-2 &= x^2-8x+16 \\ 0 &= x^2-9x+18 \\ (x-6)(x-3) &= 0 \\ x &= 6 \quad \& \end{aligned}$$

$$\begin{aligned} 16) \quad n + \sqrt{n^2+3} &= 3n \\ \sqrt{n^2+3} &= 2n \\ n^2+3 &= (2n)^2 \\ n^2+3 &= 4n^2 \\ 0 &= 3n^2-3 \\ 3(n^2-1) &= 0 \\ 3(n-1)(n+1) &= 0 \\ n &= 1 \quad \& \end{aligned}$$

-1 does not check



10.7

Answer Key



$$\begin{aligned} \textcircled{1} \quad 2^2 + 6^2 &= x^2 \\ 4 + 36 &= x^2 \\ x^2 &= 40 \\ x &= \sqrt{40} \end{aligned}$$

$$\boxed{2\sqrt{10} \text{ m}}$$

$$\begin{aligned} \textcircled{2} \quad x^2 + 8^2 &= 12^2 \\ x^2 + 64 &= 144 \\ x^2 &= 80 \\ x &= \sqrt{80} \end{aligned}$$

$$\boxed{4\sqrt{5} \text{ m}}$$

$$\begin{aligned} \textcircled{3} \quad x^2 + (6\sqrt{2})^2 &= 10^2 \\ x^2 + (36)(2) &= 100 \\ x^2 &= 28 \\ x &= \sqrt{28} \end{aligned}$$

$$\boxed{2\sqrt{7} \text{ m}}$$

$$\begin{aligned} \textcircled{4} \quad x^2 + (4\sqrt{6})^2 &= 12^2 \\ x^2 + (16)(6) &= 144 \\ x^2 &= 48 \\ x &= \sqrt{48} \end{aligned}$$

$$\boxed{4\sqrt{3} \text{ m}}$$

$$\begin{aligned} \textcircled{5} \quad (3\sqrt{2})^2 + (3\sqrt{3})^2 &= x^2 \\ (9)(2) + (9)(3) &= x^2 \\ x^2 &= 45 \\ x &= \sqrt{45} \end{aligned}$$

$$\boxed{3\sqrt{5} \text{ m}}$$

$$\begin{aligned} \textcircled{6} \quad 8^2 + (4\sqrt{2})^2 &= x^2 \\ 64 + (16)(2) &= x^2 \\ x^2 &= 96 \\ x &= \sqrt{96} \end{aligned}$$

$$\boxed{4\sqrt{6} \text{ m}}$$

$$\textcircled{7} \quad (-4, 2) (4, 17)$$

$$d = \sqrt{(-4-4)^2 + (2-17)^2}$$

$$d = \sqrt{64 + 225} = \boxed{17}$$

$$\textcircled{8} \quad (5, -1) (11, 7)$$

$$d = \sqrt{(5-11)^2 + (-1-7)^2}$$

$$d = \sqrt{36 + 64} = \boxed{10}$$

$$\textcircled{9} \quad (7, -9) (4, -3)$$

$$d = \sqrt{(7-4)^2 + (-9-3)^2}$$

$$d = \sqrt{9 + 36} = \sqrt{45}$$

$$\boxed{3\sqrt{5}}$$

$$\textcircled{10} \quad \sqrt{4x-3} = 3$$

$$\sqrt{4x} = 6$$

$$4x = 36$$

$$\boxed{x = 9}$$

$$\begin{aligned} \textcircled{11} \quad n + \sqrt{n^2 - 2n} &= 3n - 4 \\ \sqrt{n^2 - 2n} &= 2n - 4 \\ n^2 - 2n &= (2n - 4)^2 \\ n^2 - 2n &= 4n^2 - 16n + 16 \\ 0 &= 3n^2 - 14n + 16 \end{aligned}$$

$$3n^2 - 6n - 8n + 16 = 0$$

$$3n(n-2) - 8(n-2) = 0$$

$$(n-2)(3n-8) = 0$$

$$\boxed{n = 2, 8/3} \quad \text{both answers check}$$

$$\textcircled{12} \quad \sqrt{18a^3b^2c^5}$$

$$\boxed{3c^2 | ab | \sqrt{2ac}}$$

"c" is protected by even exponent in the solution. "b" and "c" are dependent (same sign). "c" must be protected if both dependent variables are negative. "b" is independent, can be negative, must be protected.

$$\textcircled{13} \quad 3\sqrt{2} (\sqrt{8} - 4\sqrt{2})$$

$$3\sqrt{16} - 12(2)$$

$$3(4) - 24 = \boxed{-12}$$

$$\textcircled{14} \quad 6\sqrt{2} - 2\sqrt{32}$$

$$6\sqrt{2} - 2(4\sqrt{2})$$

$$6\sqrt{2} - 8\sqrt{2} = \boxed{-2\sqrt{2}}$$

$$\textcircled{15} \quad \frac{\sqrt{3}-2}{\sqrt{3}} \cdot \frac{\sqrt{3}}{\sqrt{3}} = \boxed{\frac{3-2\sqrt{3}}{3}}$$

$$\textcircled{16} \quad \frac{2}{6\sqrt{3}} \cdot \frac{6+\sqrt{3}}{6+\sqrt{3}} = \frac{12+2\sqrt{3}}{36-3} = \boxed{\frac{12+2\sqrt{3}}{33}}$$

$$\textcircled{17} \quad \frac{25.33}{\sqrt{642.0000}} \approx \boxed{25.3}$$

$$\begin{array}{r} 4 \\ \hline 4\overline{)242} \\ \underline{225} \\ 1700 \\ \underline{1509} \\ 19100 \\ \underline{15189} \end{array}$$

$$\begin{aligned} 18) \quad 24 &= \sqrt{576} \\ &\quad \sqrt{590} \\ 25 &= \sqrt{625} \end{aligned} \left. \vphantom{\begin{aligned} 24 \\ 25 \end{aligned}} \right\} 49 \left. \vphantom{\begin{aligned} 49 \\ 24 \\ 25 \end{aligned}} \right\} 14 \quad 24 \frac{14}{49}$$

$$\boxed{24 \frac{2}{7}}$$

Unit 10 REVIEW Answer Key

$$1) -\sqrt{180} = \boxed{-6\sqrt{5}}$$

$$2) \pm\sqrt{300} = \boxed{\pm 10\sqrt{3}}$$

$$3) \sqrt{60n^3} = \boxed{2n\sqrt{15n}}$$

$$4) \sqrt{80n^7} = \boxed{4n^3\sqrt{5n}}$$

$$5) \sqrt{20a^2b^3} = \boxed{2b|a|\sqrt{5b}}$$



$$6) \sqrt{46x^3y^4z^5} = \boxed{4y^2z^2|x|\sqrt{6xz}}$$

$$7) \sqrt{200n^7m^6p^5} = \boxed{10p^2|n^3m^3|\sqrt{2np}}$$

$$8) \sqrt{288x^7y^7z^4} = \boxed{12x^3y^3z^2\sqrt{2xy}}$$

$$9) \sqrt{12a^5b^6c^7d^8} = \boxed{2a^2d^4|b^3c^3|\sqrt{3ac}}$$

$$10) \sqrt{20w^4x^3y^5z^7} = \boxed{2w^2y^2|xz^3|\sqrt{5xyz}}$$

$$11) (2\sqrt{6})(2\sqrt{2}) = 4\sqrt{12} = 4(2\sqrt{3}) = \boxed{8\sqrt{3}}$$

$$12) (5\sqrt{3})(4\sqrt{8}) = 20\sqrt{24} = 20(2\sqrt{6}) = \boxed{40\sqrt{6}}$$

$$13) \sqrt{3}(2\sqrt{6}-\sqrt{3}) = 2\sqrt{18}-3 = 2(3\sqrt{2})-3$$

$$\boxed{6\sqrt{2}-3}$$

$$14) \sqrt{5}(3\sqrt{10}-\sqrt{8})$$

$$3\sqrt{50}-\sqrt{40}$$

$$3(5\sqrt{2})-2\sqrt{10}$$

$$\boxed{15\sqrt{2}-2\sqrt{10}}$$

$$15) 2\sqrt{8}-\sqrt{32}+\sqrt{2}$$

$$2(2\sqrt{2})-4\sqrt{2}+\sqrt{2}$$

$$4\sqrt{2}-4\sqrt{2}+\sqrt{2}$$

$$\boxed{\sqrt{2}}$$

$$16) \sqrt{5}+2\sqrt{20}-3\sqrt{45}$$

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

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

$$17) 6\sqrt{18}-4\sqrt{50}$$

$$6(3\sqrt{2})-4(5\sqrt{2})$$

$$18\sqrt{2}-20\sqrt{2} = \boxed{-2\sqrt{2}}$$

$$18) \sqrt{125}-3\sqrt{20}$$

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

$$5\sqrt{5}-6\sqrt{5} = \boxed{-\sqrt{5}}$$

$$19) \frac{3\sqrt{2}}{\sqrt{6}} \cdot \frac{\sqrt{6}}{\sqrt{6}} = \frac{3\sqrt{12}}{6} = \frac{3(2\sqrt{3})}{6}$$

$$\frac{6\sqrt{3}}{6} = \boxed{\sqrt{3}}$$

$$20) \frac{4\sqrt{6}}{\sqrt{3}} \cdot \frac{\sqrt{3}}{\sqrt{3}} = \frac{4\sqrt{18}}{3} = \frac{4(3\sqrt{2})}{3}$$

$$\frac{12\sqrt{2}}{3} = \boxed{4\sqrt{2}}$$

$$21) \frac{2\sqrt{7}}{\sqrt{7}-3} \cdot \frac{\sqrt{7}+3}{\sqrt{7}+3} = \frac{2(7)+6\sqrt{7}}{7-9}$$

$$\frac{14+6\sqrt{7}}{-2} = \boxed{-7-3\sqrt{7}}$$

$$22) \frac{3\sqrt{3}}{3-\sqrt{3}} \cdot \frac{3+\sqrt{3}}{3+\sqrt{3}} = \frac{9\sqrt{3}+3(3)}{9-3}$$

$$\frac{9\sqrt{3}+9}{6} = \boxed{\frac{3\sqrt{3}+3}{2}}$$

$$23) \sqrt{18}-\frac{1}{\sqrt{8}} \quad \frac{\sqrt{1}}{\sqrt{8}} \cdot \frac{\sqrt{8}}{\sqrt{8}} = \frac{\sqrt{8}}{8}$$

$$3\sqrt{2}-\frac{\sqrt{8}}{8}$$

$$3\sqrt{2}-\frac{2\sqrt{2}}{8}$$

$$3\sqrt{2}-\frac{\sqrt{2}}{4} \quad \text{multiply } 3\sqrt{2} \cdot \frac{4}{4}$$

$$\frac{12\sqrt{2}}{4}-\frac{\sqrt{2}}{4} = \boxed{\frac{11\sqrt{2}}{4}}$$

$$24) 2\sqrt{12}-\frac{\sqrt{2}}{\sqrt{3}} \quad \frac{\sqrt{2}}{\sqrt{3}} \cdot \frac{\sqrt{3}}{\sqrt{3}} = \frac{\sqrt{6}}{3}$$

$$2\sqrt{12}-\frac{\sqrt{6}}{3} \quad \text{multiply } 2\sqrt{12} \cdot \frac{3}{3}$$

$$\frac{6\sqrt{12}}{3}-\frac{\sqrt{6}}{3} = \frac{6(2\sqrt{3})-\sqrt{6}}{3} = \boxed{4\sqrt{3}-\frac{\sqrt{6}}{3}}$$

$$\begin{aligned} (25) \quad & \frac{3\sqrt{3} - 3}{6-\sqrt{3}} - \frac{3}{11\sqrt{3}} \\ & \frac{3\sqrt{3} \cdot \frac{6+\sqrt{3}}{6+\sqrt{3}} - \frac{3}{11\sqrt{3}} \cdot \frac{\sqrt{3}}{\sqrt{3}}}{\frac{36-3}{36-3} - \frac{3\sqrt{3}}{11(3)}} \\ & \frac{18\sqrt{3}+3(3) - \frac{3\sqrt{3}}{11(3)}}{36-3} \\ & \frac{18\sqrt{3}+9}{33} - \frac{3\sqrt{3}}{33} \\ & \frac{6\sqrt{3}+3}{11} - \frac{\sqrt{3}}{11} \end{aligned}$$

