01a. Factor completely.

$20x^2y - 32xy^2$

$4xy$	2 pts to here
$4xy(5x - 8y)$	4 pts to here
Award 3 points if the correct GCF is found, but there is a minor mistake in factoring.	

01b. Factor completely.

$20xy^2 - 35x^2y$

$5xy$	2 pts to here
$5xy(4y - 7x)$	4 pts to here
Award 3 points if the correct GCF is found, but there is a minor mistake in factoring.	

01c. Factor completely.

$18wz^2 - 27w^2z$

$9wz$	2 pts to here
$9wz(2z - 3w)$	4 pts to here
Award 3 points if the correct GCF is found, but there is a minor mistake in factoring.	

01d. Factor completely.

$21a^2b - 14ab^2$

$7ab$	2 pts to here
$7ab(3a - 2b)$	4 pts to here
Award 3 points if the correct GCF is found, but there is a minor mistake in factoring.	

02a. Factor completely.

$x^2 + 6x - 27$

$(x + 9)(x - 3)$	4 pts
Reversed signs award 2 pts for the problem	
One correct factor award 1 pt for the problem	

02b. Factor completely.

$x^2 - 6x - 27$

$(x - 9)(x + 3)$	4 pts
Reversed signs award 2 pts for the problem	
One correct factor award 1 pt for the problem	

02c. Factor completely.

$x^2 + 3x - 28$

$(x+7)(x-4)$	4 pts
Reversed signs award 2 pts for the problem	
One correct factor award 1 pt for the problem	

02d. Factor completely.

$x^2 - 3x - 28$

$(x-7)(x+4)$	4 pts
Reversed signs award 2 pts for the problem	
One correct factor award 1 pt for the problem	

03a. Factor completely.

$6x^2 + x - 5$

$6x^2 + 6x - 5x - 5$	1 pt to here
$6x(x+1) - 5(x+1)$	2 pt to here
$(6x-5)(x+1)$	4 pts to here
Reversed signs award 3 pts for the problem	
One correct factor award 2 pt for the problem	

03b. Factor completely.

$5x^2 - 11x + 2$

$5x^2 - 10x - x + 2$	1 pt to here
$5x(x-2) - (x-2)$	2 pt to here
$(5x-1)(x-2)$	4 pts
Reversed signs award 3 pts for the problem	
One correct factor award 2 pt for the problem	

03c. Factor completely.

$5x^2 - 13x - 6$

$5x^2 - 15x + 2x - 6$	1 pt to here
$5x(x-3) + 2(x-3)$	2 pt to here
$(5x+2)(x-3)$	4 pts
Reversed signs award 3 pts for the problem	
One correct factor award 2 pt for the problem	

03d. Factor completely.

$9x^2 - 13x + 4$

$9x^2 - 9x - 4x + 4$	1 pt to here
$9x(x-1) - 4(x-1)$	2 pt to here
$(9x-4)(x-1)$	4 pts
Reversed signs award 3 pts for the problem	
One correct factor award 2 pt for the problem	

04a. Factor completely.

$25a^2 - 81$

$(5a-9)(5a+9)$	4 pts
Incorrect signs, numbers are correct	3 pts
One correct factor award	2 pts

04b. Factor completely.

$49a^2 - 64$

$(7a-8)(7a+8)$	4 pts
Incorrect signs, numbers are correct	3 pts
One correct factor award	2 pts

04c. Factor completely.

$81a^2 - 49$

$(9a-7)(9a+7)$	4 pts
Incorrect signs, numbers are correct	3 pts
One correct factor award	2 pts

04d. Factor completely.

$64a^2 - 25$

$(8a-5)(8a+5)$	4 pts
Incorrect signs, numbers are correct	3 pts
One correct factor award	2 pts

05a. Factor completely.

$25x^3y - 30x^2y + 9xy$

$xy(25x^2 - 30x + 9)$	2 pts to here
$xy(5x-3)^2$	4 pts
Incorrect sign, numbers are correct	3 pts

05b. Factor completely.

$49x^3y - 28x^2y + 4xy$

$xy(49x^2 - 28x + 4)$	2 pts to here
$xy(7x-2)^2$	4 pts
Incorrect sign, numbers are correct	3 pts

05c. Factor completely.

