L2 Algebra Practice #5

1. Make x the subject of: $y = \log_{10}(2x)$

2. Simplify using positive indices: $(xy^{-3})^{-2}$

3. Expand and simplify: $(2x - 1)(x - 1)(x + 3)$

4. A jet-ski is purchased new for $15,000. It depreciates at a rate of 10% a year. Its value can be found by the formula:

   $$V = P\,(0.9)^{t}$$

   where V *is the value,* P *is the price and* t *the time in years*

   How long will it take for the value of the jet-ski to fall to 60% of its starting price?

5. Solve: $\dfrac{x(6 - x)}{2} = 4$

6. Solve: $\log_{x}(243) = 2.5$

7. Solve: $4(1 - x) > 3$

8. Solve $2x^2 + kx - k^2 = 0$

   You may want to use the quadratic formula, $x = \dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

Answers: L2 Algebra Practice #5

1. $y = \log_{10}(2x)$ If $y = b^x$ then $\log_b y = x$ $2x = 10^y$ $\boldsymbol{x = \frac{10^y}{2}}$

2. $(xy^{-3})^{-2}$ $= (x)^{-2}(y^{-3})^{-2}$ $= x^{-2}y^6$ $= \boldsymbol{\frac{y^6}{x^2}}$

3. $(2x - 1)(x - 1)(x + 3)$ $= (2x - 1)(x^2 + 2x - 3)$ $= 2x^3 + 4x^2 - 6x$

$\underline{+ \; -x^2 - 2x + 3}$

$= \mathbf{2}\boldsymbol{x}^\mathbf{3} \mathbf{+ 3}\boldsymbol{x}^\mathbf{2} \mathbf{- 8}\boldsymbol{x} \mathbf{+ 3}$

4. $V = P\,(0.9)^t$ $0.6 \times 15000 = 15000 \times 0.9^t$

$\log(0.6 \times 15000) = \log(15000 \times 0.9^t)$ $\log(9000) = \log(15000) + t\log(0.9)$

$t = \frac{\log(9000) - \log(15000)}{\log(0.9)} = 4.848.$ It will take **4.85 years** to fall to 60%

5. $\frac{x(6-x)}{2} = 4$ $x(6 - x) = 8$ $6x - x^2 = 8$

$x^2 - 6x + 8 = 0$ $\boldsymbol{x = 2 \text{ or } 4}$

6. $\log_x(243) = 2.5$ If $y = b^x$ then $\log_b y = x$ $243 = x^{2.5}$

$x = \sqrt[2.5]{243}$ your calculator can do this (also $= \sqrt[5]{(243^2)}$) $\boldsymbol{x = 9}$

7. $4(1 - x) > 3$ $4 - 4x > 3$ $4 > 3 + 4x$

$1 > 4x$ $\boldsymbol{x < \tfrac{1}{4}}$ (0.25)

8. $2x^2 + kx - k^2 = 0$ $a = 2,\ b = k,\ c = -k^2$

$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} = \frac{-k \pm \sqrt{k^2 - 4 \times 2 \times -k^2}}{2 \times 2} = \frac{-k \pm \sqrt{k^2 + 8k^2}}{4} = \frac{-k \pm \sqrt{9k^2}}{4} = \frac{-k \pm 3k}{4}$

$= \frac{-k - 3k}{4}$ and $\frac{-k + 3k}{4} = \frac{-4k}{4}$ and $\frac{2k}{4}$

$\boldsymbol{x = -k \text{ and } \tfrac{1}{2}k}$

(Q4 and Q8 are Merit)