SAVINGS PLANS

A = accumulated savings plan balance   n = number of payment periods per year
PMT = regular payment (deposit) amount   Y = number of years
APR = annual percentage rate (in decimal form if doing by hand)

Note: Some calculators have finance calculation options. For example, on the TI-83, this is the Time Value of Money (TVM) Solver.

	Example	Using TVM Solver (TI-83:FINANCE; TI-83+, TI-84:APPS)
Savings Plan with Regular Payments $$A = PMT \times \frac{\left[\left(1+\dfrac{APR}{n}\right)^{(n \times Y)} - 1\right]}{\left(\dfrac{APR}{n}\right)}$$	Begin with $0 in account, deposit $100 at the end of each month with an APR of 6% compounded monthly for 15 years. After 15 years, the accumulated amount is: $$A = \$100 \times \frac{\left[\left(1+\dfrac{.06}{12}\right)^{(12 \times 15)} - 1\right]}{\left(\dfrac{.06}{12}\right)} = \$29,081.87$$ This is the total amount saved. The total amount deposited is: $$(15\,years)\left(\frac{12\,months}{year}\right)\left(\frac{\$100}{month}\right) = \$18,000.00$$ So, the interest earned is: $$\$29,081.87 - \$18,000.00 = \$11,081.87$$	(1) Press ⟨2nd⟩ ⟨x⁻¹⟩ (FINANCE) or ⟨APPS⟩ (2) Choose 1: TVM Solver (3) Enter N = 12 × 15 or 180 = number of payment periods I% = 6 PV = 0 = beginning amount in account PMT = 100 = monthly deposit FV = 0 = future value P/Y = 12 = number of deposits per year C/Y = 12 = number of compounding periods per year (12 for monthly) PMT = highlight END for end of month deposits (4) Arrow up to FV since we are looking for the accumulated amount after 15 years (5) Press ALPHA ENTER (SOLVE). The amount that appears is the accumulated amount. It is negative because the calculator considers it an outflow of cash. ▪ FV = -29081.87124 should appear, so the accumulated amount is $29,081.87 which agrees with the formula calculation to the left.

SAVINGS PLANS (continued)

	Example	Using TVM Solver (TI-83:FINANCE; TI-83+, TI-84:APPS)

Savings Plan Payments
 	
$$PMT = \dfrac{A \times \dfrac{APR}{n}}{\left[\left(1 + \dfrac{APR}{n}\right)^{(n \times Y)} - 1\right]}$$
	To build an $80,000.00 fund (for your college education or down payment on your home, for example) over 18 years, your parents make regular, end-of-the-month deposits to an account with an APR of 6%. How much should your parents deposit monthly?
	
	$$PMT = \dfrac{80000 \times \left(\dfrac{.06}{12}\right)}{\left[\left(1 + \dfrac{.06}{12}\right)^{(12 \times 18)} - 1\right]} = \$206.53$$
	
	So, your parents need to deposit $206.53 monthly to provide you with this fund.
		(1) Press [2nd] [x⁻¹] (FINANCE) or [APPS]
		(2) Choose 1: TVM Solver
		(3) Enter N $= 12 \times 18$ or 216
		    I% $= 6$
		    PV $= 0$
		    PMT $= 0$
		    FV $= 80000$
		    P/Y $= 12 =$ number of payments per year
		    C/Y $= 12 =$ number of compounding periods per year (12 for monthly)
		    PMT $=$ highlight END for end of month deposits
		(4) Arrow up to PMT
		(5) Press ALPHA ENTER (SOLVE).
		▪ PMT $= 206.53$ (rounded)

Total return at end of period: $$= \dfrac{newvalue - starting\ principal}{starting\ principal} \times 100$$ $= percent\ increase$	You invest $5000 in a mutual fund which grows in value to $18,500 in 5 years. Your total return $$= \dfrac{18500 - 5000}{5000} = 2.7 = 270\%$$ Your return on your investment after 5 years is 2.7 times the original value.	
Annual return: $$= \left(\dfrac{A}{P}\right)^{\left(\frac{1}{Y}\right)} - 1$$ $= average\ rate\ of\ growth\ per\ year$	Annual return $$= \left(\dfrac{18500}{5000}\right)^{\left(\frac{1}{5}\right)} - 1 = \sqrt[5]{3.7} - 1 \approx 0.299 \approx 29.9\%$$ Your investment has grown by an average of 29.9% each year.	