Module G

Algebraic Fractions
Exercises: Simplifying algebraic fractions

Section I - Find the values for which the algebraic fraction is undefined.

1) \[ \frac{4x}{x - 3} \]
2) \[ \frac{7}{x + 2} \]
3) \[ \frac{2x^5}{8x^6} \]
4) \[ \frac{6x^3y^4}{20x^3y^7} \]
5) \[ \frac{2x^5}{14x^2 - 2x} \]
6) \[ \frac{2x - 2}{x^2 - x} \]
7) \[ \frac{3y^4 + 15y^3}{3y^3 - 75y} \]
8) \[ \frac{x + 1}{x^2 + 4x + 3} \]
9) \[ \frac{x + 7}{x^2 + 12x + 35} \]
10) \[ \frac{x - 6}{x^2 - 5x - 6} \]

Section II - Reduce the algebraic fraction to lowest terms.

11) \[ \frac{4x}{6x - 18} \]
12) \( \frac{7}{14x + 7} \)
13) \( \frac{2x^5}{8x^6} \)
14) \( \frac{6x^3y^4}{20x^3y^7} \)
15) \( \frac{2x^5}{14x^2 - 2x} \)
16) \( \frac{2x - 2}{x^2 - x} \)
17) \( \frac{3y^4 + 15y^3}{3y^3 - 75y} \)
18) \( \frac{x + 1}{x^2 + 4x + 3} \)
19) \( \frac{x + 7}{x^2 + 12x + 35} \)
20) \( \frac{x - 6}{x^2 - 5x - 6} \)
21) \( \frac{a + 1}{a^2 - 8a - 9} \)
22) \( \frac{2 - x}{8 - 2x - x^2} \)
23) \( \frac{x - 2}{8 - 2x - x^2} \)
24) \[
\frac{x^2 - 9}{x^2 - 6x + 9}
\]

25) \[
\frac{t^2 - 2t - 35}{t^2 + 10t + 25}
\]

26) \[
\frac{2y^2 + 5y - 3}{4y^2 - 4y + 1}
\]

27) \[
\frac{4(x^2 + 5x - 36)}{4x^2 - 32x + 64}
\]

28) \[
\frac{216 - 12r - 4r^2}{2r^2 + 30r + 108}
\]

29) \[
\frac{40x^3 + 140x^2 - 300x}{8x^3 + 28x^2 - 60x}
\]
Answers to exercises: Simplifying algebraic fractions

Section I - Find the values for which the algebraic fraction is undefined.

1) \( x \neq 3 \)
2) \( x \neq -2 \)
3) \( x \neq 0 \)
4) \( x \neq 0 \) & \( y \neq 0 \)
5) \( x \neq 0 \) & \( x \neq 1/7 \)
6) \( x \neq 0 \) & \( x \neq 1 \)
7) \( y \neq 0, y \neq 5 \) & \( y \neq -5 \)
8) \( x \neq -3 \) & \( x \neq -1 \)
9) \( x \neq -5 \) & \( x \neq -7 \)
10) \( x \neq -1 \) & \( x \neq 6 \)

Section II - Reduce the algebraic fraction to lowest terms.

11) \( \frac{2x}{3(x-3)} \)
12) \( \frac{1}{2x+1} \)
13) \( \frac{1}{4x} \)
14) \( \frac{3}{10y^3} \)
15) \( \frac{x^4}{7x-1} \)
16) \( \frac{2}{x} \)
17) \( \frac{y^2}{y - 5} \)
18) \( \frac{1}{x + 3} \)
19) \( \frac{1}{x + 5} \)
20) \( \frac{1}{x + 1} \)
21) \( \frac{1}{a - 9} \)
22) \( \frac{1}{4 + x} \)
23) \( -\frac{1}{4 + x} \)
24) \( \frac{x + 3}{x - 3} \)
25) \( \frac{t - 7}{t + 5} \)
26) \( \frac{y + 3}{2y - 1} \)
27) \( \frac{x + 9}{x - 4} \)
28) \( \frac{2(6 - r)}{r + 6} \)
29) 5
Exercises: Multiplying and dividing algebraic fractions

Multiply/divide the algebraic fraction as indicated.