$$\boxed{\frac{5\sqrt{3}+3}{11}}$$



$$\begin{aligned} (26) \quad & \frac{2\sqrt{6}}{\sqrt{6}-2} - \frac{2\sqrt{2}}{\sqrt{3}} \\ & \frac{2\sqrt{6} \cdot \frac{\sqrt{6}+2}{\sqrt{6}+2} - \frac{2\sqrt{2}}{\sqrt{3}} \cdot \frac{\sqrt{3}}{\sqrt{3}}}{\frac{2(6)+4\sqrt{6}}{6-4} - \frac{2\sqrt{6}}{3}} \\ & \frac{12+4\sqrt{6}}{2} - \frac{2\sqrt{6}}{3} \\ & 6+2\sqrt{6} - \frac{2\sqrt{6}}{3} \\ & \text{multiply } (6+2\sqrt{6}) \cdot \frac{3}{3} \\ & \frac{18+6\sqrt{6}}{3} - \frac{2\sqrt{6}}{3} \\ & \boxed{\frac{18+4\sqrt{6}}{3}} \end{aligned}$$

$$\begin{aligned} (27) \quad & \frac{23.32}{\sqrt{544.0000}} \\ & \begin{array}{r} 4\overline{)144} \\ \underline{129} \\ 1500 \\ \underline{1389} \\ 11100 \\ \underline{9324} \end{array} \\ & \boxed{\approx 23.3} \end{aligned}$$

$$\begin{aligned} (28) \quad & \frac{51.05}{\sqrt{2607.0000}} \\ & \begin{array}{r} 25 \\ 10\overline{)107} \\ \underline{101} \\ 600 \\ 102\overline{)600} \\ \underline{600} \\ 0 \end{array} \\ & \begin{array}{r} 1020\overline{)60000} \\ \underline{51025} \end{array} \\ & \boxed{\approx 51.1} \end{aligned}$$

$$\begin{aligned} (29) \quad & \left. \begin{array}{l} 47 = \sqrt{2209} \\ 48 = \sqrt{2304} \end{array} \right\} \begin{array}{l} 95 \\ 20 \end{array} \\ & 47 \frac{20}{95} = \boxed{47 \frac{4}{19}} \end{aligned}$$

$$\begin{aligned} (30) \quad & \left. \begin{array}{l} 40 = \sqrt{1600} \\ 41 = \sqrt{1681} \end{array} \right\} \begin{array}{l} 81 \\ 36 \end{array} \\ & 40 \frac{36}{81} = \boxed{40 \frac{4}{9}} \end{aligned}$$

$$\begin{aligned} (31) \quad & \sqrt{3x+3} = 6 \\ & 3x+3 = 36 \\ & 3x = 33 \\ & \boxed{x=11} \end{aligned}$$

$$\begin{aligned} (32) \quad & \sqrt{2n-7} = 7 \\ & 2n-7 = 49 \\ & 2n = 56 \\ & \boxed{n=28} \end{aligned}$$

$$\begin{aligned} (33) \quad & \sqrt{2n+7} = n+4 \\ & 2n+7 = (n+4)^2 \\ & 2n+7 = n^2+8n+16 \\ & 0 = n^2+6n+9 \\ & (n+3)^2 = 0 \\ & \boxed{n=-3} \end{aligned}$$

$$\begin{aligned} (34) \quad & \sqrt{13-3n} = n-5 \\ & 13-3n = (n-5)^2 \\ & 13-3n = n^2-10n+25 \\ & 0 = n^2-7n+12 \\ & (n-4)(n-3) = 0 \\ & n = 4, 3 \\ & \text{neither answer} \\ & \text{checks} \\ & \boxed{\text{no real solutions}} \end{aligned}$$

$$\begin{aligned} (35) \quad & \sqrt{2x+9} = x+3 \\ & 2x+9 = (x+3)^2 \\ & 2x+9 = x^2+6x+9 \\ & 0 = x^2+4x \\ & x(x+4) = 0 \\ & \boxed{x=0} \rightarrow \text{no} \end{aligned}$$

$$\begin{aligned} (36) \quad & \sqrt{2x+6} = x-1 \\ & 2x+6 = (x-1)^2 \\ & 2x+6 = x^2-2x+1 \\ & 0 = x^2-4x-5 \\ & (x-5)(x+1) = 0 \\ & \boxed{x=5} \rightarrow \text{no} \end{aligned}$$

$$\begin{aligned} (37) \quad & x^2 + (2\sqrt{6})^2 = (4\sqrt{2})^2 \\ & x^2 + (4)(6) = (16)(2) \\ & x^2 = 8 = \boxed{2\sqrt{2} m} \end{aligned}$$

$$\begin{aligned} (38) \quad & (3\sqrt{3})^2 + (4\sqrt{3})^2 = x^2 \\ & (9)(3) + (16)(3) = x^2 \\ & x^2 = 75 \\ & x = \sqrt{75} = \boxed{5\sqrt{3} m} \end{aligned}$$

$$\begin{aligned} (39) \quad & d = \sqrt{(4-2)^2 + (9-c3)^2} \\ & d = \sqrt{4+36} = \sqrt{40} \\ & d = \boxed{2\sqrt{10}} \end{aligned}$$

$$\textcircled{40} d = \sqrt{(6-(-2))^2 + (-8-(-4))^2}$$

$$d = \sqrt{64+16} = \sqrt{80}$$

$$d = \boxed{4\sqrt{5}}$$

$$\textcircled{8} \frac{4\sqrt{5}}{5\sqrt{5}} - \frac{2\sqrt{15}}{\sqrt{3}}$$

$$\frac{4\sqrt{5}}{5\sqrt{5}} \cdot \frac{5+5}{5+5} - \frac{2\sqrt{15}}{\sqrt{3}} \cdot \frac{\sqrt{3}}{\sqrt{3}}$$

$$\frac{20\sqrt{5}+4(5)}{25-5} - \frac{2\sqrt{45}}{3}$$

$$\frac{20\sqrt{5}+20}{20} - \frac{2(3\sqrt{5})}{3}$$

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

Unit 10 SKILL CHECK

$$\textcircled{1} \sqrt{28a^3b^5c^6}$$

$$\boxed{2b^2|ac^3|\sqrt{7ab}}$$

$$\textcircled{2} \sqrt{24a^6b^5c^6d^7}$$

$$\boxed{2b^2|a^3c^3d^3|\sqrt{6bd}}$$

$$\textcircled{3} 2\sqrt{3}(\sqrt{6}-3\sqrt{3})$$

$$2\sqrt{18}-6(3)$$

$$2(3\sqrt{2})-18 = \boxed{6\sqrt{2}-18}$$

$$\textcircled{4} 3\sqrt{2}-2\sqrt{8}-\sqrt{18}$$

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

$$3\sqrt{2}-4\sqrt{2}-3\sqrt{2} = \boxed{-4\sqrt{2}}$$

$$\textcircled{5} \frac{3\sqrt{5}}{\sqrt{3}} \cdot \frac{\sqrt{3}}{\sqrt{3}} = \frac{3\sqrt{15}}{3} = \boxed{\sqrt{15}}$$

$$\textcircled{6} \frac{2\sqrt{6}}{\sqrt{6}+2} \cdot \frac{\sqrt{6}-2}{\sqrt{6}-2}$$

$$\frac{12-4\sqrt{6}}{6-4} = \frac{12-4\sqrt{6}}{2} = \boxed{6-2\sqrt{6}}$$

$$\textcircled{7} \sqrt{40}-\sqrt{\frac{1}{8}} \quad \frac{\sqrt{1}}{\sqrt{8}} \cdot \frac{\sqrt{8}}{\sqrt{8}} = \frac{\sqrt{8}}{8}$$

$$2\sqrt{10}-\frac{\sqrt{8}}{8}$$

$$2\sqrt{10}-\frac{2\sqrt{2}}{8} = \boxed{2\sqrt{10}-\frac{\sqrt{2}}{4}}$$

$$\textcircled{9} \frac{46.35}{\sqrt{2149.0000}}$$

$$\begin{array}{r} 8\overline{)6} \overset{16}{5}49 \\ \underline{516} \\ 923 \overline{)3}300 \\ \underline{2769} \\ 926\overline{)5}3100 \\ \underline{46325} \end{array}$$

$$46.35 \approx \boxed{46.4}$$

$$\textcircled{10} \left. \begin{array}{l} 62 = \sqrt{3844} \\ 63 = \sqrt{3969} \end{array} \right\} \begin{array}{l} 125 \\ 50 \end{array} \quad 62 \frac{50}{125} = \boxed{62 \frac{2}{5}}$$

$$\textcircled{11} \sqrt{n+5} = n+3$$

$$n+5 = (n+3)^2$$

$$n+5 = n^2+6n+9$$

$$0 = n^2+5n+4$$

$$(n+1)(n+4) = 0$$

$$\boxed{n = -1} \neq 4$$

$$\textcircled{12} \sqrt{3x+4} = x+2$$

$$3x+4 = (x+2)^2$$

$$3x+4 = x^2+4x+4$$

$$0 = x^2+x$$

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

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

$$\textcircled{13} x^2 + (3\sqrt{6})^2 = (6\sqrt{2})^2$$

$$x^2 + 54 = 72$$

$$x^2 = 18 \quad x = \sqrt{18} \quad x = \boxed{3\sqrt{2} \text{ m}}$$

$$\textcircled{14} d = \sqrt{(-6-(-12))^2 + (7-11)^2}$$

$$d = \sqrt{36+16} = \sqrt{52} = \boxed{2\sqrt{13}}$$

Unit 10 REMEDICATION

① $\sqrt{60x^5y^6z^7}$
 $2x^2|y^3z^3|\sqrt{15xz}$

② $\sqrt{27a^3b^5c^{10}d^3}$
 $3b^2|ac^5d|\sqrt{3abd}$

③ $3\sqrt{2}(\sqrt{8} + 2\sqrt{2})$
 $3\sqrt{16} + 6(2)$
 $3(4) + 6(2) = \boxed{24}$

④ $4\sqrt{5} - 2\sqrt{20} - 3\sqrt{45}$
 $4\sqrt{5} - 2(2\sqrt{5}) - 3(3\sqrt{5})$
 $4\sqrt{5} - 4\sqrt{5} - 9\sqrt{5} = \boxed{-9\sqrt{5}}$

⑤ $\frac{2\sqrt{2}}{\sqrt{6}} \cdot \frac{\sqrt{6}}{\sqrt{6}} = \frac{2\sqrt{12}}{6} = \frac{2(2\sqrt{3})}{6}$
 $\frac{4\sqrt{3}}{6} = \boxed{\frac{2\sqrt{3}}{3}}$

⑥ $\frac{3\sqrt{3}}{6-\sqrt{3}} \cdot \frac{6+\sqrt{3}}{6+\sqrt{3}} = \frac{18\sqrt{3}+3(3)}{36-3}$
 $\frac{18\sqrt{3}+9}{33} = \boxed{\frac{6\sqrt{3}+3}{11}}$

⑦ $\sqrt{54} - \sqrt{\frac{2}{3}} \quad \frac{\sqrt{2}}{\sqrt{3}} \cdot \frac{\sqrt{3}}{\sqrt{3}} = \frac{\sqrt{6}}{3}$
 $3\sqrt{6} - \frac{\sqrt{6}}{3}$
 $\frac{9\sqrt{6}}{3} - \frac{\sqrt{6}}{3} = \boxed{\frac{8\sqrt{6}}{3}}$



⑧ $\frac{3\sqrt{6}}{\sqrt{6}-3} \cdot \frac{\sqrt{6}+3}{\sqrt{6}+3} - \frac{3\sqrt{2}}{\sqrt{3}} \cdot \frac{\sqrt{3}}{\sqrt{3}}$
 $\frac{3(6)+9\sqrt{6}}{6-9} - \frac{3\sqrt{6}}{3}$
 $\frac{18+9\sqrt{6}}{-3} - \sqrt{6} = (-6-3\sqrt{6}) - \sqrt{6} = \boxed{-6-4\sqrt{6}}$

⑨ $\sqrt{2624.0000}$
 $\begin{array}{r} 51.22 \\ 10\overline{)124} \\ \underline{101} \\ 2300 \\ 102\overline{)2300} \\ \underline{2044} \\ 25600 \\ 1024\overline{)25600} \\ \underline{20484} \end{array}$
 $51.22 \approx \boxed{51.2}$

⑩ $60 = \sqrt{3600}$
 $61 = \sqrt{3721}$
 $\left. \begin{array}{l} 60 = \sqrt{3600} \\ 61 = \sqrt{3721} \end{array} \right\} 121 \left. \begin{array}{l} \end{array} \right\} 44$
 $60 \frac{44}{121} = \boxed{60 \frac{4}{11}}$

⑪ $\sqrt{10+x} = x+4$
 $10+x = (x+4)^2$
 $10+x = x^2+8x+16$
 $0 = x^2+7x+6$
 $(x+1)(x+6) = 0$
 $x = -1$ ~~$x = -6$~~