$16x^3y - 24x^2y + 9xy$

$xy(16x^2 - 24x + 9)$	2 pts to here
$xy(4x - 3)^2$	4 pts
Incorrect sign, numbers are correct	3 pts

05d. Factor completely.

$36x^3y - 24x^2y + 4xy$

$xy(36x^2 - 24x + 4)$	2 pts to here
$xy(6x - 2)^2$	4 pts
Incorrect sign, numbers are correct	3 pts

05weathera. Factor completely.

$3x^4 + 18x^3 + 27x^2$

$3x^2(x^2 + 6x + 9)$	2 pts to here
$3x^2(x + 3)^2$	4 pts
Incorrect sign, numbers are correct	3 pts

05weatherb. Factor completely.

$2x^4 + 12x^3 + 18x^2$

$2x^2(x^2 + 6x + 9)$	2 pts to here
$2x^2(x + 3)^2$	4 pts
Incorrect sign, numbers are correct	3 pts

06a. The height in feet that a model rocket attains is given by $h(t) = -5t^2 + 13t + 6$ where t is the time measured in seconds. How many seconds will it take until the rocket finally reaches the ground? (Hint: ground level is $h = 0$)

$0 = -5t^2 + 13t + 6$	2 pts to here
$0 = -(5t + 2)(t - 3)$	4 pts to here
$t - 3 = 0$	
$5t + 2 = 0$	6 pts to here
$t = -2/5$ second	8 pts given both answers
$t = 3$ seconds	10 pts if student shows
that 3 seconds is only answer	
(9 points if units are left off)	

06b. The height in feet that a model rocket attains is given by $h(t) = -5t^2 + 8t + 4$ where t is the time measured in seconds. How many seconds will it take until the rocket finally reaches the ground? (Hint: ground level is $h = 0$)

$0 = -5t^2 + 8t + 4$	2 pts to here
$0 = -(5t + 2)(t - 2)$	4 pts to here
$t - 2 = 0$	
$5t + 2 = 0$	6 pts to here
$t = -2/5$ second	8 pts given both answers
$t = 2$ seconds	10 pts if student shows
that 2 seconds is only answer	
(9 points if units are left off)	

06c. The height in feet that a model rocket attains is given by $h(t) = -5t^2 + 11t + 12$ where t is the time measured in seconds. How many seconds will it take until the rocket finally reaches the ground? (Hint: ground level is $h = 0$)

$0 = -5t^2 + 11t + 12$	2 pts to here
$0 = -(5t + 4)(t - 3)$	4 pts to here
$t - 3 = 0$	
$5t + 4 = 0$	6 pts to here
$t = -4/5$ second	8 pts given both answers
$t = 3$ seconds	10 pts if student shows
that 3 seconds is only answer	
(9 points if units are left off)	

06d. The height in feet that a model rocket attains is given by $h(t) = -5t^2 - 23t + 10$ where t is the time measured in seconds. How many seconds will it take until the rocket finally reaches the ground? (Hint: ground level is $h = 0$)

$0 = -5t^2 + 23t + 10$	2 pts to here
$0 = -(5t + 2)(t - 5)$	4 pts to here
$t - 5 = 0$	
$5t + 2 = 0$	6 pts to here
$t = -2/5$ second	8 pts given both answers
$t = 5$ seconds	10 pts if student shows
that 5 seconds is only answer	
(9 points if units are left off)	

07a. Simplify.

$$\frac{x^2 - 9x + 18}{2x^2 - 9x + 9}$$

Partial factoring of only the numerator	1 pt
Partial factoring of only the denominator	2 pts to here
$\frac{(x-6)(x-3)}{(2x-3)(x-3)}$	3 pts to here
$\frac{x-6}{2x-3}$	4 pts to here

07b. Simplify.

$$\frac{3x^2 - 11x - 4}{x^2 + x - 20}$$

Partial factoring of only the denominator	1 pt
Partial factoring of only the numerator	2 pts to here
$\frac{(3x+1)(x-4)}{(x+5)(x-4)}$	3 pts to here
$\frac{3x+1}{x+5}$	4 pts to here

