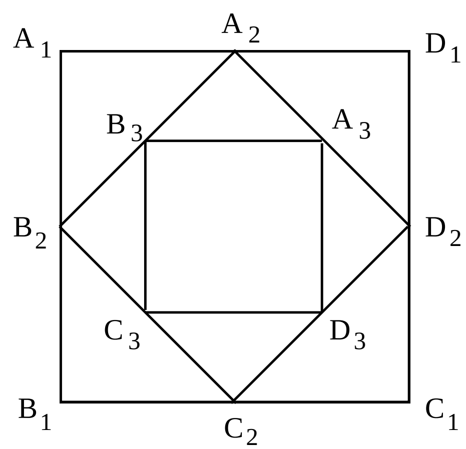
1) Find A and B such that $\dfrac{2x+11}{(x+1)(x-2)} = \dfrac{A}{x+1} + \dfrac{B}{x-2}$.

2) Solve the inequality: $\log_2 \; x^2 + 4x \; < 5$. (Show detailed algebraic work).

3) Solve the inequality by using the ‘factor’ command of the TI-89 and making an interval graph.

$$6x^4 + 5x^3 - 72x^2 - 29x + 210 \geq 0$$

4) Consider the sequence of squares formed by connecting the midpoints of a square whose sides are four inches long.



a) Find the length of A_3B_3.

b) Find a formula for the length of A_nB_n.

c) Find the area of $A_nB_nC_nD_n$.

5) Let $a_n \,{}_{n=1}^{\infty}$ be a sequence whose partial sums are $S_n \,{}_{n=1}^{\infty}$. Let $a_1 = 1$ and $a_n = 2a_{n-1}$.

a) Write out the terms of $a_n \,{}_{n=1}^{7}$.

b) Write out the terms of $S_n \,{}_{n=1}^{7}$.

c) Find a general formula for the *n*th term of the sequence S_n.

6) Solve for x: $\dfrac{1}{\log_3 x} + \dfrac{1}{\log_6 x} + \dfrac{1}{\log_8 x} + \dfrac{1}{\log_9 x} = 4$. Show work.

7) Let $a_n \,{}_{n=1}^{\infty}$ be the sequence defined by: $a_n = \begin{cases} 1 & \text{if } n = 1 \\ \sin\left(\dfrac{\pi}{2} - a_{n-1}\right) & \text{if } n > 1 \end{cases}$

a) List the first four terms of the sequence. (Round to the nearest thousandth.)

b) Determine a_{200}. (Round to the nearest thousandth.) Hint: You may want to use the sequence mode of your calculator whose directions appear after problem 12.

8) Let $T = \begin{bmatrix} 0 & 1 & 0 \\ -1 & 0 & 0 \\ 0 & 0 & 1 \end{bmatrix}$, and $V = \begin{bmatrix} 2 & 4 & -5 \\ 7 & -3 & 2 \\ 1 & 1 & 1 \end{bmatrix}$ be the vertex matrix for ΔABC where

$A = (2, 7)$, $B = (4, -3)$ and $C = (-5, 2)$. Let $V_n = T^n \cdot V$.

a) Find V_1, V_2, and V_3. Please use your calculator for this problem.

b) Describe the transformation, T.

9) What is the domain of $f(x) = \sqrt{\dfrac{(x+5)(x+7)}{(x-4)(x-2)}}$? Leave your answer in interval notation.

10) Low tide occurred at 4:45 a.m. and high tide occurred exactly six hours later. High tide was 440 cm above low tide. If the low water mark is taken to be zero and the height of the water follows a sinusoidal curve, find a function that describes the height of the water at time t given in hours past midnight.

11) Find the sum using appropriate formulas. Show your algebraic work.

a) $\displaystyle\sum_{n=0}^{10} 3^n$

b) $\displaystyle\sum_{i=1}^{\infty} 6\left(\frac{-2}{3}\right)^i$

c) $\displaystyle\sum_{i=1}^{n} 2i^2 + 2i - 3$ Write answer as a single fraction.

