

Friendship Jr. High School
Accelerated Math Program

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



Algebra

4

UNIT #10

Radicals

UNIT #11

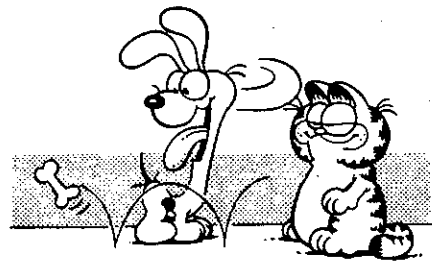
Quadratic Functions & Equations

UNIT #12

Rational Expressions

Radicals

Lesson 10.1 SIMPLIFYING RADICALS



Simplify the radicals:

1 • $\sqrt{49}$

The radical is a perfect square

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

2 • $\pm \sqrt{200}$

Use a factor tree to determine prime factors

$$\begin{array}{l} \pm \sqrt{2 \cdot 2 \cdot 2 \cdot 5 \cdot 5} \\ \pm \sqrt{2^3 \cdot 5^2} \\ \pm 2 \cdot 5 \sqrt{2} \\ \boxed{\pm 10 \sqrt{2}} \end{array} \quad \begin{array}{l} 200 \\ \wedge \\ 20 \quad 10 \\ \wedge \quad \wedge \\ 10 \quad (2) \quad (2) \quad (5) \\ \wedge \quad \wedge \\ (2) \quad (5) \end{array}$$

3 • $-\sqrt{20x^3}$

Assume the radicand must be positive. Can "x" be negative?

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

"x" cannot be negative (or $\sqrt{5x}$ would be imaginary).

4 • $\sqrt{50n^2m^3}$

"n" can be negative, but "m" cannot be negative.

$$\sqrt{2 \cdot 5^2 \cdot n^2 \cdot m^3} = \boxed{5|n|m \sqrt{2m}}$$

Use absolute value bars to protect the solution.

5 • $\sqrt{a^3b^3m^4}$

"a" and "b" are both positive or both negative. "m" could be negative.

$$\sqrt{a^3b^3m^4} = \boxed{abm^2 \sqrt{ab}}$$

No bars needed. "ab" and "m²" are positive.

6 • $\sqrt{x^3y^2z^5}$

"y" could be negative. "x" and "z" are both positive or both negative.

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

"x" and "y" both need bars because they could be negative. "z²" is automatically positive.

Lesson 10.2

BASIC OPERATIONS

Multiply and simplify:

1• $(\sqrt{6})(\sqrt{3})$

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

2• $(2\sqrt{3})(3\sqrt{3})$

$$6\sqrt{9} = 6(3) = \boxed{18}$$

Add/subtract and simplify:

3• $4\sqrt{3} + 3\sqrt{5} - 3\sqrt{3}$

combine like terms $\boxed{3\sqrt{5} + \sqrt{3}}$

4• $3\sqrt{2} + 2\sqrt{8} - 5\sqrt{32}$

simplify and combine the like terms

$$3\sqrt{2} + 4\sqrt{2} - 20\sqrt{2} = \boxed{-13\sqrt{2}}$$

Distributive Property:

5• $3\sqrt{2}(2\sqrt{6} - 2\sqrt{24})$

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

$$12\sqrt{3} - 24\sqrt{3} = \boxed{-12\sqrt{3}}$$

distribute, simplify, and combine like terms

Lesson 10.3

RATIONALIZE & SIMPLIFY

In simplified form, there can be no radicals in the denominator of a fraction.

Rationalize and simplify:

1• $\frac{3\sqrt{2}}{\sqrt{6}}$

multiply by $\frac{\sqrt{6}}{\sqrt{6}}$

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



2• $\frac{3\sqrt{3}}{\sqrt{3}-3}$

multiply by the conjugate

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

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

3• $\frac{2\sqrt{6}}{4+\sqrt{3}}$

multiply by the conjugate

$$\frac{2\sqrt{6}}{4+\sqrt{3}} \cdot \frac{4-\sqrt{3}}{4-\sqrt{3}} = \frac{8\sqrt{6} - 2\sqrt{18}}{16-3} = \boxed{\frac{8\sqrt{6} - 6\sqrt{2}}{13}}$$

$$4 \bullet \sqrt{24} + \sqrt{\frac{3}{2}}$$

Simplify and rationalize

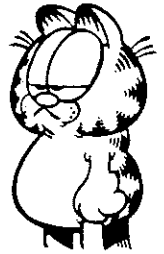
$$2\sqrt{6} + \frac{\sqrt{3}}{\sqrt{2}} \rightarrow \frac{\sqrt{3}}{\sqrt{2}} \cdot \frac{\sqrt{2}}{\sqrt{2}} = \frac{\sqrt{6}}{2}$$

$$2\sqrt{6} + \frac{\sqrt{6}}{2} \quad \text{Common denominator is 2}$$

$$\frac{4\sqrt{6}}{2} + \frac{\sqrt{6}}{2} = \boxed{\frac{5\sqrt{6}}{2}}$$

$$2 \bullet \sqrt{1710}$$

$$\begin{array}{r} 41.35 \approx \boxed{41.4} \\ \sqrt{1710.0000} \\ \underline{16} \\ 81 \quad 110 \\ \underline{81} \\ 823 \quad 2900 \\ \underline{2469} \\ 8265 \quad 43100 \\ \underline{41325} \end{array}$$



Lesson 10.4 CALCULATING SQ. ROOTS

Calculate to $\frac{1}{10}$:

$$1 \bullet \sqrt{465}$$

$$\begin{array}{r} 21.56 \\ \sqrt{465.0000} \\ \underline{40} \quad 4 \\ 425 \quad 65 \\ \underline{41} \\ 425 \quad 41 \\ \underline{425} \quad 2400 \\ 2125 \\ \underline{4306} \quad 27500 \\ 25836 \end{array}$$



$$21.56 \approx \boxed{21.6}$$

Lesson 10.5 INTERPOLATING SQ. ROOTS

Interpolate using the square root table (see problem set):

$$1 \bullet \sqrt{154} \quad \left. \begin{array}{l} 12 = \sqrt{144} \\ \sqrt{154} \\ 13 = \sqrt{169} \end{array} \right\} 25 \left. \right\} 10$$

$$12 \frac{10}{25} = \boxed{12 \frac{2}{5}}$$

$$2 \bullet \sqrt{982} \quad \left. \begin{array}{l} 31 = \sqrt{961} \\ \sqrt{982} \\ 32 = \sqrt{1024} \end{array} \right\} 63 \left. \right\} 21$$

$$31 \frac{21}{63} = \boxed{31 \frac{1}{3}}$$

Lesson 10.6

RADICAL EQUATIONS

Solve and check:

1• $\sqrt{x} = 5$

Square each side of the equation.

$$(\sqrt{x})^2 = (5)^2$$

$$\boxed{x = 25}$$

check:

$$\sqrt{x} = 5$$

$$\sqrt{25} = 5$$

$$5 = 5 \checkmark$$

2• $\sqrt{3n+1} - 2 = 2$

Isolate the radical, square both sides, and solve.

$$\sqrt{3n+1} = 4$$

$$3n+1 = 16$$

$$3n = 15$$

$$\boxed{n = 5}$$

check:

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

$$\sqrt{16} - 2 = 2$$

$$4 - 2 = 2$$

$$2 = 2 \checkmark$$

3• $2\sqrt{2n^2-8} = 8$

Isolate the radical, square both sides, and solve.

$$\sqrt{2n^2-8} = 4$$

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

$$2n^2 = 24$$

$$n^2 = 12$$

$$n = \pm\sqrt{12} = \boxed{\pm 2\sqrt{3}}$$

Be sure to use \pm

check:

$$2\sqrt{2(2\sqrt{3})^2-8} = 8$$

$$2\sqrt{2(12)-8} = 8$$

$$2\sqrt{16} = 8$$

$$8 = 8 \checkmark$$

check:

$$2\sqrt{2(-2\sqrt{3})^2-8} = 8$$

$$2\sqrt{2(12)-8} = 8$$

$$2\sqrt{16} = 8$$

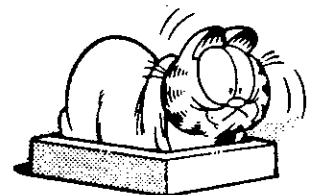
$$8 = 8 \checkmark$$

4• $\sqrt{3n} + 4 = 1$

Isolate the radical. If the radical is equal to a negative value, there are no real solutions.

$$\sqrt{3n} = -3$$

$\boxed{\text{no real solutions}}$



5• $\sqrt{n-2} = n-2$

Square both sides, factor.

$$n-2 = (n-2)^2$$

$$n-2 = n^2 - 4n + 4$$

$$0 = n^2 - 5n + 6$$

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

$$\boxed{n = 3, 2}$$

check:

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

$$1 = 1 \checkmark$$

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

$$0 = 0 \checkmark$$

6● $5 + \sqrt{x+27} = x+2$

Isolate the radical. Square both sides. Factor.

$$\sqrt{x+27} = x-3$$

$$x+27 = (x-3)^2$$

$$x+27 = x^2 - 6x + 9$$

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

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

$$9 \quad -2$$

$$\boxed{x = 9}$$

check:

$$5 + \sqrt{(9)+27} = (9)+2$$

$$5 + \sqrt{36} = 11$$

$$11 = 11 \checkmark$$

$$5 + \sqrt{(-2)+27} = (-2)+2$$

$$5 + \sqrt{25} = 0$$

$$5 + 5 = 0$$

$$10 = 0$$

-2 does not check

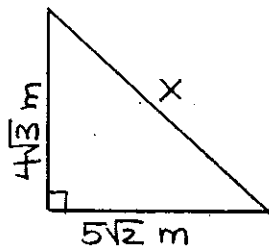
2● $(4\sqrt{3})^2 + (5\sqrt{2})^2 = x^2$

$$48 + 50 = x^2$$

$$x^2 = 98$$

$$x = \sqrt{98}$$

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



Note: Only positive values need be considered.

3● Identify common Pythagorean triples.

3-4-5

5-12-13

8-15-17

7-24-25

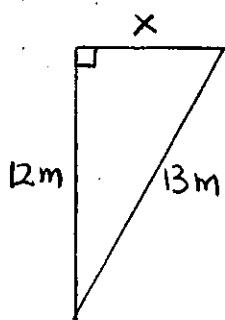
All multiples of these are also valid Pythagorean triples.

Lesson 10.7

THE DISTANCE FORMULA

Solve using the Pythagorean Theorem:

1●



$$x^2 + 12^2 = 13^2$$

$$x^2 + 144 = 169$$

$$x^2 = 25$$

$$\boxed{x = 5 \text{ m}}$$

The Distance Formula:

Distance between (x_1, y_1) and (x_2, y_2)

$$d = \sqrt{(x_1 - x_2)^2 + (y_1 - y_2)^2}$$

4● Use the formula to find the distance between $(-2, 6)$ and $(-8, 10)$

$$d = \sqrt{((-2) - (-8))^2 + (6 - 10)^2}$$

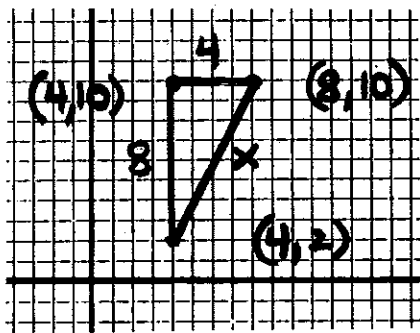
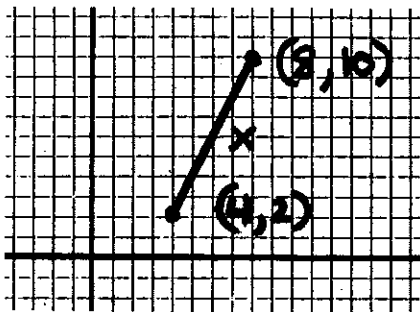
$$d = \sqrt{(6)^2 + (-4)^2}$$

$$d = \sqrt{36 + 16} = \sqrt{52}$$

$$d = \boxed{2\sqrt{13}}$$



- 5 • Use the Pythagorean theorem to determine the distance between (4, 2) and (8, 10)



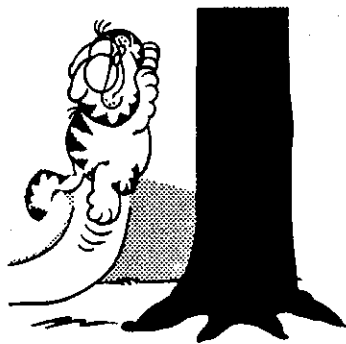
$$4^2 + 8^2 = x^2$$

$$16 + 64 = x^2$$

$$x^2 = 80$$

$$x = \sqrt{80}$$

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



If you forget the distance formula, you can always use the theorem. You can use either method to check the other.

10.1 Problems

SIMPLIFYING RADICALS

Simplify the radicals:

① $\sqrt{36}$

② $\sqrt{49}$

③ $-\sqrt{81}$

④ $-\sqrt{64}$

⑤ $\pm\sqrt{9}$

⑥ $\pm\sqrt{16}$

⑦ $\sqrt{\frac{4}{9}}$

⑧ $\sqrt{\frac{25}{36}}$

⑨ $\sqrt{24}$

⑩ $\sqrt{45}$

⑪ $\sqrt{48}$

⑫ $\sqrt{80}$

⑬ $-\sqrt{150}$

⑭ $-\sqrt{162}$

⑮ $\sqrt{8n}$

⑯ $\sqrt{20x}$

⑰ $\sqrt{40n^3}$

⑱ $\sqrt{12a^3}$

⑲ $\sqrt{75n^4}$

⑳ $\sqrt{60a^4b^4}$

㉑ $\sqrt{18n^2}$

㉒ $\sqrt{54x^2}$

㉓ $\sqrt{90a^3b^2}$

㉔ $\sqrt{50x^2y^5}$

㉕ $\sqrt{72a^3b^3}$

㉖ $\sqrt{32x^4y^3}$

㉗ $\sqrt{28a^6b^4}$

㉘ $\sqrt{24n^3m^5}$

㉙ $\sqrt{45a^4b^2}$

㉚ $\sqrt{12x^3y^4}$

㉛ $\sqrt{20a^2b^4}$

㉜ $\sqrt{8n^3m^2}$

㉝ $\sqrt{80x^3y^3}$

㉞ $\sqrt{44n^5m^2}$

㉟ $\sqrt{a^3b^5c^2}$

㊱ $\sqrt{x^4y^6z^3}$

㊲ $\sqrt{x^5y^3z^4}$

㊳ $\sqrt{a^3b^3c^3}$

㊴ $\sqrt{n^2m^3p}$

㊵ $\sqrt{x^3y^2z^3}$



10.2 Problems

BASIC OPERATIONS (x + -)

Calculate and simplify:

- ① $(\sqrt{2})(\sqrt{3})$
- ② $(\sqrt{5})(\sqrt{7})$
- ③ $(\sqrt{6})(\sqrt{2})$
- ④ $(\sqrt{8})(\sqrt{3})$
- ⑤ $\sqrt{2}(\sqrt{3} + \sqrt{8})$
- ⑥ $\sqrt{3}(\sqrt{3} - \sqrt{2})$
- ⑦ $2\sqrt{2} + \sqrt{18}$
- ⑧ $4\sqrt{3} - 2\sqrt{12}$
- ⑨ $2\sqrt{50} - 3\sqrt{32}$
- ⑩ $3\sqrt{27} - 5\sqrt{48}$
- ⑪ $3\sqrt{28} - 8\sqrt{63}$
- ⑫ $3\sqrt{2}(2\sqrt{6} - \sqrt{24})$
- ⑬ $2\sqrt{3}(\sqrt{15} + 2\sqrt{3})$
- ⑭ $2\sqrt{2} - 3\sqrt{18} + 2\sqrt{6}$
- ⑮ $4\sqrt{3} + 2\sqrt{8} - 3\sqrt{12}$



Review

Simplify each radical

- ⑯ $-\sqrt{8x^3y^4}$
- ⑰ $\sqrt{12a^5b^3c^2}$
- ⑱ $\pm\sqrt{20n^3m^3}$
- ⑲ $\sqrt{x^2y^2z^3}$
- ⑳ $\sqrt{a^3b^4c^5}$

10.3 Problems

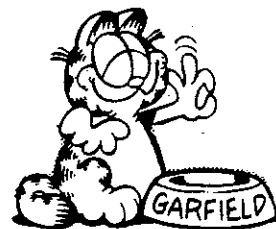
RATIONALIZE & SIMPLIFY

Simplify and rationalize:

- ① $\frac{\sqrt{8}}{\sqrt{3}}$
- ② $\frac{\sqrt{10}}{\sqrt{2}}$
- ③ $\frac{2\sqrt{5}}{\sqrt{2}}$
- ④ $\frac{3\sqrt{6}}{\sqrt{3}}$
- ⑤ $\frac{3\sqrt{2}}{\sqrt{6}}$
- ⑥ $\frac{2\sqrt{3}}{\sqrt{8}}$
- ⑦ $\frac{1}{6+\sqrt{3}}$
- ⑧ $\frac{1}{7-\sqrt{2}}$
- ⑨ $\frac{\sqrt{3}}{2-\sqrt{3}}$
- ⑩ $\frac{\sqrt{5}}{5+\sqrt{5}}$
- ⑪ $\sqrt{6} + \sqrt{\frac{2}{3}}$
- ⑫ $\sqrt{7} + \sqrt{\frac{1}{7}}$
- ⑬ $14\sqrt{\frac{3}{2}} + 9\sqrt{\frac{2}{3}}$
- ⑭ $3\sqrt{\frac{7}{4}} - 10\sqrt{\frac{1}{7}}$

Review Simplify

- ⑮ $\sqrt{12a^2b^2}$
- ⑯ $-\sqrt{n^3m^5p}$
- ⑰ $-\sqrt{8x^2y^3z^6}$
- ⑱ $\sqrt{a^5b^6c^2}$



10.4 Problems

CALCULATING SQ. ROOTS

Calculate to $\frac{1}{10}$:

- ① $\sqrt{264}$ ④ $\sqrt{1963}$
 ② $\sqrt{586}$ ⑤ $\sqrt{3620}$
 ③ $\sqrt{2924}$ ⑥ $\sqrt{4126}$

Review

- ⑦ Simplify $\sqrt{32a^2b^3}$
 ⑧ Simplify $\sqrt{24x^3y^3z^2}$
 ⑨ $4\sqrt{2}(\sqrt{8} - 3\sqrt{18})$
 ⑩ $\frac{\sqrt{6}}{2-\sqrt{3}}$ ⑪ $\frac{2\sqrt{2}}{\sqrt{8}-2}$