07c. Simplify.

$$\frac{x^2 + 10x + 21}{2x^2 + 11x - 21}$$

Partial factoring of only the numerator	1 pt
Partial factoring of only the denominator	2 pts to here
$\frac{(x+7)(x+3)}{(2x-3)(x+7)}$	3 pts to here
$\frac{x+3}{2x-3}$	4 pts to here

07d. Simplify.

$$\frac{x^2 + 9x + 20}{2x^2 + 7x - 15}$$

Partial factoring of only the numerator	1 pt
Partial factoring of only the denominator	2 pts to here
$\frac{(x+5)(x+4)}{(2x-3)(x+5)}$	3 pts to here
$\frac{x+4}{2x-3}$	4 pts to here

08a. Simplify.

$$\frac{2x^2 - 7x - 15}{25 - x^2}$$

Partial factoring of only denominator or numerator	1 pt
$\frac{(2x+3)(x-5)}{(5-x)(5+x)}$	2 pts to here
$\frac{-(2x+3)(5-x)}{(5-x)(5+x)}$	3 pts to here
$-\frac{2x+3}{5+x}$	4 pts to here

08b. Simplify.

$$\frac{49 - x^2}{2x^2 - 9x - 35}$$

Partial factoring of only denominator or numerator	1 pt
$\frac{(7-x)(7+x)}{(2x+5)(x-7)}$	2 pts to here
$\frac{(7-x)(7+x)}{-(2x+5)(7-x)}$	3 pts to here
$-\frac{7+x}{2x+5}$	4 pts to here

08c. Simplify.

$$\frac{2x^2 - 7x - 4}{16 - x^2}$$

Partial factoring of only denominator or numerator	1 pt
$\frac{(x-4)(2x+1)}{(4-x)(4+x)}$	2 pts to here
$\frac{-(4-x)(2x+1)}{(4-x)(4+x)}$	3 pts to here
$-\frac{2x+1}{4+x}$	4 pts to here

08d. Simplify.

$$\frac{2x^2 - 11x + 12}{16 - x^2}$$

Partial factoring of only denominator or numerator	1 pt
$\frac{(x-4)(2x-3)}{(4-x)(4+x)}$	2 pts to here
$\frac{-(4-x)(2x-3)}{(4-x)(4+x)}$	3 pts to here
$-\frac{2x-3}{4+x}$	4 pts to here

09a. Multiply.

$$\frac{2x - 10}{x - 4} \times \frac{x^2 + 5x + 4}{x^2 - 4x - 5}$$

Factoring of equivalent of one rational expression	2 pt
$\frac{2(x-5)}{x-4} \times \frac{(x+4)(x+1)}{(x-5)(x+1)}$	4 pts to here
$\frac{2(x+4)}{x-4}$	6 pts to here

09b. Multiply.

$$\frac{x^2 - 2x - 15}{4x + 12} \times \frac{5x + 30}{x^2 - 3x - 10}$$

Factoring of equivalent of one rational expression	2 pt
$\frac{(x-5)(x+3)}{4(x+3)} \times \frac{5(x+6)}{(x-5)(x+2)}$	4 pts to here
$\frac{5(x+6)}{4(x+2)}$	6 pts to here

09c. Multiply.

$$\frac{x^2 - 2x - 35}{6x + 30} \times \frac{5x + 5}{x^2 - 5x - 14}$$

Factoring of equivalent of one rational expression	2 pt
$\frac{(x-7)(x+5)}{6(x+5)} \times \frac{5(x+1)}{(x-7)(x+2)}$	4 pts to here
$\frac{5(x+1)}{6(x+2)}$	6 pts to here

09d. Multiply.

$$\frac{x^2 + x - 30}{2x - 10} \times \frac{5x + 15}{x^2 + 4x - 12}$$

Factoring of equivalent of one rational expression	2 pt
$\frac{(x-5)(x+6)}{2(x-5)} \times \frac{5(x+3)}{(x-2)(x+6)}$	4 pts to here
$\frac{5(x+3)}{2(x-2)}$	6 pts to here

