For each of the problems below, identify the name of the appropriate test or interval to use in the calculator (Z-Test, T-Test, 2-SampZTest, 2-SampTTest, 1-PropZTest, 2-PropZTest, TTest for paired differences, ZInterval, TInterval, 2SampZInt, 2-SampTInt, 1-PropZInt, 2-PropZInt). Also write appropriate null and alternate hypotheses, and check the conditions for the test/interval. Please note: You do not need to perform the actual mechanics of the test!

1. Joseph Lister (for whom Listerine is named) was a British physician who was interested in the role of bacteria in human infections. He suspected that germs were involved in transmitting infection, and so he tried using carbolic acid as an operating room disinfectant. In a random sample of 40 amputations performed using carbolic acid, 34 patients lived. In a random sample of 35 amputations without the use of carbolic acid, 19 patients lived. At the 5% level of significance, is there evidence that the use of carbolic acid increases the chances of surviving an amputation?

2. In July 2002, the American Journal of Clinical Nutrition reported that, in a random sample of 1546 African-American women, 649 had vitamin D deficiency. The data came from a national nutrition study conducted by the Center for Disease Control in Atlanta. Create a 95% confidence interval for the population proportion of African-American women who are deficient in vitamin D.

3. Livestock are given a special feed supplement to see if it will promote weight gain. The researchers report that a random sample of 77 cows studied gained an average of 56 pounds. If \( \sigma \) is known to be 2.3 pounds, find a 95% confidence interval for the population mean weight gain for cows fed the special supplement.

4. Having done poorly on their math final exams in June, six students repeat the course in summer school, then take another exam in August. At the 1% level of significance, is there evidence that this program improves student test scores?

<table>
<thead>
<tr>
<th>Student 1</th>
<th>Student 2</th>
<th>Student 3</th>
<th>Student 4</th>
<th>Student 5</th>
<th>Student 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>June Score</td>
<td>54</td>
<td>49</td>
<td>68</td>
<td>66</td>
<td>62</td>
</tr>
<tr>
<td>August Score</td>
<td>50</td>
<td>65</td>
<td>74</td>
<td>64</td>
<td>68</td>
</tr>
</tbody>
</table>
5. The data below show sugar content (as a percentage of weight) of several randomly selected national brands of children’s and adults’ cereals. Create and interpret a 95% confidence interval for the difference in mean sugar content. Assume that the distribution of sugar content is normal.

Children’s Cereals:
40.3 55 45.7 43.3 50.3 45.9 53.5 43 44.2 44 47.4 44
Adults’ Cereals:
20 30.2 2.2 7.5 4.4 22.2 16.6 14.5 21.4 3.3 6.6 7.8 10.6 16.2 14.5 4.1 15.8 4.1 2.4 3.5 8.5 10

6. Education influences attitude and lifestyle. Differences in education are a big factor in the “generation gap.” Is the younger generation really better educated? Large surveys of people age 65 and older were taken in \( n_1 = 32 \) U.S. cities. The sample mean for those cities showed that \( \bar{x}_1 = 15.2\% \) of the older adults had attended college. Large surveys of young adults (ages 25-34) were taken in \( n_2 = 35 \) U.S. cities. The sample mean for these cities showed that \( \bar{x}_2 = 19.7\% \) of the young adults had attended college. From previous studies, it is known that \( \sigma_1 = 7.2\% \) and \( \sigma_2 = 5.2\% \). Does this information indicate that the population mean percentage of young adults who attended college is higher than the percentage of older adults who had attended college? Use \( \alpha = 0.05 \).

7. In a rural area only about 30% of the wells that are drilled find adequate water at a depth of 100 feet or less. A local man claims to be able to find water by “dowsing” – using a forked stick to indicate where the well should be drilled. You randomly select 80 of his customers and find that 27 have wells less than 100 feet deep. Using the 5% level of significance, can you substantiate the man’s claim that he can accurately find well sites less than 100 feet deep?

8. The painful wrist condition called carpal tunnel syndrome can be treated with surgery, or with less invasive wrist splints. In September 2002, Time magazine reported that of 88 randomly selected patients who had surgery, 70 showed improvement after three months. But, of the 88 randomly selected patients who used the wrist splints only 48 had improved. Construct a 99% confidence interval for the difference in proportions of patients who improved with surgery versus using wrist splints.
9. Some students checked 6 bags of Doritos marked with a net weight of 28.3 grams. They carefully weighed the contents of each bag, recording the following weights (in grams):

   29.2  28.5  28.7  28.9  29.1  29.5

Create a 95% confidence interval for the population mean weight of such bags of chips.

10. A manufacturer claims that a new design for a portable phone has increased the range to 150 feet, allowing many customers to use the phones throughout their homes and yards. An independent testing laboratory found that a random sample of 44 of these phones worked over an average distance of 142 feet. From previous studies, $\sigma$ is known to be 12 feet. At the 5% level of significance, is there evidence that the manufacturer’s claim is false (that is, is the range of the phones less than 150 feet)?

11. A factory hiring people to work on an assembly line gives job applicants a test of manual agility. This test counts how many strangely shaped pegs the applicant can fit into matching holes in a one-minute period. In a random sample of $n_1 = 50$ women, the average amount of pegs placed in one minute was $\bar{x}_1 = 17.91$. In a random sample of $n_2 = 50$ men, the average amount of pegs placed in one minute was $\bar{x}_2 = 19.39$. Suppose $\sigma_1 = 2.52$ and $\sigma_2 = 3.39$. Find an 80% confidence interval for the difference in the population mean numbers of pegs women and men are able to place.

12. A nutrition laboratory tests 40 “reduced sodium” hot dogs, finding that the mean sodium content is 310 mg, with a sample standard deviation of 36 mg. If the population mean sodium content for regular hot dogs is 550 mg, use a 1% level of significance to test the claim that these hot dogs really do have “reduced sodium.”

13. In June 2002, the *Journal of Applied Psychology* reported on a study that examined whether the content of TV shows influenced the ability of viewers to recall brand names of items featured in the commercials. In a random sample of $n_1 = 108$ subjects watching TV shows with neutral content, the mean number of brand names recalled was $\bar{x}_1 = 3.17$ with a standard deviation of $s_1 = 1.77$. In a random sample of $n_2 = 108$ subjects watching TV shows with sexual content, the mean number of brand names recalled was $\bar{x}_2 = 1.71$ with a standard deviation of $s_2 = 1.76$. Use a 1% significance level to test the claim that subjects watching neutral TV shows will remember more brand names than those watching TV shows with sexual content.