Do your work and circle final answers on separate paper, provided. Remember, to write big and bold, but mostly bold, or your teacher can't read it and give you any points for it. Leave a margin for the staple!

1. 5 people are going to be chosen out of 24 people to sit on stage at an awards ceremony.

    a. (5 pts) How many ways can the 5 people be chosen?

    b. (5 pts) How many ways could you choose the 5 people and arrange their seating on stage?

2. Consider the finite geometric sum $4+3+\dfrac{9}{4}+\dfrac{27}{16}+....+\dfrac{19683}{65536}$.

    a. (5 pts) Determine a, r and n for the sum.

    b. (5 pts) Use a, r, and n to determine the *exact* value of the sum $\sum\limits_{k=1}^{n} a \cdot r^{k-1} = a\left(\dfrac{1-r^n}{1-r}\right)$. For full credit, submit your answer as a (possibly improper) fraction, in lowest terms. Decimal answers are worth at most 9 points.

3. (5 pts) Find the sum of the infinite geometric series $\sum\limits_{k=1}^{\infty} 3 \cdot \left(\dfrac{2}{9}\right)^{k-1}$.

Future Value of Annuity: $FV = R\left[\dfrac{\left(1+\dfrac{r}{m}\right)^{mt}-1}{\left(\dfrac{r}{m}\right)}\right] = R\left(\dfrac{(1+i)^n-1}{i}\right)$ Future Value of Savings: $A = P\left(1+\dfrac{r}{m}\right)^{mt} = P(1+i)^n$

4. (5 pts) **(Present Value of Annuity)** If your monthly house payments are $1,000, and the loan is for 30 years, at 3.9% annual percentage rate, compounded monthly, how much did you borrow in the first place?

5. (5 pts) Solve $-2\log_4(5x+15)+7=0$. Give an exact answer and an answer rounded to 4 decimal places.

6. A homeowner wants to enclose a rectangular garden next to her house. She has a total of 150 feet of fencing. She will use the house for one side of the garden and will not need fencing on that side.

    a. (5 pts) Let x be the length (in feet) of the side of the garden next to the house. Write an equation for the area of the garden as a function of x, assuming she uses all the fencing for the other three sides.

    b. (5 pts) What value of x will maximize the area?

    c. (5 pts) What will the dimensions be for the garden with the maximum area?

7. To make yogurt, you heat milk to 180°. You then put the saucepan into a tub of ice water which is 32°. The milk has to cool to 110° before a spoonful of the previous batch of yogurt is added.   After 10 minutes, it has cooled to 140°. The question we will eventually answer is: "How much longer do you have to wait before adding the spoonful of yogurt?" (Assume the surrounding ice water stays 32°, and use Newton's Law of Cooling.)

   a. (5 pts) Define the variables t and D, and state their values for the two parts of the problem.

   b. (5 pts) What is the value of D_0 ?

   c. (5 pts) Find the rate of cooling.

   d. (5 pts) Write the function.

   e. (5 pts) How much longer do you have to wait before adding the spoonful of yogurt?

8. A club is selling cookies at an event to raise money. They start with some money in the cash box for making change. After selling 10 cookies, there is $50 in the cashbox. After selling 30 cookies, there is $90 in the cashbox.

   a. (5 pts) Find the slope of the line through the two points. Let x represent the number of cookies sold and y represent the amount of money in the cashbox. In what units is the slope measured?

   b. (5 pts) Find a linear equation expressing the money as a function of the number of cookies sold.

   c. (5 pts) Use your equation to find the amount of money in the cashbox at the beginning, when no cookies had been sold.

9. (5 pts) Solve $\left|-3x+7\right|<9$

10. (5 pts) Use the Binomial Theorem (or Pascal's Triangle) to expand $(x-2y)^5$. No points awarded for doing this by brute force.

B 1 (5 pts) Let $f(x)=-2\log_4(5x+15)+7$. Find $f^{-1}(x)$.

B 2 (5 pts) Re-write $f(x)=7x^2-2x+1$ in the form $a(x-h)^2+k$.

B 3 (5 pts) John can finish a job in 10 hours that it takes Bill 17 hours to finish. Suppose Bill shows up and starts working 2 hours before John shows up, and then they work together until the job is done. How many hours does each of the two end up working?

B 4 (5 pts) What is the domain of $f(x)=\sqrt{(x-5)(x+1)^2(x-7)}$?