Presentations03

Generic presentation: Select a problem from your textbook in the section currently discussed and solve it. Get my okay and confirmation as a presentation topic.	
State and solve a Diophantine equation.	
Given the cubic equation $\boldsymbol{x^3 + p = qx}$, let $\boldsymbol{b = \sqrt{q}, c = \frac{p}{b}}$ and show that the equivalent equation $\boldsymbol{x^3 + b^2c = b^2x}$ has a solution which is the intersection of the hyperbola $\boldsymbol{y^2 + cx = x^2}$ and the parabola $\boldsymbol{y = \frac{1}{b} x^2}$.	
Show that if $\boldsymbol{r}$ is a root of the polynomial $\boldsymbol{x^2 + bx + c}$ then $\boldsymbol{x - r}$ is a factor of that polynomial; similarly show that if r is a root of the polynomial $\boldsymbol{x^3 + b\,x^2x + cx + d}$ then $\boldsymbol{x - r}$ is factor of that polynomial. [Hint, use long division.]	
Show that if $\boldsymbol{P(x) = x^n + A_{n-1}\,x^{n-1} + A_{n-2}\,x^{n-2} + \cdots + A_1x + A_0 = (x - r_1)(x - r_2) \ldots (x - r_n)}$ then $\boldsymbol{A_0 = r_1r_2 \ldots r_n}$ and $\boldsymbol{A_{n-1} = -r_1 - r_2 \ldots - r_n}$.	
Problem (translated) from an old text: A man put one pair of rabbits in a certain place entirely surrounded by a wall, How many rabbits can be produced from that pair in a year, if the nature of these rabbits is such that every month each pair bears a new pair which from the second month on becomes productive?	
Show that the ratio of the $(n+1)^{th}$ Fibonacci number to the n^{th} limits to the golden ratio.	
Given the general cubic equation: $\boldsymbol{x^3 + ax^2 + bx + c = 0}$, find a value for $\boldsymbol{k}$ so that the transformation $\boldsymbol{x = t + k}$ transforms the equation into one without a quadratic term.	
Solve the cubic equation.	
Solve the quartic equation.	
Fibonacci problem: A man entered an orchard through 7 gates and picked some apples. When he left, he gave the first guard half his apples and 1 apple more. To the second guard he gave half his remaining apples and 1 more. He did the same to each of the remaining five guards and left the orchard with 1 apple. How many apples did he gather in all?	