The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

ALGEBRA II

Wednesday, June 10, 2026 — 9:15 a.m.to 12:15 p.m., only

MODEL RESPONSE SET

Table of Contents

Question 25

25 Given $a_1 = 5$ and $a_n = (a_{n-1})^2 + 4$, determine a_3.

$a_2 = (5)^2 + 4$

$a_2 = 29$

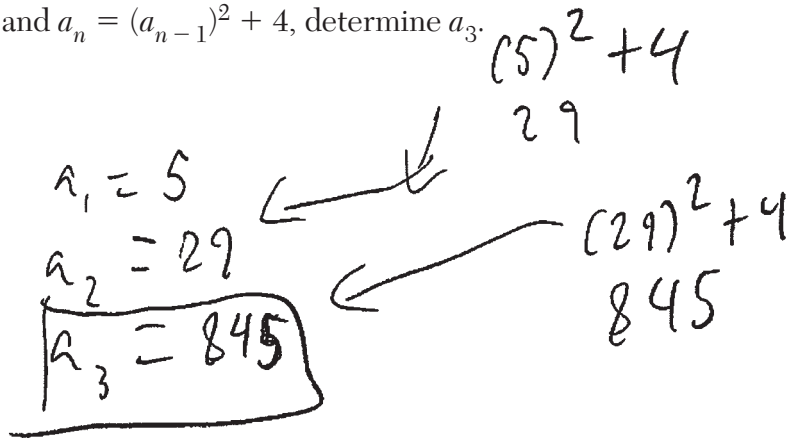
$a_3 = (29)^2 + 4$

$a_3 = 845$

Score 2: The student gave a complete and correct response.

Question 25

25 Given $a_1 = 5$ and $a_n = (a_{n-1})^2 + 4$, determine a_3.



Score 2: The student gave a complete and correct response.

Question 25

25 Given $a_1 = 5$ and $a_n = (a_{n-1})^2 + 4$, determine a_3.

$a_1 = 5$

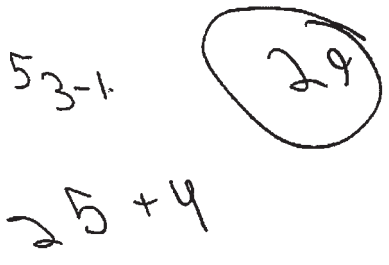
$a_2 = 29$

$a_3 = 845$

Score 2: The student gave a complete and correct response.

Question 25

25 Given $a_1 = 5$ and $a_n = (a_{n-1})^2 + 4$, determine a_3.



Score 1: The student only found a_2.

Question 25

25 Given $a_1 = 5$ and $a_n = (a_{n-1})^2 + 4$, determine a_3.

$a_2 = (a_1)^2 + 4$

$a_2 = (a_{2-1})^2 + 4$

$a_2 = 5^2 + 4$

$a_2 = 25 + 4$

$a_3 = 25^2 + 4$

$a_3 = 629$

$a_1 = 5$

$a_2 = 29$

$a_3 = 629$

Score 1: The student made a substitution error.

Question 25

25 Given $a_1 = 5$ and $a_n = (a_{n-1})^2 + 4$, determine a_3.

$(a_{n-1})^2 + 4$

$(5)^2 + 4 = 29 \quad 29 - 1 = 28$

$(28)^2 + 4 = 788 \quad 788 - 1 = 787$

$(787)^2 + 4 = 619373$

$a_3 = 619373$

Score 1: The student reached a benchmark in the rubric.

Question 25

25 Given $a_1 = 5$ and $a_n = (a_{n-1})^2 + 4$, determine a_3.

$a_2 = (5-1)^2 + 4$

$\downarrow$

$a_2 = 16 + 4$

$\downarrow$

$a_2 = 20$

$\downarrow$

$a_3 = (a_2 - 1)^2 + 4$

$\downarrow$

$a_3 = 365$

Score 1: The student made one conceptual error.

Question 25

25 Given $a_1 = 5$ and $a_n = (a_{n-1})^2 + 4$, determine a_3.

$a_1 = 5$

$a_2 = (a_2 - 5)^2 + 4$

$= (2-5)^2 + 4$

$a_2 = 13$

$a_3 = (3-5)^2 + 4$

$a_3 = 8$

Score 0: The student did not satisfy the criteria for one or more credits.

Question 26

26 The table below shows the average tuition and fees for four-year colleges in the U.S. since 1970.

Years Since 1970 (x)	1	10	20	30	40	49
Tuition and Fees in Dollars (y)	5534	5099	7878	11,079	15,408	17,030

Write an exponential regression equation for this set of data, rounding all values to the *nearest thousandth.*

$a = 4686.77084$

$b = 1.02775212$

$y = a(b)^x$

$y = 4686.771(1.028)^x$

Score 2: The student gave a complete and correct response.

Question 26

26 The table below shows the average tuition and fees for four-year colleges in the U.S. since 1970.

Years Since 1970 (x)	1	10	20	30	40	49
Tuition and Fees in Dollars (y)	5534	5099	7878	11,079	15,408	17,030

Write an exponential regression equation for this set of data, rounding all values to the *nearest thousandth.*

$y = 4686.771 \cdot 1.028^x$

Score 2: The student gave a complete and correct response.

Question 26

26 The table below shows the average tuition and fees for four-year colleges in the U.S. since 1970.

Years Since 1970 (x)	1	10	20	30	40	49
Tuition and Fees in Dollars (y)	5534	5099	7878	11,079	15,408	17,030

Write an exponential regression equation for this set of data, rounding all values to the *nearest thousandth.*

$4686.771(1.028)^x$

Score 1: The student wrote an expression.

Question 26

26 The table below shows the average tuition and fees for four-year colleges in the U.S. since 1970.

Years Since 1970 (x)	1	10	20	30	40	49
Tuition and Fees in Dollars (y)	5534	5099	7878	11,079	15,408	17,030

Write an exponential regression equation for this set of data, rounding all values to the *nearest thousandth.*

$y = (4686.771)(1.028)$

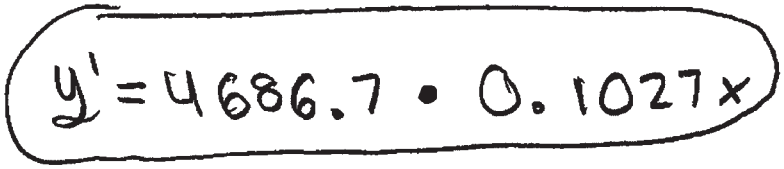
Score 1: The student did not write the exponent, x.

Question 26

26 The table below shows the average tuition and fees for four-year colleges in the U.S. since 1970.

Years Since 1970 (x)	1	10	20	30	40	49
Tuition and Fees in Dollars (y)	5534	5099	7878	11,079	15,408	17,030

Write an exponential regression equation for this set of data, rounding all values to the *nearest thousandth.*



Score 0: The student made multiple errors.

Question 26

26 The table below shows the average tuition and fees for four-year colleges in the U.S. since 1970.

Years Since 1970 (x)	1	10	20	30	40	49
Tuition and Fees in Dollars (y)	5534	5099	7878	11,079	15,408	17,030

Write an exponential regression equation for this set of data, rounding all values to the *nearest thousandth.*

$y = ab^x$

$a = 468.770984$

$b = 1.027782128$

$y = 468.77(1.027)$

Score 0: The student made multiple errors.

Question 27

27 Given $f(x) = 3x^3 - 2x + 5$, determine the remainder when $f(x)$ is divided by $x - 2$.

$3x^2 + 6x + 10$

$x-2 \overline{)3x^3 + 0x^2 - 2x + 5}$

$3x^3 - 6x^2$

$6x^2 - 2x$

$6x^2 - 12x$

remainder = 25

$10x + 5$

$10x - 20$

25

Score 2: The student gave a complete and correct response.

Question 27

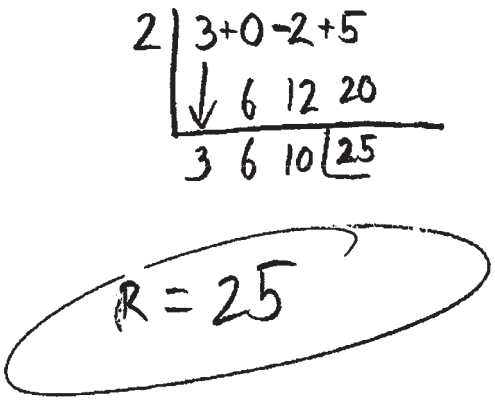
27 Given $f(x) = 3x^3 - 2x + 5$, determine the remainder when $f(x)$ is divided by $x - 2$.

$3(2)^3 - 2(2) + 5 = 25$

Score 2: The student gave a complete and correct response.

Question 27

27 Given $f(x) = 3x^3 - 2x + 5$, determine the remainder when $f(x)$ is divided by $x - 2$.



Score 2: The student gave a complete and correct response.

Question 27

27 Given $f(x) = 3x^3 - 2x + 5$, determine the remainder when $f(x)$ is divided by $x - 2$.

$-3x^2 - 6x - 10$ R 25

$x - 2 \overline{)\ 3x^3 - 2x + 5}$

$-3x^3 + 6x^2$

$6x^2 - 2x$

$-6x^2 + 12x$

$10x + 5$

$-10x + 20$

$= 25$

The remainder is 25

Score 1: The student found the correct answer but divided incorrectly.

Question 27

27 Given $f(x) = 3x^3 - 2x + 5$, determine the remainder when $f(x)$ is divided by $x - 2$.

$3x^3 - 2x + 5$ / $x - 2$

$3x^2 + 6x + 14 + \frac{33}{x-2}$

$x-2\overline{)3x^3 + 0x^2 + 2x + 5}$

$-(3x^3 - 6x^2)$

$0\ (+6x^2 + 2x)$

$-(6x^2 - 12x)$

$0\ +14x + 5$

$-(14x - 28)$

$0\ +33$

the remainder is 33

Score 1: The student made a transcription error.