1) \( \frac{4x}{x - 3} \cdot \frac{3}{x} \)

2) \( \frac{7}{x + 2} \cdot \frac{x^2 - 4}{14x} \)

3) \( \frac{2x^5}{7y^6} \cdot \frac{21xy^3}{10} \)

4) \( \frac{6x^3y^4}{30a^5b} \div \frac{20x^3y^7}{a^9b^4} \)

5) \( \frac{2x^5}{14x^2 - 2x} \div \frac{4x}{x^2 + 8x - 9} \)

6) \( \frac{2x + 2}{x^2 - x} \cdot \frac{1 - x}{x + 2} \)

7) \( \frac{y^2 + 9y + 18}{3y^3 - 75y} \cdot \frac{3y^4 + 15y^3}{6 + y} \)

8) \( \frac{x^2 + 6x + 9}{x^2 + 4x + 3} \div \frac{x + 3}{x + 1} \)

9) \( \frac{x + 7}{x^2 + 12x + 35} \div \frac{3x - 15}{x^2 - 10x + 25} \)

10) \( \frac{x + 5}{x^2 - 5x - 6} \cdot \frac{x^2 - 36}{5x + 30} \)

11) \( \frac{4x}{6x - 18} \div \frac{20x^2}{3x + 9} \)
12) \( \frac{x+7}{x} \cdot \frac{4x}{7+x} \)
13) \( \frac{3a^2b}{20x^3y^7} \div \frac{15a^4b^5}{6x^3y^4} \)
14) \( \frac{2x^2 - 5x - 12}{5x - 5y} \div \frac{2(2x + 3)(x - 4)}{y - x} \)
15) \( \frac{2x^5}{4x + 9} \cdot \frac{16x^2 + 36x}{4x + 4} \)
16) \( \frac{2xy - x}{49} \cdot \frac{7xy - 7y^2}{x^2 - xy} \)
17) \( \frac{y^2 + 9}{y^2 - 9} \div \frac{y + 3}{y - 3} \)
18) \( \frac{a^2 + 4a + 3}{9a^2 + 54a + 81} \div \frac{3a + 3}{2a + 6} \)
19) \( \frac{t^2 - 2t - 35}{49t - 7t^2} \cdot \frac{25t + 5t^2}{t^3 + 10t^2 + 25t} \)
Answers to exercises: Multiplying and dividing algebraic fractions

Multiply/divide the algebraic fraction as indicated.

1) $\frac{12}{x - 3}$
2) $\frac{x - 2}{2x}$
3) $\frac{3x^6}{5y^3}$
4) $\frac{a^4b^3}{100y^3}$
5) $\frac{x^3(x - 1)(x + 9)}{4(7x - 1)}$
6) $\frac{-2(x + 1)}{x(x + 2)}$
7) $\frac{y^2(y + 3)}{y - 5}$
8) 1
9) $\frac{x - 5}{3(x + 5)}$
10) $\frac{x + 5}{5(x + 1)}$
11) $\frac{x + 3}{10x(x - 3)}$
12) 4
13) \frac{3}{50a^2b^4y^3}

14) \frac{1}{10}

15) \frac{2x^6}{x + 1}

16) \frac{y(2y - 1)}{7}

17) \frac{y^2 + 9}{(y + 3)^2}

18) \frac{2}{27}

19) - \frac{5}{7t}
Exercises: Addition and subtraction of algebraic fractions

Add/subtract the algebraic fractions as indicated.

