

**Problem 1.** Consider the market for second-hand cars. The quality of a car is denoted by  $q$ . There are six possible quality levels:  $A, B, C, D, E$ , and  $F$ . Sellers value quality 10% less than buyers, as shown in the following table:

| Quality ( $q$ ) | $A$    | $B$    | $C$    |
|-----------------|--------|--------|--------|
| Worth to Buyer  | \$3000 | \$2000 | \$1000 |
| Worth to Seller | \$2700 | \$1800 | \$900  |
| Number of Cars  | 120    | 90     | 30     |

Each seller knows the quality of her own car, while the buyers have the preceding information and cannot discover the quality of any particular car before buying. Everyone is risk-neutral.

Determine how many cars are traded if the price of a second-hand car is:

- (a) \$2750      (b) \$1850      (c) \$910

**Problem 2.** Second-hand meteorite fragments differ in quality  $q$  and are sold at price  $p$ . Each seller knows the quality of her meteorite fragment, while the buyer does not. Everyone is risk neutral. The proportions of meteorite fragments are as follows:

| Quality ( $q$ ) | 1              | 2              | 3              | 4              |
|-----------------|----------------|----------------|----------------|----------------|
| Proportion      | $\frac{2}{10}$ | $\frac{1}{10}$ | $\frac{4}{10}$ | $\frac{3}{10}$ |

Find the proportion of meteorite fragments that are offered for sale and their average quality when the price is in the following regions:

- (a)  $p \geq 4$       (b)  $3 \leq p < 4$       (c)  $2 \leq p < 3$       (d)  $1 \leq p < 2$       (e)  $p < 1$

**Problem 3.** Consider the market for a second-hand durable good which can be of quality  $A$  or  $B$ . The seller knows the quality while the buyer only knows the following:

| Quality         | $A$           | $B$           |
|-----------------|---------------|---------------|
| Value to Seller | \$496         | \$180         |
| Probability     | $\frac{3}{5}$ | $\frac{2}{5}$ |

The buyer knows that if she buys a good of quality  $A$  (which she learns after purchasing), she will be able to re-sell it for \$960; while if the good turns out to be of quality  $B$ , then she will be able to re-sell it for \$280. Suppose that the buyer's initial wealth is \$8,000 and that she is risk averse with utility-of-money function  $U(x) = \sqrt{x}$ .

Should the buyer offer to buy the good and, if so, at what price?