Chapter 6 Review

6.1 Exponent Laws, pages 342–351

1. Simplify, then evaluate. Give your answer as a whole number or a fraction.
   a) $6^{-5} \div 6^{-3}$
   b) $5^{-3} \times 5^2 \times 5^4$
   c) $(3^4)^{-1}$
   d) $(10^6)[(10^2)]^{-1}$

2. Simplify. Write your answer as a power with a positive exponent.
   a) $(k^{-3})(k^{-2})(k^4)$
   b) $\dfrac{x^{-4}}{x}$
   c) $(m^5 n^{-2})^2$
   d) $\left(\dfrac{a^3 b^2}{a^4 b^4}\right)^{-2}$

3. Simplify $(2x^{-4}yz^3)^2$. Then, evaluate for $x = 2$, $y = 3$, and $z = -1$.

4. Evaluate. Round your answer to two decimal places.
   a) $(5.6^{-1})^{-3}$ b) $(2.01^{-3})^2$

6.2 Rational Exponents, pages 352–361

5. Evaluate, if possible. If not possible, explain why.
   a) $\sqrt[5]{100\,000}$ b) $\sqrt[4]{-16}$
   c) $\sqrt[3]{-125}$ d) $\sqrt[5]{32}$

6. Express in radical form, then evaluate, if possible. If not possible, explain why.
   a) $256^{\frac{1}{2}}$ b) $-256^{\frac{1}{4}}$
   c) $(-256)^{\frac{1}{8}}$ d) $36^{\frac{3}{2}}$
   e) $(-49)^{\frac{1}{2}}$ f) $(-8)^{\frac{5}{3}}$

7. A cube has volume 27 000 cm^3. Determine its surface area, S.A., if $\text{S.A.} = 6\left(V^{\frac{1}{3}}\right)^2$.

6.3 Represent Exponential Expressions, pages 362–367

8. Write each power as a power with base 4.
   a) 16^3 b) 2^6
   c) 32^4 d) 24^0

9. Solve.
   a) $27^2 = 3^x$ b) $25^x = 5^4$
   c) $36^{x+4} = 6^{x-8}$ d) $16^{x-4} = 64^{2x}$

10. The number of bacteria, n, in a culture doubles every hour. A culture of another bacteria was started 4 h later. The number of bacteria, N, in this culture triples every hour. The equations representing these cultures are $n = 2^t$ and $N = 3^{t-4}$, where t is the time since the first culture was started. How long after the first culture was started will the two cultures have the same number of bacteria?

11. The number of bacteria, b, in a culture doubles every hour. A culture of yeast cells was started 3 h later. The number of yeast cells, y, in this culture quadruples every hour. The equations representing these cultures is $b = 2^t$ and $y = 4^{t-3}$, where t is the time since the bacteria culture was started. How long after the bacteria culture was started will the two cultures have the same number of cells?

6.4 Tools and Strategies to Solve Equations Involving Exponents, pages 368–375

12. According to Heron's formula, the area, A, of a triangle is given by

$A = [s(s-a)(s-b)(s-c)]^{\frac{1}{2}}$, where a, b, and c are the side lengths of the triangle and s is one-half the perimeter of the triangle, $s = \dfrac{a+b+c}{2}$. Calculate the area of a triangle with side lengths 6.7 cm, 6.2 cm, and 7.1 cm. Round your answer to the nearest tenth of a square centimetre.

13. The surface area, S.A., of a sphere is related to its volume, V, according to the equation $\text{S.A.} = 4\pi\left(\dfrac{3V}{4\pi}\right)^{\frac{2}{3}}$. Determine the surface area, to the nearest tenth of a square centimetre, of a sphere with volume 1200 cm^3.

6.5 Construct and Apply Exponential Models, pages 378–389

14. A car that was initially purchased for $35 000 loses 10% of its value each year.
  a) Construct a table of values showing the value of the car every year for five years.
  b) Calculate the first and second differences and the ratios.
  c) Is this relation linear, quadratic, exponential, or other? Explain.
  d) Construct a scatter plot of value versus year. Does the graph confirm your answer to part d)? Explain.

15. a) Repeat question 14 for a $35 000 boat that depreciates at a rate of $2750 per year.
  b) After two years, which is worth more, the car or the boat?
  c) After nine years, which is worth more, the car or the boat?

16. The half-life of tritium is approximately 12.5 years.
  a) Complete the table for an initial amount of 2500 units of tritium.

Time (years)	Units Remaining
0	2500
12.5	
25.0	
37.5	
40.0	
52.5	

  b) Calculate the first and second differences. Is this relation linear or non-linear? Explain.
  c) Calculate the common ratios. Is the relation exponential? Explain.
  d) Determine an equation for the line or curve of best fit.
  e) How long will it take for the initial amount of tritium to decay to 10 units?

17. Riley has $750 to invest and is considering two investment options.

  Option 1: A treasury bond that pays 6.5% simple interest. The amount, A, after n years is given by the equation $A = 750 + 46n$.

  Option 2: A savings account that pays 4.5% per year, compounded annually. The amount, A, after n years is given by the equation $A = 750(1.045)^n$.

  Which is the better option? Why?

18. Janie has $5000 to invest and is considering two investment options.

  Option 1: A GIC that pays 2.5% simple interest. The amount, A, after n years is given by the equation $A = 5000 + 50n$.

  Option 2: A savings account that pays 3.5% per year, compounded annually. The amount, A, after n years is given by the equation $A = 5000(1.035)^n$.

  Which is the better option? Why?