SQUARES & SQUARE ROOTS

N	N ²	\sqrt{N}	N	N ²	\sqrt{N}
1	1	1.000	51	2601	7.141
2	4	1.414	52	2704	7.211
3	9	1.732	53	2809	7.280
4	16	2.000	54	2916	7.348
5	25	2.236	55	3025	7.416
6	36	2.449	56	3136	7.483
7	49	2.646	57	3249	7.550
8	64	2.828	58	3364	7.616
9	81	3.000	59	3481	7.681
10	100	3.162	60	3600	7.746
11	121	3.317	61	3721	7.810
12	144	3.464	62	3844	7.874
13	169	3.606	63	3969	7.937
14	196	3.742	64	4096	8.000
15	225	3.873	65	4225	8.062
16	256	4.000	66	4356	8.124
17	289	4.123	67	4489	8.185
18	324	4.243	68	4624	8.246
19	361	4.359	69	4761	8.307
20	400	4.472	70	4900	8.367
21	441	4.583	71	5041	8.426
22	484	4.690	72	5184	8.485
23	529	4.796	73	5329	8.544
24	576	4.899	74	5476	8.602
25	625	5.000	75	5625	8.660
26	676	5.099	76	5776	8.718
27	729	5.196	77	5929	8.775
28	784	5.292	78	6084	8.832
29	841	5.385	79	6241	8.888
30	900	5.477	80	6400	8.944
31	961	5.568	81	6561	9.000
32	1024	5.657	82	6724	9.055
33	1089	5.745	83	6889	9.110
34	1156	5.831	84	7056	9.165
35	1225	5.916	85	7225	9.220
36	1296	6.000	86	7396	9.274
37	1369	6.083	87	7569	9.327
38	1444	6.164	88	7744	9.381
39	1521	6.245	89	7921	9.434
40	1600	6.325	90	8100	9.487
41	1681	6.403	91	8281	9.539
42	1764	6.481	92	8464	9.592
43	1849	6.557	93	8649	9.644
44	1936	6.633	94	8836	9.695
45	2025	6.708	95	9025	9.747
46	2116	6.782	96	9216	9.798
47	2209	6.856	97	9409	9.849
48	2304	6.928	98	9604	9.899
49	2401	7.000	99	9801	9.950
50	2500	7.071	100	10000	10.000

10.5 Problems

INTERPOLATING SQ. ROOTS

- ① $\sqrt{739}$ ⑤ $\sqrt{3754}$
 ② $\sqrt{1179}$ ⑥ $\sqrt{374}$
 ③ $\sqrt{1419}$ ⑦ $\sqrt{509}$
 ④ $\sqrt{314}$ ⑧ $\sqrt{4579}$

Review (Simplify / Calculate)

- ⑨ $\sqrt{8n^3m^5p^2}$ ⑩ $\sqrt{12a^5b^6c^3}$
 ⑪ $2\sqrt{3}(3\sqrt{12}-\sqrt{8})$ ⑫ $4\sqrt{2}-4\sqrt{20}+3\sqrt{18}$
 ⑬ $\frac{3\sqrt{3}}{\sqrt{6}}$ ⑭ $\frac{3\sqrt{2}}{3-2\sqrt{2}}$ ⑮ $\frac{\sqrt{2}-3}{\sqrt{8}}$
 ⑯ Calculate to $\frac{1}{10}$ $\sqrt{1230}$

10.6 Problems

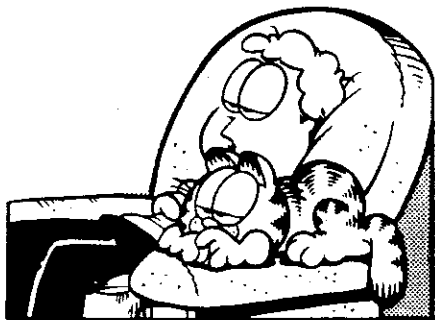
RADICALS IN EQUATIONS

Solve and check:

- ① $\sqrt{n} = 7$ ⑥ $\sqrt{a} + 3 = 1$
 ② $\sqrt{x} = 8$ ⑦ $\sqrt{8x+1} - 5 = 0$
 ③ $\sqrt{4x+1} = 3$ ⑧ $\sqrt{2n-5} + 1 = 6$
 ④ $\sqrt{2x+7} = 5$ ⑨ $\sqrt{n} = 3\sqrt{5}$
 ⑤ $\sqrt{2n} + 1 = 0$ ⑩ $3\sqrt{7} = \sqrt{c}$



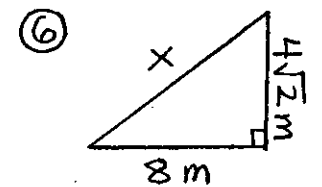
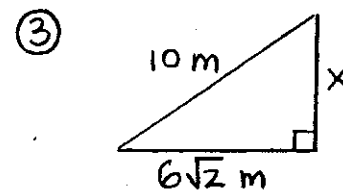
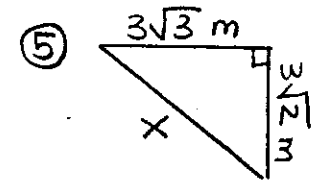
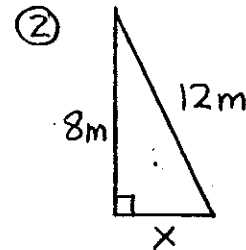
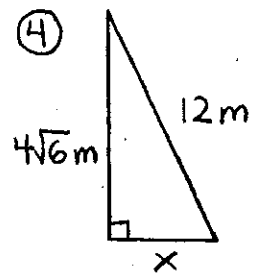
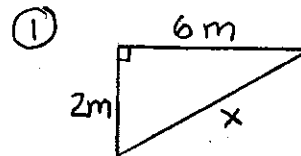
- ⑪ $5\sqrt{2n^2-28} = 20$
 ⑫ $4\sqrt{3x^2-15} = 12$
 ⑬ $\sqrt{n+2} = n-4$
 ⑭ $\sqrt{1-2x} = 1+x$
 ⑮ $4 + \sqrt{x-2} = x$
 ⑯ $n + \sqrt{n^2+3} = 3n$



10.7 Problems

THE DISTANCE FORMULA

Solve using the Pythagorean Theorem:



Find the distance between these two points:

- ⑦ $(-4, 2)$ and $(4, 17)$
 ⑧ $(5, -1)$ and $(11, 7)$
 ⑨ $(7, -9)$ and $(4, -3)$

Review

- ⑩ $\sqrt{4x} - 3 = 3$
 ⑪ $n + \sqrt{n^2-2n} = 3n-4$

- ⑫ Simplify $\sqrt{18a^3b^2c^5}$
 ⑬ $3\sqrt{2}(\sqrt{8} - 4\sqrt{2})$
 ⑭ $6\sqrt{2} - 2\sqrt{32}$
 ⑮ $\frac{\sqrt{3}-2}{\sqrt{3}}$ ⑯ $\frac{2}{6-\sqrt{3}}$
 ⑰ Calculate to $\frac{1}{10}$ $\sqrt{642}$
 ⑱ Interpolate $\sqrt{590}$

Calculate and simplify:

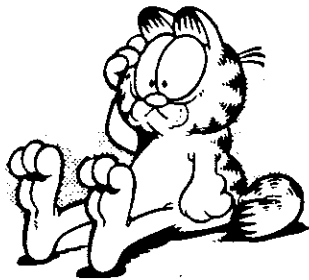
- ⑪ $(2\sqrt{6})(2\sqrt{2})$
 ⑫ $(5\sqrt{3})(4\sqrt{8})$
 ⑬ $\sqrt{3}(2\sqrt{6}-\sqrt{3})$
 ⑭ $\sqrt{5}(3\sqrt{10}-\sqrt{8})$
 ⑮ $2\sqrt{8} - \sqrt{32} + \sqrt{2}$
 ⑯ $\sqrt{5} + 2\sqrt{20} - 3\sqrt{45}$
 ⑰ $6\sqrt{18} - 4\sqrt{50}$
 ⑱ $\sqrt{125} - 3\sqrt{20}$

Unit 10

REVIEW PROBLEMS

Simplify these radicals:

- ① $-\sqrt{180}$
 ② $\pm\sqrt{300}$
 ③ $\sqrt{60n^3}$
 ④ $\sqrt{80n^7}$
 ⑤ $\sqrt{120a^2b^3}$
 ⑥ $\sqrt{96x^3y^4z^5}$
 ⑦ $\sqrt{200n^7m^6p^5}$
 ⑧ $\sqrt{288x^7y^7z^4}$
 ⑨ $\sqrt{12a^5b^6c^7d^8}$
 ⑩ $\sqrt{20w^4x^3y^5z^7}$



Simplify and rationalize:

- ⑰ $\frac{3\sqrt{2}}{\sqrt{6}}$ ⑳ $\sqrt{18} - \sqrt{\frac{1}{8}}$
 ㉑ $\frac{4\sqrt{6}}{\sqrt{3}}$ ㉒ $2\sqrt{12} - \sqrt{\frac{2}{3}}$
 ㉓ $\frac{2\sqrt{7}}{\sqrt{7}-3}$ ㉔ $\frac{3\sqrt{3}}{6-\sqrt{3}} - \frac{3}{11\sqrt{3}}$
 ㉕ $\frac{3\sqrt{3}}{3-\sqrt{3}}$ ㉖ $\frac{2\sqrt{6}}{\sqrt{6}-2} - \frac{2\sqrt{2}}{\sqrt{3}}$

Calculate to $\frac{1}{10}$:

- ㉗ $\sqrt{544}$ ㉘ $\sqrt{2607}$

Interpolate:

- ㉙ $\sqrt{2229}$ ㉚ $\sqrt{1636}$

Solve and check:

31 $\sqrt{3x+3} = 6$

32 $\sqrt{2n-7} = 7$

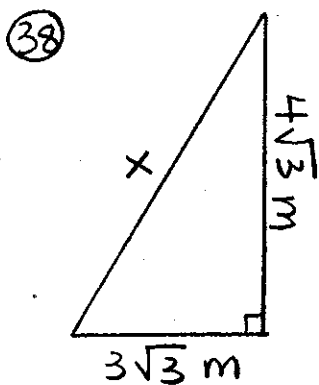
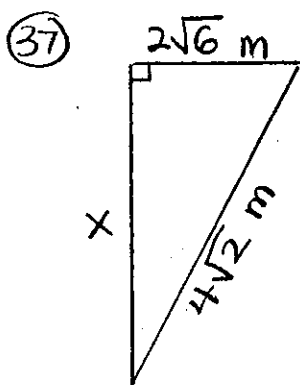
33 $\sqrt{2n+7} = n+4$

34 $\sqrt{13-3n} = n-5$

35 $\sqrt{2x+9} = x+3$

36 $\sqrt{2x+6} = x-1$

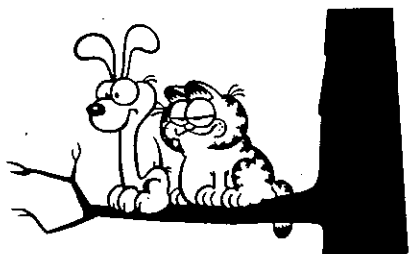
Solve using the Pythagorean Theorem:



Find the distance:

39 $(4, -9)$ to $(2, -3)$

40 $(6, -8)$ to $(-2, -4)$



Unit 10

SKILL CHECK

Simplify these radicals:

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

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

Calculate and simplify:

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

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

Simplify and rationalize:

5 $\frac{3\sqrt{5}}{\sqrt{3}}$

7 $\sqrt{40} - \sqrt{\frac{1}{8}}$

6 $\frac{2\sqrt{6}}{\sqrt{6}+2}$

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

9 Calculate to $\frac{1}{10}$ $\sqrt{2149}$

10 Interpolate $\sqrt{3894}$

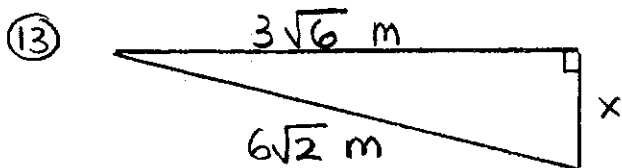
Solve and check:

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

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

continued

Solve using the Pythagorean Theorem:



Find the distance:

⑭ $(-6, 7)$ to $(-12, 11)$

Unit 10 REMIEDIATION

Simplify these radicals:

① $\sqrt{60x^5y^6z^7}$

② $\sqrt{27a^3b^5c^{10}d^3}$

Calculate and simplify:

③ $3\sqrt{2}(\sqrt{8} + 2\sqrt{2})$

④ $4\sqrt{5} - 2\sqrt{20} - 3\sqrt{45}$

Simplify and rationalize:

⑤ $\frac{2\sqrt{2}}{\sqrt{6}}$

⑥ $\frac{3\sqrt{3}}{6-\sqrt{3}}$

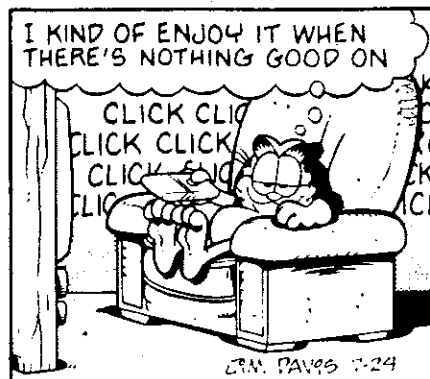
⑦ $\sqrt{54} - \sqrt{\frac{2}{3}}$



⑧ $\frac{3\sqrt{6}}{\sqrt{6}-3} - \frac{3\sqrt{2}}{\sqrt{3}}$

⑨ Calculate to $\frac{1}{10}$ $\sqrt{2624}$

⑩ Interpolate $\sqrt{3644}$

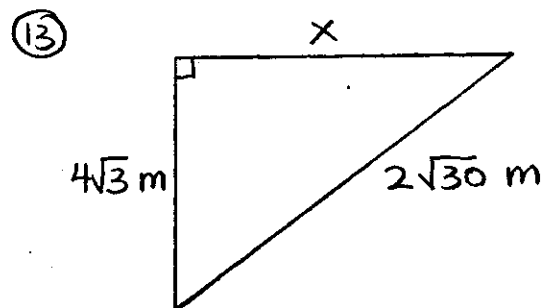


Solve and check:

⑪ $\sqrt{10+x} = x+4$

⑫ $\sqrt{2n+4} = n-2$

Solve using the Pythagorean Theorem:



Find the distance:

⑭ $(4, -11)$ to $(-4, -7)$

Unit 10

EXTRA PRACTICE

Simplify:

- ① $\pm \sqrt{288}$
- ② $\sqrt{27x^5}$
- ③ $\sqrt{24a^3b^2}$
- ④ $\sqrt{45x^3yz^5}$

Calculate and simplify:

- ⑤ $(4\sqrt{12})(3\sqrt{2})$
- ⑥ $\sqrt{6}(2\sqrt{6} - \sqrt{3})$
- ⑦ $2\sqrt{18} - 3\sqrt{8} + \sqrt{32}$
- ⑧ $3\sqrt{3} - 2\sqrt{75}$

Simplify and rationalize:

- ⑨ $\frac{3\sqrt{2}}{\sqrt{10}}$
- ⑩ $\frac{2\sqrt{3}}{\sqrt{3}-3}$
- ⑪ $\sqrt{45} - \sqrt{\frac{1}{5}}$

Calculate to $\%0$:

- ⑫ $\sqrt{448}$

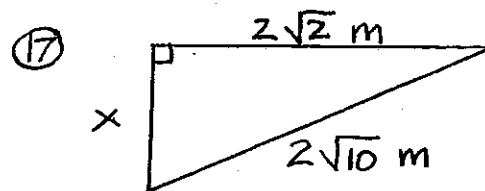
Interpolate:

- ⑬ $\sqrt{2467}$

Solve and check:

- ⑭ $\sqrt{3n-9} = 3$
- ⑮ $\sqrt{n+5} = n+5$
- ⑯ $\sqrt{n-2} = n-4$

Solve using the Pythagorean Theorem:



Find the distance:

- ⑱ $(2, -8) (4, -12)$

Simplify:

- ⑲ $\sqrt{72a^4b^2c^5d^6}$
- ⑳ $\frac{2\sqrt{3}}{\sqrt{3}-3} + \sqrt{3}$



Quadratic Functions & Equations

Lesson 11.1

QUADRATIC FUNCTIONS

A quadratic function fits the form:

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

for $a \neq 0$

State whether the graph of each function opens upward or downward:

1 • $y = x^2 + 6x + 7$ upward

2 • $y = -2x^2 + x + 3$ downward

Note: If $a > 0$, opening is upward.

Axis of Symmetry

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

Find the equation of the axis of symmetry and the maximum or minimum point. Graph the function.

3 • $y = x^2 - 6x + 5$

$a = 1$ $b = -6$ $c = 5$

Axis $\rightarrow x = \frac{-b}{2a} = \frac{-(-6)}{2(1)} = \frac{6}{2} = 3$

Axis of symmetry: $x = 3$

Because $a > 0$, the graph opens upward. To find the minimum point:

$y = x^2 - 6x + 5$

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

$y = 9 - 18 + 5$

$y = -4$

minimum point

$(3, -4)$

The graph forms a parabola that can be sketched from a chart.

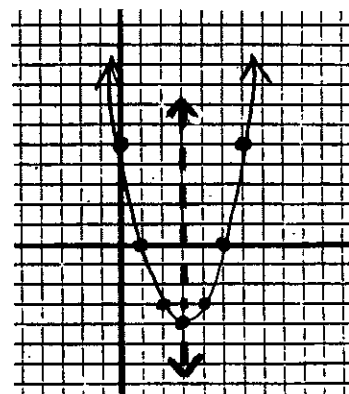
x	y
2	-3
1	0
0	5

$x = 2 \rightarrow y = (2)^2 - 6(2) + 5$ $y = -3$

$x = 1 \rightarrow y = (1)^2 - 6(1) + 5$ $y = 0$

$x = 0 \rightarrow y = (0)^2 - 6(0) + 5$ $y = 5$

For each ordered pair in the chart, there is a companion point on the other side of the axis.