⑫ $\sqrt{2n+4} = n-2$
 $2n+4 = (n-2)^2$
 $2n+4 = n^2-4n+4$
 $0 = n^2-6n$
 $n = n(n-6)$
 ~~$n = 0$~~ $\boxed{n=6}$

⑬ $x^2 + (4\sqrt{3})^2 = (2\sqrt{30})^2$
 $x^2 + (16)(3) = (4)(30)$
 $x^2 + 48 = 120$
 $x^2 = 72 \quad x = \sqrt{72} \quad x = \boxed{6\sqrt{2}m}$

⑭ $d = \sqrt{(4-(-4))^2 + (-11-(-7))^2}$
 $d = \sqrt{(8)^2 + (-4)^2} = \sqrt{64+16}$
 $d = \sqrt{80}$
 $d = \boxed{4\sqrt{5}}$

Unit 10

EXTRA PRACTICE

① $\pm \sqrt{288} = \pm \sqrt{2^5 \cdot 3^2} = \boxed{\pm 12\sqrt{2}}$

② $\sqrt{27x^5} = \boxed{3x^2 \cdot \sqrt{3x}}$

③ $\sqrt{24a^3b^2} = \boxed{2a|b|\sqrt{6a}}$

④ $\sqrt{45x^3y^2z^5} = \boxed{3|xy|z^2\sqrt{5xz}}$

⑤ $(4\sqrt{12})(3\sqrt{2}) = 12\sqrt{24} = \boxed{24\sqrt{6}}$

⑥ $\sqrt{6}(2\sqrt{6}-\sqrt{3}) = 2(6) - \sqrt{18} = \boxed{12-3\sqrt{2}}$

⑦ $2\sqrt{18} - 3\sqrt{8} + \sqrt{32}$
 $2(3\sqrt{2}) - 3(2\sqrt{2}) + 4\sqrt{2} = \boxed{4\sqrt{2}}$

⑧ $3\sqrt{3} - 2\sqrt{15} = 3\sqrt{3} - 2(5\sqrt{3}) = \boxed{-7\sqrt{3}}$

⑨ $\frac{3\sqrt{2} \cdot \sqrt{10}}{\sqrt{10} \cdot \sqrt{10}} = \frac{3\sqrt{20}}{10} = \frac{6\sqrt{5}}{10} = \boxed{\frac{3\sqrt{5}}{5}}$

⑩ $\frac{2\sqrt{3} \cdot \sqrt{3} + 3}{\sqrt{3} - 3 \cdot \sqrt{3} + 3} = \frac{6 + 6\sqrt{3}}{3 - 9} = \boxed{-1 - \sqrt{3}}$

⑪ $\sqrt{45} - \sqrt{\frac{1}{5}} = 3\sqrt{5} - \frac{\sqrt{5}}{5} = \frac{15\sqrt{5}}{5} - \frac{\sqrt{5}}{5}$
 $\boxed{\frac{14\sqrt{5}}{5}}$

⑫

$$\begin{array}{r} 21.16 \approx \boxed{21.2} \\ \sqrt{448.0000} \\ 4 \\ \hline 411 \quad | \quad 048 \\ \quad 41 \\ \hline 4211 \quad | \quad 700 \\ \quad 421 \\ \hline 4226 \quad | \quad 27900 \\ \quad 25356 \end{array}$$

⑬ $49 = \sqrt{2401}$
 $50 = \sqrt{2500}$
 $\left. \begin{array}{l} \sqrt{2467} \\ \sqrt{2500} \end{array} \right\} 99 \left. \begin{array}{l} \\ \end{array} \right\} 66$
 $\boxed{49 \frac{2}{3}}$

⑭ $\sqrt{3n-9} = 3$

$3n-9=9$

$3n=18$

$\boxed{n=6}$

⑮ $\sqrt{n+5} = n+5$

$n+5 = n^2+10n+25$

$n^2+9n+20=0$

$(n+5)(n+4)=0$

$\boxed{-5, -4}$

⑯ $\sqrt{n-2} = n-4$

$n-2 = n^2-8n+16$

$n^2-9n+18=0$

$(n-6)(n-3)=0$

$\boxed{6} \quad \cancel{3}$

⑰ $x^2 + (2\sqrt{2})^2 = (2\sqrt{10})^2$

$x^2 + (4)(2) = (4)(10)$

$x^2 + 8 = 40$

$x^2 = 32 = 2\sqrt{2} \cdot \boxed{2\sqrt{2}m}$

⑱ $d = \sqrt{(2-4)^2 + (-8-(-12))^2}$

$d = \sqrt{(-2)^2 + (4)^2} = \sqrt{20} = \boxed{2\sqrt{5}}$

⑲ $\sqrt{72a^4b^2c^5d^6} = \boxed{6a^2c^2|bd^3|\sqrt{2c}}$

c is independent because of odd exponent. c² is protected in solution because of even exponent.

a, b, and d all have odd exponents in radicand. Either 0 or 2 of them are negative. b and d³ must be protected. a² is protected (even exp).

⑳ $\frac{2\sqrt{3}}{\sqrt{3}-3} + \sqrt{3}$

$\frac{2\sqrt{3}}{\sqrt{3}-3} \left(\frac{\sqrt{3}+3}{\sqrt{3}+3} \right) + \sqrt{3}$

$\frac{6+6\sqrt{3}}{3-9} + \sqrt{3} = -6 - \sqrt{3} + \sqrt{3} = \boxed{-6}$

11.1

Answer Key



- ① upward ④ upward
 ② upward ⑤ downward
 ③ downward ⑥ downward

⑦ $y = x^2 - 4x + 3$
 axis $x = \frac{-b}{2a} = \frac{4}{2}$
 $(2)^2 - 4(2) + 3 = -1$

$x = 2$
 minimum
 $(2, -1)$

⑧ $y = -3x^2 - 6x + 5$
 axis $x = \frac{-b}{2a} = \frac{6}{-6}$
 $-3(-1)^2 - 6(-1) + 5 = 8$

$x = -1$
 maximum
 $(-1, 8)$

⑨ $y = 7x^2 + 14x - 9$
 axis $x = \frac{-b}{2a} = \frac{-14}{14}$
 $7(-1)^2 + 14(-1) - 9 = -16$

$x = -1$
 minimum
 $(-1, -16)$

⑩ $y = x^2 + 6x + 8$
 axis $x = \frac{-b}{2a} = \frac{-6}{2}$
 $(-3)^2 + 6(-3) + 8 = -1$

$x = -3$
 minimum
 $(-3, -1)$

⑪ $y = x^2 + 8x + 3$
 axis $x = \frac{-b}{2a} = \frac{-8}{2}$
 $(-4)^2 + 8(-4) + 3 = -13$

$x = -4$
 minimum
 $(-4, -13)$

⑫ $y = x^2 + 2x$
 axis $x = \frac{-b}{2a} = \frac{-2}{2}$
 $(-1)^2 + 2(-1) = -1$

$x = -1$
 minimum
 $(-1, -1)$

⑬ $y = -3x^2 + 4$
 axis $x = \frac{-b}{2a} = \frac{0}{-6}$
 $-3(0)^2 + 4 = 4$

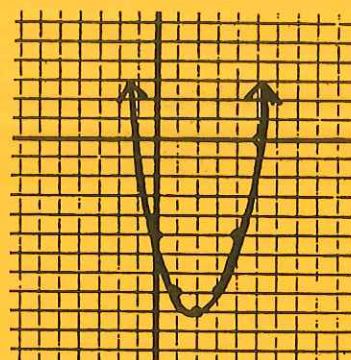
$x = 0$
 maximum
 $(0, 4)$

⑭ $y = -2x^2 + 9$
 axis $x = \frac{-b}{2a} = \frac{0}{-4}$
 $-2(0)^2 + 9 = 9$

$x = 0$
 maximum
 $(0, 9)$

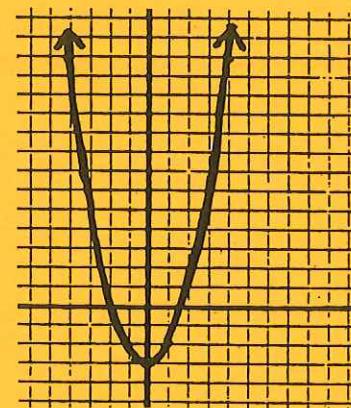
⑮ $y = x^2 - 4x - 5$
 $x = 2$
 $(2, -9)$
 $(2)^2 - 4(2) - 5 = -9$

x	y
1	-8
0	-5
-1	0



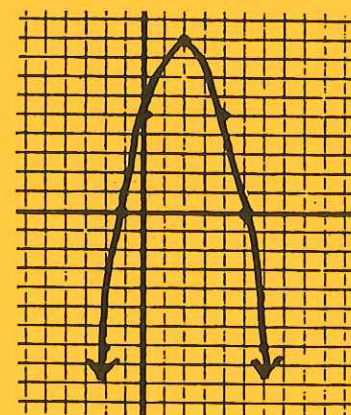
⑯ $y = x^2 - 3$
 $x = 0$
 $(0, -3)$
 $(0)^2 - 3 = -3$

x	y
1	-2
3	6
4	13



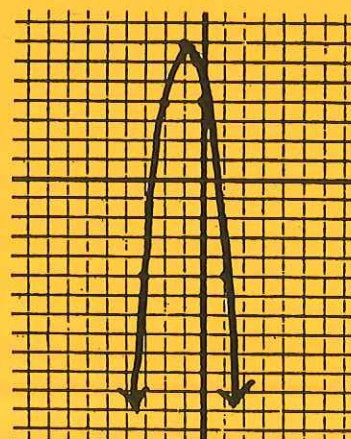
⑰ $y = -x^2 + 4x + 5$
 $x = 2$
 $(2, 9)$
 $-(2)^2 + 4(2) + 5 = 9$

x	y
0	5
-1	0
-2	-7



⑱ $y = -3x^2 - 6x + 4$
 $x = -1$
 $(-1, 7)$
 $-3(-1)^2 - 6(-1) + 4 = 7$

x	y
0	4
1	-5
2	-20

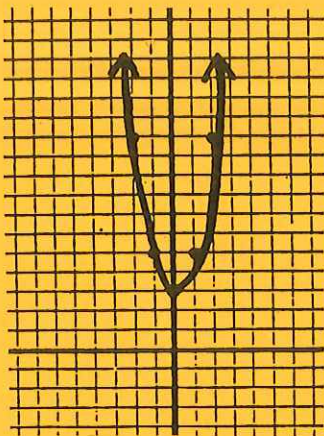


⑨ $y = 2x^2 + 3$

$x = 0$
 $(0, 3)$

$2(0) + 3 = 3$

x	y
1	5
2	11
3	21

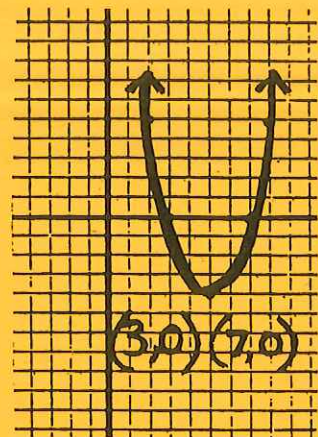


⑪ $y = x^2 - 10x + 21$

$x = 5$
 $(5, -4)$

$(5)^2 - 10(5) + 21 = -4$

x	y
4	-3
3	0
2	5



⑩ $y = x^2 - 2x - 8$

$x = 1$
 $(1, -9)$

$(1)^2 - 2(1) - 8 = -9$

x	y
0	-8
-1	-5
-2	0

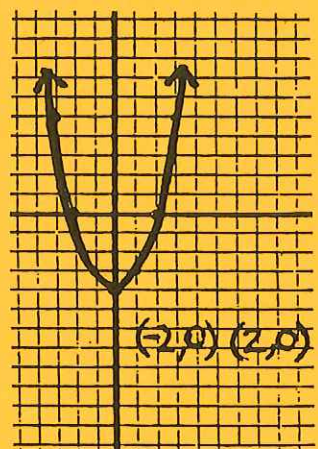


⑫ $y = x^2 + 4$

$x = 0$
 $(0, 4)$

$(0)^2 + 4 = 4$

x	y
1	5
2	8
3	13

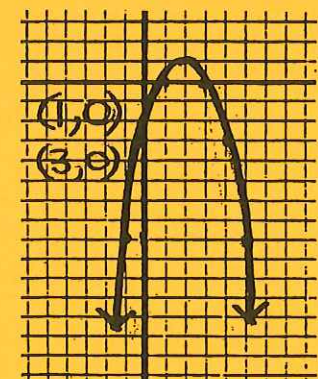


⑬ $y = -x^2 + 4x - 3$

$x = 2$
 $(2, 1)$

$-(2)^2 + 4(2) - 3 = 1$

x	y
1	0
0	-3
-1	-8

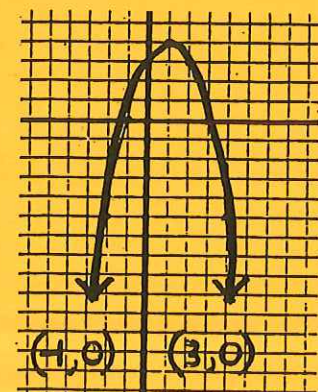


⑭ $y = -x^2 + 2x + 3$

$x = 1$
 $(1, 4)$

$-(1)^2 + 2(1) + 3 = 4$

x	y
0	3
-1	0
-2	-5



11.2

Answer Key



- ① equation
- ② function
- ③ function
- ④ equation
- ⑤ equation
- ⑥ function
- ⑦ $(-7, 0)$ $(-1, 0)$
- ⑧ $(0, 0)$ $(6, 0)$
- ⑨ $(-4, 0)$
- ⑩ none