Question 27

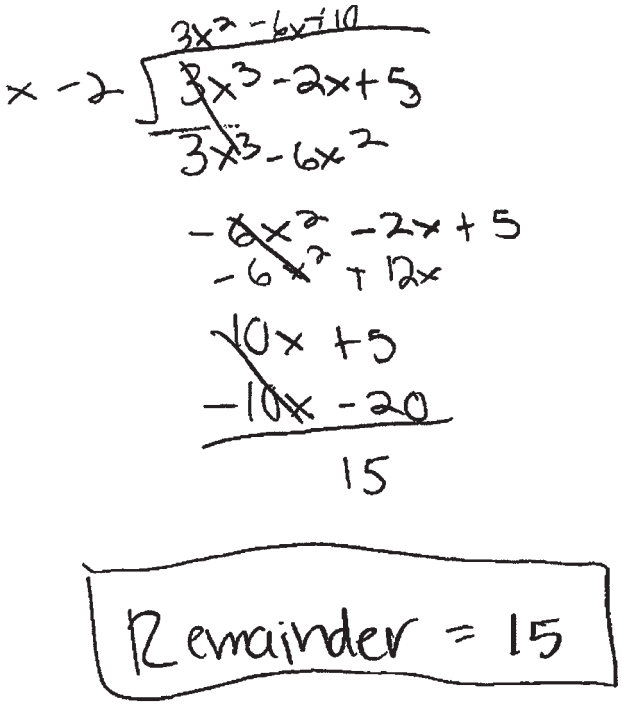
27 Given $f(x) = 3x^3 - 2x + 5$, determine the remainder when $f(x)$ is divided by $x - 2$.

$$
\begin{array}{r|l}
x-2 & 3x^3-2x+5 \\
 & -3x^2+6x-10 \\
\hline
 & -3x^3+6x^2 \\
\hline
 & 6x^2-2x+5 \\
 & -6x^2+12x \\
\hline
 & 10x+5 \\
 & -10x+20 \\
\hline
\end{array}
$$

Score 0: The student made multiple errors.

Question 27

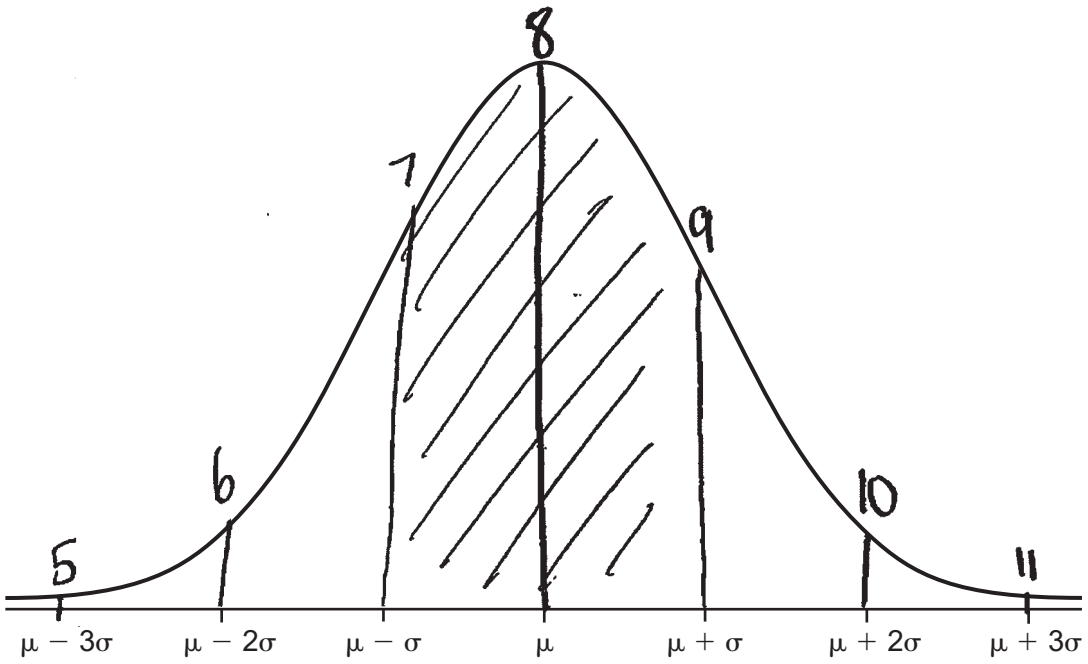
27 Given $f(x) = 3x^3 - 2x + 5$, determine the remainder when $f(x)$ is divided by $x - 2$.



Score 0: The student made multiple errors.

Question 28

28 In the U.S., the number of hours people sleep per day is approximately normally distributed with a mean of eight hours and a standard deviation of one hour. Write the seven values representing hours of sleep on the labeled increments below.



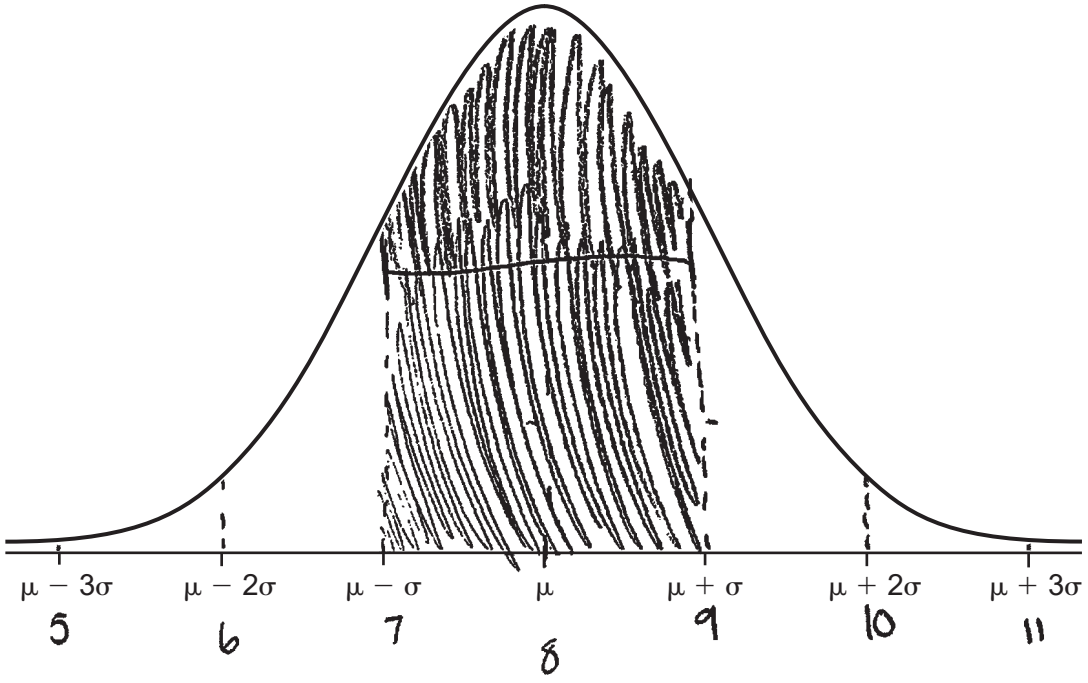
Using your values from the normal curve, state the interval centered on the mean representing approximately 68% of sleep times, in hours.

between 7-9 hours of sleep

Score 2: The student gave a complete and correct response.

Question 28

28 In the U.S., the number of hours people sleep per day is approximately normally distributed with a mean of eight hours and a standard deviation of one hour. Write the seven values representing hours of sleep on the labeled increments below.



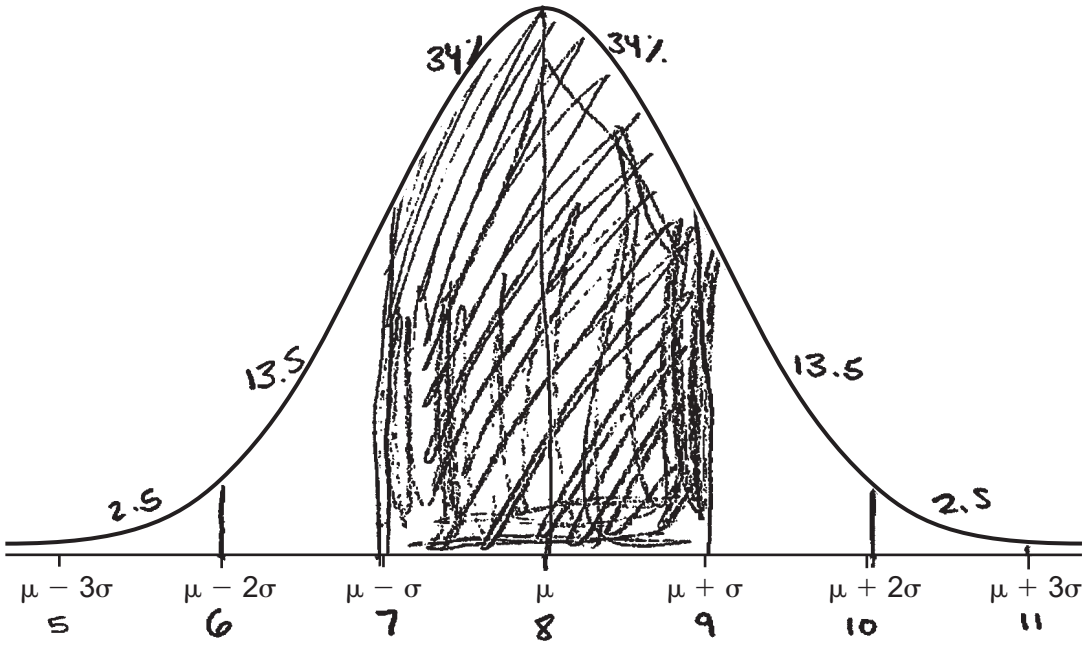
Using your values from the normal curve, state the interval centered on the mean representing approximately 68% of sleep times, in hours.

$(7 \leq x \leq 9)$

Score 2: The student gave a complete and correct response.

Question 28

28 In the U.S., the number of hours people sleep per day is approximately normally distributed with a mean of eight hours and a standard deviation of one hour. Write the seven values representing hours of sleep on the labeled increments below.

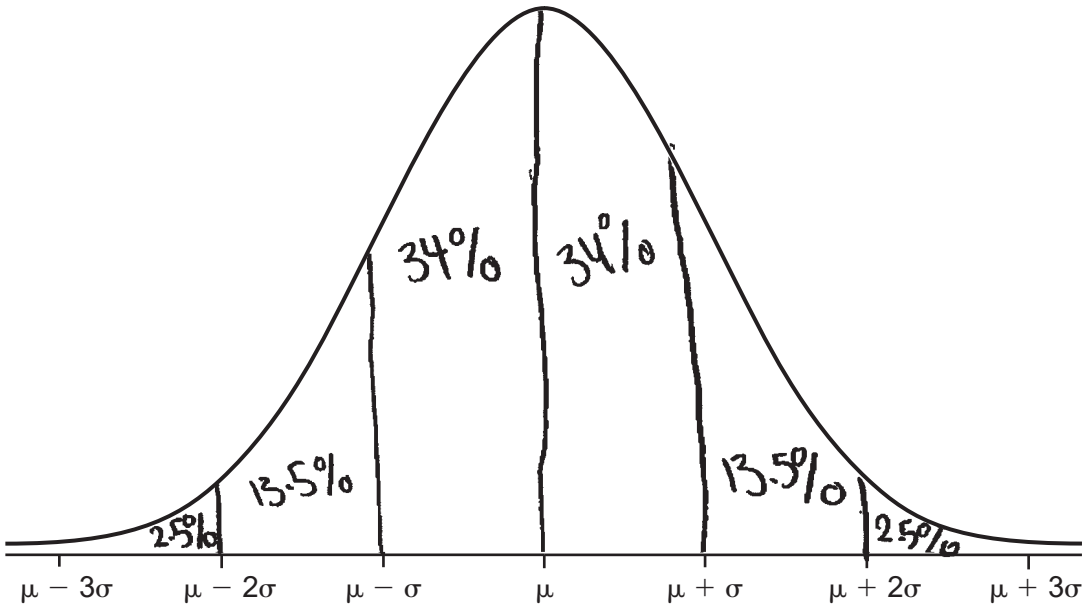


Using your values from the normal curve, state the interval centered on the mean representing approximately 68% of sleep times, in hours.

