Solutions to the two contest problems are provided below, including a video for the second problem.

**2020 Gauss Contest, #6**

In the pie chart shown, 80 students chose juice. How many students chose milk?

(A) 120  (B) 160  (C) 240  
(D) 180  (E) 80

**Solution:**

The fraction of the circle which represents students who chose juice is \( \frac{1}{4} \).

Therefore, \( \frac{1}{4} \) of all students chose juice.

Since the 80 students who chose juice represent \( \frac{1}{4} \) of the total number of students, then the total number of students is \( 4 \times 80 = 320 \).

Therefore, \( 320 - 80 = 240 \) students chose milk.

**Answer:** (C)

**2012 Gauss Contest, #15**

Yelena recites \( P, Q, R, S, T, U \) repeatedly (e.g. \( P, Q, R, S, T, U, P, Q, R, \ldots \)). Zeno recites 1, 2, 3, 4 repeatedly (e.g. 1, 2, 3, 4, 1, 2, \ldots ). If Yelena and Zeno begin at the same time and recite at the same rate, which combination will *not* be said?

(A) \( T1 \)  (B) \( U2 \)  (C) \( Q4 \)  (D) \( R2 \)  (E) \( T3 \)

**Solution:**

To determine which combination will not be said, we list the letters and numbers chanted by Yelena and Zeno in the table below.

<table>
<thead>
<tr>
<th></th>
<th>P</th>
<th>Q</th>
<th>R</th>
<th>S</th>
<th>T</th>
<th>U</th>
<th>P</th>
<th>Q</th>
<th>R</th>
<th>S</th>
<th>T</th>
<th>U</th>
<th>P</th>
<th>Q</th>
<th>...</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yelena</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>1</td>
<td>2</td>
<td>...</td>
</tr>
<tr>
<td>Zeno</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>1</td>
<td>2</td>
<td>...</td>
</tr>
</tbody>
</table>

Remember that after Yelena chants “U”, she will start her pattern all over again beginning from \( P \).

Similarly, after Zeno chants “4”, he will start over at 1.

You can see from the table that the pattern for both kids starts to repeat after 12 rounds (it goes back to \( P1, Q2, \ldots \)).

To determine which combination will not be said we need only compare the 5 answers with the 12 possibilities given in the table.

The only combination that appears among the 5 answers, but that does not appear in the table, is \( R2 \).

**Answer:** (D)

**Video**

Visit the following link for an explanation of the solution to the second contest problem and a discussion of a follow-up problem: [https://youtu.be/woHduEnD8M4](https://youtu.be/woHduEnD8M4)