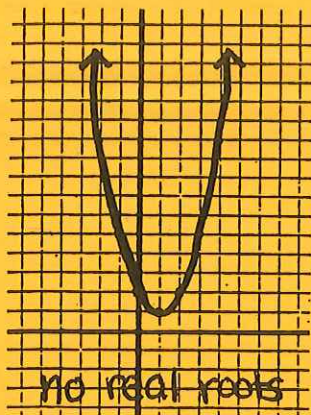
$$\textcircled{15} y = x^2 - 2x + 2$$

$$\boxed{x=1}$$

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

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

x	y
0	2
-1	5
-2	10



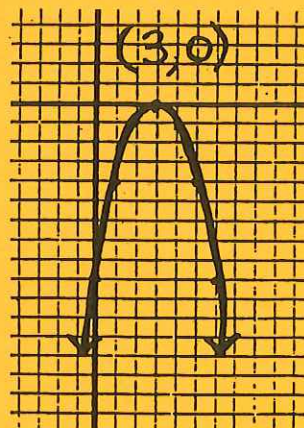
$$\textcircled{16} y = -x^2 + 6x - 9$$

$$\boxed{x=3}$$

$$\boxed{(3,0)}$$

$$-(3)^2 + 6(3) - 9 = 0$$

x	y
2	-1
1	-4
0	-9



11.3

Answer Key



$$\textcircled{1} y^2 + 4y + 3 = 0$$

$$y^2 + 4y = -3$$

$$+ y^2 + 4y + 4 = -3 + 4$$

$$(y+2)^2 = 1$$

$$y+2 = \pm\sqrt{1}$$

$$y = -2 \pm 1$$

$$\boxed{y = -3, -1}$$

$$\textcircled{2} n^2 + 8n + 7 = 0$$

$$n^2 + 8n = -7$$

$$+ n^2 + 8n + 16 = -7 + 16$$

$$(n+4)^2 = 9$$

$$n+4 = \pm\sqrt{9}$$

$$n = -4 \pm 3$$

$$\boxed{n = -1, -7}$$

$$\textcircled{3} x^2 - 4x = 2$$

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

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

$$x-2 = \pm\sqrt{6}$$

$$\boxed{x = 2 \pm \sqrt{6}}$$

$$\textcircled{4} y^2 - 8y = 4$$

$$+ y^2 - 8y + 16 = 4 + 16$$

$$(y-4)^2 = 20$$

$$y-4 = \pm\sqrt{20}$$

$$\boxed{y = 4 \pm 2\sqrt{5}}$$

$$\textcircled{5} \frac{1}{2}a^2 - 2a - \frac{3}{2} = 0 \quad \times(2)$$

$$a^2 - 4a - 3 = 0$$

$$a^2 - 4a = 3$$

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

$$(a-2)^2 = 7$$

$$a-2 = \pm\sqrt{7}$$

$$\boxed{a = 2 \pm \sqrt{7}}$$

$$\textcircled{6} 2x^2 - 16x = 24 \quad \div(2)$$

$$x^2 - 8x = 12$$

$$+ x^2 - 8x + 16 = 12 + 16$$

$$(x-4)^2 = 28$$

$$x-4 = \pm\sqrt{28}$$

$$x-4 = \pm 2\sqrt{7}$$

$$\boxed{x = 4 \pm 2\sqrt{7}}$$

$$\textcircled{7} 3x^2 - 18x + 21 = 0 \quad \div(3)$$

$$x^2 - 6x + 7 = 0$$

$$x^2 - 6x = -7$$

$$+ x^2 - 6x + 9 = -7 + 9$$

$$(x-3)^2 = 2$$

$$x-3 = \pm\sqrt{2}$$

$$\boxed{x = 3 \pm \sqrt{2}}$$

$$\textcircled{8} \frac{1}{4}b^2 - \frac{3}{2}b = -1 \quad \times(4)$$

$$b^2 - 6b = -4$$

$$b^2 - 6b + 9 = -4 + 9$$

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

$$b-3 = \pm\sqrt{5}$$

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

$$\textcircled{9} x^2 + 4x + c = 0$$

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

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

$$(x+2)^2 = 4 - c$$

$$x+2 = \pm\sqrt{4-c}$$

$$\boxed{x = -2 \pm \sqrt{4-c}}$$

$$\begin{aligned} \textcircled{10} \quad x^2 - bx + 8 &= 0 \\ x^2 - bx &= -8 \\ -\frac{b}{2} x^2 - bx + \frac{b^2}{4} &= -8 + \frac{b^2}{4} \\ \left(x - \frac{b}{2}\right)^2 &= \frac{b^2 - 32}{4} \\ x - \frac{b}{2} &= \frac{\pm \sqrt{b^2 - 32}}{2} \\ \boxed{x = \frac{b \pm \sqrt{b^2 - 32}}{2}} \end{aligned}$$



- \textcircled{11} upward
 \textcircled{12} downward

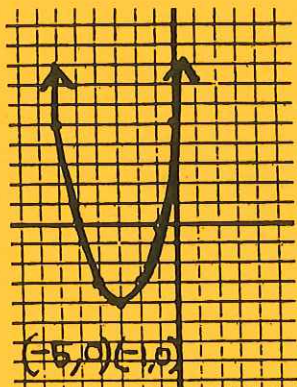
$$\textcircled{13} \quad y = x^2 + 6x + 5$$

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

$$\boxed{(-3, -4)}$$

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

x	y
-2	-3
-1	0
0	5



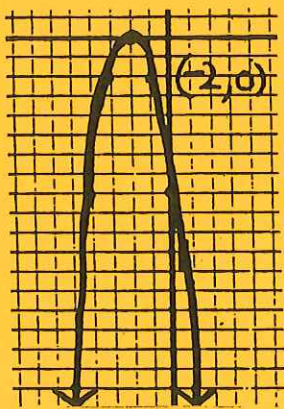
$$\textcircled{14} \quad y = -2x^2 - 8x - 8$$

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

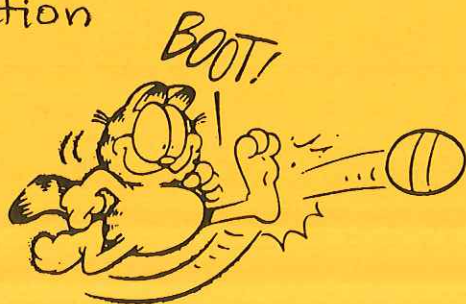
$$\boxed{(-2, 0)}$$

$$-2(-2)^2 - 8(-2) - 8 = 0$$

x	y
-1	-2
0	-8
1	-18



\textcircled{15} quadratic function



11.4

Answer Key

$$\textcircled{1} \quad m^2 + 4m + 3 = 0$$

$$a = 1 \quad b = 4 \quad c = 3$$

$$m = \frac{-4 \pm \sqrt{(4)^2 - 4(1)(3)}}{2(1)}$$

$$m = \frac{-4 \pm \sqrt{4}}{2} = \frac{-4 \pm 2}{2}$$

$$\boxed{m = -1, -3}$$

$$\textcircled{2} \quad 2x^2 + x - 15 = 0$$

$$a = 2 \quad b = 1 \quad c = -15$$

$$x = \frac{-1 \pm \sqrt{(1)^2 - 4(2)(-15)}}{2(2)}$$

$$x = \frac{-1 \pm \sqrt{121}}{4} = \frac{-1 \pm 11}{4}$$

$$\boxed{x = \frac{5}{2}, -3}$$

$$\textcircled{3} \quad y^2 - 25 = 0$$

$$a = 1 \quad b = 0 \quad c = -25$$

$$y = \frac{-0 \pm \sqrt{(0)^2 - 4(1)(-25)}}{2(1)}$$

$$y = \frac{\pm \sqrt{100}}{2} = \frac{\pm 10}{2} \quad \boxed{y = \pm 5}$$

$$\textcircled{4} \quad 5a^2 = 125$$

$$5a^2 - 125 = 0$$

$$a = 5 \quad b = 0 \quad c = -125$$

$$a = \frac{-0 \pm \sqrt{(0)^2 - 4(5)(-125)}}{2(5)}$$

$$a = \frac{\pm \sqrt{2500}}{10} = \frac{\pm 50}{10}$$

$$\boxed{a = \pm 5}$$

$$\textcircled{5} -n^2 - 6n + 3 = 0$$

$$a = -1 \quad b = -6 \quad c = 3$$

$$n = \frac{-(-6) \pm \sqrt{(-6)^2 - 4(-1)(3)}}{2(-1)}$$

$$n = \frac{6 \pm \sqrt{48}}{-2} = \frac{6 \pm 4\sqrt{3}}{-2}$$

$$\boxed{n = -3 \pm 2\sqrt{3}}$$

$$\textcircled{6} k^2 - 6k + 1 = 0$$

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

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

$$k = \frac{6 \pm \sqrt{32}}{2} = \frac{6 \pm 4\sqrt{2}}{2}$$

$$\boxed{k = 3 \pm 2\sqrt{2}}$$

$$\textcircled{7} 4x^2 + 8x - 1 = 0$$

$$a = 4 \quad b = 8 \quad c = -1$$

$$x = \frac{-8 \pm \sqrt{(8)^2 - 4(4)(-1)}}{2(4)}$$

$$x = \frac{-8 \pm \sqrt{80}}{8} = \frac{-8 \pm 4\sqrt{5}}{8}$$

$$\boxed{x = -1 \pm \frac{1}{2}\sqrt{5}} \quad \text{or} \quad \boxed{x = \frac{-2 \pm \sqrt{5}}{2}}$$

$$\textcircled{8} -4y^2 + 16y + 13 = 0$$

$$a = -4 \quad b = 16 \quad c = 13$$

$$y = \frac{-16 \pm \sqrt{(16)^2 - 4(-4)(13)}}{2(-4)}$$

$$y = \frac{-16 \pm \sqrt{464}}{-8} = \frac{-16 \pm 4\sqrt{29}}{-8}$$

$$\boxed{y = 2 \pm \frac{1}{2}\sqrt{29}} \quad \text{or} \quad \boxed{y = \frac{4 \pm \sqrt{29}}{2}}$$

$$\textcircled{9} -2x^2 + 8x + 3 = 3$$

$$-2x^2 + 8x = 0 \quad \div (-2)$$

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

Continued in next column

$$\rightarrow x^2 - 4x + 4 = 0 + 4$$

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

$$x-2 = \pm \sqrt{4}$$

$$x = 2 \pm 2 \quad \boxed{x = 0, 4}$$

$$\textcircled{10} 4n^2 + 20n + 23 = 0$$

$$4n^2 + 20n = -23 \quad \div (4)$$

$$n^2 + 5n = \frac{-23}{4}$$

$$\frac{5}{2} n^2 + 5n + \frac{25}{4} = \frac{-23}{4} + \frac{25}{4}$$

$$(n + 5/2)^2 = \frac{1}{2}$$

$$n + 5/2 = \pm \sqrt{\frac{1}{2}}$$

$$\frac{\sqrt{1}}{\sqrt{2}} \cdot \frac{\sqrt{2}}{\sqrt{2}} = \frac{\sqrt{2}}{2}$$

$$n + 5/2 = \pm \frac{\sqrt{2}}{2}$$

$$\boxed{n = \frac{-5 \pm \sqrt{2}}{2}}$$

$$\textcircled{11} ax^2 + 2ax + ab = 0$$

$$ax^2 + 2ax = -ab \quad \div (a)$$

$$x^2 + 2x = -b$$

$$1 \quad x^2 + 2x + 1 = -b + 1$$

$$(x+1)^2 = 1-b$$

$$x+1 = \pm \sqrt{1-b} \quad \boxed{x = -1 \pm \sqrt{1-b}}$$

$$\textcircled{12} ax^2 + bx + 3a = 0$$

$$ax^2 + bx = -3a \quad \div (a)$$

$$x^2 + \frac{b}{a}x = -3$$

$$\frac{b}{2a} x^2 + \frac{b}{a}x + \frac{b^2}{4a^2} = -3 + \frac{b^2}{4a^2}$$

$$\left(x + \frac{b}{2a}\right)^2 = \frac{b^2 - 12a^2}{4a^2}$$

$$x + \frac{b}{2a} = \pm \frac{\sqrt{b^2 - 12a^2}}{2a} \quad \boxed{x = \frac{-b \pm \sqrt{b^2 - 12a^2}}{2a}}$$