Score 1: The student did not state the interval.

Question 28

28 In the U.S., the number of hours people sleep per day is approximately normally distributed with a mean of eight hours and a standard deviation of one hour. Write the seven values representing hours of sleep on the labeled increments below.



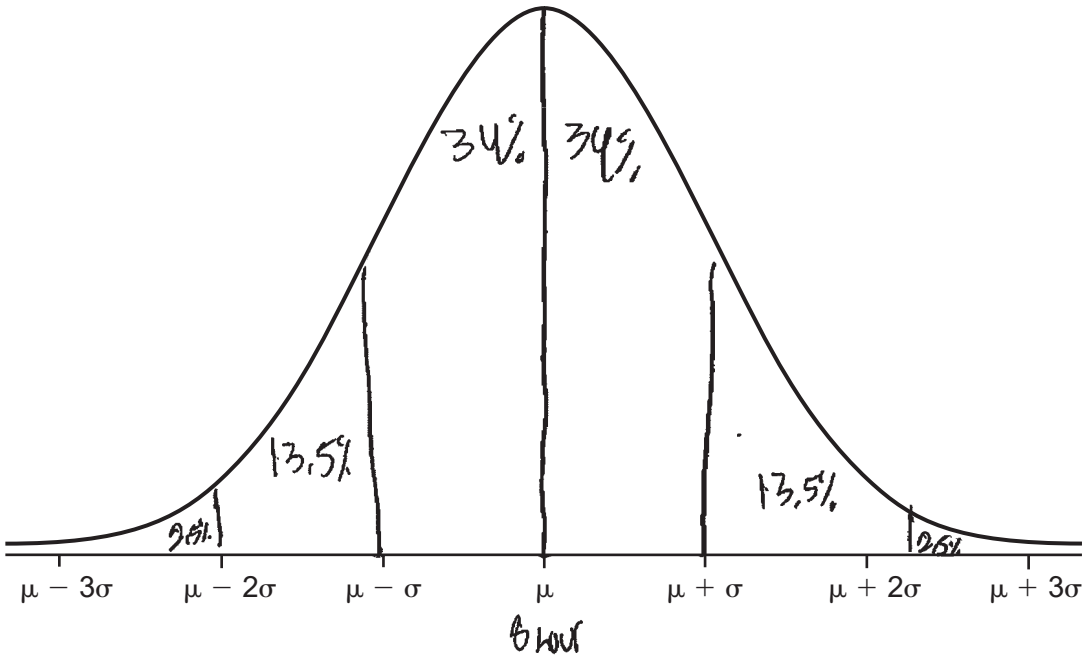
Using your values from the normal curve, state the interval centered on the mean representing approximately 68% of sleep times, in hours.

Representing approximatley 68% of sleep is between $\mu-\sigma$ — $\mu+\sigma$ in terms of hours

Score 1: The student constructed a correct interval based on the absence of numeric labels.

Question 28

28 In the U.S., the number of hours people sleep per day is approximately normally distributed with a mean of eight hours and a standard deviation of one hour. Write the seven values representing hours of sleep on the labeled increments below.



Using your values from the normal curve, state the interval centered on the mean representing approximately 68% of sleep times, in hours.

68% = 0.68

μ − σ to μ + σ

8−1 = 7 | 8 | 8+1 = 9

hours

7, 8, 9

Score 0: The student did not show enough correct work to receive any credit.

Question 28

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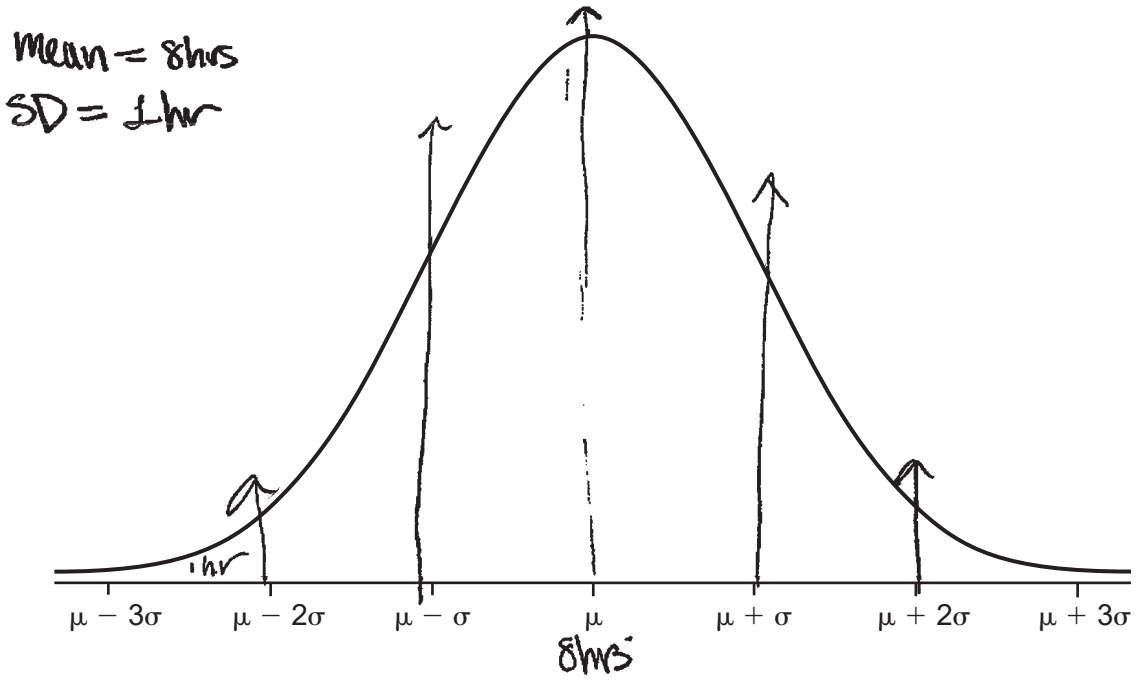


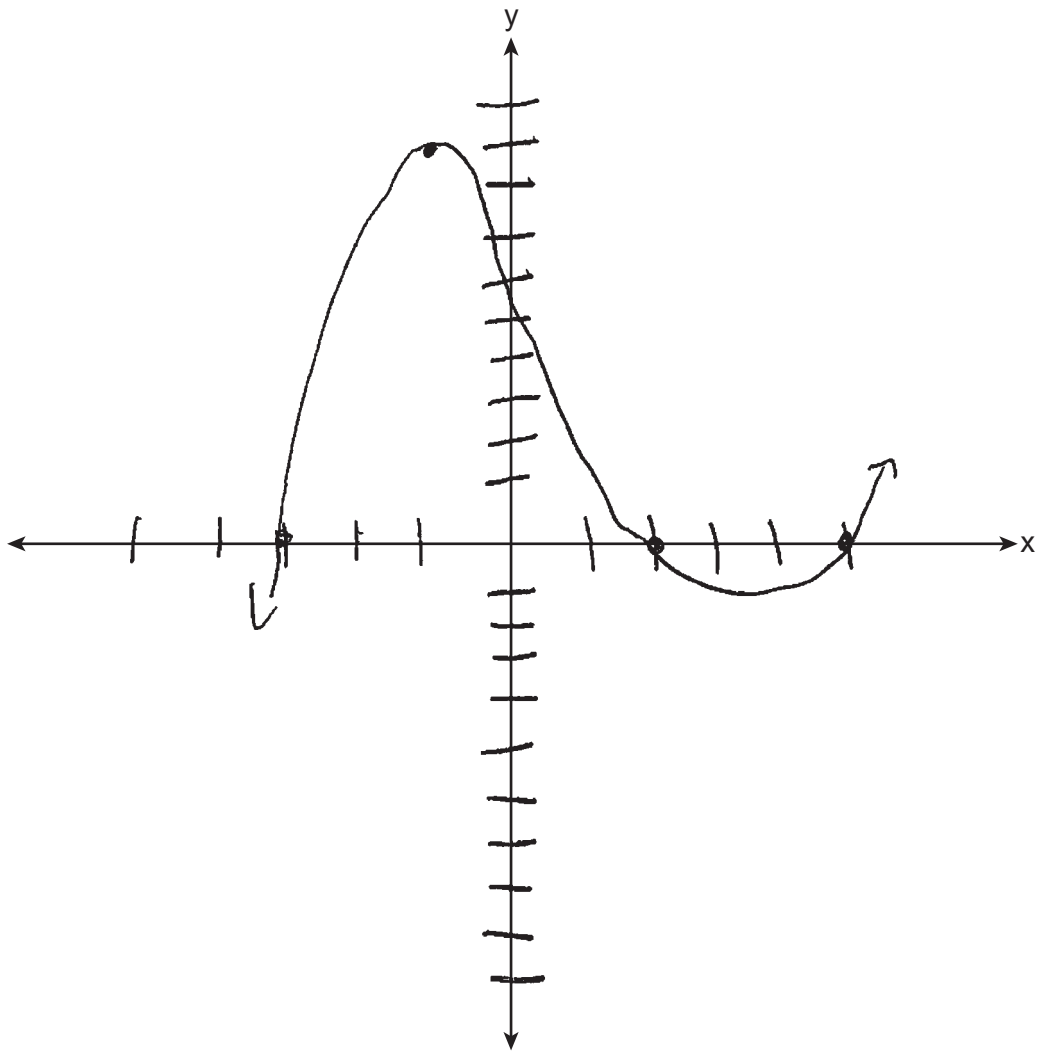
Using your values from the normal curve, state the interval centered on the mean representing approximately 68% of sleep times, in hours.

68% = standard deviation . mean

Score 0: The student did not show enough correct work to receive any credit.