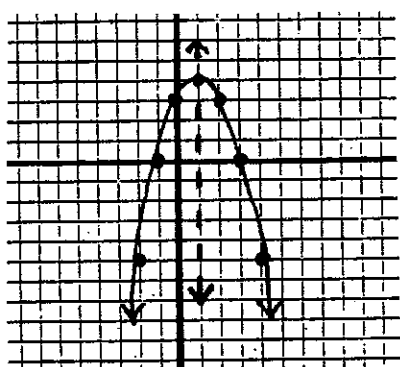
4 • $y = -x^2 + 2x + 3$
 $a = -1$ $b = 2$ $c = 3$

Axis of symmetry

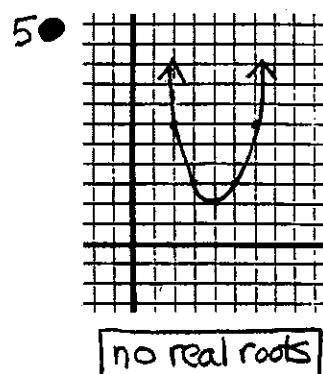
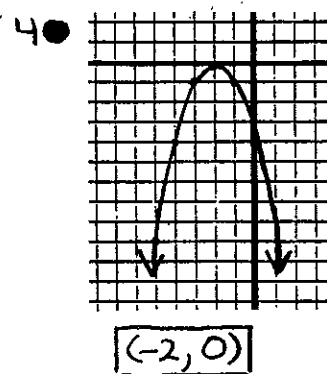
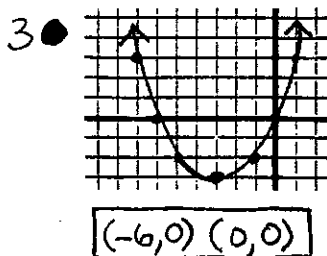
$x = \frac{-b}{2a} = \frac{-2}{2(-1)} \quad \boxed{x = 1}$

$y = -x^2 + 2x + 3$
 $y = -(1)^2 + 2(1) + 3$
 $y = 4$
 maximum point
 $\boxed{(1, 4)}$

x	y		
0	3	$y = -(0)^2 + 2(0) + 3$	$y = 3$
-1	0	$y = -(-1)^2 + 2(-1) + 3$	$y = 0$
-2	-5	$y = -(-2)^2 + 2(-2) + 3$	$y = -5$



State the roots of each equation from the graph of its related function:



Identify the roots of a quadratic equation by graphing the related function:

6 • $x^2 + 2x - 3 = 0$

axis

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

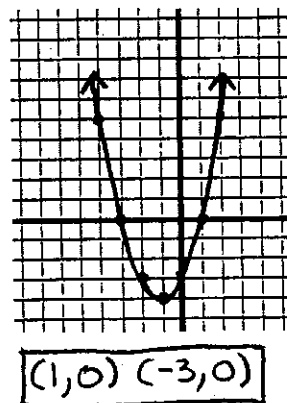
$\boxed{x = -1}$

min. pt.

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

$y = -4$

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



Lesson 11.2

QUADRATIC EQUATIONS

Identify as a quadratic function or equation:

1 • $y = 2x^2 + 3x + 3$ $\boxed{\text{function}}$

2 • $x^2 - 4x + 5 = 0$ $\boxed{\text{equation}}$

x	y
0	-3
1	0
2	5

$y = (0)^2 + 2(0) - 3 \quad y = -3$
 $y = (1)^2 + 2(1) - 3 \quad y = 0$
 $y = (2)^2 + 2(2) - 3 \quad y = 5$

Lesson 11.3

COMPLETING THE SQUARE

Solve each equation by completing the square:

1● $x^2 + 4x + 1 = 0$

$$\begin{aligned} x^2 + 4x &= -1 \\ x^2 + 4x + 4 &= -1 + 4 \\ (x+2)^2 &= 3 \\ x+2 &= \pm\sqrt{3} \end{aligned}$$

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

2● $2m^2 - 9m + 3 = -5$

$$\begin{aligned} 2m^2 - 9m &= -8 \\ m^2 - \frac{9}{2}m &= -4 \\ m^2 - \frac{9}{2}m + \frac{81}{16} &= -4 + \frac{81}{16} \end{aligned}$$

$$\left(m - \frac{9}{4}\right)^2 = \frac{-64}{16} + \frac{81}{16}$$

$$\left(m - \frac{9}{4}\right)^2 = \frac{17}{16}$$

$$\left(m - \frac{9}{4}\right) = \frac{\pm\sqrt{17}}{4}$$

$$m = \frac{9 \pm \sqrt{17}}{4}$$



3● $\frac{1}{4}a^2 - 2a + 3 = 0$

$$\begin{aligned} a^2 - 8a + 12 &= 0 \\ a^2 - 8a &= -12 \\ a^2 - 8a + 16 &= -12 + 16 \\ (a-4)^2 &= 4 \\ a-4 &= \pm 2 \\ a &= 4 \pm 2 \end{aligned}$$

$$a = 2 \text{ or } 6$$



4● $x^2 + bx + c = 0$

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

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

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

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

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

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

Lesson 11.4

THE QUADRATIC FORMULA

The quadratic formula can be used to solve quadratic equations:

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

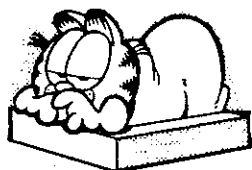
1 • $x^2 - 6x - 7 = 0$

$a = 1$ $b = -6$ $c = -7$

$$x = \frac{-(-6) \pm \sqrt{(-6)^2 - 4(1)(-7)}}{2(1)}$$

$$x = \frac{6 \pm \sqrt{64}}{2} = \frac{6 \pm 8}{2} = 3 \pm 4$$

$$x = 7 \text{ or } -1$$



2 • $\frac{4}{3}x^2 - 2x = \frac{1}{3}$

$$4x^2 - 6x + 1 = 0$$

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

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

$$x = \frac{6 \pm \sqrt{20}}{8} = \frac{6 \pm 2\sqrt{5}}{8}$$

$$x = \frac{3 \pm \sqrt{5}}{4}$$

3 • Derivation of the quadratic formula:

$$ax^2 + bx + c = 0$$

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

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

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

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

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

4 • Try: $ax^2 + 4bx + b = 0$

Lesson 11.5

USING THE DISCRIMINANT

The radicand of the quadratic formula is called the discriminant.

$$\text{Discriminant: } b^2 - 4ac$$

The nature of the roots is determined by the value of the discriminant.

If $b^2 - 4ac > 0 \rightarrow$ 2 real roots

If $b^2 - 4ac = 0 \rightarrow$ 1 real roots

If $b^2 - 4ac < 0 \rightarrow$ 0 real roots

Use the discriminant to determine the nature of the roots:

1● $2x^2 - 10x + 11 = 0$

$b^2 - 4ac = (-10)^2 - 4(2)(11) = 12$

$b^2 - 4ac > 0$

2 real roots Irrational

2● $4x^2 - 12x + 9 = 0$

$b^2 - 4ac = (-12)^2 - 4(4)(9) = 0$

$b^2 - 4ac = 0$

1 real root Rational

3● $3x^2 + 4x + 2 = 0$

$b^2 - 4ac = (4)^2 - 4(3)(2) = -8$

$b^2 - 4ac < 0$

no real roots

Solve the equation by factoring:

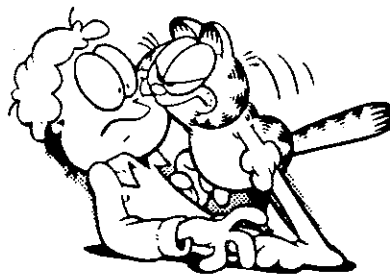
1● $3x^2 - 14x - 24 = 0$

$3x^2 - 18x + 4x - 24 = 0$

$3x(x-6) + 4(x-6) = 0$

$(x-6)(3x+4) = 0$

$x = 6$ or $-\frac{4}{3}$



Methods of solving quadratic equations:

1. Factoring *
2. Formula
3. Completing the Square
4. Graphing

* Factoring can only be used on some (not all) quadratic equations.

Solve by factoring:

- 2● Find two integers whose sum is -10 and whose product is 16.

x } Two integers
 $-10-x$ } that sum to -10

Lesson 11.6

PROBLEM SOLVING

Graphing, completing the square, and the quadratic formula can be used to solve equations. Factoring can also be used.

$$\begin{array}{l}
 x \\
 -10-x \\
 \hline
 \end{array}
 \begin{array}{l}
 x(-10-x) = 16 \\
 -10-x^2 = 16 \\
 x^2+10x+16=0 \\
 (x+8)(x+2)=0 \\
 x = -8 \text{ or } -2
 \end{array}$$

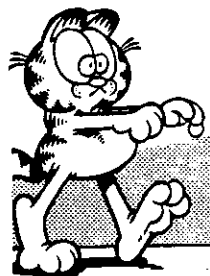
$$\begin{array}{|c|c|}
 \hline
 -8 & -2 \\
 \hline
 -2 & -8 \\
 \hline
 \end{array}$$

- 3● Find two integers whose difference is 4 and whose product is 21.

$$\begin{array}{l}
 x \\
 x+4 \\
 \hline
 \end{array}
 \begin{array}{l}
 x(x+4) = 21 \\
 x^2+4x-21=0 \\
 (x+7)(x-3)=0 \\
 x = -7 \text{ or } 3
 \end{array}$$

$$\begin{array}{|c|c|}
 \hline
 -7 & 3 \\
 \hline
 3 & -7 \\
 \hline
 \end{array}$$

Solve by completing the square:



- 4● The length of a rectangle is 2 in. less than 3 times its width. Find the dimensions if the area is 40 in.²

$$\begin{array}{|c|c|}
 \hline
 3x-2 \\
 \hline
 x \\
 \hline
 \end{array}
 \begin{array}{l}
 x(3x-2) = 40 \\
 3x^2-2x = 40 \\
 x^2-\frac{2}{3}x = \frac{40}{3} \\
 x^2-\frac{2}{3}x+\frac{4}{36} = \frac{40}{3}+\frac{4}{36}
 \end{array}$$

$$\begin{array}{l}
 x=4 \\
 3x-2=10
 \end{array}$$

$$\boxed{4 \text{ by } 10 \text{ in.}}$$

$$\begin{array}{l}
 (x-\frac{2}{6})^2 = \frac{484}{36} \\
 x-\frac{2}{6} = \pm \frac{22}{6} \\
 x = \frac{2 \pm 22}{6} = 4 \text{ or } \frac{-10}{3}
 \end{array}$$

Solve using the formula:

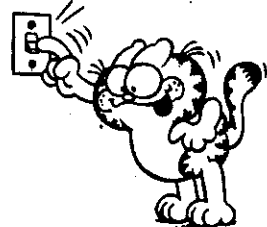
- 5● A rectangle has a perimeter of 22 cm and an area of 18 cm.² Find the dimensions.

$$\begin{array}{|c|c|}
 \hline
 y \\
 \hline
 \text{perimeter} \\
 2x+2y = 22 \\
 x+y = 11 \\
 y = 11-x \\
 \hline
 \end{array}$$

area

$$\begin{array}{l}
 xy = 18 \\
 x(11-x) = 18 \\
 11x - x^2 = 18 \\
 x^2 - 11x + 18 = 0
 \end{array}$$

CLICK!



$$a=1 \quad b=-11 \quad c=18$$

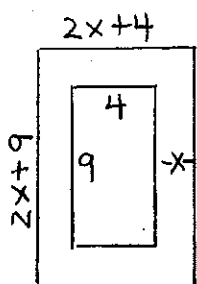
$$x = \frac{-(-11) \pm \sqrt{(-11)^2 - 4(1)(18)}}{2(1)}$$

$$x = \frac{11 \pm \sqrt{49}}{2} = \frac{11 \pm 7}{2} = 9 \text{ or } 2$$

$$\boxed{9 \text{ by } 2 \text{ cm}}$$

- 6● A 4 by 9 inch photograph fits exactly in a frame that has an area of 30 in.² What is the uniform width of the frame?

continued



$$(2x+9)(2x+4) - (4)(9) = 30$$

$$4x^2 + 26x + 36 - 36 = 30$$

$$4x^2 + 26x - 30 = 0$$

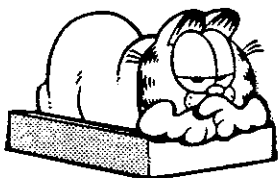
$$2x^2 + 13x - 15 = 0$$

$$a = 2 \quad b = 13 \quad c = -15$$

$$x = \frac{-13 \pm \sqrt{(13)^2 - 4(2)(-15)}}{2(2)}$$

$$x = \frac{-13 \pm \sqrt{289}}{4} = \frac{-13 \pm 17}{4} = 1 \text{ or } \frac{-15}{2}$$

1 inch wide



Lesson 11.7

SUM & PRODUCT OF ROOTS

$$ax^2 + bx + c = 0$$

$$\frac{-b}{a} = \text{sum of the roots}$$

$$\frac{c}{a} = \text{product of the roots}$$

State the sum and product of the roots;

1● $x^2 - 7x + 12 = 0$ sum prod
 $a = 1 \quad b = -7 \quad c = 12$ $\frac{-b}{a} = 7$ $\frac{c}{a} = 12$

2● $3x^2 - 17x + 10 = 0$ sum prod
 $a = 3 \quad b = -17 \quad c = 10$ $\frac{-b}{a} = \frac{17}{3}$ $\frac{c}{a} = \frac{10}{3}$

3● $4x^2 + x\sqrt{3} + 8 = 0$ sum prod
 $a = 4 \quad b = \sqrt{3} \quad c = 8$ $\frac{-b}{a} = \frac{-\sqrt{3}}{4}$ $\frac{c}{a} = 2$

Write a quadratic equation with the given roots:

4● roots 3, -8

sum: $(3) + (-8) = -5$ $b = 5$

prod: $(3)(-8) = -24$ $c = -24$

$$x^2 + 5x - 24 = 0$$

5● roots $\frac{3}{5}, 4$

sum: $(\frac{3}{5}) + (4) = \frac{23}{5}$ $b = \frac{-23}{5}$

prod: $(\frac{3}{5})(4) = \frac{12}{5}$ $c = \frac{12}{5}$

$$x^2 - \frac{23}{5}x + \frac{12}{5} = 0$$

$$5x^2 - 23x + 12 = 0$$

Note: In final form, quadratic equations should have no fractions

6● roots $4 \pm \sqrt{5}$

sum: $(4 + \sqrt{5}) + (4 - \sqrt{5}) = 8$ $b = -8$

prod: $(4 + \sqrt{5})(4 - \sqrt{5}) = 11$ $c = 11$

↳ conjugates
 $16 - 5 = 11$

$$x^2 - 8x + 11 = 0$$



11.1 Problems

QUADRATIC FUNCTIONS

State whether the graph of each function opens upward or downward:

① $y = 3x^2 + 9x - 1$

② $y = 2x^2 - 8x + 1$

③ $y = -x^2 + x + 1$

④ $y = x^2 - 1$

⑤ $y = -5x^2 + 3x + 2$

⑥ $y = -x^2 + 4x + 5$

Find the equation of the axis of symmetry and the maximum or minimum point:

⑦ $y = x^2 - 4x + 3$

⑧ $y = -3x^2 - 6x + 5$

⑨ $y = 7x^2 + 14x - 9$

⑩ $y = x^2 + 6x + 8$

⑪ $y = x^2 + 8x + 3$

⑫ $y = x^2 + 2x$

⑬ $y = -3x^2 + 4$

⑭ $y = -2x^2 - 9$



Find the equation of the axis of symmetry, the maximum or minimum point, and graph the function:

⑮ $y = x^2 - 4x - 5$

⑯ $y = x^2 - 3$

⑰ $y = -x^2 + 4x + 5$

⑱ $y = -3x^2 - 6x + 4$

⑲ $y = 2x^2 + 3$

⑳ $y = x^2 - 2x - 8$

11.2 Problems

QUADRATIC EQUATIONS

Identify each of the following as quadratic functions or equations:

① $x^2 - x - 12 = 0$

② $y = x^2 - 2x + 2$

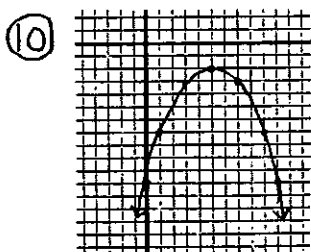
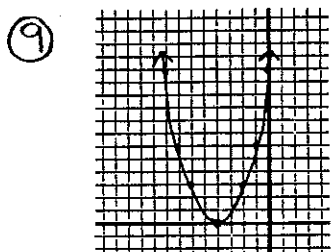
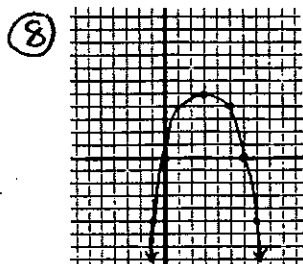
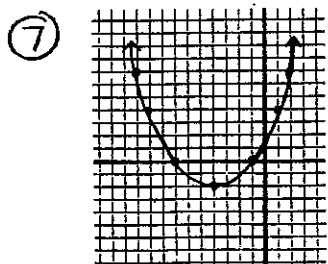
③ $y = x^2 - 6x + 4$

④ $x^2 - 4x + 1 = 0$

⑤ $x^2 - 10x = -21$

⑥ $y = x^2 - 4$

State the roots of each quadratic equation from the graph of the related function:



Identify the roots of each equation by graphing the related function:

⑪ $x^2 - 10x = -21$

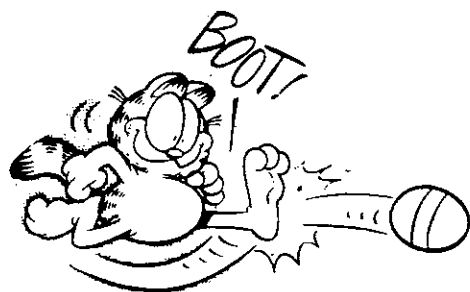
⑫ $x^2 - 4 = 0$

⑬ $-x^2 + 4x - 3 = 0$

⑭ $-x^2 + 2x + 3 = 0$

⑮ $x^2 - 2x + 2 = 0$

⑯ $-x^2 + 6x - 9 = 0$



11.3 Problems

COMPLETING THE SQUARE

Solve each equation by completing the square:

① $y^2 + 4y + 3 = 0$

② $n^2 + 8n + 7 = 0$

③ $x^2 - 4x = 2$

④ $y^2 - 8y = 4$

⑤ $\frac{1}{2}a^2 - 2a - \frac{3}{2} = 0$

⑥ $2x^2 - 16x = 24$

⑦ $3x^2 - 18x + 21 = 0$

⑧ $\frac{1}{4}b^2 - \frac{3}{2}b = -1$

Solve by completing the square:

⑨ $x^2 + 4x + c = 0$

⑩ $x^2 - bx + 8 = 0$

Review

Indicate if the graph of each function opens upward or downward:

⑪ $y = 4x^2 + 12x + 5$

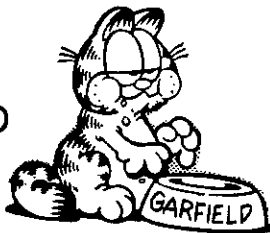
⑫ $y = -2x^2 + 3x + 5$

continued

Find the roots of each equation by graphing the related function. State the equation for the axis of symmetry and the coordinate of the maximum or minimum point:

⑬ $x^2 + 6x + 5 = 0$

⑭ $-2x^2 - 8x - 8 = 0$



Identify as a quadratic function or equation:

⑮ $y = 3x^2 + 5x - 8$

Solve by completing the square:

⑨ $-2x^2 + 8x + 3 = 3$

⑩ $4n^2 + 20n + 23 = 0$

⑪ $ax^2 + 2ax + ab = 0$

⑫ $ax^2 + bx + 3a = 0$

More practice completing the square:

⑬ $3x^2 + 12ax + 3b = 0$

⑭ $ax^2 + abx + 4a = 0$

Note: Answers can be checked using the formula.