$$\textcircled{13} 3x^2 + 12ax + 3b = 0$$

$$3x^2 + 12ax = -3b \quad \div (3)$$

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

$$2a \quad x^2 + 4ax + 4a^2 = -b + 4a^2$$

$$(x+2a)^2 = 4a^2 - b$$

$$x+2a = \pm \sqrt{4a^2 - b}$$

$$\boxed{x = -2a \pm \sqrt{4a^2 - b}}$$

$$\begin{aligned} \textcircled{14} \quad ax^2 + bx + c &= 0 \\ ax^2 + bx &= -c \div a \\ x^2 + bx &= -c/a \\ \frac{b}{2} \quad x^2 + bx + \frac{b^2}{4} &= -c/a + \frac{b^2}{4} \\ (x + \frac{b}{2})^2 &= \frac{b^2 - 4c}{4} \\ x + \frac{b}{2} &= \pm \frac{\sqrt{b^2 - 4c}}{2} \end{aligned}$$

$$x = \frac{-b \pm \sqrt{b^2 - 4c}}{2}$$



11.5

Answer Key

$$\begin{aligned} \textcircled{1} \quad z^2 + 8z - 5 &= 0 \\ a=1 \quad b=8 \quad c=-5 \\ b^2 - 4ac &= 8^2 - 4(1)(-5) = 84 \\ \text{Irrational} \\ \boxed{2 \text{ real roots}} \end{aligned}$$

$$\begin{aligned} \textcircled{4} \quad m^2 - 14m + 49 &= 0 \\ a=1 \quad b=-14 \quad c=49 \\ b^2 - 4ac &= (-14)^2 - 4(1)(49) = 0 \\ \text{Rational} \\ \boxed{1 \text{ real root}} \end{aligned}$$

$$\begin{aligned} \textcircled{2} \quad m^2 + 7m + 6 &= 0 \\ a=1 \quad b=7 \quad c=6 \\ b^2 - 4ac &= 7^2 - 4(1)(6) = 25 \\ \text{Rational} \\ \boxed{2 \text{ real roots}} \end{aligned}$$

$$\begin{aligned} \textcircled{5} \quad 3g^2 - 4g + 1 &= 0 \\ a=3 \quad b=-4 \quad c=1 \\ b^2 - 4ac &= (-4)^2 - 4(3)(1) = 4 \\ \text{Rational} \\ \boxed{2 \text{ real roots}} \end{aligned}$$

$$\begin{aligned} \textcircled{3} \quad k^2 + 6k + 10 &= 0 \\ a=1 \quad b=6 \quad c=10 \\ b^2 - 4ac &= 6^2 - 4(1)(10) = -4 \\ \text{Imaginary} \\ \boxed{\text{no real roots}} \end{aligned}$$

$$\begin{aligned} \textcircled{6} \quad d^2 + 4d + 7 &= 0 \\ a=1 \quad b=4 \quad c=7 \\ b^2 - 4ac &= 4^2 - 4(1)(7) = -12 \\ \text{Imaginary} \\ \boxed{\text{no real roots}} \end{aligned}$$

$$\begin{aligned} \textcircled{7} \quad 9y^2 - 6y + 1 &= 0 \\ a=9 \quad b=-6 \quad c=1 \\ b^2 - 4ac &= (-6)^2 - 4(9)(1) = 0 \\ \text{Rational} \\ \boxed{1 \text{ real root}} \end{aligned}$$

$$\begin{aligned} \textcircled{8} \quad 3p^2 - 4p - 1 &= 0 \\ a=3 \quad b=-4 \quad c=-1 \\ b^2 - 4ac &= (-4)^2 - 4(3)(-1) \\ \text{Irrational} \\ \boxed{2 \text{ real roots}} \end{aligned}$$

$$\begin{aligned} \textcircled{9} \quad 2b^2 - b - 14 &= 7 \\ 2b^2 - b &= 21 \quad \div 2 \\ b^2 - \frac{1}{2}b &= \frac{21}{2} \\ \frac{1}{4} \quad b^2 - \frac{1}{2}b + \frac{1}{16} &= \frac{21}{2} + \frac{1}{16} \\ (b - \frac{1}{4})^2 &= \frac{169}{16} \\ b - \frac{1}{4} &= \pm \frac{13}{4} \\ b &= \frac{1 \pm 13}{4} \quad \boxed{b = \frac{7}{2}, -3} \end{aligned}$$

$$\begin{aligned} \textcircled{10} \quad 2ax^2 + 2abx + 6ac &= 0 \\ 2ax^2 + 2abx &= -6ac \\ \text{divide by } 2a & \\ x^2 + bx &= -3c \\ \frac{b}{2} \quad x^2 + bx + \frac{b^2}{4} &= -3c + \frac{b^2}{4} \\ (x + \frac{b}{2})^2 &= \frac{b^2 - 12c}{4} \\ x + \frac{b}{2} &= \pm \frac{\sqrt{b^2 - 12c}}{2} \\ \boxed{x = \frac{-b \pm \sqrt{b^2 - 12c}}{2}} \end{aligned}$$

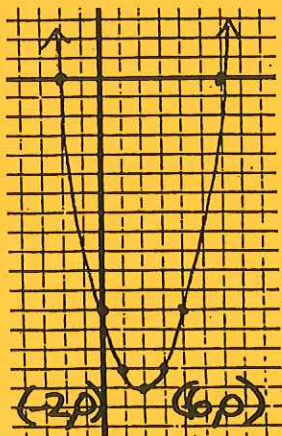
⑪ $3k^2 + 11k = 4$
 $3k^2 + 11k - 4 = 0$
 $a=3 \quad b=11 \quad c=-4$
 $k = \frac{-11 \pm \sqrt{(11)^2 - 4(3)(-4)}}{2(3)}$
 $k = \frac{-11 \pm \sqrt{169}}{6} = \frac{-11 \pm 13}{6}$
 $k = 1/3, -4$

⑫ $ax^2 + 3bx + c = 0$
 $a=a \quad b=3b \quad c=c$
 $x = \frac{-3b \pm \sqrt{(3b)^2 - 4(ac)}}{2(a)}$
 $x = \frac{-3b \pm \sqrt{9b^2 - 4ac}}{2a}$

⑬ $y = x^2 - 4x - 12$
 $x=2$
 $(2, -16)$

$(2)^2 - 4(2) - 12 = -16$

x	y
1	-15
0	-12
-2	0

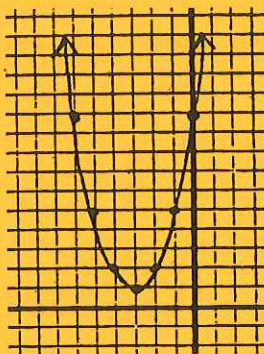


⑭ $y = x^2 + 6x + 10$
 $x = -3$
 $(-3, 1)$

$(-3)^2 + 6(-3) + 10 = 1$

x	y
-2	2
-1	5
0	10

no real roots



⑮ $6x^2 + x - 2 = 0$
 $6x^2 + 4x - 3x - 2 = 0$
 $2x(3x+2) - 1(3x+2) = 0$
 $(3x+2)(2x-1) = 0$
 $x = -2/3, 1/2$

⑯ $x(13-x) = 42$
 $13x - x^2 = 42$
 $x^2 - 13x + 42 = 0$
 $(x-6)(x-7) = 0$
 $x = 6, 7$

⑰ $x(17-x) = 72$
 $17x - x^2 = 72$
 $x^2 - 17x + 72 = 0$
 $(x-9)(x-8) = 0$
 $x = 9, 8$

⑱ $x(x+6) = 135$
 $x^2 + 6x - 135 = 0$
 $(x+15)(x-9) = 0$
 $x = -15, 9$

x	-15	9
x+6	-9	15

⑳ $x(x+8) = 48$
 $x^2 + 8x - 48 = 0$
 $(x+12)(x-4) = 0$
 $x = -12, 4$

x	-12	4
x+8	-4	12

① $x^2 - 8x + 15 = 0$
 $(x-5)(x-3) = 0$
 $x = 5, 3$

② $n^2 - 5n - 24 = 0$
 $(n-8)(n+3) = 0$
 $n = 8, -3$

③ $2n^2 - 7n - 4 = 0$
 $2n^2 - 8n + n - 4 = 0$
 $2n(n-4) + 1(n-4) = 0$
 $(n-4)(2n+1) = 0$
 $n = 4, -1/2$

11.6

Answer Key

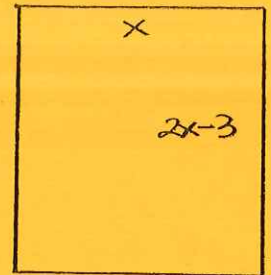


$$\begin{aligned} \textcircled{9} \quad x(x+4) &= 45 \\ x^2 + 4x &= 45 \\ 2 \quad x^2 + 4x + 4 &= 45 + 4 \\ (x+2)^2 &= 49 \\ x+2 &= \pm\sqrt{49} \\ x+2 &= \pm 7 \\ x &= -2 \pm 7 = 5, -9 \end{aligned}$$



5 by 9 in

$$\begin{aligned} \textcircled{12} \quad x(2x-3) &= 35 \\ 2x^2 - 3x &= 35 \\ x^2 - \frac{3}{2}x &= \frac{35}{2} \\ -\frac{3}{4} \quad x^2 - \frac{3}{2}x + \frac{9}{16} &= \frac{35}{2} + \frac{9}{16} \\ (x - \frac{3}{4})^2 &= \frac{289}{16} \\ x - \frac{3}{4} &= \pm\sqrt{\frac{289}{16}} \\ x - \frac{3}{4} &= \pm \frac{17}{4} \\ x &= \frac{3 \pm 17}{4} = 5, -\frac{14}{4} \end{aligned}$$



5 by 7 in

$$\begin{aligned} \textcircled{10} \quad x(x-3) &= 54 \\ x^2 - 3x &= 54 \\ \frac{3}{2} \quad x^2 - 3x + \frac{9}{4} &= 54 + \frac{9}{4} \\ (x - \frac{3}{2})^2 &= \frac{225}{4} \\ x - \frac{3}{2} &= \pm\sqrt{\frac{225}{4}} \\ x - \frac{3}{2} &= \pm \frac{15}{2} \\ x &= \frac{3 \pm 15}{2} = 9, -6 \end{aligned}$$



9 by 6 feet

$$\begin{aligned} \textcircled{13} \quad & \begin{array}{l} y \\ x \end{array} \quad \begin{array}{l} 2x + 2y = 36 \\ x + y = 18 \\ y = 18 - x \end{array} \end{aligned}$$

$$\begin{aligned} xy &= 72 \\ x(18-x) &= 72 \\ 18x - x^2 &= 72 \end{aligned}$$

$$\begin{aligned} x^2 - 18x + 72 &= 0 \\ a=1 \quad b=-18 \quad c=72 \end{aligned}$$

$$x = \frac{-(-18) \pm \sqrt{(-18)^2 - 4(1)(72)}}{2(1)}$$

$$x = \frac{18 \pm \sqrt{36}}{2} = \frac{18 \pm 6}{2} = 12, 6$$

6 by 12 cm

$$\begin{aligned} \textcircled{11} \quad x(3x-1) &= 24 \\ 3x^2 - x &= 24 \\ x^2 - \frac{1}{3}x &= 8 \\ \frac{1}{6} \quad x^2 - \frac{1}{3}x + \frac{1}{36} &= 8 + \frac{1}{36} \\ (x - \frac{1}{6})^2 &= \frac{289}{36} \\ x - \frac{1}{6} &= \pm\sqrt{\frac{289}{36}} \\ x - \frac{1}{6} &= \pm \frac{17}{6} \\ x &= \frac{1 \pm 17}{6} \\ x &= 3, -\frac{8}{6} \end{aligned}$$



3 by 8 inches

$$\begin{aligned} \textcircled{14} \quad & \begin{array}{l} y \\ x \end{array} \quad \begin{array}{l} 2x + 2y = 26 \\ x + y = 13 \\ y = 13 - x \end{array} \end{aligned}$$