Question 29

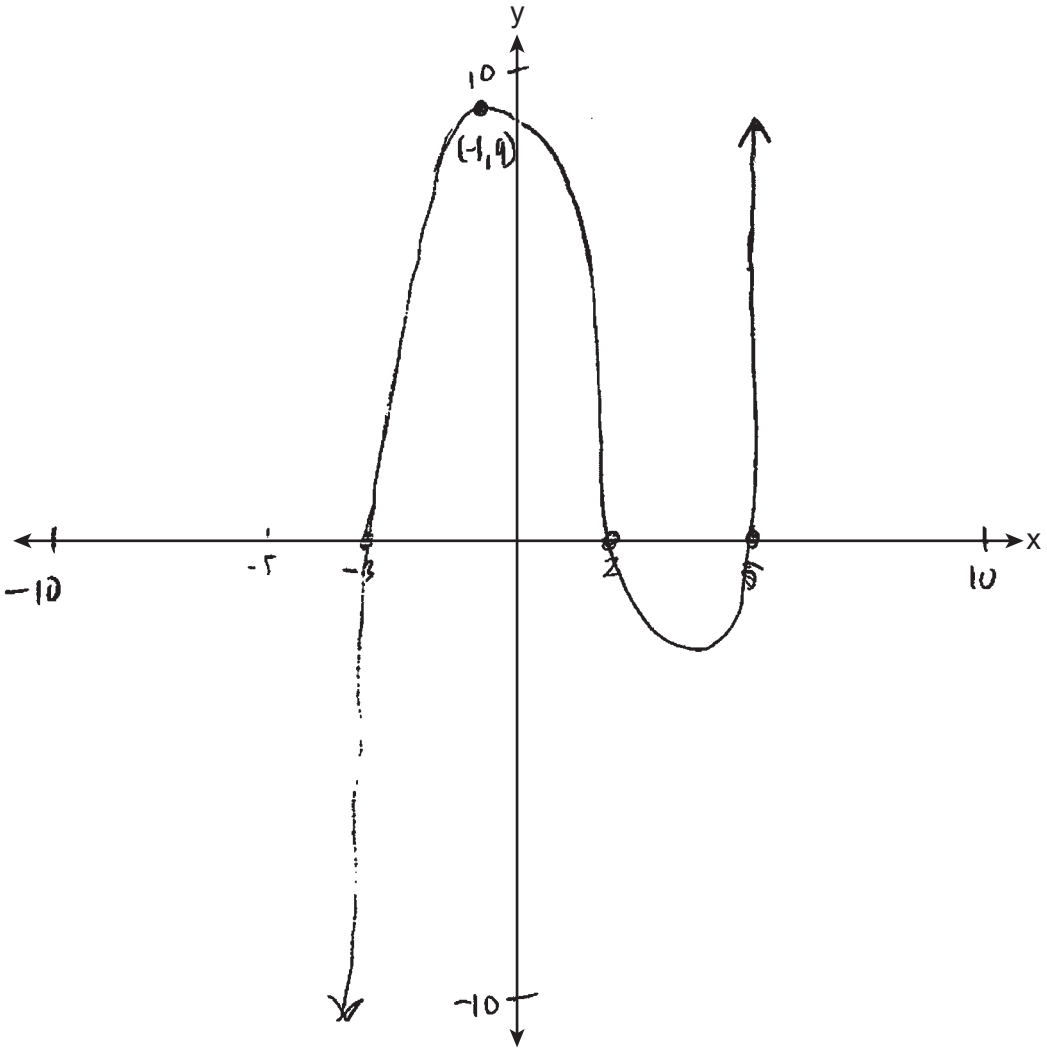
29 The zeros of a cubic polynomial function are -3, 2, and 5. There is a relative maximum of the function at $(-1, 9)$. Construct a sketch of the function on the set of axes below.



Score 2: The student gave a complete and correct response.

Question 29

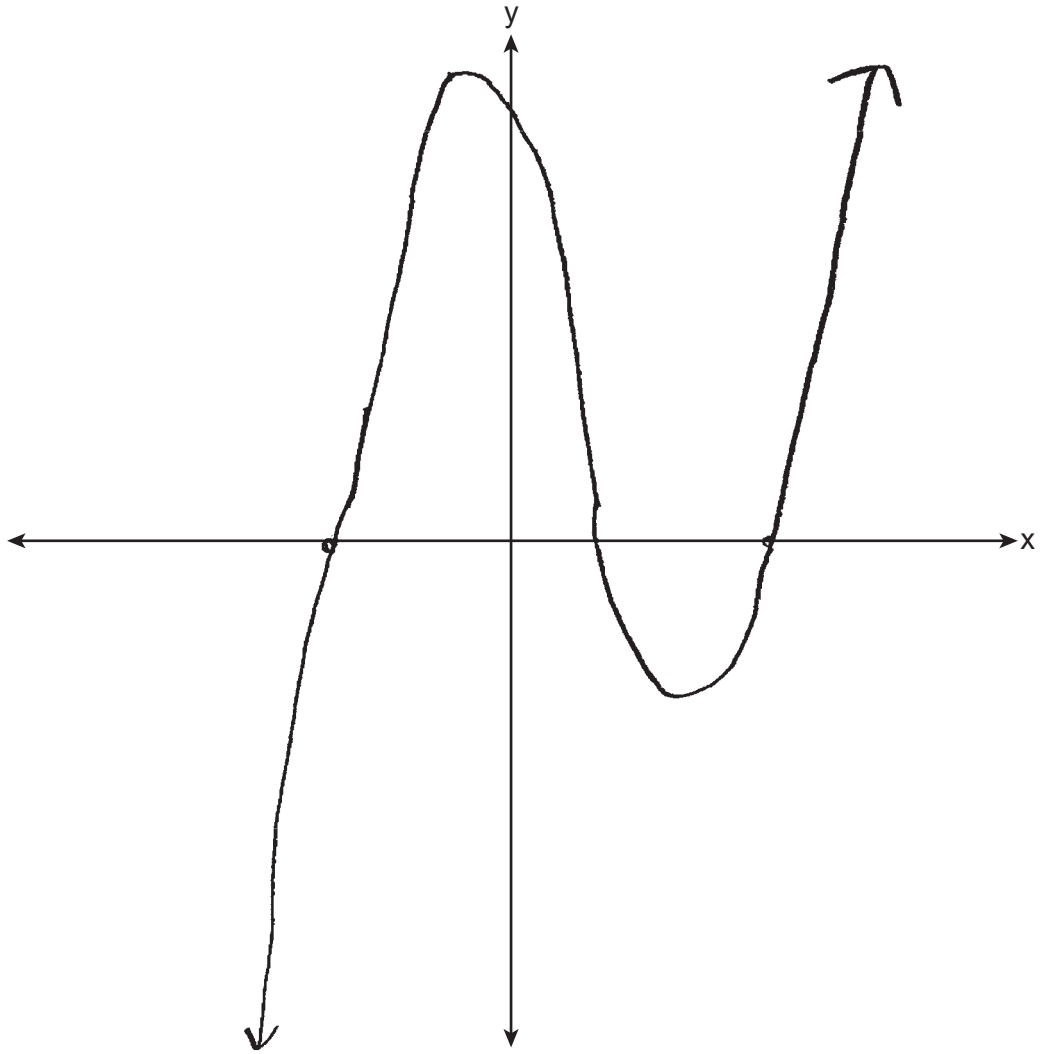
29 The zeros of a cubic polynomial function are −3, 2, and 5. There is a relative maximum of the function at (−1, 9). Construct a sketch of the function on the set of axes below.



Score 2: The student gave a complete and correct response.

Question 29

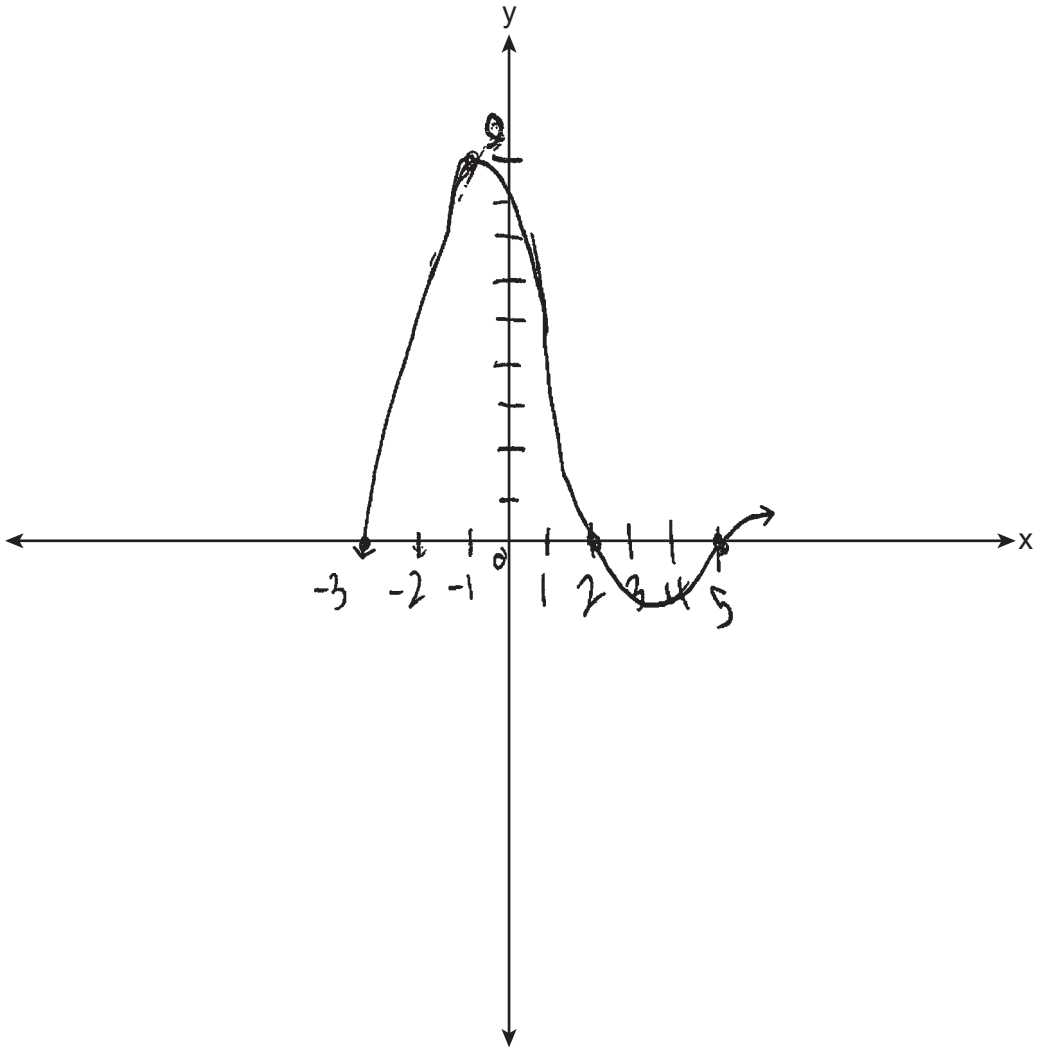
29 The zeros of a cubic polynomial function are -3, 2, and 5. There is a relative maximum of the function at $(-1, 9)$. Construct a sketch of the function on the set of axes below.