10a. Divide.

$$\frac{7x^2+28xy+28y^2}{x^2+7xy+6y^2} \div \frac{8x+16y}{x+y}$$

Factoring of equivalent of one rational expression	2 pt
$\frac{7(x+2y)(x+2y)}{(x+6y)(x+y)} \times \frac{x+y}{8(x+2y)}$	3 pts to here
$\frac{7(x+2y)}{8(x+6y)}$	6 pts to here

10b. Divide.

$$\frac{2x^2+16xy+32y^2}{x^2+9xy+8y^2} \div \frac{9x+36y}{x+y}$$

Factoring of equivalent of one rational expression	2 pt
$\frac{2(x+4y)(x+4y)}{(x+8y)(x+y)} \times \frac{x+y}{9(x+4y)}$	3 pts to here
$\frac{2(x+4y)}{9(x+8y)}$	6 pts to here

10c. Divide.

$$\frac{x^2-8x+15}{x^2+10x-24} \div \frac{x^2-3x-10}{x^2+14x+24}$$

Factoring of equivalent of one rational expression	2 pt
$\frac{(x-3)(x-5)}{(x+12)(x-2)} \times \frac{(x+12)(x+2)}{(x-5)(x+2)}$	3 pts to here
$\frac{x-3}{x-2}$	6 pts to here

10d. Divide.

$$\frac{x^2-9x+18}{x^2+9x-22} \div \frac{x^2-4x-12}{x^2+13x+22}$$

Factoring of equivalent of one rational expression	2 pt
$\frac{(x-3)(x-6)}{(x+11)(x-2)} \times \frac{(x+11)(x+2)}{(x-6)(x+2)}$	3 pts to here
$\frac{x-3}{x-2}$	6 pts to here

11a. Subtract.

$$\frac{3x}{x^2-49} - \frac{2}{x+7}$$

Factoring of equivalent of one rational expression	2 pt
$\frac{3x}{(x+7)(x-7)} - \frac{2(x-7)}{(x+7)(x-7)}$	3 pts to here
$\frac{3x-2x+14}{(x+7)(x-7)}$	5 pts to here
(4 pts if $3x-2x-14$)	
$\frac{x+14}{(x+7)(x-7)}$	6 pts to here
5 pts if $\frac{x-14}{(x+7)(x-7)}$	

11b. Subtract.

$$\frac{5x}{x^2-64} - \frac{4}{x+8}$$

Factoring of equivalent of one rational expression	2 pt
$\frac{5x}{(x+8)(x-8)} - \frac{4(x-8)}{(x+8)(x-8)}$	3 pts to here
$\frac{5x-4x+32}{(x+8)(x-8)}$	5 pts to here
(4 pts if $3x-2x-32$)	
$\frac{x+32}{(x+8)(x-8)}$	6 pts to here
5 pts if $\frac{x-32}{(x+8)(x-8)}$	

11c. Subtract.

$$\frac{6x}{x^2-25} - \frac{5}{x+5}$$

Factoring of equivalent of one rational expression	2 pt
$\frac{6x}{(x+5)(x-5)} - \frac{5(x-5)}{(x+5)(x-5)}$	3 pts to here
$\frac{6x-5x+25}{(x+5)(x-5)}$	5 pts to here
(4 pts if $6x-5x-25$)	
$\frac{x+25}{(x+5)(x-5)}$	6 pts to here
5 pts if $\frac{x-25}{(x+5)(x-5)}$	

11d. Subtract.

$$\frac{7x}{x^2-36} - \frac{6}{x+6}$$

Factoring of equivalent of one rational expression	2 pt
$\frac{7x}{(x+6)(x-6)} - \frac{6(x-6)}{(x+6)(x-6)}$	3 pts to here
$\frac{7x-6x+36}{(x+6)(x-6)}$	5 pts to here
(4 pts if $7x-6x-36$)	
$\frac{x+36}{(x+6)(x-6)}$	6 pts to here
5 pts if $\frac{x-36}{(x+6)(x-6)}$	

12a. Add.