1) \frac{1}{x} + \frac{2}{x}

2) \frac{1}{x} - \frac{2}{x}

3) \frac{x}{xy} + \frac{2}{xy}

4) \frac{x}{xy} + \frac{y}{xy}

5) \frac{x}{x+y} + \frac{y}{x+y}

6) \frac{x}{x+y} - \frac{y}{x+y}

7) \frac{2x}{x+4} + \frac{x-4}{x+4}

8) \frac{2x}{x+4} - \frac{x-4}{x+4}

9) \frac{1}{x+2} + \frac{1}{x}

10) \frac{1}{x+2} - \frac{1}{x}
11) \( \frac{1}{x+2} - \frac{1}{x^2} \)

12) \( \frac{1}{x(x-2)} - \frac{1}{x^2} \)

13) \( \frac{2}{x-2} - \frac{1}{x-1} \)

14) \( \frac{x}{x-3} + \frac{2}{x-1} \)

15) \( \frac{x}{x^2-25} + \frac{1}{x+5} \)

16) \( \frac{x}{x^2-25} - \frac{1}{x+5} \)

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

18) \( \frac{1}{x^2-2x+1} - \frac{1}{x^2-x} \)

19) \( \frac{8x-4}{x^3-x^2-6x} + \frac{2}{x+2} \)

20) \( \frac{8x-4}{x^2-x-6} + \frac{2}{x^2+2x} \)

21) \( \frac{x+1}{x^2+8x-9} - \frac{1}{x^2-x} \)
\[
\begin{align*}
22) \quad & \frac{1}{x^2 + 8x + 16} + \frac{1}{x^2 - 16} \\
23) \quad & \frac{2x - 4}{x^2 - 4x + 4} - \frac{x + 2}{x^2 - 4}
\end{align*}
\]
Answers to exercises: Addition and subtraction of algebraic fractions

Add/subtract the algebraic fractions as indicated.

1) \( \frac{3}{x} \)
2) \( -\frac{1}{x} \)
3) \( \frac{x + 2}{xy} \)
4) \( \frac{x + y}{xy} \)
5) 1
6) \( \frac{x - y}{x + y} \)
7) \( \frac{3x - 4}{x + 4} \)
8) 1
9) \( \frac{2x + 2}{x(x + 2)} \)
10) \( -\frac{2}{x(x + 2)} \)
11) \( \frac{x^2 - x - 2}{x^2(x + 2)} \)
12) \( \frac{2}{x^2(x - 2)} \)

13) \( \frac{x}{(x - 2)(x - 1)} \)

14) \( \frac{(x + 3)(x - 2)}{(x - 3)(x - 1)} \)

15) \( \frac{2x - 5}{(x - 5)(x + 5)} \)

16) \( \frac{5}{(x - 5)(x + 5)} \)

17) \( \frac{1}{x - 1} \)

18) \( \frac{1}{x(x - 1)^2} \)

19) \( \frac{2(x - 1)}{x(x - 3)} \)

20) \( \frac{2(4x + 3)(x - 1)}{x(x - 3)(x + 2)} \)

21) \( \frac{x^2 - 9}{x(x + 9)(x - 1)} \)

22) \( \frac{2x}{(x + 4)^2(x - 4)} \)
23) \( \frac{1}{x-2} \)
Exercises: Solving equations containing algebraic fractions

Solve for the indicated variable.

1) \( \frac{1}{x} + \frac{2}{x} = \frac{x-1}{x} \)
2) \( \frac{1}{x} - \frac{2}{x} = \frac{x-1}{x} \)
3) \( \frac{y+7}{3y} + \frac{2}{3y} = \frac{4}{3y} \)
4) \( \frac{y+7}{3y} - \frac{2}{3y} = \frac{4}{3y} \)
5) \( \frac{a}{a+3} + \frac{3}{a+3} = \frac{12}{a+3} \)
6) \( \frac{a}{a-2} - \frac{1}{a-2} = \frac{1}{a-2} \)
7) \( \frac{2x}{x+4} + \frac{x-4}{x+4} = \frac{8}{x+4} \)
8) \( \frac{5x-2}{x-7} - \frac{2x+8}{x-7} = \frac{11}{x-7} \)
9) \( \frac{x}{x+2} + \frac{1}{x} = \frac{4}{x^2 + 2x} \)
10) \( \frac{x}{x+2} - \frac{1}{x} = \frac{4}{x^2 + 2x} \)
11) \( \frac{2}{x+2} - \frac{1}{x^2} = \frac{4}{x^3 + 2x^2} \)
12) \( \frac{1}{x(x-2)} - \frac{1}{x^2} = \frac{4}{x^2 - 2x} \)
13) \( \frac{2}{x-2} - \frac{1}{x-1} = \frac{4x}{x^2 - 3x + 2} \)