Score 1: The student did not include a scale.

Question 29

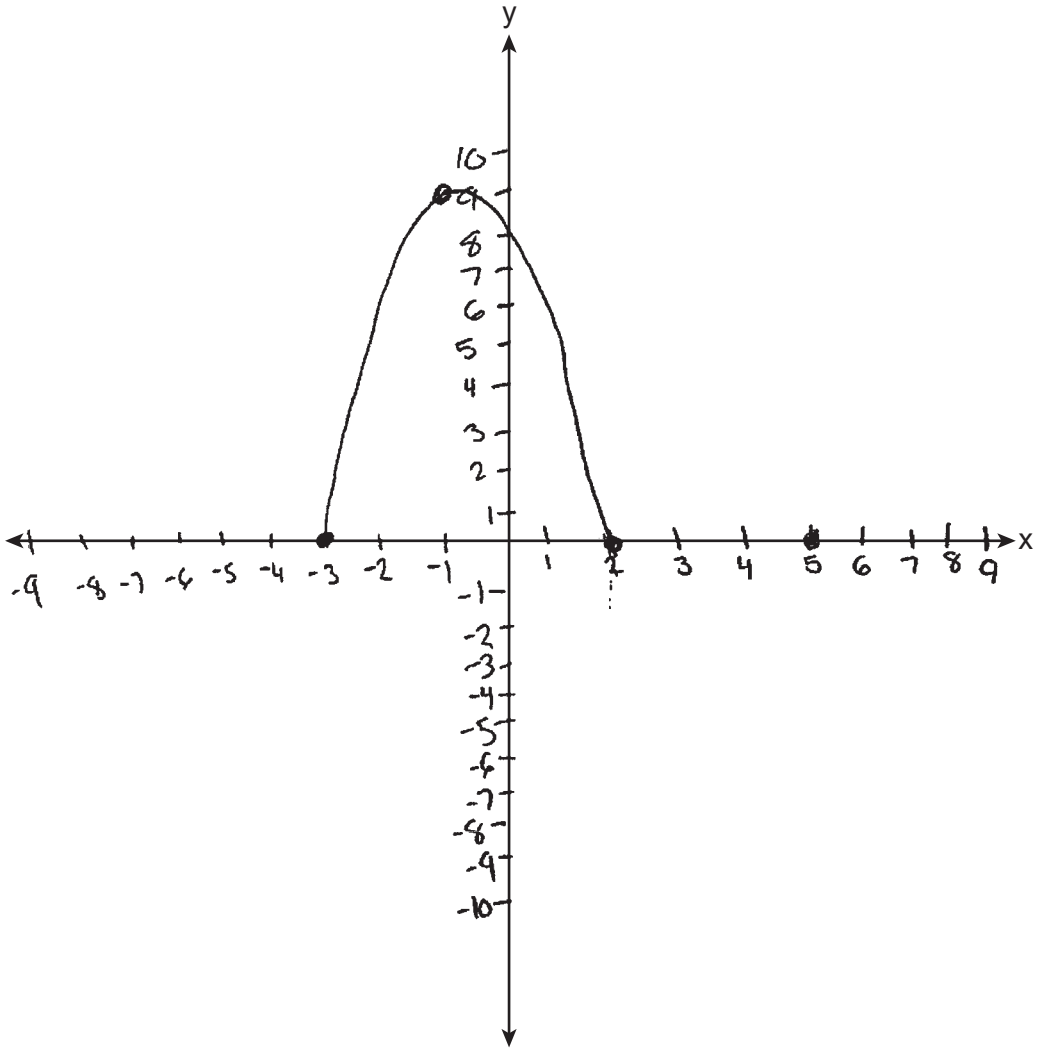
29 The zeros of a cubic polynomial function are -3, 2, and 5. There is a relative maximum of the function at $(-1, 9)$. Construct a sketch of the function on the set of axes below.



Score 1: The student did not sketch a cubic function.

Question 29

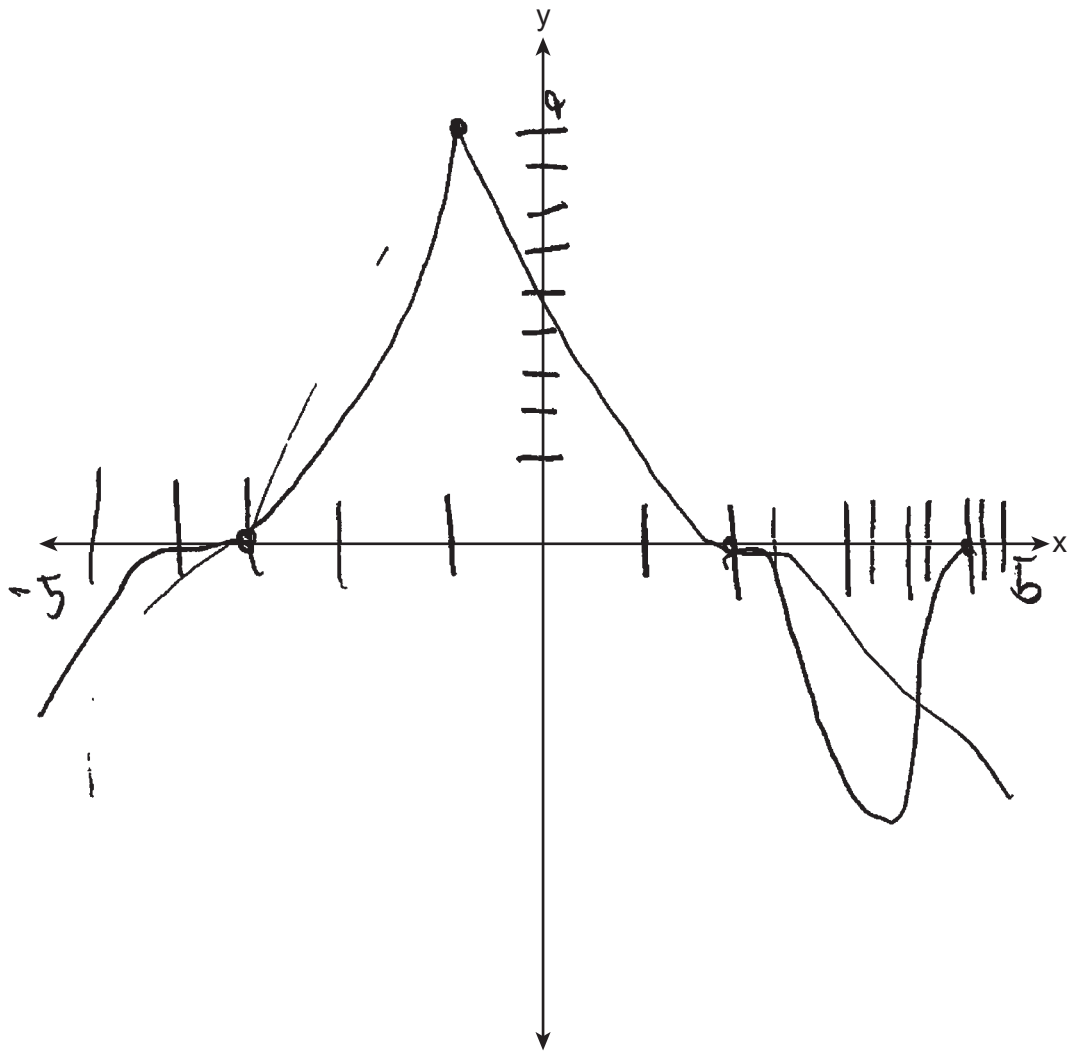
29 The zeros of a cubic polynomial function are -3, 2, and 5. There is a relative maximum of the function at $(-1, 9)$. Construct a sketch of the function on the set of axes below.



Score 0: The student did not show enough correct work to receive any credit.

Question 29

29 The zeros of a cubic polynomial function are -3, 2, and 5. There is a relative maximum of the function at $(-1, 9)$. Construct a sketch of the function on the set of axes below.



Score 0: The student did not show enough correct work to receive any credit.

Question 30

S|A
T|C

SOH-CAH-TOA

30 Given $\cos(\theta) = \frac{7}{12}$ and $\sin(\theta) < 0$, determine the exact value of $\tan(\theta)$.

$\cos\theta = \frac{7}{12}$ $\frac{A}{H}$

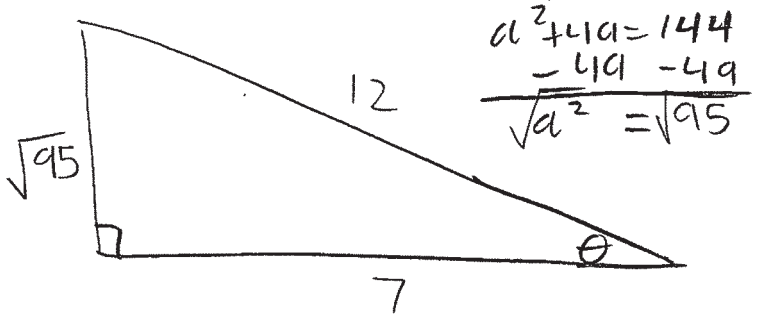
$\tan\theta = \frac{-\sqrt{95}}{7}$ $\frac{O}{A}$

$a^2 + 7^2 = 12^2$

$a^2 + 49 = 144$

$-49 \quad -49$

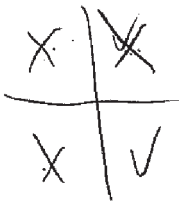
$\sqrt{a^2} = \sqrt{95}$



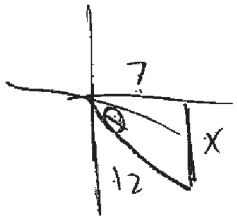
Score 2: The student gave a complete and correct response.

Question 30

30 Given $\cos(\theta) = \frac{7}{12}$ and $\sin(\theta) < 0$, determine the exact value of $\tan(\theta)$.



negative



$7^2 + x^2 = 12^2$

$\sqrt{144 - 49} = \sqrt{95}$

$\tan\theta = \frac{-\sqrt{95}}{7}$

Score 2: The student gave a complete and correct response.

Question 30

30 Given $\cos(\theta) = \frac{7}{12}$ and $\sin(\theta) < 0$, determine the exact value of $\tan(\theta)$.

$\left(\frac{7}{12}\right)^2 + \sin\theta^2 = 1$

$\frac{49}{144} + \sin\theta^2 = \frac{144}{144} - \frac{49}{144}$

$\sqrt{\sin\theta^2} = \sqrt{\frac{95}{144}}$

$\sin\theta = -\frac{\sqrt{95}}{12}$

$\tan = \frac{\sin\theta}{\cos\theta}$

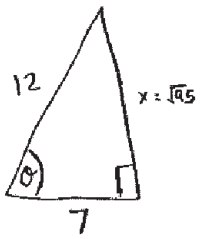
$\tan = \frac{-\frac{\sqrt{95}}{12}}{\frac{7}{12}} = -1.392$

Score 1: The student did not clearly indicate their final answer as an exact value.