$$\frac{7}{x^2+5x+6} + \frac{4}{x^2+10x+21}$$

$\frac{7}{(x+3)(x+2)} + \frac{4}{(x+7)(x+3)}$	2 pts to here
$\frac{7(x+7)}{(x+3)(x+2)(x+7)} + \frac{4(x+2)}{(x+7)(x+3)(x+2)}$	3 pts to here
$\frac{7x+49+4x+8}{(x+3)(x+2)(x+7)}$	5 pts to here
$\frac{11x+57}{(x+3)(x+2)(x+7)}$	6 pts to here

12b. Add.

$$\frac{4}{x^2+9x+14} + \frac{3}{x^2+6x+8}$$

$\frac{4}{(x+7)(x+2)}+\frac{3}{(x+2)(x+4)}$	2 pts to here
$\frac{4(x+4)}{(x+7)(x+2)(x+4)}+\frac{3(x+7)}{(x+7)(x+2)(x+4)}$	3 pts to here
$\frac{4x+16+3x+21}{(x+4)(x+2)(x+7)}$	5 pts to here
$\frac{7x+37}{(x+4)(x+2)(x+7)}$	6 pts to here

12c. Add.

$$\frac{3}{x^2+9x+20}+\frac{2}{x^2+10x+24}$$

$\frac{3}{(x+4)(x+5)}+\frac{2}{(x+6)(x+4)}$	2 pts to here
$\frac{3(x+6)}{(x+4)(x+5)(x+6)}+\frac{2(x+5)}{(x+6)(x+4)(x+5)}$	3 pts to here
$\frac{3x+18+2x+10}{(x+4)(x+5)(x+6)}$	5 pts to here
$\frac{5x+28}{(x+4)(x+5)(x+6)}$	6 pts to here

12d. Add.

$$\frac{4}{x^2+11x+28}+\frac{5}{x^2+9x+14}$$

$\frac{4}{(x+4)(x+7)}+\frac{5}{(x+7)(x+2)}$	2 pts to here
$\frac{4(x+2)}{(x+4)(x+7)(x+2)}+\frac{5(x+4)}{(x+7)(x+2)(x+4)}$	3 pts to here
$\frac{4x+8+5x+20}{(x+4)(x+7)(x+2)}$	5 pts to here
$\frac{9x+28}{(x+4)(x+7)(x+2)}$	6 pts to here

13a. Simplify.

$$\frac{\frac{16}{x^2-64}}{\frac{3}{x+8}+\frac{3}{x-8}}$$

Method 1

$\frac{\frac{16}{x^2-64}}{\frac{3(x-8)}{(x+8)(x-8)}}+\frac{3(x+8)}{(x-8)(x+8)}$	2 pts to here
$\frac{\frac{16}{x^2-64}}{\frac{6x}{(x+8)(x-8)}}$	3 pts to here
$\frac{16}{(x+8)(x-8)}\times\frac{(x+8)(x-8)}{6x}$	4 pts to here
$\frac{16}{6x}$	5 pts to here
$\frac{8}{3x}$	6 pts to here

Method 2

$\frac{(x+8)(x-8)}{(x+8)(x-8)}\times\frac{\frac{16}{x^2-64}}{\frac{3}{x+8}+\frac{3}{x-8}}$	2 pts to here
$\frac{16}{3(x-8)+3(x+8)}$	4 pts to here
$\frac{16}{6x}$	5 pts to here
$\frac{8}{3x}$	6 pts to here

13b. Simplify.

$$\frac{\frac{14}{x^2-49}}{\frac{4}{x+7}+\frac{4}{x-7}}$$

Method 1	
$\frac{\frac{14}{x^2-49}}{\frac{4(x-7)}{(x+7)(x-7)}} + \frac{4(x+7)}{(x+7)(x-7)}$	2 pts to here
$\frac{\frac{14}{x^2-49}}{\frac{8x}{(x+7)(x-7)}}$	3 pts to here
$\frac{14}{(x+7)(x-7)} \times \frac{(x+7)(x-7)}{8x}$	4 pts to here
$\frac{14}{8x}$	5 pts to here
$\frac{7}{4x}$	6 pts to here
Method 2	
$\frac{(x+7)(x-7)}{(x+7)(x-7)} \times \frac{\frac{14}{x^2-49}}{\frac{4}{x+7}+\frac{4}{x-7}}$	2 pts to here
$\frac{14}{4(x-7)+4(x+7)}$	4 pts to here
$\frac{14}{8x}$	5 pts to here
$\frac{7}{4x}$	6 pts to here