11.4 Problems

THE QUADRATIC FORMULA

Use the quadratic formula to solve each equation:

① $m^2 + 4m + 3 = 0$

② $2x^2 + x - 15 = 0$

③ $y^2 - 25 = 0$

④ $5a^2 = 125$

⑤ $-n^2 - 6n + 3 = 0$

⑥ $k^2 - 6k + 1 = 0$

⑦ $4x^2 + 8x - 1 = 0$

⑧ $-4y^2 + 16y + 13 = 0$



11.5 Problems

USING THE DISCRIMINANT

Use the discriminant to find the nature of the roots:

① $z^2 + 8z - 5 = 0$

② $m^2 + 7m + 6 = 0$

③ $k^2 + 6k + 10 = 0$

④ $m^2 - 14m + 49 = 0$

⑤ $3g^2 - 4g + 1 = 0$

⑥ $d^2 + 4d + 7 = 0$

⑦ $9y^2 - 6y + 1 = 0$

⑧ $3p^2 - 4p - 1 = 0$

Review

Solve by completing the square:

- ⑨ $2b^2 - b - 14 = 7$
⑩ $2ax^2 + 2abx + 6ac = 0$

Use the formula to solve:

- ⑪ $3k^2 + 11k = 4$
⑫ $ax^2 + 3bx + c = 0$

Solve by graphing the related function:

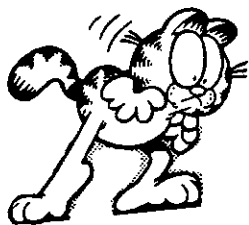
- ⑬ $x^2 - 4x - 12 = 0$
⑭ $x^2 + 6x + 10 = 0$

11.6 Problems

PROBLEM SOLVING (Area/Per)

Solve the first eight problems by factoring:

- ① $x^2 - 8x + 15 = 0$
② $n^2 - 5n - 24 = 0$
③ $2n^2 - 7n - 4 = 0$
④ $6x^2 + x - 2 = 0$



- ⑤ Find two integers whose sum is 13 and whose product is 42.

- ⑥ Find two integers whose sum is 17 and whose product is 72.
⑦ Find two integers whose difference is 6 and whose product is 135.
⑧ Find two integers whose difference is 8 and whose product is 48.

Solve the next four problems by completing the square:

- ⑨ The length of a rectangle is 4 inches more than its width. The area is 45 in.^2 . Find the dimensions.
⑩ The width of a rectangle is 3 feet less than its length. The area is 54 ft.^2 . Find the dimensions.
⑪ The length of a rectangle is 1 inch less than 3 times its width. The area is 24 in.^2 . What are the dimensions?
⑫ The length of a rectangle is 3 inches less than twice its width. The area is 35 in.^2 . Find the dimensions.

Solve the next four problems using the formula:

- ⑬ Find the dimensions of a rectangle with a perimeter of 36 cm and an area of 72 cm.^2

⑭ A rectangle has a perimeter of 26 in. and an area of 36 in.² Find the dimensions.

⑮ Dan has a rectangular flower garden measuring 15 by 20 yards. He puts a sidewalk with an area of 74 yd.² around the garden. How wide is the sidewalk?

⑯ A square painting that measures 5 by 5 feet is placed in a frame with an area of 56 ft.² How wide is the frame?

Review

Complete the square:

⑰ $ax^2 + c = -bx$

Find a quadratic equation with the given roots:

⑦ 4, 7

⑩ $-\frac{4}{5}, \frac{5}{4}$

⑧ 5, -9

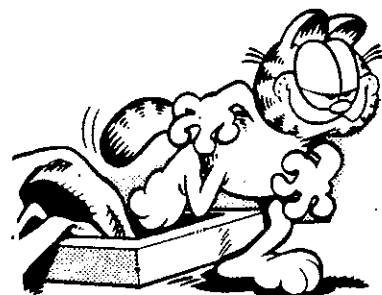
⑫ $-\frac{3}{4}, 8$

⑨ $\frac{5}{2}, 2$

⑬ $\sqrt{3}, \sqrt{3}$

⑩ $\frac{2}{3}, -\frac{3}{2}$

⑭ $2+\sqrt{3}, 2-\sqrt{3}$



Review

Complete the square:

⑮ The length of a rectangle is 4 cm less than 3 times its width. The area is 32 cm.² Find the dimensions.

Use the formula:

⑯ A rectangular picture is 3 by 8 in. Its frame has an area of 60 in.² How wide is the frame?

Graph the function and indicate the axis of symmetry and the maximum or minimum point:

⑰ $-x^2 - 6x - 10 = 0$

11.7 Problems

SUM & PRODUCT OF ROOTS

State the sum and product of the roots:

① $a^2 - 5a - 24 = 0$

② $b^2 + 12b - 28 = 0$

③ $4y^2 + 4y + 1 = 0$

④ $3n^2 + 11n - 20 = 0$

⑤ $a^2 + 4a\sqrt{3} + 9 = 0$

⑥ $2y^2 + y\sqrt{2} - 6 = 0$



Unit 11

REVIEW PROBLEMS

State whether the graph of each quadratic function opens upward or downward:

① $y = -2x^2 - 3x + 4$

② $y = 3x^2 + 2x + 5$

Identify each of the following as a quadratic function or equation:

③ $2x^2 + x - 4 = 0$

④ $y = x^2 - 2x - 3$

For each quadratic equation and its related function, determine the axis of symmetry, the maximum or minimum point, and the roots. Graph each related function:

⑤ $x^2 - 8x + 12 = 0$

⑥ $-x^2 - 6x - 9 = 0$

⑦ $-x^2 - 2x + 8 = 0$

⑧ $x^2 - 8x + 15 = 0$

Solve by factoring:

⑨ $x^2 - x - 12 = 0$

⑩ $x^2 - 7x + 12 = 0$

⑪ $2x^2 - 5x - 3 = 0$

⑫ $3x^2 + 13x + 4 = 0$

Solve by completing the square:

⑬ $x^2 - 16x + 32 = 0$

⑭ $x^2 + 6x + 4 = 0$

⑮ $2x^2 + 3 = 7x$

⑯ $2x^2 - 15 = -7x$

⑰ $x^2 + bx + c = 0$

⑱ $x^2 + 2bx + 4c = 0$



Solve with the formula:

⑲ $4x^2 + 16x + 15 = 0$

⑳ $x^2 - 8x = 20$

㉑ $9x^2 - 12x - 1 = 0$

㉒ $5x^2 + 9x + 3 = 0$

㉓ $ax^2 + bx + 4b = 0$

㉔ $ax^2 - 3bx + c = 0$

Use the discriminant to find the nature of the roots:

㉕ $3x^2 - 8x - 40 = 0$

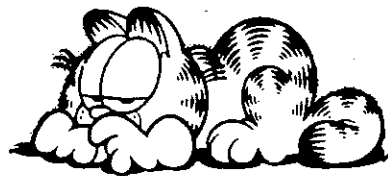
㉖ $3x^2 - 8x + 6 = 0$

㉗ $7x^2 - 6x + 5 = 0$

㉘ $4x^2 + 4x = 15$

㉙ $2x^2 - 8x + 8 = 0$

㉚ $5x^2 - 10x + 5 = 0$



State the sum and product of the roots:

- (31) $8x^2 - 5x - 3 = 0$
 (32) $9x^2 + 5x + 1 = 0$
 (33) $x^2 - 3x\sqrt{7} + 14 = 0$
 (34) $x^2 - 5x\sqrt{3} + 18 = 0$

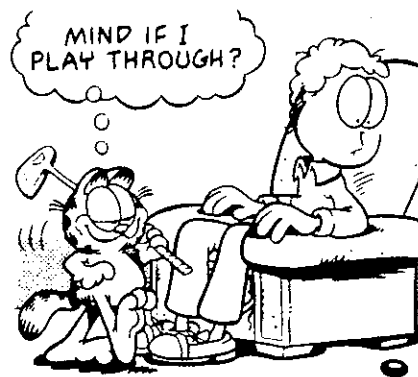
Write a quadratic equation with the given roots:

- (35) $\frac{3}{2}, -4$
 (36) $-\frac{2}{3}, 3$
 (37) $\sqrt{5}, 3\sqrt{5}$
 (38) $-2\sqrt{3}, 3\sqrt{3}$



Solve using any method:

- (39) Find two integers whose difference is 2 and whose product is 35.
 (40) Find two integers whose sum is -10 and whose product is 24.
 (41) The length of a rectangle is 2 inches less than twice its width. The area is 40 in.² Find the dimensions.
 (42) The length of a rectangle is 2 inches more than 3 times its width. The area is 33 in.² Find the dimensions.



- (43) How wide all the way around is a frame that fits around a photo that is 2 by 3 cm if the frame has an area of 24 cm²?
 (44) How wide is a sidewalk with an area of 125 ft.² that is built around an 8 by 12 foot garden?

Unit 11 SKILL CHECK

Indicate whether the graph opens upward or downward:

① $y = -2x^2 + 5x + 4$

Identify the following as a quadratic function or equation:

② $3x^2 - x + 10 = 0$

For the following equation and its related function, determine the axis of symmetry, the maximum or minimum point, and the roots. Graph the related function:

③ $-x^2 - 8x - 16 = 0$

Use factoring to solve:

④ $6x^2 - 13x + 5 = 0$

Use completing the square to solve:

⑤ $4x^2 - 4x - 17 = 0$

Use the quadratic formula to solve:

⑥ $9x^2 - 12x - 1 = 0$

Use the discriminant to determine the nature of the roots:

⑦ $3x^2 - 6x + 3 = 0$

Write a quadratic equation with the given roots:

⑧ $\frac{3}{5}, -2$



Use any method to solve:

⑨ The length of a rectangle is 1 cm less than 5 times its width. The area is 18 cm^2 . Find the dimensions.

⑩ How wide is a sidewalk with an area of 115 ft^2 that surrounds an 8 by 10 foot garden?

⑪ $ax^2 - bx + 2b = 0$



Unit 11 REMEDICATION

Indicate if the graph opens upward or downward:

① $y = 3x^2 + 2x + 6$

Identify as a quadratic function or equation:

② $y = x^2 - 3x + 5$

For the following equation and its related function, determine the axis of symmetry, the maximum or minimum point, and the roots. Graph the related function:

③ $x^2 - 2x - 8 = 0$

Use factoring to solve:

④ $3x^2 - 10x + 8 = 0$

Use completing the square to solve:

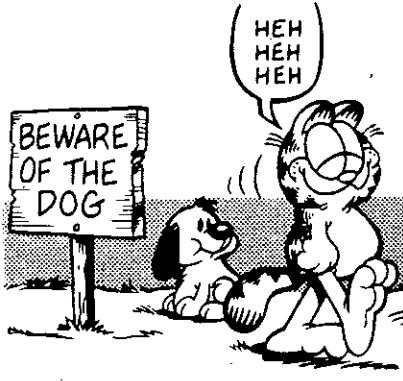
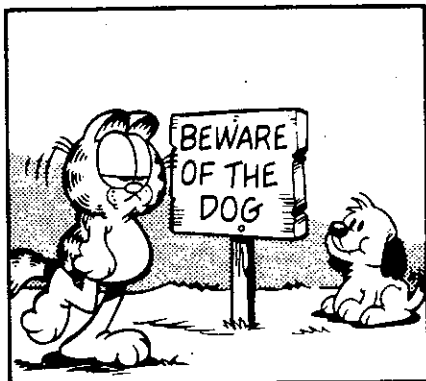
⑤ $2x^2 - 2x - 1 = 0$

Use the quadratic formula to solve:

⑥ $4x^2 - 12x + 3 = 0$

Use the discriminant to determine the nature of the roots:

⑦ $3x^2 + 4x + 5 = 0$



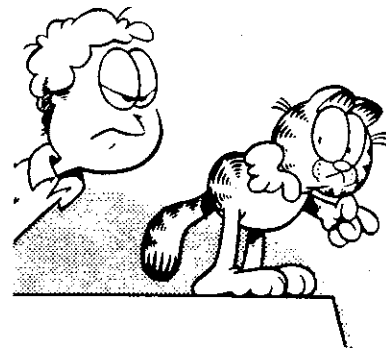
Determine a quadratic equation having the given roots:

⑧ $-\frac{2}{3}, -6$

Use any method to solve:

⑨ Find two integers whose difference is 8 and whose product is 48.

⑩ Determine the uniform width of a picture frame that fits around a 5 by 7 cm picture if the frame has an area of 45 cm².



Solve (any method):

⑪ $ax^2 - 3bx + c = 0$

Unit 11

EXTRA PRACTICE

Indicate whether the graph opens upward or downward:

① $y = -2x^2 - 6x + 3$

② $y = 3x^2 - 5x - 12$

Identify each as a quadratic function or equation:

③ $y = x^2 - 4x + 25$

④ $2x^2 + 8x + 11 = 0$

For the related function, determine the axis and max/min point. Determine root of the equation. Graph the function:

⑤ $-x^2 + 8x - 12 = 0$

⑥ $x^2 + 2x - 3 = 0$

Solve by factoring:

⑦ $x^2 - 5x - 24 = 0$

⑧ $3x^2 - 13x - 30 = 0$

Solve by completing the square:

⑨ $x^2 - 10x + 22 = 0$

⑩ $x^2 + 4x - 1 = 0$

Use the quadratic formula to solve:

⑪ $3x^2 + 5x - 2 = 0$

⑫ $9x^2 - 12x - 1 = 0$

Use the discriminant to determine the nature of the roots:

⑬ $x^2 - 6x + 11 = 0$

⑭ $4x^2 - 4x + 1 = 0$

Determine a quadratic equation with these roots:

⑮ $\frac{2}{5}, -2$

⑯ $2\sqrt{3}, -5\sqrt{3}$

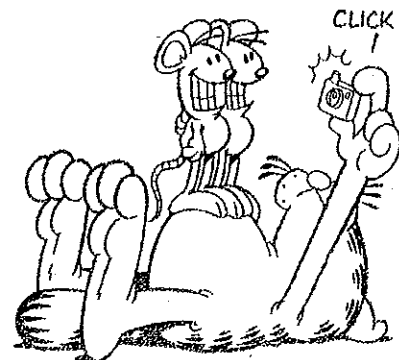
Solve (any method):

⑰ Find two integers whose sum is 3 and whose product is -40.

⑱ The length of a rectangle is 1 inch less than 3 times its width. The area is 44 in^2 . Find the dimensions.

⑲ $ax^2 + 3bx - 6b = 0$

⑳ What is the uniform width of a frame with an area of 70 in^2 if it fits exactly around a 3 by 6 inch photo?



Rational Expressions

Lesson 12.1

SIMPLIFYING EXPRESSIONS

To simplify an expression, an important first step is to factor and cancel.

Simplify each expression:

1• $\frac{a+2}{a^2-4}$

$$\frac{a+2}{a^2-4} = \frac{\cancel{(a+2)}}{\cancel{(a+2)}(a-2)} = \boxed{\frac{1}{a-2}}$$

2• $\frac{y^2-9}{y^2-y-6}$

$$\frac{y^2-9}{y^2-y-6} = \frac{(y+3)\cancel{(y-3)}}{\cancel{(y-3)}(y+2)} = \boxed{\frac{y+3}{y+2}}$$

3• $\frac{x-y}{y^2-x^2}$

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

Note: $(x-y)$ and $(y-x)$ are opposites. To cancel, multiply by (-1) twice.

$$\boxed{\frac{-1}{y+x}}$$

4• $\frac{a^4-5a^2+4}{a^2-3a+2}$

$$\frac{(a^2)^2-5(a^2)+4}{a^2-3a+2} = \frac{(a^2-1)(a^2-4)}{(a-1)(a-2)}$$

$$\frac{(a+1)\cancel{(a-1)}(a+2)\cancel{(a-2)}}{\cancel{(a-1)}\cancel{(a-2)}}$$

$$\boxed{(a+1)(a+2)}$$

Note: The numerator was factored using the quadratic form.



Lesson 12.2

MULTIPLYING & DIVIDING

Multiply and simplify:

1• $\frac{4n^3}{3ab} \cdot \frac{6a}{4n}$

$$\frac{4n^3}{3ab} \cdot \frac{6a}{4n} = \frac{\cancel{2} \cdot \cancel{2} \cdot 2 \cdot \cancel{3} \cdot n \cdot n \cdot \cancel{n} \cdot \cancel{a}}{\cancel{2} \cdot \cancel{2} \cdot \cancel{3} \cdot \cancel{a} \cdot b \cdot \cancel{n}}$$

$$\frac{2 \cdot n \cdot n}{b} = \boxed{\frac{2n^2}{b}}$$

$$2 \bullet \frac{4a+8}{a^2-25} \cdot \frac{a-5}{5a+10}$$

$$\frac{4(\cancel{a+2})}{(a+5)(\cancel{a-5})} \cdot \frac{(\cancel{a-5})}{5(\cancel{a+2})} = \boxed{\frac{4}{5(a+5)}}$$

$$\frac{x-y}{x^2-y^2} \cdot \frac{x^2+2xy+y^2}{x+y}$$

$$\frac{(\cancel{x-y})}{(\cancel{x+y})(\cancel{x-y})} \cdot \frac{(\cancel{x+y})(\cancel{x+y})}{(\cancel{x+y})} = \boxed{1}$$

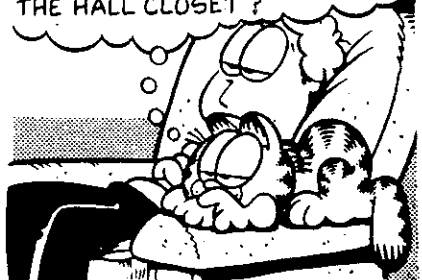
$$3 \bullet \frac{x^2-x-6}{9-x^2} \cdot \frac{x^2+7x+12}{x^2+4x+4}$$

$$\frac{(x-3)(\cancel{x+2})}{(3-x)(\cancel{3+x})} \cdot \frac{(x+4)(\cancel{x+3})}{(x+2)(\cancel{x+2})}$$

multiply by (-1) twice

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

DID I MENTION I ROLLED ODIE UP IN A BLANKET AND STUFFED HIM ONTO THE TOP SHELF OF THE HALL CLOSET?



4 • Divide and simplify

$$\frac{x-y}{x^2-y^2} \div \frac{x+y}{x^2+2xy+y^2}$$

To divide, multiply by the reciprocal of the divisor.