Question 30

30 Given $\cos(\theta) = \frac{7}{12}$ and $\sin(\theta) < 0$, determine the exact value of $\tan(\theta)$.

$\sin^2\theta + \cos^2\theta = 1$



$c^2 = a^2 + b^2$

$12^2 = 7^2 + b^2$

$144 = 49 + b^2$

$\sqrt{95} = \sqrt{b^2}$

$b = \sqrt{95}$

$\left(\frac{7}{12}\right)^2 + \sin^2\theta = 1$

$\tan^2\theta + 1 = \sec^2\theta$

$\tan^2\theta + 1 = \left(\frac{12}{7}\right)^2$

$\tan^2\theta + 1 = \frac{144}{49}$

$-1 \quad -1$

$\sqrt{\tan^2\theta} = \sqrt{\frac{95}{49}}$

$\tan\theta = \frac{\sqrt{95}}{7}$

Score 1: The student made a conceptual error.

Question 30

30 Given $\cos(\theta) = \frac{7}{12}$ and $\sin(\theta) < 0$, determine the exact value of $\tan(\theta)$.

$\text{Tan } \theta = \frac{\sin\theta}{\cos\theta}$

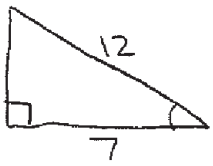
$\text{Tan}\,\theta = \frac{7/12}{1}$

$\text{Tan}\,\theta = 7/12$

Score 0: The student made multiple errors.

Question 30

30 Given $\cos(\theta) = \frac{7}{12}$ and $\sin(\theta) < 0$, determine the exact value of $\tan(\theta)$.



$7^2 + x^2 = 12^2$

$49 + x^2 = 144$

$x^2 = 95$

$x = 9.746794345$

$\tan\theta \left(\frac{9.7}{12}\right)$

Score 0: The student made multiple errors.

Question 31

31 Over the set of complex numbers, determine the roots of the equation $6x^2 + 50 = 2$ in simplest form.

$$\frac{6x^2+0x+48}{6}=\frac{0}{6}$$

$$x^2+0x+8=0$$

$$x=\frac{\pm\sqrt{-32}}{2}$$

$$x=\frac{\pm 4i\sqrt{2}}{2}$$

$$\boxed{x=\pm 2i\sqrt{2}}$$

Score 2: The student gave a complete and correct response.

Question 31

31 Over the set of complex numbers, determine the roots of the equation $6x^2 + 50 = 2$ in simplest form.

$6x^2 = -48$

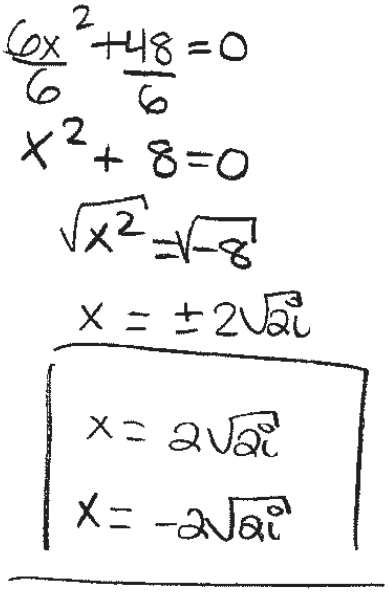
$x^2 = -8$

$x = \pm 2i\sqrt{2}$

Score 2: The student gave a complete and correct response.

Question 31

31 Over the set of complex numbers, determine the roots of the equation $6x^2 + 50 = 2$ in simplest form.



Score 1: The student made a conceptual error.

Question 31

31 Over the set of complex numbers, determine the roots of the equation $6x^2 + 50 = 2$ in simplest form.

$6x^2+50=2$
$-2 \quad -2$

$6x^2+48=0$

$6x^2+0x+48=0$

$6(x^2+0x+8)=0$

$x=\frac{-0 \pm \sqrt{0^2-4(1)(8)}}{2(1)}$

$\frac{\pm\sqrt{-32}}{2}$

$\frac{\pm\sqrt{-1\cdot16\cdot2}}{2}$

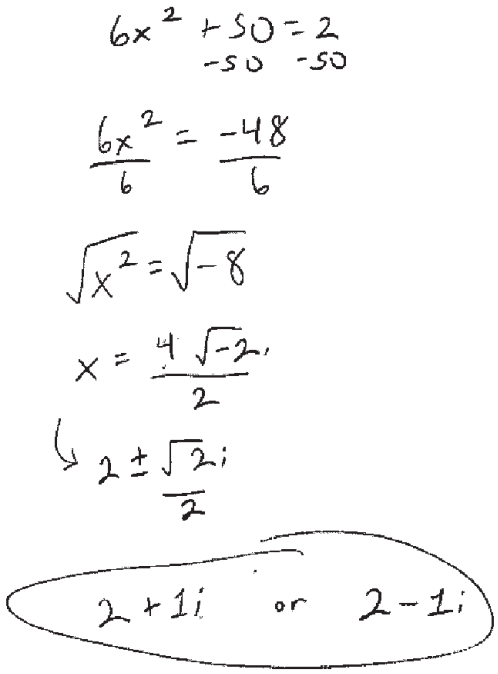
$\frac{\pm4i\sqrt{2}}{2} \rightarrow \pm2i\sqrt{2}$

$2i \pm \sqrt{2}$

Score 1: The student's final answer is incorrect.

Question 31

31 Over the set of complex numbers, determine the roots of the equation $6x^2 + 50 = 2$ in simplest form.



Score 0: The student made multiple errors.

Question 31

31 Over the set of complex numbers, determine the roots of the equation $6x^2 + 50 = 2$ in simplest form.

$6x^2 + 50 = 2$

$-50 \quad -50$

$\frac{6x^2}{6} = \frac{-48}{6}$

$\sqrt{x^2} = \sqrt{-8}$

$\sqrt{-1} \rightarrow i$

$\sqrt{8}$

$\sqrt{4} \rightarrow 2$

$2i\sqrt{2}$

$x = \sqrt{2} + 2i$

Score 0: The student made multiple errors.

Question 32

32 For all the values of x for which the expression is defined, rewrite the expression below in simplest form.

$$\frac{x^3 + 64}{2x^2 + 7x - 4}$$

$a^3 + b^3 = (a+b)(a^2 - ab + b^2)$

$(x+4)(x^2 - 4x + 16)$

$2x^2 + 9x - 4$

$2x^2 + 8x - 1x - 4$

$2x(x+4) - 1(x+4)$

$\frac{(x+4)(x^2-4x+16)}{(2x-1)(x+4)}$

$\frac{x^2 - 4x + 16}{2x - 1}$

Score 2: The student gave a complete and correct response.

Question 32

32 For all the values of x for which the expression is defined, rewrite the expression below in simplest form.

$$\frac{x^3 + 64}{2x^2 + 7x - 4}$$

$\frac{x^3+64}{2x^2+7x-4}$

$\frac{(x+4)(x^2-4x+16)}{2x^2+8x-x-4}$

$\frac{(x+4)(x^2-4x+16)}{2x(x+4)-(x+4)}$

$\frac{x^2-4x+16}{2x-1}$

Score 2: The student gave a complete and correct response.

Question 32

32 For all the values of x for which the expression is defined, rewrite the expression below in simplest form.

$$\frac{x^3 + 64}{2x^2 + 7x - 4}$$

$\frac{x^3+64}{2x^2+7x-4}$ $2x^2+8x-1x-4$

$2x(x+4)-1(x+4)$

$(2x-1)(x+4)$

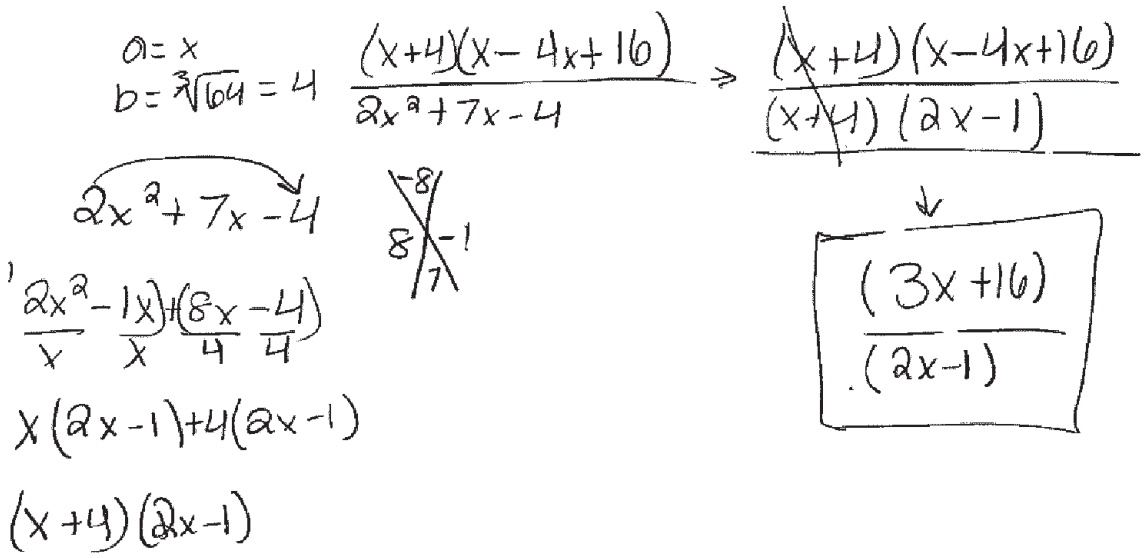
$\frac{x^3+64}{(2x-1)(x+4)}$

Score 1: The student factored the denominator correctly.

Question 32

32 For all the values of x for which the expression is defined, rewrite the expression below in simplest form.

$$\frac{x^3 + 64}{2x^2 + 7x - 4}$$

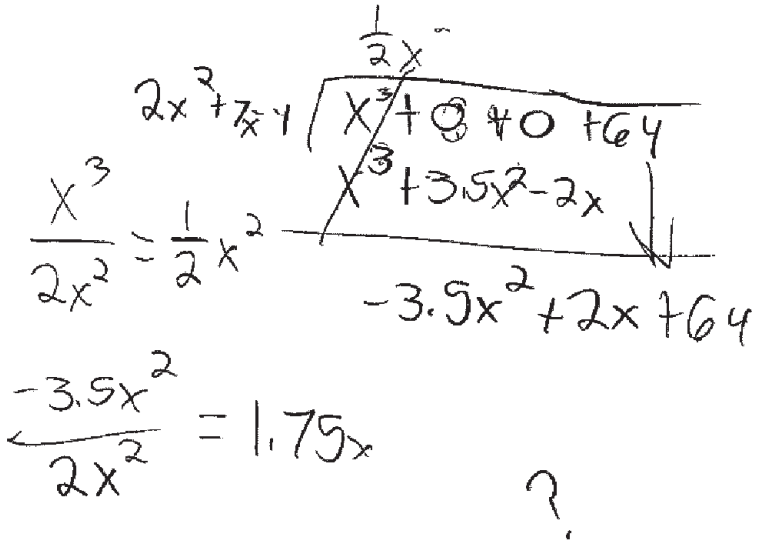


Score 1: The student reached the benchmark of factoring the denominator correctly.