14) \( \frac{x}{x-3} + \frac{2}{x-1} = \frac{x-2}{x^2 - 4x + 3} \)

15) \( \frac{1}{x+5} - \frac{2x}{x^2 - 25} = \frac{x}{x-5} \)

16) \( \frac{x}{x+5} + \frac{14x}{x^2 - 25} = \frac{7}{x-5} \)

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

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

19) \( \frac{8x - 4}{x^3 - x^2 - 6x} + \frac{2}{x+2} = \frac{6}{x^2 - 3x} \)

20) \( \frac{8x + 6}{x^2 - x - 6} - \frac{1}{x^2 + 2x} = \frac{6}{x^2 - 3x} \)

21) \( \frac{x + 3}{x^2 - x - 6} + \frac{1}{x^2 + 2x} = \frac{6}{x^2 - 3x} \)

22) \( \frac{x}{x^2 + 8x + 16} - \frac{1}{x + 4} = \frac{2}{x^2 - 16} \)

23) \( \frac{x + 1}{x^2 + 8x + 16} - \frac{1}{(x + 4)^2} = \frac{3x}{x^2 - 16} \)
Answers to exercises: Solving equations containing algebraic fractions

Solve for the indicated variable.

1) \( x = 4 \)
2) No solution
3) \( y = -5 \)
4) \( y = -1 \)
5) \( a = 9 \)
6) No solution
7) \( x = 4 \)
8) No solution
9) \( x = 1 \)
10) \( x = 3 \)
11) \( x = 2 \) & \( x = -3/2 \)
12) \( x = 1/2 \)
13) \( x = 0 \)
14) \( x = 2 \) & \( x = -2 \)
15) \( x = -1 \)
16) \( x = -7 \)
17) \( x = 3 \) & \( x = -3 \)
18) \( x = -1 \)
19) \( x = 4 \)
20) \( x = -1 \) & \( x = 9/8 \)
21) \( x = 5 \) & \( x = -3 \)
22) \( x = 4/3 \)
23) \( x = 0 \) & \( x = -8 \)
Exercises: Solving applied problems

Section I – Solve each proportion for the indicated variable.

1) \( \frac{x}{3} = \frac{7}{10} \)

2) \( \frac{a}{3} = \frac{5}{3} \)

3) \( \frac{2}{14} = \frac{x}{7} \)

4) \( \frac{7}{4} = \frac{7}{2a} \)

5) \( \frac{2}{5} = \frac{x-2}{25} \)

6) \( \frac{4}{9} = \frac{y}{3} \)

7) \( \frac{x+5}{11} = \frac{1}{x-5} \)

8) \( \frac{3x}{5} = \frac{6}{x+3} \)

9) \( \frac{2x-3}{x+1} = \frac{2x}{x+1} \)

10) \( \frac{x-7}{3} = \frac{x^2-49}{9} \)

Section II – Solve each problem algebraically, i.e., define a variable and set up a proportion using that variable.
11) A recipe calls for 63 grams of butter. You know from experience that one tablespoon of butter weighs approximately 14 grams. How many tablespoons do you add to the recipe?

12) A recipe calls for 52 ounces of cream. You know one cup of cream weighs approximately 8 ounces. How many cups of cream do you add?

13) You must add 165 grams of chocolate to a recipe. Each square of semi-sweet chocolate weighs approximately 30 grams. How many squares do you add to the recipe?

