L2 Algebra Practice #3

1. Simplify as one log: $\log_b(x) + 2\log_b(y)$

2. Simplify: $\dfrac{x^3+6x^2+9x}{x^2+3x}$

3. Make x the subject of: $y = \dfrac{4}{3x} - 1$

4. Mary invests $10 000 in government bonds. They pay 8% interest at the end of each year, which is then reinvested. The money she has after y years is therefore:

   $$M = 10\,000\,(1.08)^y$$

   Where M = is the amount she has, in dollars.
   And y = the number of full years it is invested.

   After how many years will her sum with interest be $25 000 or more?

5. Solve: $\log_4(256) = x$

6. Solve: $-2(x + 1) > 5$

7. Solve: $4x - 5 = \dfrac{3}{2x}$

8. Find two numbers that have a sum of 32 and a sum of their squares of 514.

Answers: L2 Algebra Practice #3

1. $\log_b(x) + 2\log_b(y)$ $= \log_b(x) + \log_b(y^2)$ $= \mathbf{\log_b(x\,y^2)}$

2. $\dfrac{x(x^2+6x+9)}{x^2+3x}$ $= \dfrac{x(x+3)(x+3)}{x\,(x+3)}$ $= \dfrac{\cancel{x}(x+3)\cancel{(x+3)}}{\cancel{x\,(x+3)}}$ $= \mathbf{x+3}$

3. $y = \dfrac{4}{3x} - 1$ $y + 1 = \dfrac{4}{3x}$ $(3x)\,(y+1) = 4$

   $\mathbf{x = \dfrac{4}{3(y+1)}}$ $\mathbf{x = \dfrac{4}{3y+3}}$

4. $M = 10\,000\,(1.08)^y$ Putting in our values: $25\,000 = 10\,000\,(1.08)^y$

   $\log(25\,000) = \log(10\,000\,(1.08)^y)$

   $\log(25000) = \log(10000) + y\log(1.08)$

   Rearranging: $y = \dfrac{\log(25000) - \log(10000)}{\log(1.08)} = 11.9059.$

   Need to round up, since interest at end of the year **12 years**

5. $\log_4(256) = x$ If $y = b^x$ then $\log_b y = x$ so here $256 = 4^x$ $\mathbf{x = 4}$

6. $-2(x+1) > 5$ $-2x - 2 > 5$ $-2 - 5 > 2x$ $\mathbf{x < -3.5}$

7. $4x - 5 = \dfrac{3}{2x}$ $2x(4x-5) = 3$ $8x^2 - 10x = 3$

   $8x^2 - 10x - 3 = 0$ calculator $\mathbf{x = -0.25 \text{ or } 1.5}$

8. $a + b = 32$ and $a^2 + b^2 = 514$ rearranging the first: $a = 32 - b$

   substituting to remove a : $(32-b)^2 + b^2 = 514$ expanding: $1024 - 64b + b^2 + b^2 = 514$

   $2b^2 - 64b + 510 = 0$ $b = 15$ or 17

   solving using $a + b = 32$ gives $a = 17$ or 15 **The numbers are 15 and 17**

(Q4 and Q8 are Merit)