Practice Test

1. If you have built 1 mile of road and it generates $200,000 of revenue each year, and you reinvest that revenue into building more road at $1,000,000/mile,
   1. how much more road could you build at the end of a year?
   2. What would be the total amount of road built, when you add it to your original mile?
   3. If this new, extended road, then generates $200,000 per mile in the second year, how much does it generate?
   4. When you invest this additional revenue into more road, how much more road can you build the second year?
   5. Add this extension on to the total road you found in part b. How much total road do you have now, after 2 years?
   6. How much road will you have after 3 years?
   7. How much road will you have after 10 years?
2. In each of the diagrams below, with the given road system from A to B, how many paths are there from A to B, if the only possible moves are up or to the right?
   1. B

A

* 1. B

A

* 1. Careful! Count! B

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |

1. How many ways can you
   1. Arrange 7 students in a row?
   2. Choose a president, vice president, and secretary in a club with 20 members?
   3. Choose a committee of 5 members out of a group of 15 members?
   4. In a city with 20, 000 telephones, how many three-phone conference calls are possible?
2. The fine that was imposed for the crime of dismantling the trolley system was $5,000 in 1949.
   1. If the money were put in the bank and earned 7% simple interest for 75 years, how much money would there be?
   2. If it earned 7% interest compounded annually for 75 years, how much money would there be?
   3. If it earned 7% interest compounded continuously, how much money would there be?
3. All organic matter (plants, animals,…) contain two types of carbon. Carbon-12 which is regular carbon, and carbon 14 which is radioactive and decays over time. The amount of carbon 14 left in an organic object can be calculated using the ratio of carbon-12 to carbon-14. The equation for the amount left A(t) is given by the following equation :

A(t) = A(0) e(-t/8033)

Here A(0) is the original amount, 1/8033 = 0.0001245 is the decay constant. Notice the negative sign in the exponent. If it were exponential growth, the exponent would be positive.

* 1. How much carbon-14 would be left after 1000 years if you start with 200g ?
  2. Find the half-life of carbon-14 (how long would it take for, say, 200g to become 100g? It doesn’t matter how much you start with, though).

1. Consider the following graph of the average global temperature since 1880. The [X axis](https://en.wikipedia.org/wiki/X_axis) represents time, and the [Y axis](https://en.wikipedia.org/wiki/Y_axis) represents the [temperature anomaly](https://en.wikipedia.org/wiki/Instrumental_temperature_record#Absolute_temperatures_v._anomalies) (departure from 1961-1990 baseline of 14.0°C, Jones et al. 1999).



* 1. Overall, would you say that the average global world temperature has been increasing, decreasing, or staying the same since 1880?
  2. There seems to be a period in the 1900’s when the average world temperature seemed to level off. What years would you estimate that to be?
  3. What would you say to the skeptics who tell us that the average global temperature has stopped rising recently?

1. The law of Arrhenius says that , where is the radiative forcing, measured in Watts per square meter, α is about 6.3, is the “original” amount of carbon dioxide in the atmosphere (about 275 parts per million), and *C* is the current amount of CO2 in the atmosphere. For August 2015, this was measured at about 399 ppm (parts per million). Find the current radiative forcing due to CO2.
2. The function to translate from centrigrade to Fahrenheit is . How many degrees Fahrenheit correspond to a change in temperature of 3 degrees centigrade?