**Problem 1:** Colorado milk (and milk products) customer demand and producer supply curves are well known (and influenced) by farming organizations and cooperatives.

These demand and supply curves (in annual per capita consumption in pounds) as a function of x ($/pound) are shown below.

- Accurately graph the curves below.
- Estimate from the graph the equilibrium point.
- Mathematically calculate this equilibrium point. Show all work

$$\text{Demand}(x) = -232.0 \cdot x + 14.5 \cdot x^2 + 1348.0$$

$$\text{Supply}(x) = 276.8 \cdot x + -17.3 \cdot x^2 - 157.2$$
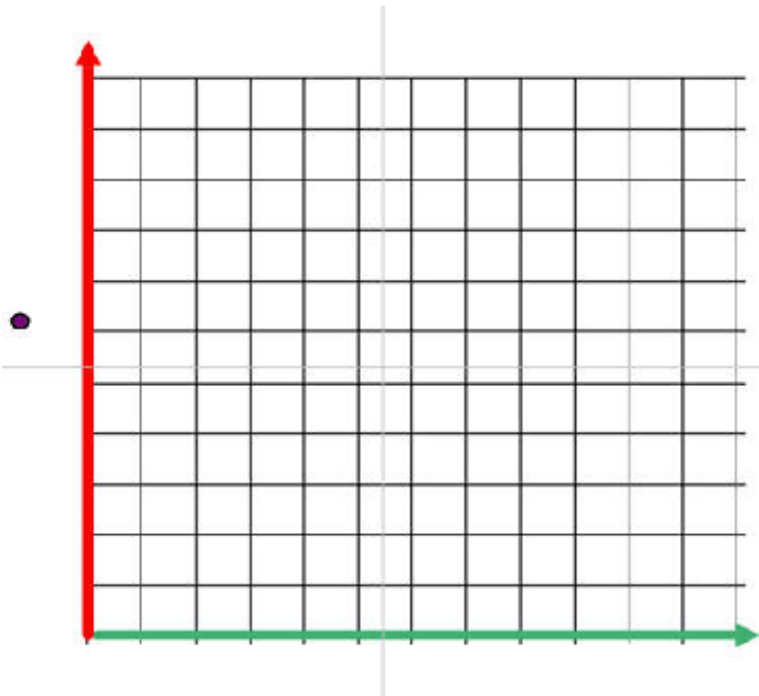
Problem 2: Two radioactive isotopes decay at slightly different rates.

- cobalt-57 has a half-life of 271.8 days
- vanadium-49 has a half-life of 330.6 days

If you start (t = 0) with 4.3 kg of cobalt-57 and 3.4 kg of vanadium-49, **at what day will the isotopes have the same radioactive mass? What will this mass be?**
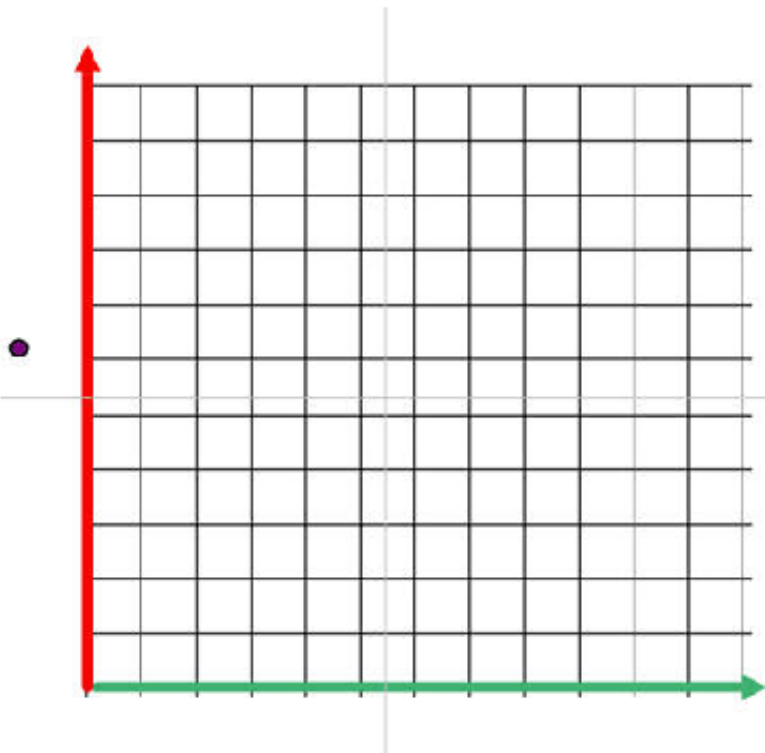
Solve the problem mathematically and show an accurate sketch of both isotopes radioactive amounts vs. time below;

Radioactive half-life can be modeled by:

$$F(t) = A \cdot \left(\frac{1}{2}\right)^{\frac{t}{h}}$$

Where:

F = future amount
A = initial amount
t = time in days
h = half life (in days)

Problem 3: A juice company makes 2 kinds of juice: Orange-aid and Berry-fruity. One gallon of Orange-aid is made by mixing 2.5 quarts of orange juice with 1.5 quarts of raspberry juice. One gallon of Berry-fruity is made by mixing 3 quarts of raspberry juice with 1 quart of orange juice. The company has 150 gallons of raspberry juice and 125 gallons of orange juice.

Plot and identify (shade in) the feasible region on the graph below.

If the company makes a profit of $0.60 for every gallon of Berry-fruity and $0.45 for each gallon of Orange-aid sold, **how many gallon of each type of drink should be made to maximize the company's profit?**
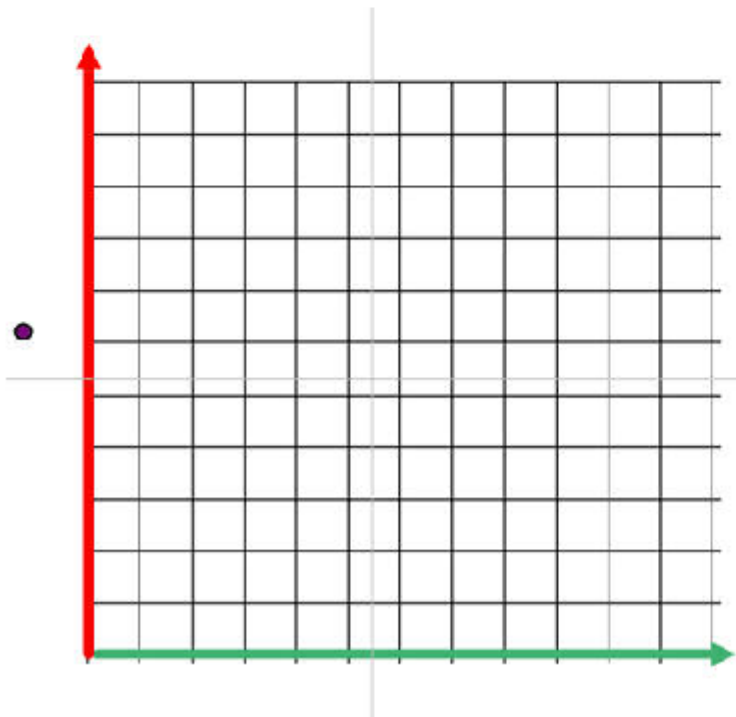
Problem 4: A Canon City investor decides to invest $400,000 in a business and has the option of being "paid back" with either of the cash flows shown below.

Which cash flow is the best deal? Show all work.