13c. Simplify.

$$\frac{\frac{15}{x^2-36}}{\frac{5}{x+6}+\frac{5}{x-6}}$$

Method 1	
$\frac{\frac{15}{x^2-36}}{\frac{5(x-6)}{(x+6)(x-6)}} + \frac{5(x+6)}{(x+6)(x-6)}$	2 pts to here
$\frac{\frac{15}{x^2-36}}{\frac{10x}{(x+6)(x-6)}}$	3 pts to here
$\frac{15}{(x+6)(x-6)} \times \frac{(x+6)(x-6)}{10x}$	4 pts to here
$\frac{15}{10x}$	5 pts to here
$\frac{3}{2x}$	6 pts to here
Method 2	
$\frac{(x+6)(x-6)}{(x+6)(x-6)} \times \frac{\frac{15}{x^2-36}}{\frac{5}{x+6}+\frac{5}{x-6}}$	2 pts to here
$\frac{15}{5(x-6)+5(x+6)}$	4 pts to here
$\frac{15}{10x}$	5 pts to here
$\frac{3}{2x}$	6 pts to here

13d. Simplify.

$$\frac{\frac{10}{x^2-25}}{\frac{7}{x+5}+\frac{7}{x-5}}$$

Method 1	
$\frac{\frac{10}{x^2-25}}{\frac{7(x-5)}{(x+5)(x-5)}} + \frac{7(x+5)}{(x+5)(x-5)}$	2 pts to here
$\frac{\frac{10}{x^2-25}}{\frac{14x}{(x+5)(x-5)}}$	3 pts to here
$\frac{10}{(x+5)(x-5)} \times \frac{(x+5)(x-5)}{14x}$	4 pts to here
$\frac{10}{14x}$	5 pts to here
$\frac{5}{7x}$	6 pts to here
Method 2	
$\frac{(x+5)(x-5)}{(x+5)(x-5)} \times \frac{\frac{10}{x^2-25}}{\frac{7}{x+5}+\frac{7}{x-5}}$	2 pts to here
$\frac{10}{7(x-5)+7(x+5)}$	4 pts to here
$\frac{10}{14x}$	5 pts to here
$\frac{5}{7x}$	6 pts to here

14a. Solve for x.

$$\frac{3x}{x^2-1} = \frac{7}{x+1} - \frac{5}{x-1}$$

$(x+1)(x-1)\frac{3x}{(x+1)(x-1)} = \frac{(x+1)(x-1)7}{x+1} - \frac{(x+1)(x-1)5}{x-1}$	2 pts to here
$3x = 7(x-1) - 5(x+1)$	3 pts to here
$3x = 7x - 7 - 5x - 5$	4 pts to here
$3x = 2x - 12$	5 pts to here
$x = -12$	6 pts to here

14b. Solve for x.

$$\frac{5x}{x^2-4} = \frac{8}{x+2} - \frac{4}{x-2}$$

$(x+2)(x-2)\frac{5x}{(x+2)(x-2)} = \frac{(x+2)(x-2)8}{x+2} - \frac{(x+2)(x-2)4}{x-2}$	2 pts to here
$5x = 8(x-2) - 4(x+2)$	3 pts to here
$5x = 8x - 16 - 4x - 8$	4 pts to here
$5x = 4x - 24$	5 pts to here
$x = -24$	6 pts to here

14c. Solve for x.

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

$(x+1)(x-1)\frac{2x}{(x+1)(x-1)} = \frac{(x+1)(x-1)3}{x+1} - \frac{(x+1)(x-1)2}{x-1}$	2 pts to here
$2x = 3(x-1) - 2(x+1)$	3 pts to here
$2x = 3x - 3 - 2x - 2$	4 pts to here
$2x = x - 5$	5 pts to here
$x = -5$	6 pts to here

14d. Solve for x.

