7. [8 points] Freckles and Comet are cats in the same household. Consider the functions F, C, and D which are defined as follows:

- $F(m)$ is the number of ounces of food that Freckles eats in month m.
- $C(m)$ is the number of ounces of food that Comet eats in month m.
- $D(q)$ is the cost of buying q cans of cat food at a time when there are no sale prices.

Assume that D is invertible.
For each of questions below, circle the ONE best answer from among the options provided.
If none of the options are correct, circle NONE OF THESE.
Please note: To receive credit, you must clearly circle your choices. (Circle the **entire** *answer. If there is any ambiguity in your answer, you will not receive credit.)*

a. [1 point] What is the total number of ounces of food that Freckles and Comet eat in month m?

$D(m) + C(m)$ $\boxed{F(m) + C(m)}$ $F(C(m))$ $C(F(m))$ NONE OF THESE

Solution: Freckles eats $F(m)$ ounces of food in month m. Comet eats $C(m)$ ounces of food in month m. Combined, they eat $F(m) + C(m)$ ounces of food in month m.

b. [2 points] Suppose that there are 3 ounces of food per can. What is the total cost of the food Freckles eats in month 4?

$\dfrac{D(4)}{3}$ $3D(4)$ $D(3F(4))$ $\boxed{D\left(\dfrac{F(4)}{3}\right)}$ NONE OF THESE

Solution: If Freckles eats $F(4)$ ounces of food in month 4 and there are 3 ounces of cat food per can, Freckles eats $\frac{F(4)}{3}$ cans of cat food in month 4. The cost of this is $D\left(\frac{F(4)}{3}\right)$.

c. [1 point] Let $A(q)$ be the average cost per can of buying q cans of cat food. Which of the following is a formula for $A(q)$?

$D^{-1}(q)$ $\dfrac{q}{D(q)}$ $\dfrac{F(q) + C(q)}{2}$ $\boxed{\dfrac{D(q)}{q}}$ NONE OF THESE

Solution: The average cost per can of buying q cans of cat food is the cost of buying q cans of cat food, $D(q)$, divided by the number of cans of cat food purchased, q.

d. [1 point] When there are no sale prices, how many cans of cat food can be purchased at a time for \$20?

$D(20)$ $\boxed{D^{-1}(20)}$ $20D^{-1}(q)$ $\dfrac{1}{D(20)}$ NONE OF THESE

Solution: If we want to spend \$20 on cans of cat food, we want to solve for q in the equation $D(q) = 20$. Thus, we can buy $D^{-1}(20)$ cans of cat food for \$20.

e. [2 points] Suppose that Comet eats at least twice as much food each month as Freckles eats. Which one of the following inequalities most accurately describes this relationship?

$C(m) \leq 2F(m)$ $\boxed{C(m) \geq 2F(m)}$ $2C(m) \leq F(m)$ $2C(m) \geq F(m)$

Solution: Twice as much food as Freckles eats in month m is $2F(m)$. Comet eats $C(m)$ ounces of food in month m, so the relationship is that $C(m) \geq 2F(m)$ for all m.

f. [1 point] If cat food goes on sale for 40% off its regular price, what is the cost of buying 20 cans of cat food at one time?

$\boxed{0.6D(20)}$ $1.4D(20)$ $0.4D(20)$ $D(8)$ NONE OF THESE

Solution: If cat food is at its regular price, the cost of buying 20 cans of cat food is $D(20)$. If we take 40% off the regular price, we have $D(20) - 0.4D(20) = 0.6D(20)$.