14) You must modify a recipe that calls for 6 tablespoons of butter and \( \frac{1}{3} \) of a cup of brown sugar. You only have \( \frac{1}{2} \) of a cup of brown sugar. How many tablespoons of butter should you use?

15) You have a terrible headache. You normally take 2 extra-strength aspirin (500 mg each) and find relief. The only thing in the house is baby aspirin (80 mg each). How many baby aspirin must you take to relieve your headache?

16) You and your Siberian Husky have arthritis. Your veterinarian recommends giving your dog 1200 mg of glucosamine daily. If 0.25 ounces of your liquid supplement provides 2000 mg of glucosamine, how many ounces of this liquid should you administer to your dog?

17) Your cat has diabetes. You normally give the cat U-40 insulin from a syringe designed for that concentration of insulin (See Supplementary examples). You refill your prescription and order U-125 insulin, a higher concentration, but neglect to order the appropriate syringes for that concentration. How many units (lines on the syringe) should you administer to your 10-kg cat?

18) The percentage of obesity in Canada is 14.3%. If the population of Toronto is 6,029,393, approximately how many people are obese in Toronto?*

19) The percentage of obesity in Japan is 3.2%. If the population of Nagoya is 3,294,602, approximately how many people are obese in Nagoya?*

20) 55% of people in Venezuela are very happy. If the female population of Venezuela is 12,766,274, approximately how many women and girls are very happy in Venezuela?*

21) 23% of people in Japan are very happy. If the population of Nagoya is 3,294,602, approximately how many people are very happy in Nagoya?*
22) 39% of people in the USA are very happy. If the population of Suffolk County is 1,493,350, approximately how many people are very happy in Suffolk County?*

23) 43% of zombies are very happy. If the population of zombies in Suffolk County is 197,050, approximately how many zombies are very happy in Suffolk County?**

24) The rate of destruction by Godzilla is known to be 19000 people per hour. This rate is dependent upon the number of people per square mile. The population density in Suffolk County is 1,637.1 people per square mile. If Suffolk County is approximately 912.2 square miles, how long before all of Suffolk County is destroyed? **

* http://www.nationmaster.com

**The author realizes the extreme unrealistic nature of this question. Godzilla is a harmless, vegetarian creature coexisting with plankton and little Nemo’s family in the Philippine and Sagami-nada seas since the 1960s. Zombies exist only in Los Angeles and parts of the East Village. No people were actually harmed in the writing of this question. No animal testing nor testing upon animations was ever conceived of before, during or after the writing of this question, with regard to this question or any other question in this virtual book. All silliness reserved.
Answers to exercises: Solving applied problems

Section I - Solve each proportion for the indicated variable.
1) $x = 2.1$
2) $a = 5$
3) $x = 1$
4) $a = 2$
5) $x = 12$
6) $y = \frac{4}{3}$
7) $x = 6$ or $x = -6$
8) $x = 2$ or $x = -5$
9) no solution
10) $x = -4$

Section II - Solve each problem algebraically, i.e., define a variable and set up a proportion using that variable.

11) Add $4\frac{1}{2}$ tablespoons of butter.
12) Use 6.5 cups of cream.
13) Add $5\frac{1}{2}$ squares of chocolate to the recipe.
14) Use 4 tablespoons of butter.
15) You must take $12\frac{1}{2}$ baby aspirin to obtain a similar result.
16) You should administer 0.15 ounces of this liquid glucosamine supplement to your dog.
17) Your cat requires 1.6 units (or 1.6 lines on the syringe) of the U-125 insulin.
18) Approximately 862,203 people are obese in Toronto.*
19) Approximately 105,427 people are obese in Nagoya, Japan.*
20) Approximately 7,021,451 women and girls are very happy in Venezuela.*
21) Approximately 757,758 people are very happy in Nagoya.*
22) Approximately 582,407 people are very happy in Suffolk County.*
23) Approximately 84,732 zombies are very happy in Suffolk County.**

24) All of Suffolk County should be destroyed in about 78.6 hours or 3 days, 6 hours and 40 minutes.**

* http://www.nationmaster.com

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Module G Review Exercises

Section I - Determine the values for which the algebraic fractions are not defined (Section G1).

