All your work is to be done on the exam. Be sure to write your name on each page of the exam.

1a. (5 points) In 10 years, 0.25 of the original amount of a radioactive isotope remains. What is its half-life? You may use either \( \log() \) or \( \log_{10}() \). Note, also use \texttt{from math import \*}.

1b. (5 points) Do part (a) without using a log table.

1c. (5 points) A population increases by 10 percent each year. How long will it take for the population to be eight times the original amount? Do this without using a log table.
2a. (10 points) What is the probability of getting 3 kings, 2 queens, 1 jack and two other cards in any order in an eight-card hand? Do this using combination symbols.

2b. (15 points) Same as in part (a) but now calculate the probability assuming the three kings come first, then the two queens, then the jack and finally the two other cards. What combination of factorials must you multiply this by to get the answer in part (a), i.e. the probability of getting the cards in any order?
3. (5 points) Given the heading of the function `def length(s):` where `s`, the parameter, is a string of digits, e.g., “34271”, fill in the blanks so that the function returns the length of the string. Here it would return 5.

```python
def length(s):
    count = _______  # the initial value of the counter
    for c in s:
        count = _______
    __________
```

4. (15 points) Write a program to calculate nCm
5. Given a cube how many paths are there from a point A to point B where A and B are diagonally opposite.
6. (10 points) A fuse has a 0.2 chance of being rejected during inspection and a 0.8 chance of passing.
(a) If five fuses are manufactured, what is the probability that all five will pass inspection?

(b) If five fuses are manufactured, what is the probability that only three will pass inspection?

7. How many 7-digit phone numbers can you have?