Lesson 12.3

ADDING & SUBTRACTING

When adding or subtracting rational expressions, find a common denominator.

$$1 \bullet \frac{x}{x-2} + \frac{x+1}{2-x}$$

Multiply by (-1) twice

$$\frac{x}{x-2} - \frac{x+1}{x-2}$$

Be sure to use parenthesis

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

$$2 \bullet \frac{6}{5x} + \frac{7}{10x^2}$$

Common denominator is $10x^2$

$$\frac{6}{5x} \cdot \frac{2x}{2x} = \frac{12x}{10x^2}$$

$$\frac{12x}{10x^2} + \frac{7}{10x^2} = \boxed{\frac{12x+7}{10x^2}}$$

$$3 \bullet \frac{a}{a^2-4} - \frac{4}{a+2}$$

$$\frac{a}{(a+2)(a-2)} - \frac{4}{(a+2)} \left(\frac{a-2}{a-2} \right)$$

$$\frac{a - 4(a-2)}{(a+2)(a-2)} = \frac{a-4a+8}{(a+2)(a-2)} = \boxed{\frac{-3a+8}{(a+2)(a-2)}}$$

$$4 \bullet \frac{2(x-6)}{x^2-4x+3} + \frac{x}{x-3}$$

$$\frac{2(x-6)}{(x-3)(x-1)} + \frac{x}{x-3} \left(\frac{x-1}{x-1} \right)$$

$$\frac{(2x-12) + x(x-1)}{(x-3)(x-1)} = \frac{x^2+x-12}{(x-3)(x-1)}$$

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

$$5 \bullet \frac{x+4}{(2-x)(x+3)} + \frac{x-5}{(x-2)^2}$$

Multiply by (-1) twice

$$\frac{-(x+4)}{(x-2)(x+3)} + \frac{(x-5)}{(x-2)^2}$$

Common denominator: $(x-2)^2(x+3)$

$$\frac{-(x+4)}{(x-2)(x+3)} \left(\frac{x-2}{x-2} \right) + \frac{x-5}{(x-2)^2} \left(\frac{x+3}{x+3} \right)$$

$$\frac{-(x^2+2x-8) + (x^2-2x-15)}{(x-2)^2(x+3)}$$

$$\boxed{\frac{-4x-7}{(x-2)^2(x+3)}} \quad \text{Part of solution can be factored}$$



Lesson 12.4 COMPLEX FRACTIONS

Simplify each fraction:

$$1 \bullet \frac{\frac{m^2}{n^4}}{\frac{m^3}{n^2}} = \frac{m^2}{n^4} \cdot \frac{n^2}{m^3} = \boxed{\frac{1}{mn^2}}$$

$$2 \bullet \frac{\frac{a}{b} - \frac{b}{a}}{\frac{1}{b} + \frac{1}{a}} = \frac{\frac{a}{b} \left(\frac{a}{a} \right) - \frac{b}{a} \left(\frac{b}{b} \right)}{\frac{1}{b} \left(\frac{a}{a} \right) + \frac{1}{a} \left(\frac{b}{b} \right)}$$

$$\frac{\frac{a^2-b^2}{ab}}{\frac{a+b}{ab}} = \frac{a^2-b^2}{ab} \cdot \frac{ab}{a+b}$$

$$\frac{(a-b)(\cancel{ab})}{\cancel{ab}(a+b)} = \boxed{a-b}$$

$$3 \bullet \frac{x+4 - \frac{1}{x+4}}{x+11 + \frac{48}{x-3}}$$



$$\frac{x+4 \left(\frac{x+4}{x+4} \right) - \frac{1}{x+4}}{x+11 \left(\frac{x-3}{x-3} \right) + \frac{48}{x-3}}$$

$$\text{continued}$$

$$\frac{\frac{(x+4)^2-1}{x+4}}{(x+1)(x-3)+48} = \frac{\frac{x^2+8x+15}{x+4}}{x^2+8x+15}$$

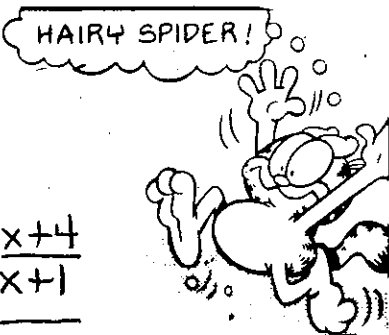
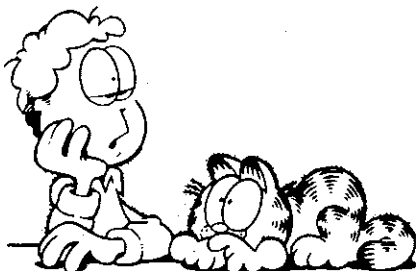
$$\frac{x^2+8x+15}{x+4} \cdot \frac{x-3}{x^2+8x+15} = \boxed{\frac{x-3}{x+4}}$$

4●
$$\frac{x - \frac{x+4}{x+1}}{x-2}$$

$$\frac{x \left(\frac{x+1}{x+1} \right) - \frac{x+4}{x+1}}{x-2}$$

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

$$\frac{\cancel{(x-2)}(x+2)}{(x+1)} \cdot \frac{1}{\cancel{(x-2)}} = \boxed{\frac{x+2}{x+1}}$$



Lesson 12.5

RATIONAL EQUATIONS

Solve each equation:

1●
$$\frac{n+2}{n} - \frac{n-3}{n} = \frac{5}{2}$$

Multiply by 2n

$$2n \left(\frac{n+2}{n} - \frac{n-3}{n} = \frac{5}{2} \right)$$

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

$$2n+4 - 2n+6 = 5n$$

$$10 = 5n \quad \boxed{n=2}$$

2●
$$\frac{x}{x-4} - \frac{2x}{4-x} = 9$$

Multiply by (-1) twice

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

$$(x-4) \left(\frac{x}{x-4} + \frac{2x}{x-4} = 9 \right)$$

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

$$x + 2x = 9x - 36$$

$$-6x = -36$$

$$\boxed{x=6}$$

Lesson 12.6

SOLVING WORK PROBLEMS

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

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

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

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

$$7x = -3$$

$$x = -3/7$$



$$4 \bullet \frac{6}{x} - \frac{9}{x-1} = \frac{1}{4}$$

$$(x)(x-1)(4) \left(\frac{6}{x} - \frac{9}{x-1} = \frac{1}{4} \right)$$

$$6(x-1)(4) - 9(x)(4) = 1(x)(x-1)$$

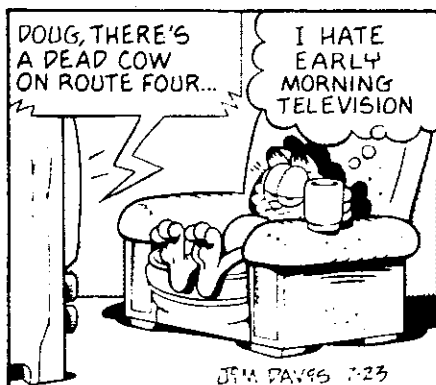
$$(24x-24) - (36x) = x^2 - x$$

$$-12x - 24 = x^2 - x$$

$$0 = x^2 + 11x + 24$$

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

$$x = -8 \text{ or } -3$$



- 1 • Kathy can wash and wax a car in 3 hours. Tom can do the same job in 4 hours. How long would it take if they worked together?

$$\text{Kathy } \frac{r}{3} \cdot t = \frac{w}{3}$$

$$\text{Tom } \frac{1}{4} \cdot t = \frac{t}{4}$$

$$\frac{t}{3} + \frac{t}{4} = 1 \quad (2) \left(\frac{t}{3} + \frac{t}{4} = 1 \right)$$

$$4t + 3t = 12$$

$$7t = 12$$

$$t = 12/7$$

$$15/7 \text{ hours}$$

- or -

$$\frac{5}{7} \cdot 60 = 42.9$$

$$1:43$$

- 2 • A water tank has two fill pipes and one drain pipe. One fill pipe can load the tank in 8 hours and the other in 6 hours. The drain pipe can empty the tank in 4 hours. If all three pipes are open, how long will it take to fill the tank?

continued

$$\begin{aligned} r \cdot t &= w \\ \text{Fill Pipe 1} \quad \frac{1}{8} \cdot t &= \frac{t}{8} \\ \text{Fill Pipe 2} \quad \frac{1}{6} \cdot t &= \frac{t}{6} \\ \text{Drain Pipe} \quad \frac{1}{4} \cdot t &= \frac{t}{4} \end{aligned}$$

$$\frac{t}{8} + \frac{t}{6} - \frac{t}{4} = 1$$

$$(24) \left(\frac{t}{8} + \frac{t}{6} - \frac{t}{4} = 1 \right)$$

$$3t + 4t - 6t = 24$$

$$t = 24 \quad \boxed{24 \text{ hours}}$$

- 3● Nicole can wash the car in 2 hours by herself. With Erin helping, it takes only 45 minutes. How long would it take Erin to wash the car herself?

$$\begin{aligned} r \cdot t &= w \\ \text{Nicole} \quad \frac{1}{2} \cdot \frac{3}{4} &= \frac{3}{8} \end{aligned}$$

When Nicole works 45 min. ($\frac{3}{4}$ hour), she completes $\frac{3}{8}$ of the work. That leaves $\frac{5}{8}$ for Erin.

$$\text{Erin} \quad r \cdot \frac{3}{4} = \frac{5}{8}$$

$$\begin{aligned} \frac{3r}{4} &= \frac{5}{8} && \text{If Erin's rate is } \frac{5}{6}, \text{ her time} \\ 24r &= 20 && \text{working alone is} \\ r &= \frac{5}{6} && \text{the reciprocal} \\ &&& \text{(6/5) hours.} \end{aligned}$$

$$\boxed{1\frac{1}{5} \text{ hours}} \text{ -or- } \boxed{1:12}$$

- 4● Mark can clean the basement 4 times faster than Matt. How long will it take Mark to do the job by himself if the two boys can do it together in 1 hour and 20 minutes?

$$\begin{aligned} r \cdot t &= w \\ \text{Mark} \quad 4r \cdot \frac{4}{3} &= \frac{16r}{3} \end{aligned}$$

$$\text{Matt} \quad r \cdot \frac{4}{3} = \frac{4r}{3}$$

$$\frac{16r}{3} + \frac{4r}{3} = 1$$

$$3 \left(\frac{16r}{3} + \frac{4r}{3} = 1 \right)$$

$$16r + 4r = 3$$

$$20r = 3$$

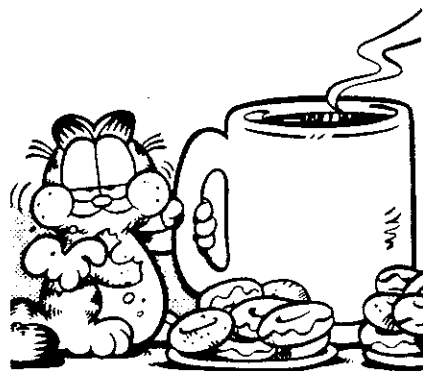
$$r = \frac{3}{20}$$

mark's rate is 4 times faster

$$4 \left(\frac{3}{20} \right) = \frac{12}{20} = \frac{3}{5}$$

Reciprocal of $\frac{3}{5}$ is $\frac{5}{3}$

$$\boxed{1\frac{2}{3} \text{ hours}} \text{ -or- } \boxed{1:40}$$



12.1 Problems

SIMPLIFYING EXPRESSIONS

Simplify each expression:

$$\textcircled{1} \frac{y-4}{y^2-16}$$

$$\textcircled{11} \frac{9-a^2}{a^2-a-6}$$

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

$$\textcircled{12} \frac{25-4x^2}{2x^2+x-15}$$

$$\textcircled{3} \frac{a^2-a}{a-1}$$

$$\textcircled{13} \frac{x^2-3x+2}{2x-2x^2}$$

$$\textcircled{4} \frac{m^2-2m}{m-2}$$

$$\textcircled{14} \frac{9a-3a^2}{3a^2-3a-18}$$

$$\textcircled{5} \frac{2x^2+6}{2x+6}$$

$$\textcircled{15} \frac{m^2-2m-8}{m^2-m-6}$$

$$\textcircled{6} \frac{3n^2-9}{3n-9}$$

$$\textcircled{16} \frac{x^2+x-12}{x^2+2x-15}$$

$$\textcircled{7} \frac{-4y^2}{2y^2-4y^3}$$

$$\textcircled{17} \frac{2a^2-ab-b^2}{b^2+ab-2a^2}$$

$$\textcircled{8} \frac{3a^2}{3a^3+6a^2b}$$

$$\textcircled{18} \frac{3x^2-3y^2}{y^2-x^2}$$

$$\textcircled{9} \frac{x+6}{x^2+7x+6}$$

$$\textcircled{19} \frac{a^4-5a^2+4}{a^2-a-2}$$

$$\textcircled{10} \frac{x-3}{x^2+x-12}$$

$$\textcircled{20} \frac{y^4-13y^2+36}{y^2+5y+6}$$

12.2 Problems

MULTIPLYING & DIVIDING

Multiply and simplify:

$$\textcircled{1} \frac{6a^2n}{8n^2} \cdot \frac{12n}{9a}$$

$$\textcircled{2} \frac{10n^3}{6x^3} \cdot \frac{12n^2x^4}{25n^2x^2}$$

$$\textcircled{3} \frac{3a-3b}{a} \cdot \frac{a^2}{a-b}$$

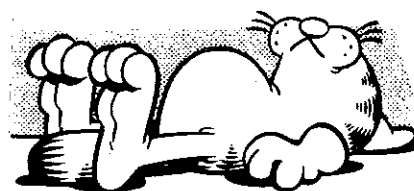
$$\textcircled{4} \frac{a^2-b^2}{a-b} \cdot \frac{7}{a+b}$$

$$\textcircled{5} \frac{x-5}{x^2-7x+10} \cdot \frac{x-2}{3}$$

$$\textcircled{6} \frac{x+1}{x^2-2x-3} \cdot \frac{x-3}{x+2}$$

$$\textcircled{7} \frac{a^2-b^2}{2a^2+3ab+b^2} \cdot \frac{2a+b}{b-a}$$

$$\textcircled{8} \frac{2x-y}{x^2-y^2} \cdot \frac{(x+y)^2}{y^2-xy-2x^2}$$



continued

Divide and simplify:

$$\textcircled{9} \quad \frac{y^2}{x+2} \div \frac{y}{x+2}$$

$$\textcircled{10} \quad \frac{2a^3}{a+1} \div \frac{a^2}{a+1}$$

$$\textcircled{11} \quad \frac{m^2+2m+1}{2} \div \frac{m+1}{m-1}$$

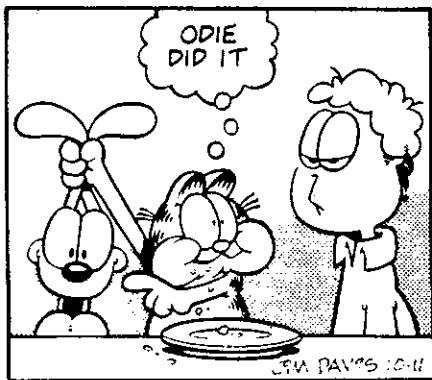
$$\textcircled{12} \quad \frac{y^2-16}{y^2-64} \div \frac{y+4}{y-8}$$

$$\textcircled{13} \quad \frac{x}{x+2} \div \frac{x^2}{x^2+5x+6}$$

$$\textcircled{14} \quad \frac{x^2+x-2}{x^2+5x+6} \div \frac{x^2+2x-3}{x^2+7x+12}$$

$$\textcircled{15} \quad \frac{a^2+3a-10}{a^2+8a+15} \div \frac{a^2-6a+8}{8-2a}$$

$$\textcircled{16} \quad \frac{2x^2-x-15}{x^2-2x-3} \div \frac{2x^2+3x-5}{1-x^2}$$



12.3 Problems

ADDING & SUBTRACTING

Find the sum or difference:

$$\textcircled{1} \quad \frac{7}{3a} - \frac{4}{6a^2}$$

$$\textcircled{10} \quad \frac{m-n}{m+n} - \frac{1}{m^2-n^2}$$

$$\textcircled{2} \quad \frac{5b}{7x} + \frac{3a}{21x^2}$$

$$\textcircled{11} \quad \frac{x^2-1}{x+1} + \frac{x^2+1}{x-1}$$

$$\textcircled{3} \quad \frac{2}{t} - \frac{t+3}{s}$$

$$\textcircled{12} \quad \frac{k}{2k+1} - \frac{2}{k+2}$$

$$\textcircled{4} \quad \frac{7}{a} - \frac{x-1}{b}$$

$$\textcircled{13} \quad \frac{-18}{y^2-9} + \frac{7}{3-y}$$

$$\textcircled{5} \quad \frac{a}{a+b} + \frac{8}{b}$$

$$\textcircled{14} \quad \frac{-3}{5-a} + \frac{5}{a^2-25}$$

$$\textcircled{6} \quad \frac{m}{m-n} - \frac{5}{m}$$

$$\textcircled{15} \quad \frac{a}{a-b} + \frac{b}{2b+3a}$$

$$\textcircled{7} \quad \frac{x+y}{y-2} + \frac{x-y}{2-y}$$

$$\textcircled{16} \quad \frac{m-1}{m+1} + \frac{4}{2m+5}$$

$$\textcircled{8} \quad \frac{a+b}{x-3} + \frac{a+b}{3-x}$$

$$\textcircled{17} \quad \frac{4a}{6a^2-a-2} - \frac{5a+1}{2-3a}$$

$$\textcircled{9} \quad \frac{2y}{y^2-25} + \frac{y+5}{y-5}$$

$$\textcircled{18} \quad \frac{2x+1}{(x-1)^2} + \frac{x-2}{(1-x)(x+4)}$$

continued

Review

Simplify expressions:

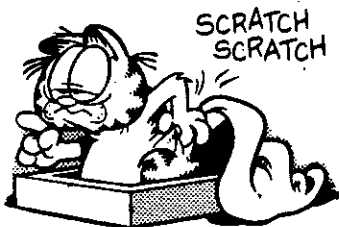
$$\textcircled{19} \frac{2t^2 - t - 2}{2t^2 - 15t + 28}$$

$$\textcircled{20} \frac{x^2 - 4x + 4}{x^2 + 4x - 12}$$

Multiply / Divide and simplify:

$$\textcircled{21} \frac{x^2 - 15x + 50}{x^2 - 9x + 20} \cdot \frac{x^2 - 11x + 24}{x^2 - 18x + 80}$$

$$\textcircled{22} \frac{y}{5} \div \frac{y^2 - 25}{5 - y}$$



$$\textcircled{23} \frac{x^2 - 16}{16 - x^2} \div \frac{7}{x}$$

Simplify by factoring using quadratic form:

$$\textcircled{24} \frac{x^4 - 37x^2 + 36}{x^2 - 7x + 6}$$

$$\textcircled{4} \frac{\frac{a^2}{b}}{\frac{a}{b^2}}$$

$$\textcircled{5} \frac{\frac{a^2 b^3}{c^2}}{\frac{ac^2}{b}}$$

$$\textcircled{6} \frac{\frac{x^3 y}{z^2}}{\frac{z^2 x}{y^2}}$$

$$\textcircled{7} \frac{\frac{x+y}{a+b}}{\frac{x^2 - y^2}{a^2 - b^2}}$$

$$\textcircled{8} \frac{\frac{4n^2 - m^2}{n^2}}{\frac{2n+m}{n}}$$

$$\textcircled{9} \frac{\frac{1}{x} + \frac{1}{y}}{\frac{1}{x} - \frac{1}{y}}$$

$$\textcircled{10} \frac{\frac{a}{b} + \frac{a}{c}}{\frac{a}{b^2 - bc}}$$

$$\textcircled{11} \frac{\frac{x^2 + 8x + 15}{x^2 + x - 6}}{\frac{x^2 + 2x - 15}{x^2 - 2x - 3}}$$

$$\textcircled{12} \frac{\frac{a^2 - 6a + 5}{a^2 + 13a + 42}}{\frac{a^2 - 4a + 3}{a^2 + 3a - 18}}$$

$$\textcircled{13} \frac{\frac{y^2 - 1}{y^2 + 3y - 4}}{y + 1}$$

12.4 Problems

COMPLEX FRACTIONS

Simplify each fraction:

$$\textcircled{1} \frac{\frac{x^2}{y}}{\frac{y}{x^3}} \quad \textcircled{2} \frac{\frac{a^3}{b^2}}{\frac{b}{a^2}} \quad \textcircled{3} \frac{\frac{x^2}{y^3}}{\frac{x^3}{y}}$$

$$\textcircled{14} \frac{\frac{a^2 - 2a - 3}{a^2 - 1}}{a - 3}$$

$$\textcircled{15} \frac{x + 5 + \frac{3}{x + 1}}{x - 1 - \frac{3}{x + 1}}$$

continued

$$\textcircled{16} \frac{x+2 + \frac{2}{x+5}}{x+6 + \frac{6}{x+1}}$$

$$\textcircled{17} \frac{x-1 - \frac{15}{x+1}}{x-4}$$

$$\textcircled{18} \frac{\frac{a^2-a-1}{a-1}}{a - \frac{1}{a-1}}$$

$$\textcircled{19} \frac{x+5 + \frac{4}{x+1}}{x+3}$$

Review
Simplify each expression:

$$\textcircled{20} \frac{a^2+a-6}{a^2+8a+15}$$

$$\textcircled{21} \frac{x^2-y^2}{x^2+2xy+y^2}$$

Multiply/Divide and simplify:

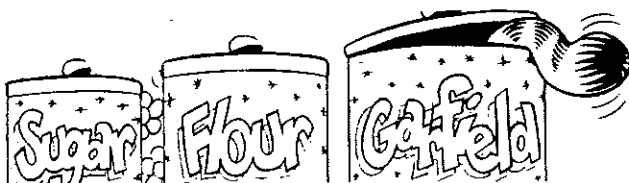
$$\textcircled{22} \frac{x^2-4}{x^2-3x-10} \cdot \frac{x^2+x-30}{x^2+3x-18}$$

$$\textcircled{23} \frac{a+b}{a^2-a-6} \div \frac{a+b}{(a+2)^2}$$

Find the sum/difference:

$$\textcircled{24} \frac{3}{x^2-3x-10} - \frac{3}{x-5}$$

$$\textcircled{25} \frac{2}{x^2-10x+21} + \frac{4}{7-x}$$



12.5 Problems

RATIONAL EQUATIONS

$$\textcircled{1} \frac{x+1}{x} + \frac{x+4}{x} = 6$$

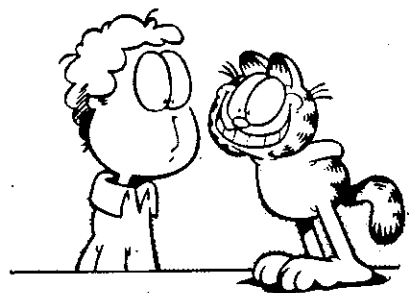
$$\textcircled{2} \frac{18}{b} = \frac{3}{b} + 5$$

$$\textcircled{3} \frac{11}{2x} - \frac{2}{3x} = \frac{1}{6}$$

$$\textcircled{4} \frac{2}{3x} - \frac{5}{2x} = \frac{11}{6}$$

$$\textcircled{5} \frac{m}{m+1} + \frac{5}{m-1} = 1$$

$$\textcircled{6} \frac{r-1}{r+1} - \frac{2r}{r-1} = -1$$



$$\textcircled{7} \frac{5}{5-p} + \frac{p^2}{p-5} = -2$$

$$\textcircled{8} \frac{r^2}{r-7} + \frac{50}{7-r} = 14$$

$$\textcircled{9} \frac{2b-5}{b-2} - 2 = \frac{3}{b+2}$$

12.6 Problems

WORK PROBLEMS

$$\textcircled{10} \frac{z+3}{z-1} + \frac{z+1}{z-3} = 2$$

$$\textcircled{11} \frac{7}{k-3} - \frac{1}{2} = \frac{3}{k-4}$$

$$\textcircled{12} \frac{x+2}{x-2} - \frac{2}{x+2} = \frac{-7}{3}$$

$$\textcircled{13} \frac{x-2}{x} - \frac{x-3}{x-6} = \frac{1}{x}$$

$$\textcircled{14} \frac{14}{n-6} = \frac{1}{2} + \frac{6}{n-8}$$

$$\textcircled{15} \frac{5}{x-3} + \frac{-x}{3-x} = x$$

$$\textcircled{16} \frac{c}{c-4} - \frac{6}{4-c} = c$$

Review

Simplify:

$$\textcircled{17} \frac{2n^2-5n+2}{2n^2-7n+3}$$

Divide and simplify:

$$\textcircled{18} \frac{x+3}{x-4} \div \frac{2x^2+11x+15}{2x^2-8x}$$

Subtract/Simplify:

$$\textcircled{19} \frac{a}{a+1} - \frac{1}{a^2+a}$$

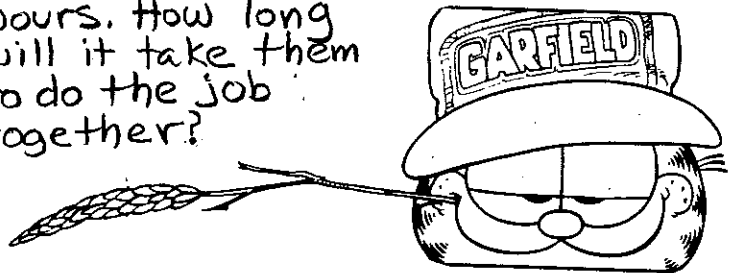
$$\textcircled{20} \frac{n+2 - \frac{30}{n+1}}{n - \frac{2(n+6)}{n+1}}$$

① Jane can wash the windows of a building in 4 hours. Jim can do the same job in 6 hours. If they work together, how long will it take them?

② Mark can clean the garage in 6 hours. Rosetta can do the same job in 8 hours. How long will it take them if they work together?

③ Helena can do a job in 5 days. Jeff can do the same job in 8 days. How long will it take them if they work together?

④ Frank can do a job in 10 hours. Keith can do the same job in 15 hours. How long will it take them to do the job together?



⑤ A swimming pool can be filled by one pipe in 12 hours and by another in 4 hours. How long will it take to fill the pool if the water flows through both?

⑥ A swimming pool can be filled by one pipe in 3 hours and by another in 10 hours. How long will it take to fill the pool if water flows through both pipes?

⑦ A swimming pool can be filled by one pipe in 10 hours. It can be

drained by another pipe in 15 hours. If the fill pipe and drain pipe are both open, how long will it take to fill the pool?

- ⑧ A swimming pool can be filled by one pipe in 6 hours and by another in 4 hours. A drain pipe empties the pool in 12 hours. If all three pipes are open, how long will it take to fill the pool?
- ⑨ Cindy and Erica can do a job together in $3\frac{3}{5}$ hours. Cindy can do the job alone in 6 hours. How long will it take for Erica to do the job alone?
- ⑩ Ben and Jason can do a job together in $1\frac{7}{8}$ days. Ben can do the job alone in 3 days. How long will it take Jason to do the job alone?
- ⑪ John and Denise can mow a lawn together in 12 minutes. Alone, John can do the job in 20 minutes. How long would it take Denise to do the job alone?
- ⑫ Ann can clean the yard three times faster than Phil. If they can clean the yard together in 45 minutes, how long would it take Ann to do the job by herself?

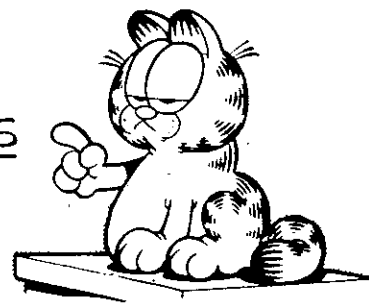
Review

Simplify:

⑬
$$\frac{n^4 - 26n^2 + 25}{n^2 + 4n - 5}$$

Solve:

⑭
$$\frac{9}{x^2 - 7x + 12} = \frac{5}{x - 3} + \frac{2}{x - 4}$$



Unit 12 REVIEW PROBLEMS

Simplify each expression:

①
$$\frac{x + y}{x^2 - y^2}$$

⑥
$$\frac{3m^2 + 8m - 3}{6m^2 + 17m - 3}$$

②
$$\frac{x + y}{x^2 + 2xy + y^2}$$

⑦
$$\frac{n^4 - 13n^2 + 36}{n^2 - 5n + 6}$$

③
$$\frac{2b - 2a}{a^2 - b^2}$$

④
$$\frac{12 - 3x}{x^2 - x - 12}$$



⑤
$$\frac{6x^2 + 17x - 14}{3x^2 - 20x + 12}$$

⑧
$$\frac{x^4 - 25x^2 + 144}{x^2 - x - 12}$$

Multiply/Divide and simplify:

$$(9) \frac{6m^3n}{16a^2} \cdot \frac{4a^2m}{9n^3}$$

$$(10) \frac{7xy^3}{11z^2} \cdot \frac{44z^3}{21x^2y}$$



$$(11) \frac{n^2+20n+99}{n+9} \cdot \frac{n+7}{n^2+12n+11}$$

$$(12) \frac{x^2+19x+84}{x-3} \cdot \frac{x^2-9}{x^2+15x+36}$$

$$(13) \frac{t^2+8t+16}{w^2-6w+9} \div \frac{2t+8}{3w-9}$$

$$(14) \frac{k^2-81}{2k^2-72} \div \frac{k-9}{2k+12}$$

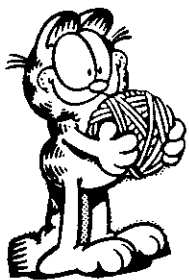
$$(15) \frac{a^2+a-6}{3a^2+13a+12} \div \frac{a^2+3a-10}{3a^2+7a+4}$$

$$(16) \frac{2n^3+6n^2}{n^2-1} \div \frac{n^2+6n+9}{n^2-n}$$

Add/Subtract and simplify:

$$(17) \frac{x+8}{x^2-64} + \frac{1}{8-x}$$

$$(18) \frac{3}{a+b} + \frac{1}{b^2-a^2}$$



$$(19) \frac{2x+3}{x^2-4} + \frac{6}{x+2}$$

$$(20) \frac{-3}{a-5} + \frac{-6}{a^2-5a}$$

$$(21) \frac{3a+2}{3a-6} - \frac{a+2}{a^2-4}$$

$$(22) \frac{n-2}{n+2} - \frac{16}{n^2-4}$$

$$(23) \frac{30-6a}{a^2-9} - \frac{a-5}{3-a}$$

$$(24) \frac{-n-5}{n^2+2n-15} - \frac{n}{3-n}$$

Simplify each complex fraction:

$$(25) \frac{\frac{a+b}{c}}{\frac{a^2-b^2}{c^2}}$$

$$(28) \frac{x+3 - \frac{x+18}{x+2}}{x - \frac{8x-6}{x+3}}$$

$$(26) \frac{\frac{n^2-9}{n^2-4}}{\frac{n^2-4n+3}{n+2}}$$

$$(29) \frac{\frac{1}{x} - \frac{1}{y}}{\frac{y}{x} - 1}$$

$$(27) \frac{n - \frac{n-4}{n-3}}{n+1 - \frac{2n+17}{n+5}}$$

$$(30) \frac{\frac{a}{b} - \frac{b}{a}}{\frac{a}{b} + 1}$$

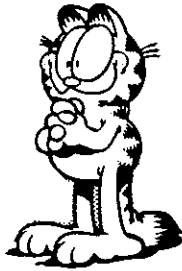
Solve each equation:

$$(31) \frac{2a-3}{a-3} - 2 = \frac{12}{a+3}$$

$$(32) \frac{3}{x} + \frac{1}{x-5} = \frac{1}{2x}$$

$$\textcircled{33} \quad \frac{4m}{m-3} + \frac{6}{3-m} = m$$

$$\textcircled{34} \quad \frac{m+3}{m-1} + \frac{m+1}{m-3} = \frac{22}{3}$$



Solve each problem:

$\textcircled{35}$ Sharon can paint the fence in 4 hours, Mike can do the same job in 5 hours. How long will it take if they work together?

$\textcircled{36}$ Andy can stack all the boxes in $2\frac{1}{2}$ hours. Pam can do the job in $1\frac{1}{2}$ hours. How long will it take if they work together?

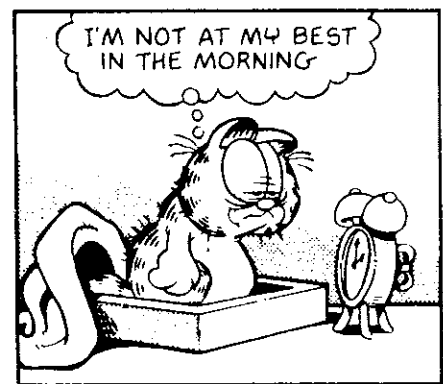
$\textcircled{37}$ The faucet can fill the tub in 10 minutes. The drain can empty the tub in 15 minutes. How long will it take for the faucet to fill the tub if the drain is open?

$\textcircled{38}$ A hose can fill the tank in 20 minutes and the drain opening can empty the tank in 30 minutes. If 2 hoses are filling while the drain is open, how long until the tank is full?

$\textcircled{39}$ Phil and Evan can label all the books in $1\frac{1}{2}$

hours working together. If Evan can complete the job by himself in 4 hours, how long would it take Phil?

$\textcircled{40}$ Ben and Jerry can complete a job together in 3 hours. If it takes Ben 5 hours by himself, how long does it take Jerry?



Unit 12 SKILL CHECK

Simplify:

$$\textcircled{1} \quad \frac{2x+6y}{x^2+2xy-3y^2}$$

$$\textcircled{2} \quad \frac{2x^2+13x+20}{2x^2+5x}$$

Multiply/Divide and simplify:

$$\textcircled{3} \quad \frac{14a^2b}{6ac} \cdot \frac{2ac^3}{7b^3}$$

$$\textcircled{4} \quad \frac{x^2+3x+2}{3x^2-14x+8} \div \frac{x^3+2x^2}{x^2-4x}$$

Add/Subtract and simplify:

$$\textcircled{5} \quad \frac{4-2a}{a^2-5a+6} + \frac{a}{a-3}$$

$$\textcircled{6} \quad \frac{y^2+xy}{x^2-y^2} - \frac{x+y}{y-x}$$

Simplify:

$$\textcircled{7} \quad \frac{\frac{a}{b^2} - \frac{2}{b}}{a^2-ab-2b^2} \quad \textcircled{8} \quad a + \frac{a+2}{a-4}$$

$$\frac{a^2-ab-2b^2}{b} \quad \frac{a+3 - \frac{4a-8}{a-2}}$$

Solve the equation:

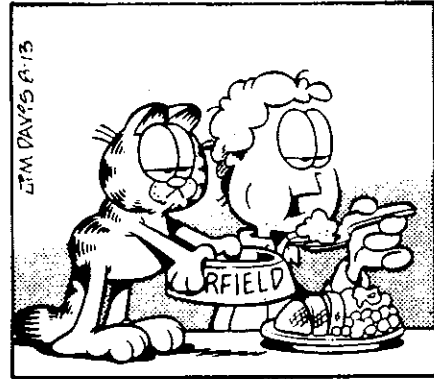
$$\textcircled{9} \quad \frac{n-1}{n-5} - \frac{9n+1}{n^2-n-20} = \frac{2n+1}{n+4}$$

Solve:

- $\textcircled{10}$ Two fill pipes lead into the water tank. One can fill the tank in 6 hours and the other in 8 hours. A drain opening can empty the tank in 12 hours. If both pipes and the drain are open, how long will it take to fill the tank?

- $\textcircled{11}$ Jan can trim the hedges in 40 minutes. Working with Dean,

the two of them can do the job together in 15 minutes. How long would it take Dean to trim the hedges by himself?



Unit 12 REMIEDIATION

Simplify:

$$\textcircled{1} \quad \frac{a^2-b^2}{3a^2-ab-2b^2}$$

$$\textcircled{2} \quad \frac{3x^2+10x+3}{x^3+3x^2}$$

Multiply/Divide and simplify:

$$\textcircled{3} \quad \frac{9xy^2z}{4z^3} \cdot \frac{2x^3z}{15xy^4}$$

$$\textcircled{4} \quad \frac{n^2+10n+21}{2n^2+9n+4} \div \frac{n^2+7n}{n^3+4n^2}$$

continued

Add/Subtract and simplify:

$$\textcircled{5} \frac{-x^2+3x-2}{x^2+5x-6} + \frac{2x+1}{x+6}$$

$$\textcircled{6} \frac{-a^2+3ab+4b^2}{a^2-b^2} - \frac{2a+b}{b-a}$$

Simplify:

$$\textcircled{7} \frac{2}{x} - \frac{5}{y}$$

$$\frac{6x}{x^2} - \frac{15}{y}$$



$$\textcircled{8} \frac{n+2 - \frac{2n+4}{n+3}}{n+4 - \frac{2}{n+3}}$$

Solve the equation:

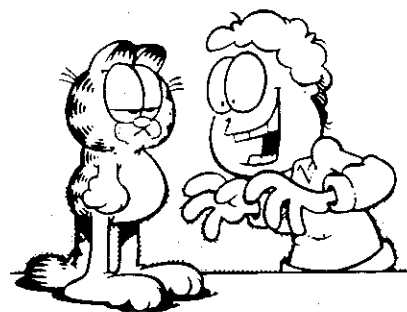
$$\textcircled{9} \frac{5}{n+3} + \frac{10n}{n^2+5n+6} = \frac{3n+2}{n+2}$$

Solve:

- $\textcircled{10}$ A pool can be filled by a pipe in 4 hours and a hose in 8 hours. It can be drained in 6 hours. If the drain is open and water is

coming into the pool from both the pipe and the hose, how long until the pool is filled?