1) \( \frac{2}{x + 5} \)

2) \( \frac{x}{x - 3} \)

3) \( \frac{x + 5}{x} \)

4) \( \frac{4x}{x(x + 5)} \)

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

6) \( \frac{x + 6}{x^2 + 5x + 6} \)

7) \( \frac{8xy^2}{2x^3y - 4x^2y^2} \)

Section II - Reduce the fraction to lowest terms (Section G1).

8) \( \frac{4x}{x(x + 5)} \)

9) \( \frac{2x - 3}{4x^2 - 9} \)

10) \( \frac{x + 2}{x^2 + 5x + 6} \)

11) \( \frac{8xy^2}{2x^3y - 4x^2y^2} \)

12) \( \frac{6x^2 + 9x}{4x^2 - 9} \)

13) \( \frac{x^2 + 5x + 6}{x^2 + x - 6} \)
Section III - Multiply/divide as indicated (Section G2).

14) \[ \frac{4}{x(x+4)} \cdot \frac{2x^3 - 8x^2}{x^2 - 8x + 16} \]
15) \[ \frac{4}{x^2(x+4)} \cdot \frac{2x^3 - 8x^2}{2x^2 - 16x + 32} \]
16) \[ \frac{4}{x^2(x-4)} + \frac{2x^3 - 8x^2}{2x^2 - 16x + 32} \]
17) \[ \frac{2x - 3}{4x^2 + 12x + 9} \]
18) \[ \frac{2x - 3}{4x^2 - 9} + \frac{4x^2 + 12x + 9}{2x^2 + 3x} \]
19) \[ \frac{6ab^2c}{21a^3bc^4} \cdot \frac{a^3c}{4b^5c^3} \]
20) \[ \frac{6ab^2c}{21a^3bc^4} + \frac{a^3c}{4b^5c^3} \]
21) \[ \frac{8xy^2}{2x^3y - 4x^2y^2} \cdot \frac{5x^3y + 15xy}{6x^5y^3} \]
22) \[ \frac{x^2 + 5x + 6}{x^2 + x - 6} \cdot \frac{x^2 - 4}{7x + 21} \]
23) \[ \frac{x^2 + 5x + 6}{x^2 + x - 6} + \frac{x^2 - 4}{7x + 21} \]

Section III - Add/subtract as indicated (Section G3).

24) \[ \frac{16}{x(x+4)} + \frac{x + 8}{x + 4} \]
25) \[ \frac{16}{x(x+4)} - \frac{x + 20}{x(x+4)} \]
26) \[ \frac{x}{x^2 - 4} + \frac{x + 4}{x^2 - 4} \]
27) \( \frac{x}{x-2} + \frac{x+2}{x^2-4} \)

28) \( \frac{x}{x-2} - \frac{4x+8}{x^2-4} \)

29) \( \frac{2a^4b^{-4}c}{21a^3c^4} + \frac{ab}{3b^5c^3} \)

30) \( \frac{4a^4b^{-4}c}{21a^3c^4} - \frac{ab}{3b^5c^3} \)

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

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

33) \( \frac{x^2+5x+6}{x^2+x-6} + \frac{x+2}{7x+21} \)

34) \( \frac{x^2+5x}{x^2+x-6} - \frac{2}{7x+21} \)

35) \( \frac{3(5-x)}{2x^2-11x+5} + \frac{2x}{2x-1} \)

Section IV - Solve for the indicated variable (Section 64).