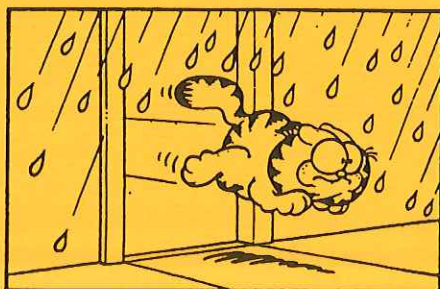
$$\begin{aligned} xy &= 36 \\ x(13-x) &= 36 \end{aligned}$$

$$\begin{aligned} 13x - x^2 &= 36 \\ x^2 - 13x + 36 &= 0 \\ a=1 \quad b=-13 \quad c=36 \end{aligned}$$

$$x = \frac{-(-13) \pm \sqrt{(-13)^2 - 4(1)(36)}}{2(1)}$$

$$x = \frac{13 \pm \sqrt{5}}{2} = \frac{13 \pm 5}{2} = 9, 4$$

4 by 9 in.



$$\textcircled{15} (2x+20)(2x+15) - (15)(20) = 74$$

$$(4x^2 + 70x + 300) - (300) = 74$$

$$4x^2 + 70x - 74 = 0$$

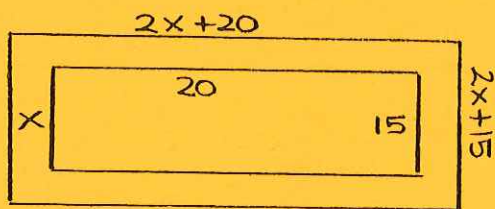
$$2x^2 + 35x - 37 = 0$$

$$a=2 \quad b=35 \quad c=-37$$

$$x = \frac{-(35) \pm \sqrt{(35)^2 - 4(2)(-37)}}{2(2)}$$

$$x = \frac{-35 \pm \sqrt{1521}}{4} = \frac{-35 \pm 39}{4}$$

$$x = 1, \quad \cancel{-7} \quad \boxed{1 \text{ yard}}$$



$$\textcircled{16} (2x+5)^2 - (5)^2 = 56$$

$$(4x^2 + 20x + 25) - 25 = 56$$

$$4x^2 + 20x - 56 = 0$$

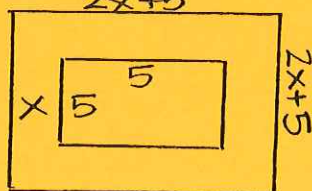
$$x^2 + 5x - 14 = 0$$

$$a=1 \quad b=5 \quad c=-14$$

$$x = \frac{-5 \pm \sqrt{5^2 - 4(1)(-14)}}{2(1)}$$

$$x = \frac{-5 \pm \sqrt{81}}{2} = \frac{-5 \pm 9}{2}$$

$$x = 2, \quad \cancel{-7} \quad \boxed{2 \text{ feet}}$$



$$\textcircled{17} ax^2 + c = -bx$$

$$ax^2 + bx = -c$$

$$x^2 + \frac{b}{a}x = \frac{-c}{a}$$

$$\frac{b}{2a}x^2 + \frac{b}{a}x + \frac{b^2}{4a^2} = \frac{-c}{a} + \frac{b^2}{4a^2}$$

continued (next column)

$$\left(x + \frac{b}{2a}\right)^2 = \frac{b^2 - 4ac}{4a^2}$$

$$x + \frac{b}{2a} = \pm \frac{\sqrt{b^2 - 4ac}}{2a}$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

11.7

Answer Key



$$\textcircled{1} a^2 - 5a - 24 = 0 \quad \boxed{\text{sum } 5 \quad \text{prod } -24}$$

$$\textcircled{2} b^2 + 12b - 28 = 0 \quad \boxed{\text{sum } -12 \quad \text{prod } -28}$$

$$\textcircled{3} 4y^2 + 4y + 1 = 0$$

$$y^2 + y + \frac{1}{4} = 0 \quad \boxed{\text{sum } -1 \quad \text{prod } \frac{1}{4}}$$

$$\textcircled{4} 3n^2 + 11n - 20 = 0$$

$$n^2 + \frac{11}{3}n - \frac{20}{3} = 0 \quad \boxed{\text{sum } -\frac{11}{3} \quad \text{prod } -\frac{20}{3}}$$

$$\textcircled{5} a^2 + 4a\sqrt{3} + 9 = 0 \quad \boxed{\text{sum } -4\sqrt{3} \quad \text{prod } 9}$$

$$\textcircled{6} 2y^2 + y\sqrt{2} - 6 = 0$$

$$y^2 + \frac{1}{2}\sqrt{2}y - 3 = 0 \quad \boxed{\text{sum } -\frac{1}{2}\sqrt{2} \quad \text{prod } -3}$$

$$\textcircled{7} \text{ roots: } 4, 7$$

$$\boxed{x^2 - 11x + 28 = 0}$$

$$\textcircled{8} \text{ roots: } 5, -9$$

$$\boxed{x^2 + 4x - 45 = 0}$$

$$\textcircled{9} \text{ roots: } \frac{5}{2}, 2$$

$$x^2 - \frac{9}{2}x + 5 = 0$$

$$\boxed{2x^2 - 9x + 10 = 0}$$

$$\textcircled{10} \text{ roots } \frac{2}{3}, -\frac{3}{2}$$

$$x^2 + \frac{5}{6}x - 1 = 0$$

$$\boxed{6x^2 + 5x - 6 = 0}$$



⑪ roots: $-\frac{1}{5}, \frac{5}{4}$
 $x^2 - \frac{9}{20}x - 1 = 0$

$20x^2 - 9x - 20 = 0$

⑫ roots: $-\frac{3}{4}, 8$
 $x^2 - \frac{29}{4}x - 6 = 0$


$4x^2 - 29x - 24 = 0$

⑬ roots: $\sqrt{3}, \sqrt{3}$

$x^2 - 2x\sqrt{3} + 3 = 0$

⑭ roots: $2+\sqrt{3}, 2-\sqrt{3}$

$x^2 - 4x + 1 = 0$

⑮ $3x - 4$


$x(3x - 4) = 32$

$3x^2 - 4x = 32$

$x^2 - \frac{4}{3}x = \frac{32}{3}$

$\frac{2}{3}x^2 - \frac{4}{3}x + \frac{4}{9} = \frac{32}{3} + \frac{4}{9}$

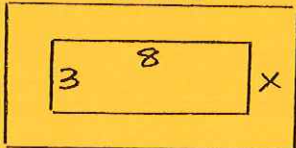
$(x - \frac{2}{3})^2 = \frac{100}{9}$

$x - \frac{2}{3} = \pm \sqrt{\frac{100}{9}}$

$x - \frac{2}{3} = \pm \frac{10}{3}$

$x = \frac{2 \pm 10}{3} = 4, \frac{-8}{3}$

$4 \text{ by } 8 \text{ cm}$

⑯ $2x + 8$


$(2x + 8)(2x + 3) - (8)(x) = 60$

$(4x^2 + 22x + 24) - (24) = 60$

continued

$4x^2 + 22x - 60 = 0$
 $2x^2 + 11x - 30 = 0$
 $a = 2 \quad b = 11 \quad c = -30$

$x = \frac{-11 \pm \sqrt{(11)^2 - 4(2)(-30)}}{2(2)}$

$x = \frac{-11 \pm \sqrt{361}}{4}$

$x = \frac{-11 \pm 19}{4} = 2, \frac{-15}{2}$

2 inches

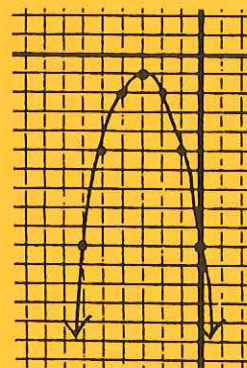
⑰ $y = -x^2 - 6x - 10$

$x = -3$

$(-3, -1)$

$-(-3)^2 - 6(-3) - 10 = -1$

x	y
-2	-2
-1	-5
0	-10



⑱ $y = x^2 - 8x + 12$

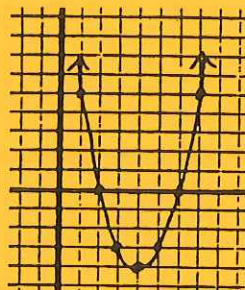
$x = 4$

$y = (4)^2 - 8(4) + 12$

$y = -4$

$(4, -4)$

x	y
3	-3
2	-4
1	-3



$(2, 0) (6, 0)$

⑲ $y = -x^2 - 6x - 9$

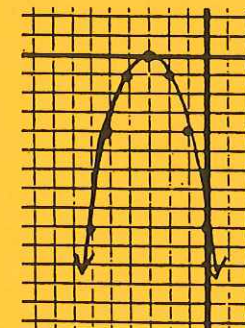
$x = -3$

$y = -(-3)^2 - 6(-3) - 9$

$y = 0$

$(-3, 0)$

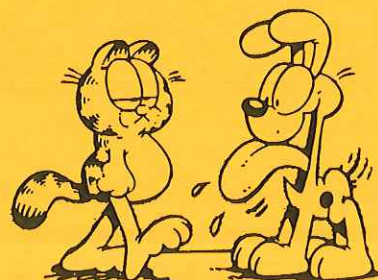
x	y
-2	-1
-1	-4
0	-9



$(-3, 0)$

Unit 11 REVIEW Answer Key

- ① downward
- ② upward
- ③ equation
- ④ function



$$\textcircled{7} \quad y = -x^2 - 2x + 8$$

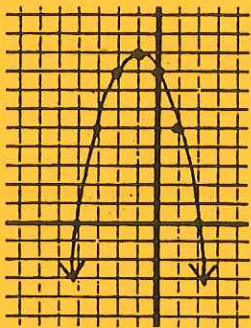
$$\boxed{x = -1}$$

$$y = -(-1)^2 - 2(-1) + 8$$

$$y = 9$$

x	y
0	8
1	5
2	0

$$\boxed{(-1, 9)}$$



$$\boxed{(-4, 0)(2, 0)}$$

$$\textcircled{8} \quad y = x^2 - 8x + 15$$

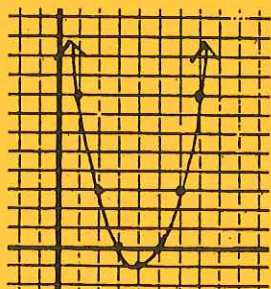
$$\boxed{x = 4}$$

$$y = (4)^2 - 8(4) + 15$$

$$y = -1$$

x	y
3	0
2	3
1	8

$$\boxed{(4, -1)}$$



$$\boxed{(3, 0)(5, 0)}$$

$$\textcircled{9} \quad x^2 - x - 12 = 0$$

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

$$\boxed{x = 4, -3}$$

$$\textcircled{10} \quad x^2 - 7x + 12 = 0$$

$$(x-4)(x-3) = 0$$

$$\boxed{x = 4, 3}$$

$$\textcircled{11} \quad 2x^2 - 5x - 3 = 0$$

$$2x^2 - 6x + x - 3 = 0$$

$$2x(x-3) + 1(x-3) = 0$$

$$(x-3)(2x+1) = 0$$

$$\boxed{x = 3, -\frac{1}{2}}$$

$$\textcircled{12} \quad 3x^2 + 13x + 4 = 0$$

$$3x^2 + 12x + x + 4 = 0$$

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

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

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

$$\textcircled{13} \quad x^2 - 16x + 32 = 0$$

$$x^2 - 16x = -32$$

$$-8 \quad x^2 - 16x + 64 = -32 + 64$$

$$(x-8)^2 = 32$$

$$x-8 = \pm\sqrt{32}$$

$$x = 8 \pm \sqrt{32}$$

$$\boxed{x = 8 \pm 4\sqrt{2}}$$

$$\textcircled{14} \quad x^2 + 6x + 4 = 0$$

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

$$+3 \quad x^2 + 6x + 9 = -4 + 9$$

$$(x+3)^2 = 5$$

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

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

$$\textcircled{15} \quad 2x^2 + 3 = 7x$$

$$2x^2 - 7x = -3$$

$$x^2 - \frac{7}{2}x = -\frac{3}{2}$$

$$-\frac{7}{4} \quad x^2 - \frac{7}{2}x + \frac{49}{16} = -\frac{3}{2} + \frac{49}{16}$$