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

$(x+2)(x-2)\frac{4x}{(x+2)(x-2)} = \frac{(x+2)(x-2)5}{x+2} - \frac{(x+2)(x-2)2}{x-2}$	2 pts to here
$4x = 5(x-2) - 2(x+2)$	3 pts to here
$4x = 5x - 10 - 2x - 4$	4 pts to here
$4x = 3x - 14$	5 pts to here
$x = -14$	6 pts to here

15a. Solve for a.

$$\frac{8a-1}{6a+8} = \frac{3}{4}$$

$4(8a-1) = 3(6a+8)$	3 pts to here
$32a - 4 = 18a + 24$	4 pts to here
$14a = 28$	5 pts to here
$a = 2$	6 pts to here

15b. Solve for a.

$$\frac{a+4}{7a-2} = \frac{1}{2}$$

$2(a+4) = 7a - 2$	3 pts to here
$2a + 8 = 7a - 2$	4 pts to here
$5a = 10$	5 pts to here
$a = 2$	6 pts to here

15c. Solve for a.

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

$3(a+3) = 2(4a-3)$	3 pts to here
$3a + 9 = 8a - 6$	4 pts to here
$5a = 15$	5 pts to here
$a = 3$	6 pts to here

15d. Solve for a.

$$\frac{a+2}{3a+1} = \frac{1}{2}$$

$2(a+2) = 3a + 1$	3 pts to here
$2a + 4 = 3a + 1$	4 pts to here
$a = 3$	6 pts to here

16a. A 5-gallon can of paint covers 300 square feet. How many gallons of paint do you need to cover 360 square feet?

$\frac{5}{300} = \frac{x}{360}$	4 pts to here
$5 \cdot 360 = 300x$	6 pts to here
$x = 6 gallons$	8 pts to here

16b. A 4-gallon can of paint covers 240 square feet. How many gallons of paint do you need to cover 360 square feet?

$\frac{4}{240} = \frac{x}{360}$	4 pts to here
$4 \cdot 360 = 240x$	6 pts to here
$x = 6 gallons$	8 pts to here

16c. A 5-gallon can of paint covers 250 square feet. How many gallons of paint do you need to cover 400 square feet?

$\frac{5}{250} = \frac{x}{400}$	4 pts to here
$5 \cdot 400 = 250x$	6 pts to here
$x = 8 gallons$	8 pts to here

16d. A 4-gallon can of paint covers 200 square feet. How many gallons of paint do you need to cover 400 square feet?

$\frac{4}{200} = \frac{x}{400}$	4 pts to here
$4 \cdot 400 = 200x$	6 pts to here
$x = 8 gallons$	8 pts to here

17a. On a map the distance between two mountains is $7\frac{1}{2}$ inches. The actual distance is 148 miles. Russ is camped at a location that on the map is $\frac{3}{4}$ inch from the base of the mountain. How many miles is he from the base of the mountain? Round to the nearest tenth.

$\frac{7.5in}{148miles} = \frac{.75in}{xmiles}$	4 pts to here
$7.5x = (.75)(148)$	6 pts to here
$x = 14.8$	7 pts to here
$x = 14.8 miles$	8 pts to here

17b. On a map the distance between two mountains is $5\frac{1}{2}$ inches. The actual distance is 116 miles. Russ is camped at a location that on the map is $\frac{3}{4}$ inch from the base of the mountain. How many miles is he from the base of the mountain? Round to the nearest tenth.

$\frac{5.5in}{116miles} = \frac{.75in}{xmiles}$	4 pts to here
$5.5x = (.75)(116)$	6 pts to here
$x = 15.8$	7 pts to here
$x = 15.8 miles$	8 pts to here

17c. On a map the distance between two mountains is $3\frac{1}{2}$ inches. The actual distance is 136 miles. Russ is camped at a location that on the map is $\frac{3}{4}$ inch from the base of the mountain. How many miles is he from the base of the mountain? Round to the nearest tenth.