36) \( \frac{16}{x(x+4)} + \frac{x+8}{x+4} = \frac{1}{x^2+4x} \)

37) \( \frac{16}{x(x+4)} - \frac{x+20}{x(x+4)} = \frac{x}{x(x+4)} \)

38) \( \frac{15}{x(x+4)} - \frac{x+20}{x(x+4)} = \frac{x+3}{x(x+4)} \)

39) \( \frac{2a^2}{3a^3c^4} + \frac{a}{3a^3c^4} = \frac{2a}{3a^3c^4} \)

40) \( \frac{x^2-4}{x^2+x-6} - \frac{x-4}{x+3} = \frac{6}{x^2+x-6} \)
Section V - Applications. Solve by writing a proportion (Section G5).

46) A recipe calls for 5 1/2 ounces of butter. You know from experience that one tablespoon of butter weighs approximately 1/2 of an ounce. How many tablespoons do you add to the recipe?

47) You are on a high protein diet. You are making a peanut butter sandwich and want to keep the calories from the peanut butter under 325. You know that 100 grams of peanut butter contains 588 calories. How many grams of peanut butter can you spread on your sandwich?

48) A recipe calls for 52 ounces of sour cream. You know one cup of sour cream weighs approximately 8 ounces. How many cups of sour cream do you use?

49) You have a terrible headache. You normally take 3 extra-strength acetaminophen tablets (435 mg each) in order to find relief. The only thing in the house is a premenstrual pain reliever containing 325 mg of acetaminophen (plus other miscellaneous ingredients) in each tablet. How many tablets of the premenstrual pain reliever should you take in order to relieve your headache?

50) Your Siberian Husky has diabetes. You normally give the dog U-40 insulin from a syringe designed for that concentration of insulin (See Supplementary examples G5). You refill your prescription and order U-160 insulin, a higher concentration, but neglect to order the appropriate syringes for that concentration. How many units (lines on the syringe) should you administer to your 20 kg dog? The correct dosage is 0.8 units per kg of dog weight.

51) 75% of people dye their hair. If the population of Suffolk County is
1,493,350, approximately how many people dye their hair in Suffolk County?

52) 53% of zombies do not dye their hair. If there are 18,250 zombies still sporting their natural hair color in Suffolk County, how many zombies reside in Suffolk County?

53) Godzilla is approaching Suffolk County. Godzilla has improved his rate of destruction by 9.2% via an intense Zumba fitness regimen. Please refer to exercise #24, section G5. How long before all of Suffolk County is destroyed?
Module G Answers to Review Exercises

Section I - Determine the values for which the algebraic fractions are not defined (Section G1).
1) \( x \neq -5 \)
2) \( x \neq 3 \)
3) \( x \neq 0 \)
4) \( x \neq 0 \) & \( x \neq -5 \)
5) \( x \neq \frac{3}{2} \) & \( x \neq -\frac{3}{2} \)
6) \( x \neq -3 \) & \( x \neq -2 \)
7) \( x \neq 0, y \neq 0 \) & \( x \neq 2y \)

Section II - Reduce the fraction to lowest terms (Section G1).

8) \( \frac{4}{x+5} \)
9) \( \frac{1}{2x+3} \)
10) \( \frac{1}{x+3} \)
11) \( \frac{4y}{x(x-2y)} \)
12) \( \frac{3x}{2x-3} \)
13) \( \frac{x+2}{x-2} \)

Section III - Multiply/divide as indicated (Section G2).

14) \( \frac{8x}{(x+4)(x-4)} \)
15) \( \frac{4}{(x+4)(x-4)} \)
16) \( \frac{4}{x^4} \)
17) \( \frac{1}{x} \)
18) \( \frac{x}{(2x + 3)^2} \)
19) \( \frac{a}{14b^4c^5} \)
20) \( \frac{8b^6}{7a^5c} \)
21) \( \frac{10(x^2 + 3)}{3x^5y(x - 2y)} \)
22) \( \frac{(x + 2)^2}{7(x + 3)} \)
23) \( \frac{7(x + 3)}{(x - 2)^2} \)

Section III - Add/subtract as indicated (Section G3).

