

Sample Problems – Answer Check

1. You conduct an experiment to compare the rate of fermentation with different sugars by yeast with a CO₂ sensor. Your collected data is in the table below:

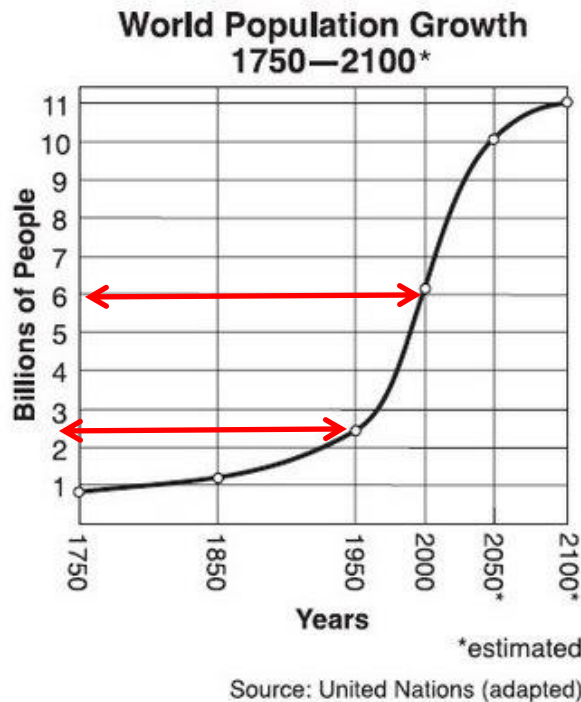
Rate of Fermentation in CO₂ ppm/min:

	Group 1	Group 2	Group 3	Group 4	Group 5	Group 6
Glucose	120.2	130.4	118.9	124.9	115.8	122.5
Fructose	100.3	109.3	102.7	98.8	107.3	103.6
Lactose	20.2	15.5	12.7	21.4	13.6	15.1

If you were graphing the comparative mean rates of fermentation for these sugars what would be your calculated \pm standard error bar for the glucose.

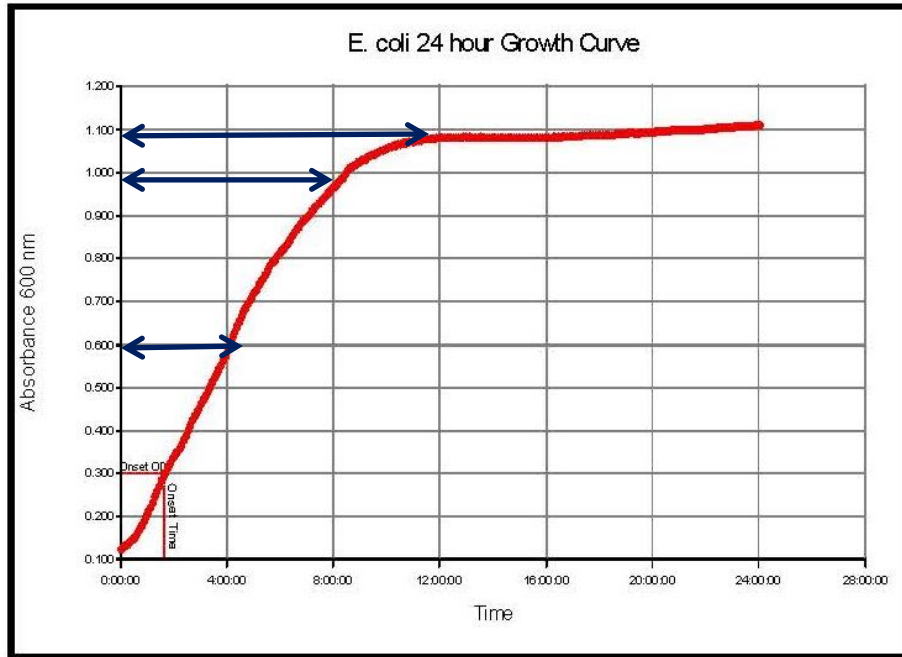
Answer: ± 2.09	Formula and/or Work: $\bar{x} = \frac{1}{n} \sum_{i=1}^n x_i$ 122.12	$s = \sqrt{\frac{\sum (x_i - \bar{x})^2}{n - 1}}$ 5.11	$SE_{\bar{x}} = \frac{s}{\sqrt{n}}$
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2. Based on the World Population Growth Graph below – what is the change in world population per year from 1950 to 2000.



Answer: 70,000,000/year	Formula and/or Work: $\text{Slope} = \frac{y_2 - y_1}{x_2 - x_1} = \frac{6,000,000,000 - 2,500,000,000}{2000 - 1950} = \frac{3,500,000,000}{50} = 70,000,000$
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3. Based on the growth curve for E. coli bacteria graphed over 24 hours and measured in absorbance at 600nm what is the rate of growth between 4 and 8 hours compared to the rate of growth between 8 hours and 12 hours.



<p>Answer: 4 hr to 8 hr is ~3.5 times faster</p>	<p>Formula and/or Work: Compare Slopes $(y_2 - y_1) \div (x_2 - x_1)$ $(4\text{hr to } 8\text{hr}) = (.98 - .60) \div (8.00 - 4.00) = (.38) \div (4.00) = \mathbf{.095 \text{ abs/hr}}$ $(8\text{hr to } 12\text{hr}) = (1.09 - .98) \div (12.00 - 8.00) = (.11) \div (4.00) = \mathbf{.028 \text{ abs/hr}}$</p>
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4. Studies in chipmunks show that there are 265 births per 1000 squirrels and 195 deaths per 1000 squirrels each year. What would be the change in population number (net population growth) if there are now 2023 chipmunks in the population – round off to whole number.

<p>Answer: 142 chipmunks</p>	<p>Formula and/or Work:</p> $\frac{dN}{dt} = B - D$ $(r) = (265/1000) - (195/1000) = .07$ $= .07 \times 2023 = \mathbf{142}$
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5. A bat population in a cave in New Mexico has 934 females and 911 males. The maximum growth rate of the population is (.24) per year, the ecosystem carrying capacity is 2225 bats.

What would be the net population growth or change in population this year – round off to whole number.

<p>Answer: 76 bats</p>	<p>Formula and/or Work:</p> $\frac{dN}{dt} = r_{\max} N \left(\frac{K - N}{K} \right)$ <p>$N = 934 + 911$; $r_{\max} = .24$; $K = 2225$</p>
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What would be the total population size of bats after 2 years if the max growth rate remains at (.24) per year.

<p>Answer: 1984 bats</p>	<p>Formula and/or Work:</p> $\frac{dN}{dt} = r_{\max} N \left(\frac{K - N}{K} \right)$ <p>$N = 934 + 911 + 76$; $r_{\max} = .24$; $K = 2225$</p>
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