$\frac{3.5in}{136miles} = \frac{.75in}{xmiles}$	4 pts to here
$3.5x = (.75)(136)$	6 pts to here
$x = 29.1$	7 pts to here
$x = 29.1miles$	8 pts to here

17d. On a map the distance between two mountains is $4\frac{1}{2}$ inches. The actual distance is 104 miles. Russ is camped at a location that on the map is $\frac{3}{4}$ inch from the base of the mountain. How many miles is he from the base of the mountain? Round to the nearest tenth.

$\frac{4.5in}{104miles} = \frac{.75in}{xmiles}$	4 pts to here
$4.5x = (.75)(104)$	6 pts to here
$x = 17.3$	7 pts to here
$x = 17.3miles$	8 pts to here

18a. Simplify.

$(-4x^{\frac{2}{3}}y^{\frac{1}{4}})(3x^{\frac{1}{6}}y^{\frac{1}{2}})$

$-12x^{\frac{2}{3}+\frac{1}{6}}y^{\frac{1}{4}+\frac{1}{2}}$	3 pts to here
$-12x^{\frac{5}{6}}y^{\frac{3}{4}}$	6 pts to here

18b. Simplify.

$(-5x^{\frac{1}{8}}y^{\frac{1}{6}})(2x^{\frac{3}{4}}y^{\frac{1}{3}})$

$-10x^{\frac{1}{8}+\frac{3}{4}}y^{\frac{1}{6}+\frac{1}{3}}$	3 pts to here
$-10x^{\frac{7}{8}}y^{\frac{1}{2}}$	6 pts to here

18c. Simplify.

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

$-6x^{\frac{1}{4}+\frac{1}{3}}y^{\frac{1}{2}+\frac{1}{3}}$	3 pts to here
$-6x^{\frac{7}{12}}y^{\frac{5}{6}}$	6 pts to here

18d. Simplify.

$(-4x^{\frac{1}{8}}y^{\frac{1}{2}})(2x^{\frac{3}{4}}y^{\frac{1}{3}})$

$-8x^{\frac{1}{8}+\frac{3}{4}}y^{\frac{1}{2}+\frac{1}{3}}$	3 pts to here
$-8x^{\frac{7}{8}}y^{\frac{5}{6}}$	6 pts to here

19a. Simplify.

$\sqrt[4]{81a^8b^{16}}$

$3a^2b^4$ 6 pts

19b. Simplify.

$\sqrt[4]{16a^{12}b^{20}}$

$2a^3b^5$ 6 pts

19c. Simplify.

$\sqrt[3]{64a^{12}b^{30}}$

$4a^4b^{10}$ 6 pts

19d. Simplify.

$\sqrt[3]{8a^{12}b^{15}}$

$2a^4b^5$ 6 pts

20a. Simplify.

$5\sqrt{2x} + 2\sqrt{18x} + 2\sqrt{32x}$

$5\sqrt{2x} + 6\sqrt{2x} + 2\sqrt{32x}$	2 pts to here
$5\sqrt{2x} + 6\sqrt{2x} + 8\sqrt{2x}$	4 pts to here
$19\sqrt{2x}$	6 pts to here

20b. Simplify.

$4\sqrt{50x} + 3\sqrt{2x} + \sqrt{72x}$

$20\sqrt{2x} + 3\sqrt{2x} + \sqrt{72x}$	2 pts to here
$20\sqrt{2x} + 3\sqrt{2x} + 6\sqrt{2x}$	4 pts to here
$29\sqrt{2x}$	6 pts to here

20c. Simplify.

$3\sqrt{12x} + 5\sqrt{3x} + \sqrt{75x}$

$6\sqrt{3x} + 5\sqrt{3x} + \sqrt{75x}$	2 pts to here
$6\sqrt{3x} + 5\sqrt{3x} + 5\sqrt{3x}$	4 pts to here
$16\sqrt{3x}$	6 pts to here

20d. Simplify.

$2\sqrt{27x} + \sqrt{48x} + 7\sqrt{3x}$

$6\sqrt{3x} + \sqrt{48x} + 7\sqrt{3x}$	2 pts to here
$6\sqrt{3x} + 4\sqrt{3x} + 7\sqrt{3x}$	4 pts to here
$17\sqrt{3x}$	6 pts to here