- $\textcircled{11}$ Working together, Peter and Gordon can shovel snow from the driveway in 20 minutes. Peter can do the job himself in 45 minutes. How long would it take Gordon to do the job by himself?



Unit 12

EXTRA PRACTICE

Simplify:

① $\frac{2x-4}{x^2-8x+12}$

③ $\frac{2n^2-7n-4}{n^2-7n+12}$

② $\frac{-2b+2a}{a^2-b^2}$

④ $\frac{2n^2-2n-4}{n+1}$

Multiply and simplify:

⑤ $\frac{3ab^4}{10c^2} \cdot \frac{5c}{12a^3b^2}$

⑥ $\frac{n^2-2n-15}{n^2+5n+6} \cdot \frac{2n^2+6n+4}{n-5}$

Divide and simplify:

⑦ $\frac{x^2+7x+12}{8} \div \frac{x+3}{6}$

⑧ $\frac{3x+12}{3x^2+x-2} \div \frac{x^3+4x^2}{x^6+x^5}$

Add and simplify:

⑨ $\frac{a-4}{a+3} + \frac{-7}{a^2+5a+6}$

⑩ $\frac{2x+10}{x^2+x-2} + \frac{x+4}{x+2}$

Subtract and simplify:

⑪ $\frac{9n+4}{n^2+4n} - \frac{-2n}{n+4}$

⑫ $\frac{-16}{x^2-16} - \frac{x-2}{4-x}$

Simplify:

⑬ $\frac{n+3}{n^3} \cdot \frac{n^2+5n+6}{n^2}$

⑭ $\frac{\frac{3}{a^2} - \frac{2}{a^3}}{\frac{3a^2+10a-8}{a}}$

Solve:

⑮ $\frac{2x}{x^2+4x+3} = \frac{2}{x+1} + \frac{6}{x+3}$

⑯ $\frac{2}{n+3} + \frac{4}{n^2-9} = \frac{3n+1}{n-3}$

⑰ Francis can paint the fence in 6 hours and Scott can do the same job in 4 hours. How long would it take them if they work together?

⑱ A swimming pool can be filled in 4 hours and drained in 6 hours. If the fill pipe and the drain are both open, how long would take to fill the pool?

Simplify:

⑲ $\frac{n+1 - \frac{n+5}{n-1}}{n - \frac{4+n}{n-1}}$

Solve:

⑳ Pablo can clean out the storage shed in 90 minutes. With Chris helping, it takes only 30 minutes. How long would it take Chris to clean out the shed alone?

Algebra Skills Review

Part I (Units 1-8)

"A"

Problems QUARTER #4 REVIEW

Identify the property:

$$\textcircled{1} \frac{-3a}{4} + \frac{3a}{4} = 0$$

Evaluate: $a = -2$, $b = -3$

$$\textcircled{2} 2a^2 - 3ab + a^3$$

Simplify:

$$\textcircled{3} 3ab - 2a(a - 3b) - 4a^2$$

Solve the equation:

$$\textcircled{4} \frac{2n}{3} - 3(n-1) = -4(n+4) - 1$$

Solve the inequality:

$$\textcircled{5} \frac{2x+9}{5} > \frac{x+4}{3}$$

Solve for n :

$$\textcircled{6} 3nc - 2 = 5n$$

Solve and graph on a

number line:

$$\textcircled{7} |a+2| - 4 \geq 2$$

$$\textcircled{8} |3a-9| < 6 \text{ and } |a| \neq 2$$

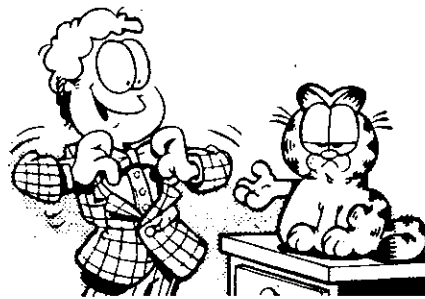
Simplify monomials:

$$\textcircled{9} \left(\frac{1}{2} x^2 y^3 z\right)^2 (-2xy^{-1}z^2)^3$$

$$\textcircled{10} \frac{-18a^2 b^3 c^{-3}}{8a^{-3} b^2 c^{-1}}$$

Evaluate in scientific notation:

$$\textcircled{11} (.03 \times 10^{-3}) (.14 \times 10^{-2})$$



Multiply/Divide polynomials:

$$\textcircled{12} (4x+7)(2x-5)$$

$$\textcircled{13} (2a^3 + a^2 - a - 5) \div (a-1)$$

$$\textcircled{14} (2ab^{x+2} - 3c^{4x})^2$$

$$\textcircled{15} (4x^n + y^{n-3})(4x^n - y^{n-3})$$

Determine GCF and LCM:

⑩ $12a^2b, 30ab^3c, 56abc^2$

Factor completely:

⑰ $n^8 - 1$

⑱ $6n^2 + 14n - 12$

⑲ $(3n - 2x)^2 - (n + 5x)^2$

⑳ $a^2b^2 - a^4 + a^2b^2 - b^4$

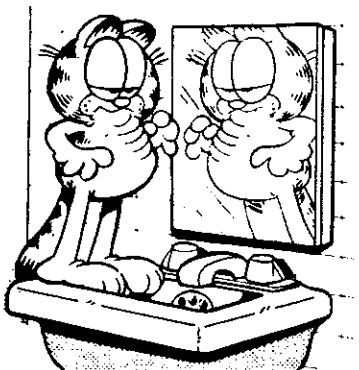
Solve the equation:

⑳ $2n^3 + 6n = -8n^2$

Linear equations:

㉒ Write an equation in standard form for a line that includes $(-2, -10)$ and $(4, -15)$.

㉓ Write an equation in slope-intercept form for a line perpendicular to $2x - y = 12$ going through $(-3, 9)$.



㉔ Write an equation in point-slope form parallel to $y = \frac{2}{5}x - 4$ passing through the point $(-2, -5)$.

㉕ Change $4x + 4 = -2y$ to slope-intercept form. Determine the slope and both intercepts. Graph it.

Determine the midpoint:

㉖ $(-9, 7)$ $(-3, 5)$

Determine the function value:

㉗ $f(g(n+3))$ for $f(x) = x - x^2$ and $g(x) = x - 5$

"B"

Problems

QUARTER #4 REVIEW

Identify the property:

① $4y + ab = ab + 4y$

Evaluate: $a = -1, b = -4$

② $a^3 - 3b^2 + 3ab$

Simplify:

③ $4x(2x - y) - 3x(y + 2x)$

Solve the equation:

$$\textcircled{4} \quad 12 + \frac{3x}{5} = -3(x+8)$$

Solve the inequality:

$$\textcircled{5} \quad \frac{3(2n+1)}{7} \geq \frac{12-n}{-2}$$

Solve for x :

$$\textcircled{6} \quad 2(3x+y) = 3y(x-1)$$

Solve and graph on a number line:

$$\textcircled{7} \quad |n-1| + 3 < 9$$

$$\textcircled{8} \quad |n+4| - 1 \geq 2 \text{ and } |n| < 10$$

Simplify monomials:

$$\textcircled{9} \quad \left(-\frac{1}{3}a^2b^3c\right)^2 (-3ab^{-1}c)^3$$

$$\textcircled{10} \quad \frac{-30a^{-3}bc^{-2}}{-6ab^4c^{-5}}$$

Evaluate in scientific notation:

$$\textcircled{11} \quad \frac{.0063 \times 10^4}{9 \times 10^7}$$

Multiply/Divide polynomials:

$$\textcircled{12} \quad (3a+5b)(a-6b)$$

$$\textcircled{13} \quad (5a^3-2b^3) \div (a+2b)$$

$$\textcircled{14} \quad (3c^{x+3} + d^{3x})^2$$

$$\textcircled{15} \quad (2a^{n-1} + 3b^{n+4})(2a^{n-1} - 3b^{n+4})$$

Determine GCF and LCM:

$$\textcircled{16} \quad 75xyz, 40x^2y, 12y^2$$

Factor completely (if possible):

$$\textcircled{17} \quad 3x^3 + 6x^2 + 15x$$

$$\textcircled{18} \quad 4a^2 + 18ab + 8b^2$$

$$\textcircled{19} \quad (a+4)^2 + 3(a+4) - 10$$

$$\textcircled{20} \quad x^6 - x^4y^2 + 16y^2 - 16x^2$$

Solve the equation:

$$\textcircled{21} \quad 4a^3 + 6a = 14a^2$$

Linear equations:

$\textcircled{22}$ Write an equation in slope-intercept form for a line defined by:

x	y
-2	5
-4	9
-6	13



$\textcircled{23}$ Write an equation in standard form for a line parallel to $y = -\frac{1}{2}x + 3$ passing through the point $(8, -6)$.

②4 Write an equation in point-slope form for a line perpendicular to $2x - 3y = 8$ that passes through $(-2, -6)$.

②5 Change the equation $y = \frac{1}{4}x - 2$ to standard form. Determine the slope and both intercepts. Draw the graph.

Determine the endpoint:

②6 Find B if A $(-2, 9)$ is one endpoint and P $(5, -1)$ is the midpoint of AB.

Determine the function value:

②7 $f[g(a+b)]$ for $f(x) = -2x$ and $g(x) = x^2$

"C"

Problems

QUARTER #4 REVIEW

Identify the property:

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

Evaluate: $x = -1, y = -5$

② $4x^2y - 2(x + 2y)$

Simplify:

③ $3n^2 - 2n(n+m) + 2mn - n^2$

Solve the equation:

④ $5(n-2) = \frac{n}{2} + 3n - 1$

Solve the inequality:

⑤ $3(n+4) > \frac{4n+6}{3}$



Solve for x:

⑥ $xy - 3ab = 2a(x+b)$

Solve and graph on a number line:

⑦ $|2a-1| - 2 > 7$

⑧ $|a+4| \leq 7$ and $|a| \neq 2$

Simplify monomials:

⑨ $(2x^{-2}y^3)^5 (-\frac{1}{2}x^4y^{-2})^3$

⑩ $\frac{-12x^3y^{-2}}{-20x^{-2}y^4z^{-2}}$

Evaluate in scientific notation:

$$\textcircled{11} \frac{7000 \times 10^{-4}}{.5 \times 10^{-2}}$$

Multiply / Divide polynomials:

$$\textcircled{12} (2a-7b)(3a-5b)$$

$$\textcircled{13} (4x^4 - 5y^4) \div (x-3y)$$

$$\textcircled{14} (x^{3n-2} - 4y^{2n+1})^2$$

$$\textcircled{15} (3a^{3x} + b^{x-1})(3a^{3x} - b^{x-1})$$

Determine GCF and LCM:

$$\textcircled{16} 60a^3b^5c^2, 100a^4b^2c^3, 108a^2b^3c^4$$

Factor completely (if possible):

$$\textcircled{17} 3a^6b^2 - 3a^2b^6$$

$$\textcircled{18} 6a^2 - 3ab - 9b^2$$

$$\textcircled{19} (2n+5)^2 - (n-4)^2$$

$$\textcircled{20} a^6 - a^4b^2 - a^2b^4 + b^6$$

Solve the equation:

$$\textcircled{21} 9a^3 = 4a$$

Linear equations:

$$\textcircled{22} \text{ Write an equation in standard form for a line that includes the points } (-4, 5) \text{ and } (-3, 9).$$

$$\textcircled{23} \text{ Write an equation in slope-intercept form for a line perpendicular to } 3x + 2y = 4 \text{ passing through } (-1, 5).$$

$$\textcircled{24} \text{ For the following equation: } y + 6 = \frac{2}{3}(x - 3) \text{ identify the slope, and then change the form of the equation to determine the intercepts.}$$

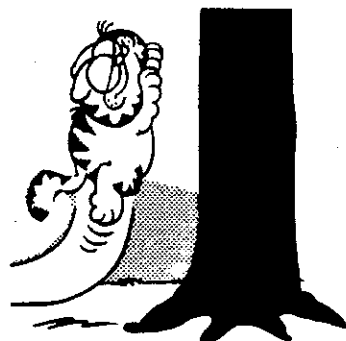
$$\textcircled{25} \text{ Change } -\frac{4}{3}x + \frac{2}{3}y = 2 \text{ to standard form. Determine the slope and both intercepts. Draw the graph.}$$

Determine the midpoint:

$$\textcircled{26} \overline{AB} \quad A(5, -12) \quad B(-1, 4)$$

Determine the function value:

$$\textcircled{27} f[g(n-3)] \text{ for } f(x) = 6 - x^2 \text{ and } g(x) = x - 1.$$



Algebra Skills Review

Part II (Units 9-12)

"A"

Problems

QUARTER #4 REVIEW

Classify the system and indicate number of solutions:

$$\begin{aligned} \textcircled{1} \quad & 4x - y = 6 \\ & 12x - 3y = 18 \end{aligned}$$

Solve the system using any method:

$$\begin{aligned} \textcircled{2} \quad & 5x - 2y = 17 \\ & x + 3y = 0 \end{aligned}$$

Graph the inequality:

$$\textcircled{3} \quad 2x + y > 6$$

Graph the system:

$$\textcircled{4} \quad |y - 1| + 3 \leq x$$

$$\begin{aligned} \textcircled{5} \quad & y < \frac{1}{2}x + 4 \\ & |x| > 3 \end{aligned}$$

Simplify the radical:

$$\textcircled{6} \quad \sqrt{54x^2y^3z^8}$$

Calculate to $\frac{1}{10}$:

$$\textcircled{7} \quad \sqrt{204}$$

Compute and simplify:

$$\textcircled{8} \quad \sqrt{2} (3\sqrt{6} - \sqrt{10}) - 2\sqrt{3}$$

Simplify and rationalize:

$$\textcircled{9} \quad \frac{2\sqrt{3}}{3\sqrt{2} - \sqrt{3}}$$



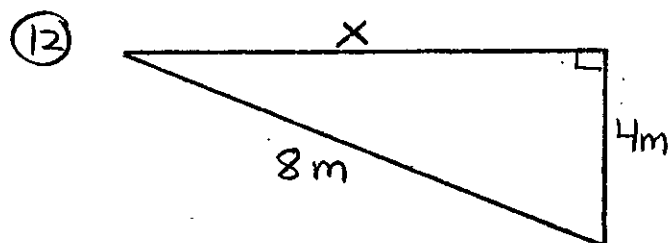
Interpolate:

$$\textcircled{10} \quad \sqrt{1179} \quad (\text{Table on page 8})$$

Radical equation:

$$\textcircled{11} \quad \sqrt{2x+5} - 1 = 2$$

Pythagorean Theorem:



Find the distance:

$$\textcircled{13} \quad (3, 5) \text{ to } (5, 9)$$

Find the axis of symmetry and turning point. Graph the function:

$$\textcircled{14} \quad y = x^2 - 10x + 21$$

Factor this quadratic equation to find the roots:

$$\textcircled{15} \quad 2x^2 - 11x + 15 = 0$$

Complete the square to determine the roots:

$$\textcircled{16} \quad 2n^2 - 12n + 14 = 0$$

Use the formula to determine the roots:

$$\textcircled{17} \quad -4n^2 + 8n = -3$$

Use the discriminant to determine the nature of the roots:

$$\textcircled{18} \quad x^2 + 5x + 3 = 0$$

Multiply and simplify:

$$\textcircled{19} \quad \frac{2x^2 + x - 1}{x^2 + 5x + 6} \cdot \frac{x + 3}{x + 1}$$

Divide and simplify:

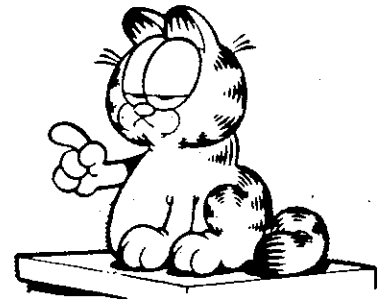
$$\textcircled{20} \quad \frac{n^2 - 16}{n^2 - 64} \div \frac{n + 4}{n - 8}$$

Subtract and simplify:

$$\textcircled{21} \quad \frac{4}{5 - n} - \frac{3}{n^2 - 5n}$$

Simplify:

$$\textcircled{22} \quad \frac{\frac{x+y}{a+b}}{\frac{x^2-y^2}{a^2-b^2}}$$



Solve:

$$\textcircled{23} \quad \frac{-2}{y+3} - \frac{2}{y} = -1$$

"B" Problems

QUARTER #4 REVIEW

Classify the system and indicate the number of solutions:

$$\textcircled{1} \quad \begin{aligned} y &= 6x - 8 \\ 12x - 3y &= 16 \end{aligned}$$

Solve the system using any method:

$$\textcircled{2} \quad \begin{aligned} 2x + 3y &= 6 \\ 3x + 4y &= 7 \end{aligned}$$

Graph the inequality:

$$\textcircled{3} \quad y < -4$$

Graph the system:

④ $|y+2| + 5 \leq -2x$

⑤ $|y-3x| > 6$
 $|y| > 4$

Simplify the radical:

⑥ $\sqrt{72a^3b^4c^2}$

Calculate to $\%0$:

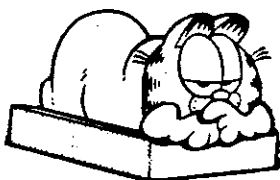
⑦ $\sqrt{456}$

Compute and simplify:

⑧ $\sqrt{5}(3\sqrt{10} + 2\sqrt{15}) - \sqrt{27}$

Simplify and rationalize:

⑨ $\frac{3\sqrt{5}}{\sqrt{5} + 2\sqrt{2}}$



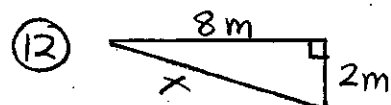
Interpolate:

⑩ $\sqrt{1488}$ (Table on page 8)

Radical equation:

⑪ $\sqrt{4a+13} - 3 = 2$

Pythagorean Theorem:



Find the distance:

⑬ $(6, -2)$ to $(-2, -4)$

Find the axis of symmetry and turning point. Graph the function:

⑭ $y = -x^2 + 8x - 12$

Factor this quadratic equation to find the roots:

⑮ $3x^2 + 16x + 16 = 0$

Complete the square to determine the roots:

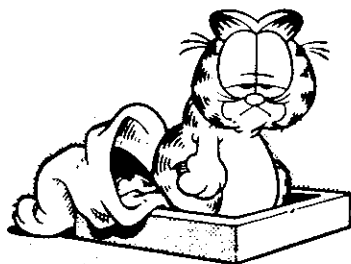
⑯ $3n^2 - 24n = 36$

Use the formula to determine the roots:

⑰ $4n^2 + 8n - 1 = 0$

Use the discriminant to determine the nature of the roots:

⑱ $3x^2 + 6x + 3 = 0$



Multiply and simplify:

$$(19) \frac{n^2-16}{n^2-8n+16} \cdot \frac{n-4}{n^2+6n+8}$$

Divide and simplify:

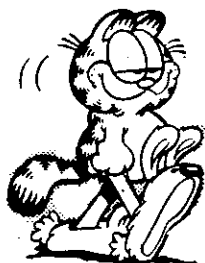
$$(20) \frac{n^2+2n+1}{n-1} \div \frac{n+1}{2n^2-8n+6}$$

Add and simplify:

$$(21) \frac{3}{2n-4} + \frac{2}{2n-n^2}$$

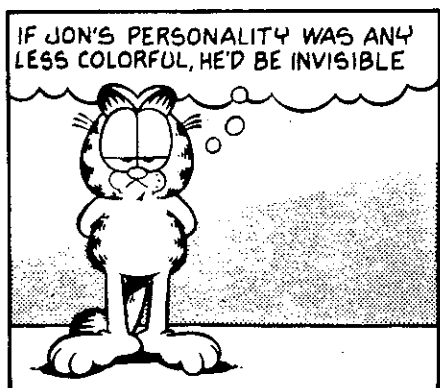
Simplify:

$$(22) \frac{\frac{x+y}{x^2-y^2}}{\frac{x-y}{y^2-x^2}}$$



Solve:

$$(23) 1 - \frac{1}{x-1} = \frac{2}{x+1}$$



"C"

Problems

QUARTER #4 REVIEW

Classify the system and indicate the number of solutions:

$$(1) \begin{cases} y = 2x + 6 \\ 8x - 4y = 10 \end{cases}$$

Solve the system using any method:

$$(2) \begin{cases} 3x - 2y = 7 \\ 4x - 3y = 11 \end{cases}$$

Graph the inequality:

$$(3) x \geq 7$$

Graph the system:

$$(4) |y-3| + 6 < 3x$$

$$(5) \begin{cases} |x| < y+3 \\ |x| > 4 \end{cases}$$

Simplify the radical:

$$(6) \sqrt{125a^3b^3c^2}$$

Calculate to $\frac{1}{10}$:

$$(7) \sqrt{642}$$

Compute and simplify:

⑧ $4\sqrt{3}(\sqrt{6} - 2\sqrt{15}) - 2\sqrt{5}$

Simplify and rationalize:

⑨ $\frac{4\sqrt{3}}{2\sqrt{2} - \sqrt{3}}$



Interpolate:

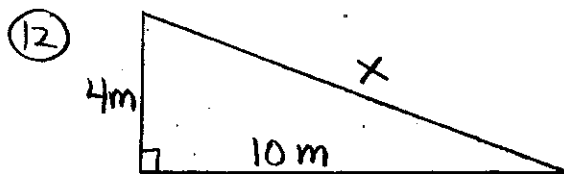
⑩ $\sqrt{2264}$

(Table on page 8)

Radical equation:

⑪ $\sqrt{4x+13} + 3 = 4$

Pythagorean Theorem:



Find the distance:

⑬ (4, 5) to (8, -1)

Find the axis of symmetry and turning point. Graph the function:

⑭ $y = x^2 - 6x - 16$

Factor this quadratic equation to determine the roots:

⑮ $4x^2 + 15x - 4 = 0$

Complete the square to determine the roots:

⑯ $3n^2 + 12 = 18n$

Use the formula to determine the roots:

⑰ $n^2 - 6n + 1 = 0$

Use the discriminant to determine the nature of the roots:

⑱ $2x^2 + 4x + 3 = 0$

Multiply and simplify:

⑲ $\frac{2n^2 - 13n + 15}{2n - 3} \cdot \frac{n + 1}{n^2 - 4n - 5}$

Divide and simplify:

⑳ $\frac{n^2 - 81}{n^2 - 36} \div \frac{n - 9}{n + 6}$



Subtract and simplify:

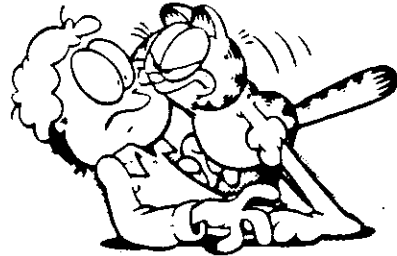
$$\textcircled{21} \quad \frac{-3}{5-a} - \frac{5}{a^2-25}$$

Simplify:

$$\textcircled{22} \quad \frac{n+2 + \frac{2}{n+5}}{n+6 + \frac{6}{n+1}}$$

Solve:

$$\textcircled{23} \quad \frac{3x}{x^2-5x+4} = \frac{2}{x-4} + \frac{3}{x-1}$$



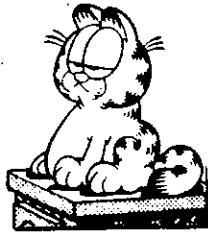
Problem Solving Review

"A" Problems QUARTER #4 REVIEW

- ① Find the middle of three consecutive odd integers such that three times the largest decreased by five more than twice the smallest is six.
- ② Find a positive even integer such that four less than three times the integer is between -10 and 17.
- ③ Ryan is $\frac{5}{8}$ as old as Sam. In 5 years, Ryan will be $\frac{3}{4}$ as old as Sam will be 4 years from now. How old was Ryan last year?
- ④ The sum of the squares of two consecutive integers is 61. Find the integers.
- ⑤ The sum of the digits of a two digit number is 7. If the digits are reversed, the new number is 25 less than twice the original. Find the original number.
- ⑥ Fran earns \$210 per week plus $8\frac{1}{2}\%$ commission on all sales. If she takes

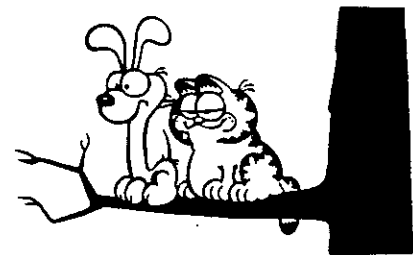
home \$1004 over a 3 week period, what are her sales?

- ⑦ Simon has 28 coins in nickels, dimes, and quarters. He has twice as many quarters as dimes and \$3.65 in all. How many nickels?



a rate of 6 mph on her way to the beach. Her brother Rick leaves 30 minutes later and arrives 15 minutes earlier. If Rick rides 8 mph, how far is it to the beach and at what time will Amy arrive?

- ⑬ A boat travels 42 miles downstream in 3 hours. The return trip takes 7 hours. What is the rate of the current?
- ⑭ A rectangle has a length that is 1 cm more than 5 times its width. The perimeter is 38 cm. Determine the area.



- ⑧ Willy paid the cashier \$15.37 including 6% sales tax. What was the price before tax?
- ⑨ Merrill invested \$18,000, part at 8% and part at 6% annual interest. After one year, he earned \$240 less from the 8% investment. How much did he invest at 6%?
- ⑩ The scout troop spent \$120 on 50 admission tickets to the carnival. If adult tickets sell for \$4.25 and child tickets sell for \$1.75, how many of each did they buy?
- ⑪ How much water should be evaporated from 30L of a 40% salt solution to raise the concentration to 60%?
- ⑫ Amy leaves home at 1:30 PM riding her bicycle at

- ⑮ A photo that is 2 inches longer than it is wide fits exactly into a frame that has an area of 39 in^2 . What are the dimensions of the photo if the frame is $1\frac{1}{2}$ inches all the way around?
- ⑯ Gary has a 6 by 12 ft. garden. When he adds a uniform strip all the way around, he increases the area by 63 square feet. How wide is the strip?

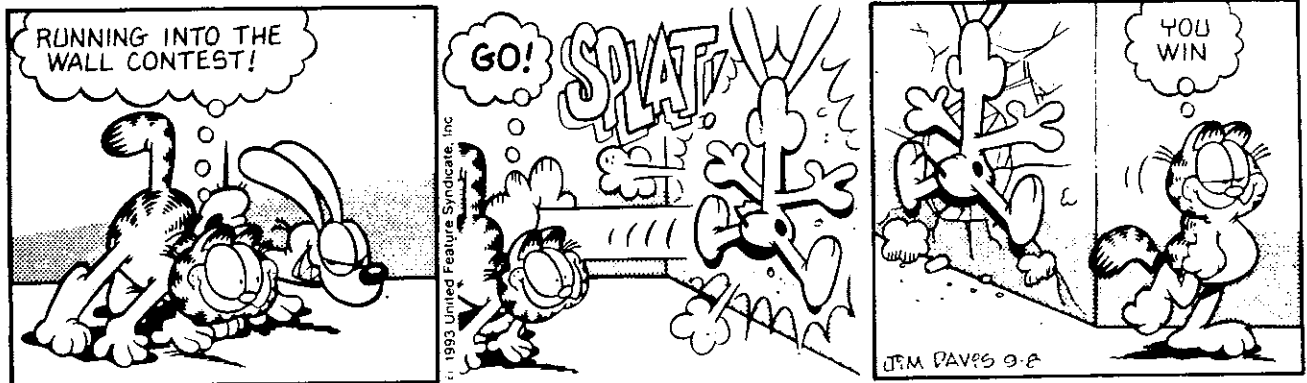
⑰ Five less than a number is multiplied by two more than twice the number. What is the number if the product is 54?

⑱ Jim can clean the house in 3 hours. It takes Russ 6 hours. How long would it take if they worked together?

⑲ Susan can wash the car in 12 minutes. Working

together with Miwa, the two girls can do the job in 8 minutes. How long would it take Miwa to do the job herself?

⑳ One pipe can load the tank in 2 hours. Another can do the job in 5 hours. The drain can empty the tank in 4 hours. If all three are open, how long (to the nearest minute) will it be until the tank is full?



Quarterly Exam #4 - Skills 1-8

REMEDICATION & EXTRA PRACTICE

Evaluate the expression:
 $a = -2$ $b = -1$

① $4ab^2 - 3(a - 2b)$
 $2a^2b^2 - 2(a + 3b) - b^3$

Simplify:

② $2xy - 3x(y - 4) - 8x$
 $12x^2 - 3x(x + 2y) - 2xy$

Solve:

③ $4 - \frac{2n}{3} = -2 - 5(n + 4)$

$2(x - 3) + \frac{x}{4} = 3x - 9$

④ $\frac{2a - 1}{3} < \frac{2(3a + 1)}{8}$

$2x - 3(x - 1) \geq \frac{x}{2} + 6$

Simplify:

⑤ $(-\frac{1}{2}a^2bc^{-3})^2 (-2a^1b^2c^{-2})^3$
 $(\frac{2}{3}x^{-1}y^{-2}z^2)^2 (-3xy^{-3}z^{-1})^2$

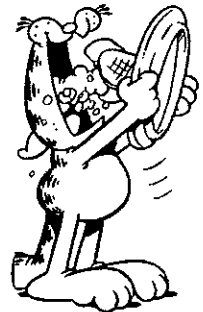
⑥ $\frac{-6xy^{-2}z^{-3}}{4x^2y^3z^{-5}}$

$\frac{12a^{-2}b^{-3}cd^4}{-9a^{-3}b^2c^4d^{-2}}$

Evaluate in scientific notation:

⑦ $\frac{.024 \times 10^{-7}}{2.5 \times 10^{-2}}$

$\frac{484 \times 10^{-5}}{2.5 \times 10^{-8}}$



Multiply/Divide

⑧ $(3n - 5)(4n + 3)$
 $(2x + 3y)(x - 4y)$

⑨ $(3n^3 - 18m^3) \div (n - 2m)$
 $(8x^3 - 8y^3) \div (2x - 3y)$

Determine GCF and LCM:

⑩ $25x^4y$
 $35xy^3$
 $45x^2y^2$

$18a^2b^3$
 $120abc$
 $150a^4bc^2$

Factor completely:

⑪ $6x^2 + xy - 2y^2$
 $12a^2 - 13ab + 3b^2$

⑫ $4a^2x^2 - x^2b^2 + y^2b^2 - 4a^2y^2$
 $6a^2x - 3a^2y - 6b^2x + 3b^2y$

Solve:

⑬ $x^3 - 10x = 3x^2$

$5n^2 + 10 = 15n$



Linear equations:

- ⑭ Write an equation in standard form for a line that includes $(-2, 3)$ and $(5, 1)$.

Write an equation in slope-intercept form for a line that includes $(-4, 3)$ and $(-6, 7)$.

- ⑮ Write an equation in standard form for a line parallel to $y = \frac{1}{2}x + 2$ that passes through $(2, 4)$. Graph the line.

Write an equation in slope-intercept for a line perpendicular to $3x - y = 5$ through $(-9, 6)$. Graph the line.

Determine the value:

- ⑯ $f(n+4)$ for $f(x) = x^2 - 2x$
 $f(2a+3)$ for $f(x) = x - x^2$

Determine the midpoint:

- ⑰ $A(-5, 12)$ $B(-9, -4)$
 $A(8, -9)$ $B(-2, 3)$

Solve for x:

- ⑱ $2xy = 3x + 4y$
 $-2y = 4x + xy - 1$

Solve and graph on a number line:

- ⑲ $|2x+4| < 8$ and $|x| \neq 1$
 $|2n-4| > 10$ and $|n| \neq 10$

Multiply:

- ⑳ $(2x^{a+b} - y^{2a+b})^2$
 $(3x^{n-2} + 2y^{3n+1})^2$



Quarterly Exam #4 - Skills 9-12

REMIEDIATION & EXTRA PRACTICE

Classify the system and indicate number of solutions:

① $3x + 2y = 12$

$y = -\frac{3}{2}x + 6$

$2x - 5y = 10$

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



Solve (any method):

② $3x - 4y = -5$

$x + 5y = -8$

$4x - 2y = -14$

$6x + y = 3$

Simplify:

③ $\sqrt{60a^2b^3c^3}$

$\sqrt{75a^4bc^3d^2}$

Compute and simplify:

④ $\sqrt{3}(2\sqrt{6} - \sqrt{15}) - 2\sqrt{2}$

$4\sqrt{3} - 3\sqrt{2}(3\sqrt{6} - 2\sqrt{10})$

Simplify and rationalize:

⑤ $\frac{2\sqrt{3}}{3\sqrt{2}-4}$

$\frac{3\sqrt{10}}{\sqrt{5}-2}$

Interpolate:

⑥ $\sqrt{1645} \quad \sqrt{4534}$

Radical equations:

⑦ $\sqrt{2n+10} - 6 = -4$

$8 - \sqrt{5x+19} = 5$

Find the distance:

⑧ $(-3, 2)$ to $(-8, -3)$

$(5, -9)$ to $(9, -7)$

Determine the axis of symmetry, turning point. Graph the function:

⑨ $y = x^2 - 6x + 8$

$y = x^2 + 8x + 12$

Complete the square:

⑩ $n^2 - 6n + 6 = 0$

$2x^2 + 8x - 2 = 0$

Use the quadratic formula:

⑪ $x^2 - 6x + 1 = 0$

$3x^2 + 12x - 9 = 0$

Divide and simplify:

$$\textcircled{12} \frac{x^2 - 4x - 5}{x^2 - 7x + 12} \div \frac{x+1}{x-3}$$

$$\frac{2n^2 - 5n - 3}{n^2 + 6n + 8} \div \frac{2n+1}{2n+4}$$

Subtract and simplify:

$$\textcircled{13} \frac{2}{n-1} - \frac{3}{n^2-n}$$

$$\frac{3x}{x-2} - \frac{5}{2x-x^2}$$

Solve:

$$\textcircled{14} \frac{n-5}{n+1} + \frac{n+8}{n-2} = 3$$

$$\frac{n+3}{n} + \frac{4n}{n+3} = -4$$

Simplify:

$$\textcircled{15} \frac{n^2 - 2n - 3}{n^2 + n - 2} \div \frac{n+1}{n^2-4}$$

$$\frac{2x^2-2}{x^2+x-2} \div \frac{3x+3}{x+2}$$

Graph the system:

$$\textcircled{16} |y-6| < x+2$$

$$|y| > 2$$

$$|y+2| < x+4$$

$$|x| < 8$$



Quarterly Exam #4 - Problem Solving

REMEDICATION & EXTRA PRACTICE

- ① Find the largest of three consecutive even integers if twice the smallest decreased by the largest is sixteen less than twice the middle one.

Find the middle of three consecutive odd integers if the smallest decreased by the largest is three more than the middle one.

- ② Mark is six years older than Ramon. Six years ago, Ramon was $\frac{3}{4}$ Mark's age. How old is Mark now?

Ken is ten years older than Steve. Fourteen years ago, Steve was $\frac{4}{5}$ as old as Ken. How old will Ken be next year?

- ③ Janet has twice as many quarters as dimes and twice as many dimes as nickels. She has \$6.25. How many dimes does she have?

Colleen has $\frac{2}{3}$ as many dimes as quarters. The number of nickels she

has is two less than half the number of dimes. If she has \$3.90, how many quarters does she have?

- ④ The sum of an odd integer and the square of the next consecutive odd integer is 88. Determine the two integers.



The sum of the squares of two consecutive integers is 85. What are the integers?

- ⑤ Harry invests \$22,800, part at 7% and part at 5%. He earns exactly twice as much from the 5% investment. How much did he invest at 5% and how much interest did he earn at that rate?

Jack invests \$13,300, part at 8% and part at 4%. He earns exactly \$100 more from the 4% investment. How much did he invest at 4% and how much interest did he earn at that rate?

⑥ How much water must be evaporated from 30L of a 50% salt solution to bring the concentration of salt up to 60%?

How much salt should be added to 20L of a 40% salt solution to raise the concentration of salt up to 75%?

⑦ Denny leaves home riding his bicycle at 6 mph. One hour later, Alan starts riding from the same location at 10 mph. How long will it take Alan to catch up to Denny?

Michael leaves the concert at 2:00 driving 40 mph on his way home. His brother Jermaine leaves home and starts driving to the concert hall 30 minutes later, driving at 30 mph. If the concert hall is 125 miles from home, at what time will they meet?

⑧ Riding a bicycle with the wind, it takes 3 hours to travel 48 miles. Against the wind, it would take twice as long. What is the rate of the wind?

It takes three hours for a boat to travel 48 miles downstream and an hour longer to make the same trip upstream. What is the rate of the current?

⑨ Adding a uniform strip all the way around an 8 by 10 foot deck adds 63 ft^2 to its area. How wide is the strip?

Adding a uniform strip all the way around a 6 by 12 foot garden adds 88 ft^2 to its area. How wide a strip?

⑩ Joan can clean the car in 20 minutes. Melissa can do the same job in 12 minutes. How long would it take them if they work together?

John can wash the dishes in 20 minutes. Working together with Sarah, it takes them 12 minutes to finish. How long would it take Sarah to wash the dishes herself?



ONLY JOHN WOULD CARRY AROUND THE PICTURE OF THE GIRL THAT CAME WITH THE WALLET

