Remember Bob and Bill

<table>
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<tr>
<th>What kind of filters installed</th>
<th>Annual Cost to Bob</th>
<th>Annual Cost to Bill</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. No filters</td>
<td>$0</td>
<td>$23,000</td>
</tr>
<tr>
<td>b. Low Grade Filters</td>
<td>$5,000</td>
<td>$6,500</td>
</tr>
<tr>
<td>c. Super Filters</td>
<td>$15,000</td>
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1. What level of filters would be chosen without regulation?
2. What level of filters would be mandated if Bob was not allowed to impose any cost on Bill?
3. What is the socially efficient filter choice? Why is this socially efficient?
4. Suppose that we start in a situation with no
regulation (Bob has the rights) and Bill wants to
pay Bob to install low grade filters?
   a. What is the minimum amount that Bill would have to pay to Bob?
   b. What is the maximum amount that Bill would be willing to pay to
      Bob?
   c. Could a deal be made?
   d. Once they have negotiated to adopt low grade filters, would Bill
      be willing to pay enough to get Bob to switch to super filters?

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5. Could Bill pay Bob to install super filters? If so, based on his total cost, would Bill be better off negotiating for low grade filters or super filters?

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6. Suppose that we start in a situation with strict
regulation requiring Bob to install Super Filters
(Bill has the rights). Would it possible to make a
deal in which Bob pays Bill to use a lower grade
filters or no filters at all?
   a. What is the range of feasible side payments in which
      Bob pays Bill?
   b. What filter would they choose?
   c. **
Now assume that Bob can purchase many grades of filters, from grade 1 to grade 10.

### Table

<table>
<thead>
<tr>
<th>Filter Grade</th>
<th>Bob's Annual Cost to Install</th>
<th>Bill's Annual Cost to Benefit</th>
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<tbody>
<tr>
<td>1</td>
<td>$50</td>
<td>$100</td>
</tr>
<tr>
<td>2</td>
<td>$14</td>
<td>$52</td>
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<tr>
<td>3</td>
<td>$21</td>
<td>$110</td>
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<tr>
<td>5</td>
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<td>6</td>
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<td>$10</td>
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<td>$10</td>
<td>$44</td>
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<tr>
<td>8</td>
<td>$110</td>
<td>$14</td>
</tr>
<tr>
<td>9</td>
<td>$120</td>
<td>$5</td>
</tr>
<tr>
<td>10</td>
<td>$130</td>
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7. Fill in the boxes indicating Bob’s marginal cost to increase the grade of filter used and the marginal benefit to Bill if Bob installs a higher grade filter.

8. Suppose we start with no regulation. Could a deal be made in which Bill pays Bob to install a grade 1 filter? If so, what range of side payments would work?

9. Suppose we start with strict regulation, requiring grade 10 filters. Could a deal be made in which Bob pays Bill to use a grade 9 filter instead? If so, what is range of side payments would work?