The TI-89 has a built in CAS feature that can do (b) and (c) in problem 11. Check your answers to 11 by using the $\sum$ key found under the calculus menu (F3). The syntax is as follows:

$\sum$ expression, variable, start, end

So to sum $\displaystyle\sum_{i=1}^{8} \frac{2}{i}$ we type $\displaystyle\sum\left(\frac{2}{i}, i, 1, 8\right)$ and get $\dfrac{761}{140}$.

12) Use the $\sum$ on the calculator to find the following. On you answer sheet write the key strokes you typed into the calculator.

a) $\sum_{n=1}^{30} \frac{4}{5n}$

b) $\sum_{i=1}^{\infty} \frac{3}{i^2}$ You can find the ∞ key above 'catalog'.

c) Robin starts his career at IBM as an engineer at a starting salary of $55,000 with an expected raise of 8% a year. What can Robin expect his total wages will be if he works for 20 years?

Sequence Mode

The TI-84 and TI-89 a can generate terms of a sequence given in recursive form. Set your calculator to sequence mode. The directions below are for the TI-89, with the instructions for TI-84 in parentheses.

Go to the Mode menu of your calculator and set it to Seq.

Ex 1: We wish to follow the rule: $c_n = \begin{cases} 3 & n=1 \\ 2c_{n-1}+1 & n>1 \end{cases}$.

Go to $y =$ (same)

$\mathrm{u}1 = 2u1(n-1)+1$ $u(n) = 2u(n-1)+1$

$\mathrm{u}i1 = 3$ $\mathrm{u}\ n\mathrm{Min} = 3$

Examine the table this generates using the table feature of your calculator. If we are only interested in say the 20th term, on the home screen type $u1(20)$ or on the TI-84, $u(20)$. Note: on the TI 84 you will find u above the 7 and n is the $\mathrm{X,T,}\theta,n$ key.

Ex 2: We wish to generate the Fibonacci Sequence, 1, 1, 2, 3, 5, . . .

$\mathrm{u}1 = u1(n-1)+u1(n-2)$ $u(n) = u(n-1)+u(n-2)$

$\mathrm{u}i1 = 1, 1$ $\mathrm{u}\ n\mathrm{Min} = 1, 1$

13) A Roth IRA is an investment option any wage earner can use. Money deposited in the IRA can accumulate interest with no taxes due on the interest if the investor waits until he is at least 59.5 years old before he withdraws any money. The maximum one can invest each year is $5000. Robin decides to contribute to his IRA the maximum each year he works. Assume his investment returns an average of 8.2% a year and Robin deposits $5000 at the beginning of each year.

a) Use the recursive sequence mode of your calculator to determine the amount Robin has as he makes each deposit. On you paper, write the expressions you typed into your calculator and give the values of the first five terms of this sequence rounded to whole dollars.
b) Determine the amount Robin has at the end of forty years. This should be your 41st term of your sequence, less $5000.
c) According to your sequence, during what year will Robin first have $1,000,000?

14) A forest contains 10000 trees. The company that owns the forest decided to harvest 8% of the trees each year and replant 700 new trees by the end of the year.

a) State the number of trees in the forest at the beginning of each of the first five years of this process. Again, state the expressions you typed into your calculator.
b) Find the 20th term of this sequence.
c) What appears to be the size the population of trees is approaching in 'long run'?

15) Find the 37th Fibonacci number. Clearly indicate how you found this number.

16) In this problem we will consider the values of the ratio of consecutive terms of the terms of the Fibonacci sequence, that is, $\frac{F_{n+1}}{F_n}$.

a) Let $G_n = \frac{F_{n+1}}{F_n}$. State (as decimals) the first 5 terms of *G*. Give to three decimals.
b) Find G_{20}.
c) What appears to be the limit of G_n as $n \to \infty$? The notation we use in mathematics is $\lim_{n\to\infty} G_n$ and by that we mean what value does G_n approach as *n* increases without bound.

17) If $\sin\alpha = x$ and $\frac{\pi}{2} < \alpha < \pi$, find the following in terms of *x*.

a) $\cos\alpha$ b) $\tan\left(\frac{\pi}{2} - \alpha\right)$