Question 32

32 For all the values of x for which the expression is defined, rewrite the expression below in simplest form.

$$\frac{x^3 + 64}{2x^2 + 7x - 4}$$

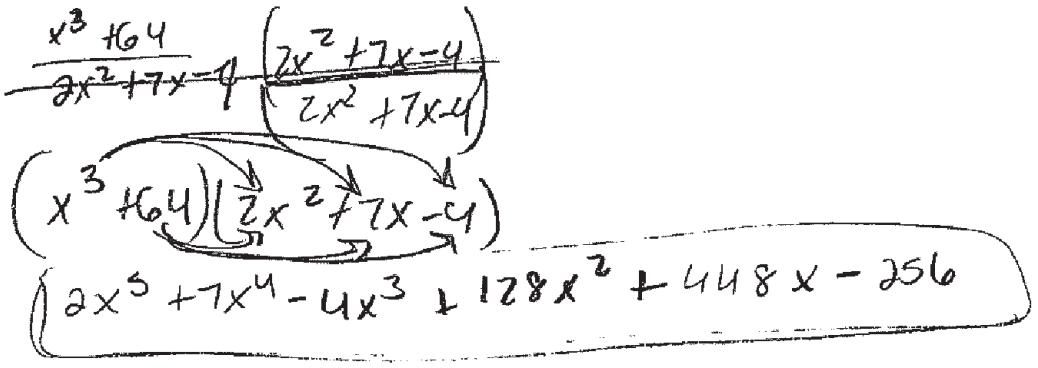


Score 0: The student did not satisfy the criteria for one or more credits.

Question 32

32 For all the values of x for which the expression is defined, rewrite the expression below in simplest form.

$$\frac{x^3 + 64}{2x^2 + 7x - 4}$$



Score 0: The student did not satisfy the criteria for one or more credits.

Question 33

33 Researchers surveyed 312 American adults to see if people's ages are related to whether they prefer ebooks or print books. The survey results are summarized in the table below.

	Prefer eBooks	Prefer Print Books	Total
Ages 27-58	42	126	168
Ages 59-90	36	108	144
Total	78	234	312

Find the probability that a randomly selected adult from the survey prefers ebooks.

$P(E) = \frac{78}{312} = .25 = 25\%$

Find the probability that a randomly selected adult from the survey prefers ebooks, given that the person is aged 27 to 58.

$P(E|Y) = \frac{42}{168} = .25 = 25\%$

Are the events "prefer ebooks" and "ages 27 to 58" independent? Use the survey results to justify your answer.

The events "prefer ebooks" and "ages 27 to 58" are independent

$P(E) = P(E|Y)$

Score 4: The student gave a complete and correct response.

Question 33

33 Researchers surveyed 312 American adults to see if people's ages are related to whether they prefer ebooks or print books. The survey results are summarized in the table below.

	Prefer eBooks	Prefer Print Books	Total
Ages 27-58	42	126	168
Ages 59-90	36	108	144
Total	78	234	312

Find the probability that a randomly selected adult from the survey prefers ebooks.

$\frac{78}{312} = .25$

Find the probability that a randomly selected adult from the survey prefers ebooks, given that the person is aged 27 to 58.

$P(A|B) = \frac{P(A \cap B)}{P(B)}$

$\frac{\frac{42}{312}}{\frac{168}{312}} = .25$

Are the events "prefer ebooks" and "ages 27 to 58" independent? Use the survey results to justify your answer.

Yes. The probability of prefering ebooks given that the subject is ages 27 to 58 and the probability of prefering ebooks are the same, signalling that these events are independant

Score 4: The student gave a complete and correct response.

Question 33

33 Researchers surveyed 312 American adults to see if people's ages are related to whether they prefer ebooks or print books. The survey results are summarized in the table below.

	Prefer eBooks	Prefer Print Books	Total
Ages 27-58	42	126	168
Ages 59-90	36	108	144
Total	78	234	312

Find the probability that a randomly selected adult from the survey prefers ebooks.

$\frac{78}{312} = \frac{1}{4}$

Find the probability that a randomly selected adult from the survey prefers ebooks, given that the person is aged 27 to 58.

$\frac{42}{168} = \frac{1}{4}$

Are the events "prefer ebooks" and "ages 27 to 58" independent? Use the survey results to justify your answer.

$\frac{1}{4} = \frac{1}{4}$ ✓ Since the results are equal, they are dependent

Score 3: The student made an error in their justification.

Question 33

33 Researchers surveyed 312 American adults to see if people's ages are related to whether they prefer ebooks or print books. The survey results are summarized in the table below.

	Prefer eBooks	Prefer Print Books	Total
Ages 27-58	42	126	168
Ages 59-90	36	108	144
Total	78	234	312

Find the probability that a randomly selected adult from the survey prefers ebooks.

$\frac{78}{312}$

Find the probability that a randomly selected adult from the survey prefers ebooks, given that the person is aged 27 to 58.

$\frac{42}{78}$

Are the events "prefer ebooks" and "ages 27 to 58" independent? Use the survey results to justify your answer.

$P(\text{ebn } 27\text{-}58) = \frac{42}{312} = .1345$

$P(\text{ebook}) = \frac{78}{312} = .25$

$P(27\text{-}58) = .538$

Yes, it is independent because it's equal to eachother.

$P(A)P(B) = P(A \cap B)$

$(.25)(.538) = .1345$

$.1345 = .1345$

Score 3: The student found an incorrect conditional probability.

Question 33

33 Researchers surveyed 312 American adults to see if people's ages are related to whether they prefer ebooks or print books. The survey results are summarized in the table below.

	Prefer eBooks	Prefer Print Books	Total
Ages 27-58	42	126	168
Ages 59-90	36	108	144
Total	78	234	312

Find the probability that a randomly selected adult from the survey prefers ebooks.

$\frac{78}{312} = .25 = 25\%$

Find the probability that a randomly selected adult from the survey prefers ebooks, given that the person is aged 27 to 58.

$\frac{42}{312} \approx .13 = 13\%$

Are the events "prefer ebooks" and "ages 27 to 58" independent? Use the survey results to justify your answer.

They are independent because for prefer ebooks the probability has 25% and for prefer ebooks for ages 27 to 58 it was 13% which aren't the same percentage so its independent.

Score 2: The student's first probability is correct and the justification is partially correct.

Question 33

33 Researchers surveyed 312 American adults to see if people's ages are related to whether they prefer ebooks or print books. The survey results are summarized in the table below.

	Prefer eBooks	Prefer Print Books	Total
Ages 27-58	42	126	168
Ages 59-90	36	108	144
Total	78	234	312

Find the probability that a randomly selected adult from the survey prefers ebooks.

$\frac{78}{312} = 25\%$.

Find the probability that a randomly selected adult from the survey prefers ebooks, given that the person is aged 27 to 58.

$\frac{42}{108} = .25\%$.

Are the events "prefer ebooks" and "ages 27 to 58" independent? Use the survey results to justify your answer.

yes, they're independent

Score 2: The student found the correct probabilities.

Question 33

33 Researchers surveyed 312 American adults to see if people's ages are related to whether they prefer ebooks or print books. The survey results are summarized in the table below.

	Prefer eBooks	Prefer Print Books	Total
Ages 27-58	42	126	168
Ages 59-90	36	108	144
Total	78	234	312

>312

Find the probability that a randomly selected adult from the survey prefers ebooks.

$P(A \cap EB) = P(A) + P(EB) - P(A \cap EB)$

$P(A \cap EB) = 312 + 78 - 78$ $\qquad P(EB) = \cdot 78$

$P(A \cap EB) = 78$

Find the probability that a randomly selected adult from the survey prefers ebooks, given that the person is aged 27 to 58.

$$P(EB \mid 27\text{-}58) = \frac{42}{168} = \frac{1}{4}$$

Are the events "prefer ebooks" and "ages 27 to 58" independent? Use the survey results to justify your answer.

$P(EB \cap 27\text{-}58) = P(EB) \cdot P(27\text{-}58)$ $\qquad$ yes.

$42 = 78 \cdot 168$

$42 = 13062$

Score 1: The student earned one credit for the second part.

Question 33

33 Researchers surveyed 312 American adults to see if people's ages are related to whether they prefer ebooks or print books. The survey results are summarized in the table below.

	Prefer eBooks	Prefer Print Books	Total
Ages 27-58	42	126	168
Ages 59-90	36	108	144
Total	78	234	312

Find the probability that a randomly selected adult from the survey prefers ebooks.

72/312

Find the probability that a randomly selected adult from the survey prefers ebooks, given that the person is aged 27 to 58.

42/168

Are the events "prefer ebooks" and "ages 27 to 58" independent? Use the survey results to justify your answer.

Yes

Score 1: The student earned one credit for the second part.

Question 33

33 Researchers surveyed 312 American adults to see if people's ages are related to whether they prefer ebooks or print books. The survey results are summarized in the table below.

	Prefer eBooks	Prefer Print Books	Total
Ages 27-58	42	126	168
Ages 59-90	36	108	144
Total	78	234	312

336
288
624

156 | 468 | 624

Find the probability that a randomly selected adult from the survey prefers ebooks.

$\frac{156}{624}$

$\frac{\frac{234}{312}}{\frac{78}{312}} = 3$

Find the probability that a randomly selected adult from the survey prefers ebooks, given that the person is aged 27 to 58.

$\frac{\frac{78}{312}}{\frac{42}{312}} = 1.857142857$

Are the events "prefer ebooks" and "ages 27 to 58" independent? Use the survey results to justify your answer.

$42 \neq 36$

Not independent

Score 0: The student did not satisfy the criteria for one or more credits.

Question 33

33 Researchers surveyed 312 American adults to see if people's ages are related to whether they prefer ebooks or print books. The survey results are summarized in the table below.

	Prefer eBooks	Prefer Print Books	Total
Ages 27-58	42	126	168
Ages 59-90	36	108	144
Total	78	234	312

Find the probability that a randomly selected adult from the survey prefers ebooks.