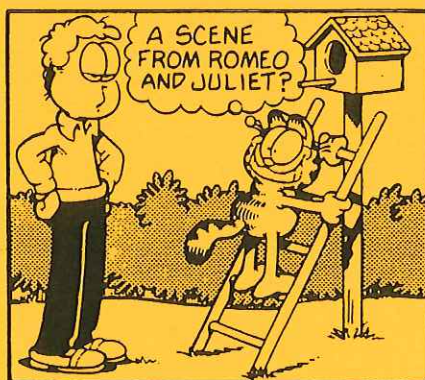
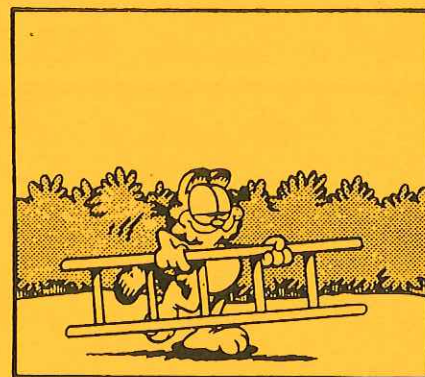
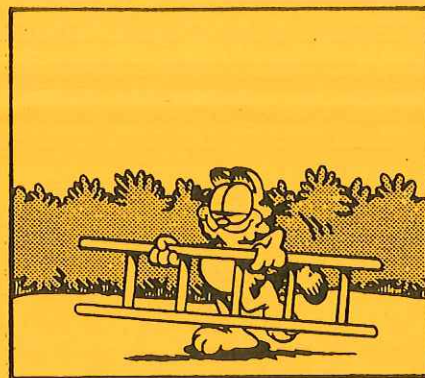
$$(x - \frac{7}{4})^2 = \frac{25}{16}$$

$$x - \frac{7}{4} = \pm\frac{5}{4}$$

$$x = \frac{7 \pm 5}{4} = 3, \frac{1}{2}$$

$$\boxed{x = 3, \frac{1}{2}}$$

Completing the square
and quadratic formula
work on all equations



$$\begin{aligned} (16) \quad 2x^2 - 15 &= -7x \\ 2x^2 + 7x &= 15 \\ x^2 + \frac{7}{2}x &= \frac{15}{2} \\ \frac{7}{4}x^2 + \frac{7}{2}x + \frac{49}{16} &= \frac{15}{2} + \frac{49}{16} \\ (x + \frac{7}{4})^2 &= \frac{169}{16} \\ x + \frac{7}{4} &= \pm \frac{13}{4} \\ x &= \frac{-7 \pm 13}{4} = \frac{3}{2}, -5 \\ \boxed{x = \frac{3}{2}, -5} \end{aligned}$$

$$\begin{aligned} (17) \quad x^2 + bx + c &= 0 \\ x^2 + bx &= -c \\ \frac{b}{2}x^2 + bx + \frac{b^2}{4} &= -c + \frac{b^2}{4} \\ (x + \frac{b}{2})^2 &= \frac{b^2 - 4c}{4} \\ x + \frac{b}{2} &= \pm \frac{\sqrt{b^2 - 4c}}{2} \\ \boxed{x = \frac{-b \pm \sqrt{b^2 - 4c}}{2}} \end{aligned}$$

$$\begin{aligned} (18) \quad x^2 + 2bx + 4c &= 0 \\ x^2 + 2bx &= -4c \\ b(x^2 + 2bx + b^2) &= -4c + b^2 \\ (x + b)^2 &= \frac{b^2 - 4c}{b} \\ x + b &= \pm \sqrt{\frac{b^2 - 4c}{b}} \\ \boxed{x = -b \pm \sqrt{\frac{b^2 - 4c}{b}}} \end{aligned}$$

$$\begin{aligned} (19) \quad 4x^2 + 16x + 15 &= 0 \\ a=4 \quad b=16 \quad c=15 \\ x &= \frac{-16 \pm \sqrt{(16)^2 - 4(4)(15)}}{2(4)} \\ x &= \frac{-16 \pm \sqrt{16}}{8} = \frac{-16 \pm 4}{8} \\ \boxed{x = -5/2, -3/2} \end{aligned}$$

$$\begin{aligned} (20) \quad x^2 - 8x &= 20 \\ x^2 - 8x - 20 &= 0 \\ a=1 \quad b=-8 \quad c=-20 \end{aligned}$$

$$\begin{aligned} x &= \frac{-(-8) \pm \sqrt{(-8)^2 - 4(1)(-20)}}{2(1)} \\ x &= \frac{8 \pm \sqrt{144}}{2} = \frac{8 \pm 12}{2} \\ \boxed{x = 10, -2} \end{aligned}$$

$$\begin{aligned} (21) \quad 9x^2 - 12x - 1 &= 0 \\ a=9 \quad b=-12 \quad c=-1 \\ x &= \frac{-(-12) \pm \sqrt{(-12)^2 - 4(9)(-1)}}{2(9)} \\ x &= \frac{12 \pm \sqrt{180}}{18} = \frac{12 \pm 6\sqrt{5}}{18} \\ \boxed{x = \frac{2 \pm \sqrt{5}}{3}} \end{aligned}$$



$$\begin{aligned} (22) \quad 5x^2 + 9x + 3 &= 0 \\ a=5 \quad b=9 \quad c=3 \\ x &= \frac{-9 \pm \sqrt{9^2 - 4(5)(3)}}{2(5)} \\ \boxed{x = \frac{-9 \pm \sqrt{21}}{10}} \end{aligned}$$

$$\begin{aligned} (23) \quad ax^2 + bx + 4b &= 0 \\ a=a \quad b=b \quad c=4b \\ x &= \frac{-b \pm \sqrt{b^2 - 4a(4b)}}{2a} \\ \boxed{x = \frac{-b \pm \sqrt{b^2 - 16ab}}{2a}} \end{aligned}$$

$$\begin{aligned} (24) \quad ax^2 - 3bx + c &= 0 \\ a=a \quad b=-3b \quad c=c \\ x &= \frac{-(-3b) \pm \sqrt{(-3b)^2 - 4ac}}{2a} \\ \boxed{x = \frac{3b \pm \sqrt{9b^2 - 4ac}}{2a}} \end{aligned}$$

$$\begin{aligned} (25) \quad 3x^2 - 8x - 40 &= 0 \\ b^2 - 4ac &= (-8)^2 - 4(3)(-40) \\ &= 64 + 480 = 544 \\ b^2 - 4ac &> 0 \\ \boxed{2 \text{ real roots}} \\ \text{Irrational} \end{aligned}$$

$$\begin{aligned} (26) \quad 3x^2 - 8x + 6 &= 0 \\ b^2 - 4ac &= (-8)^2 - 4(3)(6) \\ &= 64 - 72 = -8 \\ b^2 - 4ac &< 0 \\ \boxed{\text{no real roots}} \end{aligned}$$

$$\begin{aligned} (27) \quad 7x^2 - 6x + 5 &= 0 \\ b^2 - 4ac &= (-6)^2 - 4(7)(5) \\ &= 36 - 140 = -104 \\ b^2 - 4ac &< 0 \\ \boxed{\text{no real roots}} \end{aligned}$$

$$\begin{aligned} (28) \quad 4x^2 + 4x &= 15 \\ 4x^2 + 4x - 15 &= 0 \\ b^2 - 4ac &= (4)^2 - 4(4)(-15) \\ &= 16 + 240 = 256 \\ b^2 - 4ac &> 0 \\ \boxed{2 \text{ real roots}} \\ \text{Rational} \end{aligned}$$

$$\begin{aligned} (29) \quad 2x^2 - 8x + 8 &= 0 \\ b^2 - 4ac &= (-8)^2 - 4(2)(8) \\ &= 64 - 64 = 0 \\ b^2 - 4ac &= 0 \\ \boxed{1 \text{ real root}} \end{aligned}$$



30) $5x^2 - 10x + 5 = 0$
 $b^2 - 4ac = (-10)^2 - 4(5)(5)$
 $100 - 100 = 0$
 $b^2 - 4ac = 0$
1 real root

31) $8x^2 - 5x - 3 = 0$
 $x^2 - \frac{5}{8}x - \frac{3}{8} = 0$
sum $\frac{5}{8}$, prod $-\frac{3}{8}$

32) $9x^2 + 5x + 1 = 0$
 $x^2 + \frac{5}{9}x + \frac{1}{9} = 0$
sum $-\frac{5}{9}$, prod $\frac{1}{9}$

33) $x^2 - 3x\sqrt{7} + 14 = 0$
sum $3\sqrt{7}$, prod 14

34) $x^2 - 5x\sqrt{3} + 18 = 0$
sum $5\sqrt{3}$, prod 18

35) $(\frac{3}{2}) + (-4) = -\frac{5}{2}$
 $(\frac{3}{2})(-4) = -6$
 $x^2 + \frac{5}{2}x - 6 = 0$
 $2x^2 + 5x - 12 = 0$

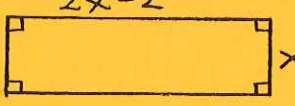
36) $(-\frac{2}{3}) + (3) = \frac{7}{3}$
 $(-\frac{2}{3})(3) = -2$
 $x^2 - \frac{7}{3}x - 2 = 0$
 $3x^2 - 7x - 6 = 0$

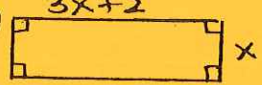
37) $(\sqrt{5}) + (3\sqrt{5}) = 4\sqrt{5}$
 $(\sqrt{5})(3\sqrt{5}) = 15$
 $x^2 - 4x\sqrt{5} + 15 = 0$

38) $(-2\sqrt{3}) + (3\sqrt{3}) = \sqrt{3}$
 $(-2\sqrt{3})(3\sqrt{3}) = -18$
 $x^2 - x\sqrt{3} - 18 = 0$

39) $x - y = 2 \quad x = 2 + y$
 $xy = 35$
 $(2+y)(y) = 35$
 $2y + y^2 = 35$
 $y^2 + 2y - 35 = 0$
 $(y+7)(y-5) = 0$
 $y = -7, 5$
 $-5, -7 \neq 7, 5$

40) $x + y = -10 \quad x = -10 - y$
 $xy = 24$
 $(-10 - y)(y) = 24$
 $-10y - y^2 = 24$
 $y^2 + 10y + 24 = 0$
 $(y+6)(y+4) = 0$
 $y = -6, -4$ **$-6, -4$**

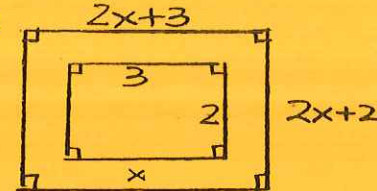
41) 
 $x(2x-2) = 40$
 $2x^2 - 2x - 40 = 0$
 $x^2 - x - 20 = 0$
 $(x-5)(x+4) = 0$
 $x = 5, -4$
5 by 8 in.

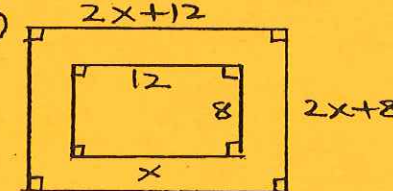
42) 
 $x(3x+2) = 33$
 $3x^2 + 2x - 33 = 0$
 $a = 3 \quad b = 2 \quad c = -33$

$x = \frac{-2 \pm \sqrt{(2)^2 - 4(3)(-33)}}{2(3)}$

$x = \frac{-2 \pm \sqrt{400}}{6} = \frac{-2 \pm 20}{6}$

$x = 3, -\frac{11}{3}$
3 in by 11 in

43) 
 $(2x+3)(2x+2) - (2)(3) = 24$
 $(4x^2 + 10x + 6) - 6 = 24$
 $4x^2 + 10x - 24 = 0$
 $2x^2 + 5x - 12 = 0$
 $a = 2 \quad b = 5 \quad c = -12$
 $x = \frac{-5 \pm \sqrt{(5)^2 - 4(2)(-12)}}{2(2)}$
 $x = \frac{-5 \pm \sqrt{121}}{4} = \frac{-5 \pm 11}{4}$
 $x = \frac{3}{2}, -4$ **$1\frac{1}{2}$ cm**

44) 
 $(2x+12)(2x+8) - (12)(8) = 125$
 $(4x^2 + 40x + 96) - 96 = 125$
 $4x^2 + 40x - 125 = 0$
 $a = 4 \quad b = 40 \quad c = -125$
 $x = \frac{-40 \pm \sqrt{(40)^2 - 4(4)(-125)}}{2(4)}$

$x = \frac{-40 \pm \sqrt{3600}}{8} = \frac{-40 \pm 60}{8}$

$x = \frac{5}{2}, -\frac{25}{2}$ **$2\frac{1}{2}$ ft.**



Unit 11 SKILL CHECK



① downward

② equation

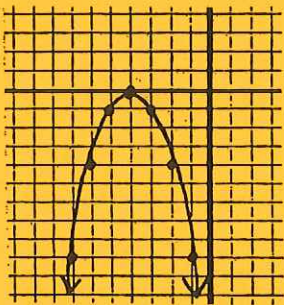
③ $y = -x^2 - 8x - 16 = 0$

$x = -4$

$y = -(-4)^2 - 8(-4) - 16$

$y = 0$	x	y
	-2	-4
	-1	-9
	-3	-1

$(-4, 0)$



$(-4, 0)$

④ $6x^2 - 13x + 5 = 0$
 $6x^2 - 10x - 3x + 5 = 0$
 $2x(3x-5) - 1(3x-5) = 0$
 $(3x-5)(2x-1) = 0$

