1. (a) We treat the equation as if it were a proportion, and solve from there, beginning by cross-multiplying:

\[ Fr^2 = GMN \]

Now we want to isolate \( G \), so we divide by the other coefficients on that side of the equation:

\[ \frac{GMN}{MN} = G = \frac{Fr^2}{MN} \]

(b) Similarly, we begin by cross-multiplying as above; next since we want to isolate \( r^2 \), we divide by \( F \):

\[ r^2 = \frac{GMN}{F} \]

And since we want \( r \), not \( r^2 \), we take the square root of both sides of the equation:

\[ \sqrt{r^2} = r = \sqrt{\frac{GMN}{F}} \]

2. (a) We divide both sides by \( x^2 \), and multiply both sides by 2:

\[ \frac{2}{x^2}(P) = \left(\frac{1}{2} kx^2\right) \frac{2}{x^2} = k \]

(b) Using the above equation, \( k = \frac{(2)(5)}{(0.00001)} = 10,000 = 1 \times 10^4 \).

3. (a) \( 7^{-1} \cdot 7^3 = 7^{-1+3} = 7^2 \)

(b) \( \frac{8^3 \cdot 8^2}{8^{-1}} = 8^{3+2-(-1)} = 8^6 \)

(c) \( 12^4 \cdot 12^3 = 12^{4+3} = 12^7 \)

(d) \( \frac{3^{-2}}{3} = \frac{3^{-2}}{3^1} = 3^{-2-1} = 3^{-3} \)

4. Each of these you could plug directly into your calculator to solve.

(a) (i) \( 2 \times 10^{-5} \)

(ii) \( 0.00002 \)

(b) (i) \( 5.60 \times 10^8 \)

(ii) \( 560,000,000 \)

5. (a) You should rewrite this as an exponential equation before solving: \( x = 10^4 = 10,000 \).

(b) You should rewrite this as a logarithmic equation before solving: \( x = \log(331) \approx 2.52 \).

6. (a) Use the calculator to get \( \log(2230) \approx 3.35 \).

(b) Use either the calculator or count the zeroes to get \( \frac{\log(0.00001)}{\log(100)} = \frac{-5}{2} = -2.5 \).

7. I have a feeling most of the difficulty with this question was simply getting your calculator to compute the answer correctly. All you needed to do was plug in \( I = 3.17 \times 10^{-7} \).

\[ dB = 10 \cdot \log \left( \frac{3.17 \times 10^{-7}}{10^{-12}} \right) \approx 55.01 dB \]

8. You had to keep in mind for this question that if the fund loses 11%, then the remaining value is 89%. Thus the solution is \( 900,000 \cdot (0.89)^5 \approx 502,565.35 \).

9. (a) For the forty year period in the problem, the card quadrupled four times. Thus the new value is \( 1 \cdot 4^4 = 256 \).

(b) After \( x \) years, the card’s value is \( y = 1 \cdot 4^x \). So after 45 years, this means \( y = 1 \cdot 4^{45} \approx 512 \).

10. (a) For this, again, the only difficulty lies in entering the equation for \( t = 5 \) into your calculator correctly. You should get 486 fish.

(b) Similarly, the trick is just to get the number into the calculator correctly. After 50 years, the number of fish will round to 500.