1. Evaluate.
   a) \( \frac{1}{(-5)^2} \)  
   b) \( \frac{5^2 - 5^1}{5^1} \)  
   c) \( 3^{-1} \)  
   \( \frac{1}{3^2 + 3^0} \) 

2. Simplify. Express each answer with positive exponents.
   a) \( \left( \frac{s^2}{t^3} \right)^{-3} \) 
   b) \( 30a^4b^2 ÷ (-5ab) \)  
   c) \( (-3a^2b^5)^2 \) 
   d) \( \frac{10m^2n^{-2} \times 2m^{-1}n^4}{-4mn^{-3}} \)  
   e) \( \frac{(-4s^2t^{-3})^2}{s^1t^{-1}} \) 

3. Evaluate.
   a) \(-100 \frac{3}{2} \)  
   b) \( 81 \frac{3}{4} \)  
   c) \( \left( \frac{8}{-27} \right)^{\frac{2}{3}} \) 

4. Measurement
   A rectangle has side lengths of \( 3 + \sqrt{2} \) and \( 3 - \sqrt{2} \). Evaluate the area of the rectangle.

5. Solve and check.
   a) \( (-3)\times = 81 \) 
   b) \( 2^{x-3} = 64 \)  
   c) \(-5^{x+2} = -1 \)  
   d) \( 3^{2y-3} = 9 \)  
   e) \( 2^{2x+2} = \frac{1}{16} \)  
   f) \( 4(6^{x+2}) = 144 \) 

6. Solve and check.
   a) \( 3^{x^2 - 2} = 3^{2x+1} \)  
   b) \( 2^{x+2} = 4^{x^3} \)  
   c) \( 5^{4x+2} = 25^{x-1} \) 
   d) \( 6^{x^2} + 6^x = 222 \)  
   e) \( 2^{x^2} - 2^{x^3} = -64 \) 

7. Simplify.
   a) \( (2x^2 + 3x - 7) + (7x^2 - 6x - 11) \)  
   b) \( (4y^2 - 7y - 7) - (8y^2 + 5y - 9) \) 

8. Expand and simplify.
   a) \( 3(t - 7) - 2(t + 5) \)  
   b) \( 4w(2w - 3) - 2w(w + 5) - 3w(2w - 1) \) 
   c) \( (x - 5)(x + 11) \)  
   d) \( 3(2x - y)(x - 3y) \) 
   e) \(-2(2s + 3t)^2 \)  
   f) \( 2(x - 3)^2 - (2x + 1)(3x + 2) \) 
   g) \( 3(2x - 3y)(2x + 3y) - (x - y)(3x + y) \) 

   a) \( \frac{3x - 3y}{5x - 5y} \)  
   b) \( \frac{2y^2 + 4y}{3y^2 + 6y} \)  
   c) \( \frac{t^2 - 16}{t^2 - t - 12} \)  
   d) \( \frac{2m^2 + m - 3}{3m^2 + 2m - 5} \)
   a) \( \frac{x^2 + 2x - 3}{x^2 + 6x + 8} \times \frac{x^2 + 2x - 8}{x^2 + x - 6} \)
   b) \( \frac{2a^2 - a - 1}{3a^2 + a - 2} \div \frac{2a^2 - 3a - 2}{3a^2 - 11a + 6} \)
   c) \( \frac{n + 2}{3} + \frac{2n - 1}{4} - \frac{3n + 1}{2} \)
   d) \( \frac{4}{2x - 3} - \frac{1}{3 - 2x} \)
   e) \( \frac{2}{x^2 + 5x + 4} - \frac{3}{x^2 - 3x - 4} \)

11. Solve. Graph the solution.
   a) \( 2z + 5 \geq z - 3 \)
   b) \( 3(x + 2) > -1(x - 2) \)
   c) \( 3(3z + 1) \leq -2(9 - z) \)
   d) \( 3(y - 1) + 10 \geq -5(2 - y) - 7 \)
   e) \( \frac{h - 5}{3} + 4 > \frac{h}{2} + 1 \)
   f) \( 2.7(y - 2) < 3(0.2y + 2.1) - 1.2 \)

12. Radiology
    Cobalt-60, which has a half-life of 5.3 years, is extensively used in medical radiology. Most of the world’s supply of cobalt-60 is produced in Canada.
   a) What fraction of an original sample of cobalt-60 will remain after 10.6 years?
   b) How long will it take until there is only 12.5% of the original sample remaining?

13. Measurement
    The length of a rectangle is represented by \( \frac{3x + 1}{2} \)
    and its width is represented by \( \frac{2x - 1}{3} \).

    a) Write and simplify an expression that represents the perimeter of the rectangle in terms of \( x \).
    b) Find the three smallest values of \( x \) that give whole-number values for the perimeter. Explain your reasoning.

14. The harmonic mean of 2 numbers, \( a \) and \( b \), is \( \frac{2}{\frac{1}{a} + \frac{1}{b}} \).
    The harmonic mean of 3 numbers, \( a \), \( b \), and \( c \), is \( \frac{3}{\frac{1}{a} + \frac{1}{b} + \frac{1}{c}} \).

    a) Simplify the expressions for 2 and 3 numbers and find a simplified expression for the harmonic mean of 4 numbers.
    b) Find the harmonic mean of the numbers 2, 3, 4, 7, and 9.