$x = 5/3, 1/2$

⑤ $4x^2 - 4x - 17 = 0$

$4x^2 - 4x = 17$

$x^2 - x = 17/4$

$1/2 x^2 - x + 1/4 = 17/4 + 1/4$

$(x - 1/2)^2 = 18/4$

$x - 1/2 = \pm 3\sqrt{2}/2$

$x = \frac{1 \pm 3\sqrt{2}}{2}$

⑥ $9x^2 - 12x - 1 = 0$

$a = 9, b = -12, c = -1$

$x = \frac{-(-12) \pm \sqrt{(-12)^2 - 4(9)(-1)}}{2(9)}$

$x = \frac{12 \pm \sqrt{180}}{18} = \frac{12 \pm 6\sqrt{5}}{18}$

$x = \frac{2 \pm \sqrt{5}}{3}$

⑦ $3x^2 - 6x + 3 = 0$

$b^2 - 4ac = (-6)^2 - 4(3)(3)$

$b^2 - 4ac = 0$

1 real root
Rational

⑧ sum $(\frac{3}{5}) + (-2) = -\frac{7}{5}$

prod $(\frac{3}{5})(-2) = -\frac{6}{5}$

$x^2 + \frac{7}{5}x - \frac{6}{5} = 0$

$5x^2 + 7x - 6 = 0$

⑨ $x(5x-1) = 18$

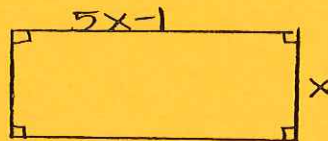
$5x^2 - x - 18 = 0$

$5x^2 - 10x + 9x - 18 = 0$

$5x(x-2) + 9(x-2) = 0$

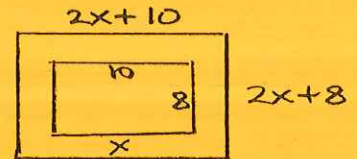
$(x-2)(5x+9) = 0$

$x = 2, -9/5$



$x = 2$ by 9 cm

⑩



$(2x+10)(2x+8) - (8)(10) = 115$

$4x^2 + 36x + 80 - 80 = 115$

$4x^2 + 36x - 115 = 0$

$a = 4, b = 36, c = -115$

$x = \frac{-36 \pm \sqrt{(36)^2 - 4(4)(-115)}}{2(4)}$

$x = \frac{-36 \pm \sqrt{336}}{8} = \frac{-36 \pm 56}{8}$

$x = 5/2, -23/2$ $\boxed{2\frac{1}{2} \text{ ft.}}$

⑪ $ax^2 - bx + 2b = 0$

$a = a, b = -b, c = 2b$

$x = \frac{-(-b) \pm \sqrt{(-b)^2 - 4(a)(2b)}}{2a}$

$x = \frac{b \pm \sqrt{b^2 - 8ab}}{2a}$

Unit 11 REMEDIATION

① upward

② function

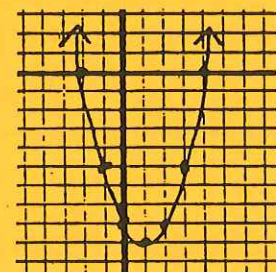
③ $y = x^2 - 2x - 8$ $\boxed{x=1}$

$y = (1)^2 - 2(1) - 8$

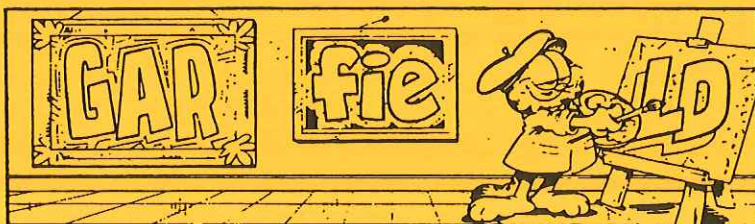
$y = -9$

$(1, -9)$

x	y
0	-8
-1	-5
-2	0



$(-2, 0) (4, 0)$



④ $3x^2 - 10x + 8 = 0$
 $3x^2 - 6x - 4x + 8 = 0$
 $3x(x-2) - 4(x+2) = 0$
 $(x-2)(3x-4) = 0$
 $x = 2, \frac{4}{3}$

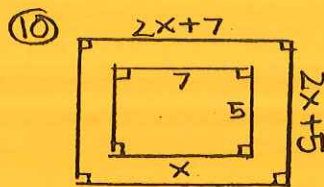
⑤ $2x^2 - 2x - 1 = 0$
 $\frac{1}{2}x^2 - x = \frac{1}{2}$
 $x^2 - x + \frac{1}{4} = \frac{1}{2} + \frac{1}{4}$
 $(x - \frac{1}{2})^2 = \frac{3}{4}$
 $x - \frac{1}{2} = \pm \sqrt{\frac{3}{4}}$
 $x = \frac{1 \pm \sqrt{3}}{2}$

⑥ $4x^2 - 12x + 3 = 0$
 $a = 4 \quad b = -12 \quad c = 3$
 $x = \frac{-(-12) \pm \sqrt{(-12)^2 - 4(4)(3)}}{2(4)}$
 $x = \frac{12 \pm \sqrt{96}}{8} = \frac{12 \pm 4\sqrt{6}}{8}$
 $x = \frac{3 \pm \sqrt{6}}{2}$

⑦ $3x^2 + 4x + 5 = 0$
 $b^2 - 4ac = (4)^2 - 4(3)(5)$
 $b^2 - 4ac = -44$
 $b^2 - 4ac < 0$
 no real roots

⑧ sum $(-\frac{2}{3}) + (-6) = -\frac{20}{3}$
 prod $(-\frac{2}{3})(-6) = 4$
 $3x^2 + 20x + 12 = 0$
 remember:
 no fractions
 $x^2 + \frac{20}{3}x + 4 = 0$

⑨ $x(x-8) = 48$
 $x^2 - 8x - 48 = 0$
 $(x-12)(x+4) = 0$
 $x = 12, -4$
 $12, 4 \neq -4, -12$



$(2x+7)(2x+5) - (5)(7) = 45$
 $4x^2 + 24x + 35 - 35 = 45$
 $4x^2 + 24x - 45 = 0$
 $a = 4$
 $b = 24$
 $c = -45$

$x = \frac{-24 \pm \sqrt{(24)^2 - 4(4)(-45)}}{2(4)}$
 $x = \frac{-24 \pm \sqrt{1296}}{8} = \frac{-24 \pm 36}{8} = \frac{3}{2}, -\frac{15}{2}$
 $\frac{3}{2} \text{ cm}$

⑪ $ax^2 - 3bx + c = 0$
 $a = a \quad b = -3b \quad c = c$
 $x = \frac{-(-3b) \pm \sqrt{(-3b)^2 - 4(a)(c)}}{2a}$
 $x = \frac{3b \pm \sqrt{9b^2 - 4ac}}{2a}$

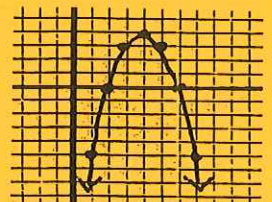
Unit 11 EXTRA PRACTICE

- ① downward ③ function
 ② upward ④ equation

⑤ $-x^2 + 8x - 12 = 0$
 $x = \frac{-b}{2a} = \frac{-8}{-2} \quad \boxed{x=4}$
 $y = -(4)^2 + 8(4) - 12$
 $y = 4 \quad \boxed{(4, 4)}$

x	y
3	3
2	0
1	-5

(2, 0)
(6, 0)



⑥ $x^2 + 2x - 3 = 0$
 $x = \frac{-b}{2a} = \frac{-2}{2} \quad \boxed{x=-1}$
 $y = (-1)^2 + 2(-1) - 3$
 $y = -4 \quad \boxed{(-1, -4)}$

x	y
0	3
1	0
2	-5

(-3, 0)
(1, 0)



$$\textcircled{7} x^2 - 5x - 24 = 0$$

$$(x-8)(x+3) = 0$$

$$x = 8, -3$$

$$\textcircled{8} 3x^2 - 13x + 30 = 0$$

$$3x^2 - 18x + 5x - 30 = 0$$

$$3x(x-6) + 5(x-6) = 0$$

$$(x-6)(3x+5) = 0$$

$$x = 6, -5/3$$

$$\textcircled{9} x^2 - 10x + 22 = 0$$

$$x^2 - 10x - (-22) = 0$$

$$x^2 - 10x + 25 = -22 + 25$$

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

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

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

$$\textcircled{10} x^2 + 4x - 1 = 0$$

$$x^2 + 4x = 1$$

$$x^2 + 4x + 4 = 1 + 4$$

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

$$x+2 = \pm\sqrt{5}$$

$$x = -2 \pm \sqrt{5}$$

$$\textcircled{11} 3x^2 + 5x - 2 = 0$$

$$a=3 \quad b=5 \quad c=-2$$

$$x = \frac{-5 \pm \sqrt{5^2 - 4(3)(-2)}}{2(3)}$$

$$x = \frac{-5 \pm \sqrt{49}}{6} = \frac{-5 \pm 7}{6}$$

$$x = -2, 1/3$$

$$\textcircled{12} 9x^2 - 12x - 1 = 0$$

$$a=9 \quad b=-12 \quad c=-1$$

$$x = \frac{12 \pm \sqrt{(-12)^2 - 4(9)(-1)}}{2(9)}$$

$$x = \frac{12 \pm \sqrt{180}}{18} = \frac{12 \pm 6\sqrt{5}}{18}$$

$$x = \frac{2 \pm \sqrt{5}}{3}$$

$$\textcircled{13} x^2 - 6x + 11 = 0$$

$$b^2 - 4ac$$

$$(-6)^2 - 4(1)(11) = -8$$

$$0 \text{ real roots}$$

$$\textcircled{14} 4x^2 - 4x + 1 = 0$$

$$b^2 - 4ac$$

$$(-4)^2 - 4(4)(1) = 0$$

$$1 \text{ real root}$$

$$\textcircled{15} \text{sum } \frac{2}{5} + (-2) = \frac{-8}{5}$$

$$\text{prod } \left(\frac{2}{5}\right)(-2) = \frac{-4}{5}$$

$$x^2 + \frac{8}{5}x - \frac{4}{5} = 0$$

$$5x^2 + 8x - 4 = 0$$

$$\textcircled{16} \text{sum } 2\sqrt{3} + (-5\sqrt{3}) = -3\sqrt{3}$$

$$\text{prod } (2\sqrt{3})(-5\sqrt{3}) = -30$$

$$x^2 + 3x\sqrt{3} - 30 = 0$$

$$\textcircled{17} x(3-x) = -40$$

$$3x - x^2 = -40$$

$$x^2 - 3x - 40 = 0$$

$$(x-8)(x+5) = 0$$

$$x \begin{matrix} 8 \\ -5 \end{matrix}$$

$$3-x \begin{matrix} -5 \\ 8 \end{matrix}$$

$$\textcircled{18} x(3x-1) = 44$$

$$3x^2 - x = 44$$

$$3x^2 - x - 44 = 0$$

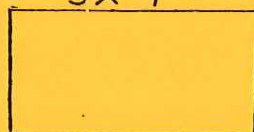
$$a=3 \quad b=-1 \quad c=-44$$

$$x = \frac{1 \pm \sqrt{(-1)^2 - 4(3)(-44)}}{2(3)}$$

$$x = \frac{1 \pm \sqrt{529}}{6} = 4, \frac{-23}{6}$$

$$3x-1$$

x



4 by 11 inches

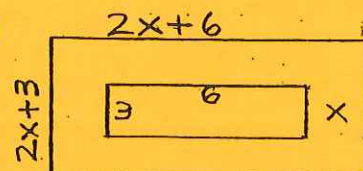
$$\textcircled{19} ax^2 + 3bx - 6b = 0$$

$$a=a \quad b=3b \quad c=-6b$$

$$x = \frac{-3b \pm \sqrt{(3b)^2 - 4a(-6b)}}{2a}$$

$$x = \frac{-3b \pm \sqrt{9b^2 + 24ab}}{2a}$$

20



$$(2x+6)(2x+3) - (6)(3) = 70$$

$$(4x^2 + 18x + 18) - 18 = 70$$

$$4x^2 + 18x - 70 = 0$$

$$2x^2 + 9x - 35 = 0$$

$$2x^2 + 14x - 5x - 35 = 0$$

$$2x(x+7) - 5(x+7) = 0$$

$$(x+7)(2x-5) = 0$$

$$x = -7, 5/2$$

5/2 inches wide