24) \( \frac{x + 4}{x} \)
25) \( \frac{1}{x} \)
26) \( \frac{2}{x - 2} \)
27) \( \frac{x + 1}{x - 2} \)
28) \( \frac{x - 4}{x - 2} \)
29) \( \frac{3a}{7b^4c^3} \)
30) \( \frac{a}{7b^4c^3} \)

31) \( \frac{2(x - 1)}{x + 3} \)

32) \( \frac{6}{(x + 3)} \)

33) \( \frac{(8x + 19)(x + 2)}{7(x + 3)(x - 2)} \)

34) \( \frac{7x^2 + 33x + 4}{7(x + 3)(x - 2)} \)

35) \( \frac{2x - 3}{2x - 1} \)

Section IV - Solve for the indicated variable (Section G4).
36) \( x = -3 \) & \( x = -5 \)
37) \( x = -2 \)
38) no solution; \( x \neq -4 \)
39) \( a = \frac{1}{2}; a \neq 0 \)
40) \( x = 3 \)
41) \( x = -3; x \neq -1 \)
42) \( x = 3 \) & \( x = -11 \)
43) \( x = -17 \)
44) no solution; \( x \neq -7 \)
45) \( x = 7; x \neq -7 \)

Section V - Applications. Solve by writing a proportion (Section G5).
46) Add 11 tablespoons of butter.
47) Using 55 grams of peanut butter will keep the calories < 325.
48) Use 6.5 cups of sour cream.
49) Take 4 tablets of the premenstrual pain reliever.
50) Administer 4 units (4 lines on the U-40 syringe) to your dog.
51) Approximately 1,120,013 people dye their hair in Suffolk County.
52) There are about 38,830 zombies residing in Suffolk County.
53) About 71.98 hours or nearly 3 days.
Module G Practice Test

There are 10 questions worth 10 points each. Upon completion, you may check your answers and grade yourself.

1) Determine the values for which \( \frac{3x - 5}{9x^2 - 25} \) is undefined.

2) Reduce \( \frac{x^2 - 64}{x^2 + 16x + 64} \) to lowest terms.

3) Multiply: \( \frac{x + 3}{x^2 + 4x + 4} \cdot \frac{2x^2 + 4x}{x^3 - 9x} \)

4) Divide: \( \frac{5y^2 - 15y}{y^2 + 5y - 6} + \frac{3y - y^2}{y^2 - 2y + 1} \)

5) Subtract: \( \frac{x + 1}{(x + 1)^2} - \frac{2}{x^2 + x} \)

6) Add: \( \frac{t + 1}{t - 4} + \frac{2t}{t^2 + 4t} \)

7) Solve for \( x \): \( \frac{x^2 - 64}{x^2 + 16x + 64} + \frac{17}{x + 8} = \frac{1}{x + 8} \)

8) Solve for \( y \): \( \frac{y - 6}{2y - 1} + \frac{4}{y} = \frac{2}{2y - 1} \)

9) Solve by writing a proportion (section G5): A recipe calls for 112 grams of olive oil. You know that one-tablespoon of olive oil weighs 28 grams. How many tablespoons of olive oil should you use?

10) Solve by writing a proportion (section G5): 32.5% of people living in Manhattan have received their bachelor degree or higher. If the population of Manhattan is 19,465,197, how many people in Manhattan have bachelor degrees or higher?
Module G Answers to Practice Test

Each question is worth 10 points.

1) $x \neq \frac{5}{3}$ and $x \neq -\frac{5}{3}$

2) \[
\frac{x-8}{x+8}
\]

3) \[
\frac{2}{(x+2)(x-3)}
\]

4) \[
\frac{-5y(y-1)}{y(y+6)}
\]

5) \[
\frac{x-2}{x(x+1)}
\]

6) \[
\frac{t^2 + 7t - 4}{t^2 - 16}
\]

7) no solution; $x \neq -8$

8) $y = 2$ and $y = -2$

9) Use 4 tablespoons of olive oil.

10) 6,326,190 people