Good HW Problems.

Work with the instructor to establish goals for the Design problems to address the goals. Use a mix of qualitative and quantitative problems as appropriate. Avoid re-using old problems or not. Search has become really good, so students usually will find (and copy) old solutions. Solution manuals for textbook problems are available. Add problems that become part of the learning process. Go beyond the in-class material.
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Designing HW and Exam Problems.

- Ask students to apply concepts learned to real-life problems and experiences.
- Try to tailor examples to students' interests.
- Design tests that emphasize what the students should have learned.
- Test skills other than recall.
- Avoid questions that require the recall of trivial details.
- State questions clearly and precisely.
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“Bloom” taxonomy: Questions that Measure...

Knowledge:
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Knowledge:

- Define
- Identify
- Match
- List
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Grading HW/exams.

Work with the reader to define grading metrics. Provide opportunities for students to make-up lost points can add tremendous value to the learning process.
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Using Rubrics for Grading.

A rubric is a set of components accompanied by definitions of performance levels for each, e.g.

<table>
<thead>
<tr>
<th>Component</th>
<th>Level</th>
<th>Description</th>
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<tbody>
<tr>
<td></td>
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</tr>
<tr>
<td></td>
<td>Competent</td>
<td>Gives some support, but sources not authoritative.</td>
</tr>
<tr>
<td></td>
<td>Exemplary</td>
<td>Supports main assertions but no subsidiary points.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Provides strong supporting evidence for main and subsidiary points with multiple authoritative sources.</td>
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Saves time and improves consistency in grading. Even in development.
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Even in development.
Example?

Rubric:
- Knows $p$ is prime? (My bad.)
- Inverses are relatively prime to $p^2$.
- Properly count relatively prime numbers.
- ◀ Maybe: The not relatively prime numbers contain factors of $p$.
- ◀ Therefore: $p^2 - p$ ...
- ◀ or $p(p-1)$
- ◀ Almost: $(p-1)^2$ ...
  pattern match with Euler.
Example?

How many numbers in \( \{0, \ldots, N - 1\} \) have inverses mod \( N \), if \( N = p^2 \)?
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