$\frac{78}{36} = 2.16 \times 10 = 216 \rightarrow$ 22%

$\frac{78}{42} = 1.857 \times 10 = 18.57 \rightarrow$ 14%

Find the probability that a randomly selected adult from the survey prefers ebooks, given that the person is aged 27 to 58.

$\frac{168}{42} = 3.375 \times 100 = \frac{337.5}{58}$

$5.81 \times 10 = 58.1$ → 58%

Are the events "prefer ebooks" and "ages 27 to 58" independent? Use the survey results to justify your answer.

$P(A \cap B) = P(A) \cdot P(B)$

No.

$42(27) \cdot 42(58)$

$1134 \cdot 2436 = 2762424$

Score 0: The student did not satisfy the criteria for one or more credits.

Question 34

34 Somika opens a savings account and deposits $20,000 into the account that grows at a rate of 2.46% per year, compounded monthly. Write an exponential function, $S(t)$, that represents the amount of money in the account t years after it is opened, assuming no other money is deposited or withdrawn from the account.

$P = 20{,}000 \quad A = S(t)$

$r = 2.46 = 0.0246 \quad n = 12$

$A = P\left(1 + \frac{r}{n}\right)^{nt}$

$S(t) = 20{,}000\left(1 + \frac{0.0246}{12}\right)^{12t}$

$S(t) = 20{,}000(1.00205)^{12t}$

Algebraically calculate the number of years, to the *nearest tenth*, it will take for her account to reach $24,000.

$S(t) = 24{,}000$

$S(t) = 20{,}000(1.00205)^{12t}$

$7.414034537 \approx t$

$\frac{24{,}000}{20{,}000} = \frac{20{,}000(1.00205)^{12t}}{20{,}000}$

7.4 years

$1.2 = (1.00205)^{12t}$

$\frac{\log 1.2}{\log 1.00205} = \frac{(\log 1.00205)12t}{\log 1.00205}$

$\frac{\log 1.2}{\frac{\log 1.00205}{12}} = \frac{12t}{12}$

Score 4: The student gave a complete and correct response.

Question 34

34 Somika opens a savings account and deposits $20,000 into the account that grows at a rate of 2.46% per year, compounded monthly. Write an exponential function, $S(t)$, that represents the amount of money in the account t years after it is opened, assuming no other money is deposited or withdrawn from the account.

monthly = 12

r : 2.46% → .0246

$$S(t) = 20000\left(1 + \frac{.0246}{12}\right)^{t(12)}$$

Algebraically calculate the number of years, to the *nearest tenth*, it will take for her account to reach $24,000.

$$24000 = 20000\left(1 + \frac{.0246}{12}\right)^{t(12)}$$

$$\frac{24}{20} = (1.00205)^{t(12)}$$

Log (math alpha math)

$$\log_{1.00205}(24/20) = t(12)$$

$$89.02847 = t(12)$$

$$7.419 = t$$

It will take 7.4 years.

Score 4: The student gave a complete and correct response.

Question 34

34 Somika opens a savings account and deposits \$20,000 into the account that grows at a rate of 2.46% per year, compounded monthly. Write an exponential function, $S(t)$, that represents the amount of money in the account t years after it is opened, assuming no other money is deposited or withdrawn from the account.

$(1+.0246)^{\frac{1}{12}}$

$S(t) = 20000(1.002027243)^{12t}$

Algebraically calculate the number of years, to the *nearest tenth*, it will take for her account to reach \$24,000.

$\frac{24000}{20000} = \frac{20000(1.002027243)^{12t}}{20000}$

$\log\left(\frac{6}{5}\right) = \log(1.002027243)^{12t}$

$\frac{\log\left(\frac{6}{5}\right)}{12\log(1.002027243)} = \frac{12t\log(1.002027243)}{12\log(1.002027243)}$

$t = \frac{\log\left(\frac{6}{5}\right)}{12\log(1.002027243)}$

$t \approx 7.5$

Score 3: The student made an error writing the exponential function.

Question 34

34 Somika opens a savings account and deposits $20,000 into the account that grows at a rate of 2.46% per year, compounded monthly. Write an exponential function, $S(t)$, that represents the amount of money in the account t years after it is opened, assuming no other money is deposited or withdrawn from the account.

0.0246 $S(t) = 20000(1.0246)^{12t}$

$S(t) = 20000(1.0246)^{12t}$

Algebraically calculate the number of years, to the *nearest tenth*, it will take for her account to reach $24,000.

$\frac{24000}{20000} = \frac{20000(1.0246)^{12t}}{20000}$

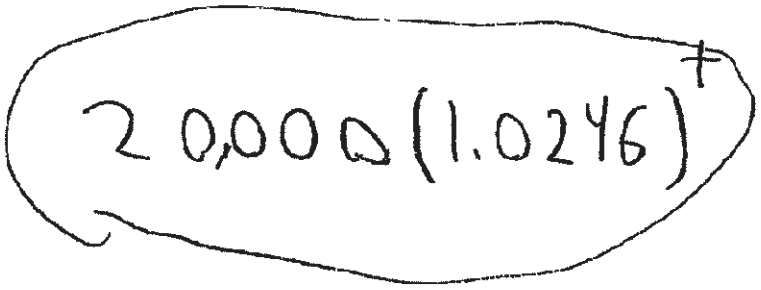
$\log_b a = c \rightarrow \frac{\log_{1.0246}\left(\frac{24000}{20000}\right)}{12} = \frac{12t}{12}$

$t = 0.6$ years

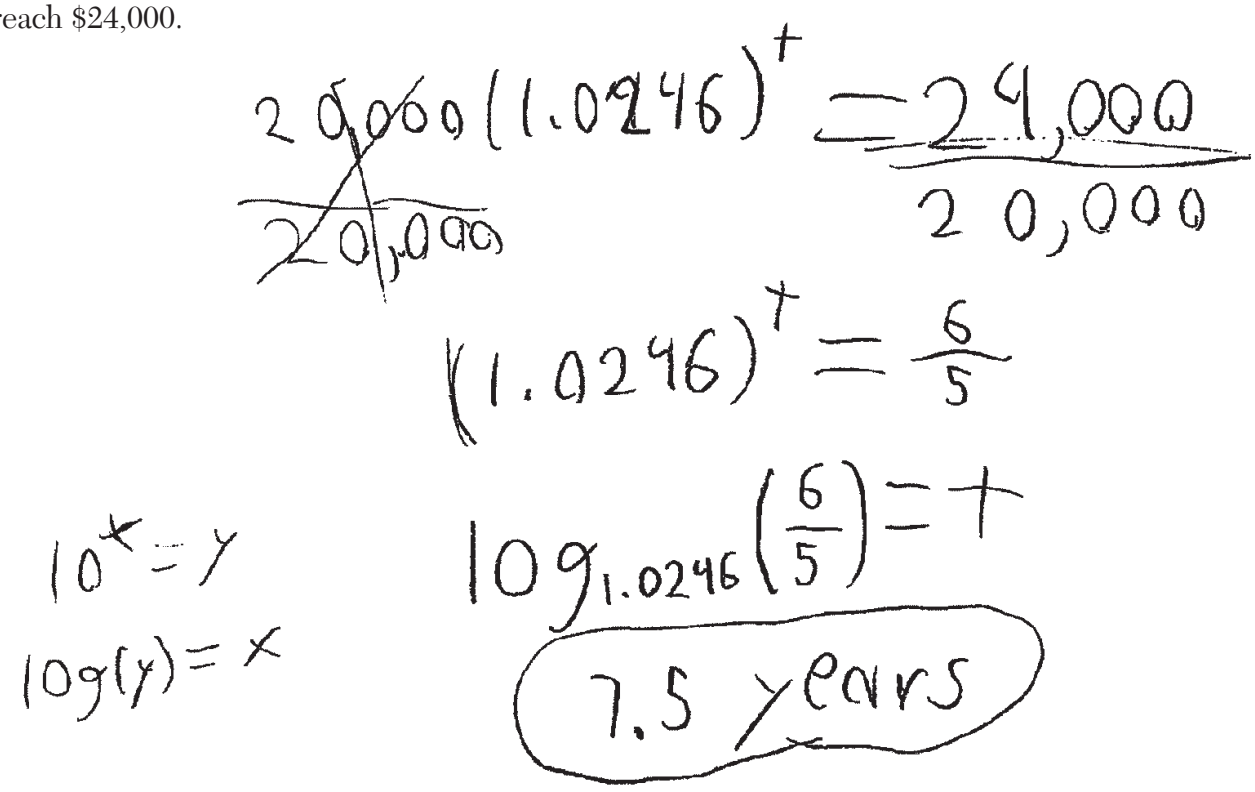
Score 3: The student made an error writing the exponential function.

Question 34

34 Somika opens a savings account and deposits \$20,000 into the account that grows at a rate of 2.46% per year, compounded monthly. Write an exponential function, $S(t)$, that represents the amount of money in the account t years after it is opened, assuming no other money is deposited or withdrawn from the account.



Algebraically calculate the number of years, to the *nearest tenth*, it will take for her account to reach \$24,000.



Score 2: The student earned two credits on the second part.

Question 34

34 Somika opens a savings account and deposits $20,000 into the account that grows at a rate of 2.46% per year, compounded monthly. Write an exponential function, $S(t)$, that represents the amount of money in the account t years after it is opened, assuming no other money is deposited or withdrawn from the account.

$$S(t) = 20{,}000\left(1 + \frac{0.0246}{12}\right)^{t/12}$$

Algebraically calculate the number of years, to the *nearest tenth*, it will take for her account to reach $24,000.

$$\frac{24{,}000}{20{,}000} = \frac{20{,}000\left(1 + \frac{0.0246}{12}\right)^{t/12}}{20{,}000}$$

$$\frac{6}{5} = \left(1 + \frac{0.0246}{12}\right)^{t/12}$$

$$\frac{6}{5} = 1.00205^{\,t/12}$$

$$\frac{\log\frac{6}{5}}{\log 1.00205} = \frac{\frac{t}{12}\log 1.00205}{\log 1.00205}$$

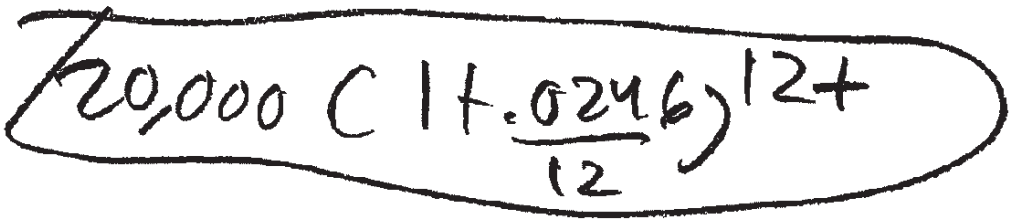
$$12 \cdot 89.02847 = \frac{t}{12} \cdot 12$$

$$t = 1068$$

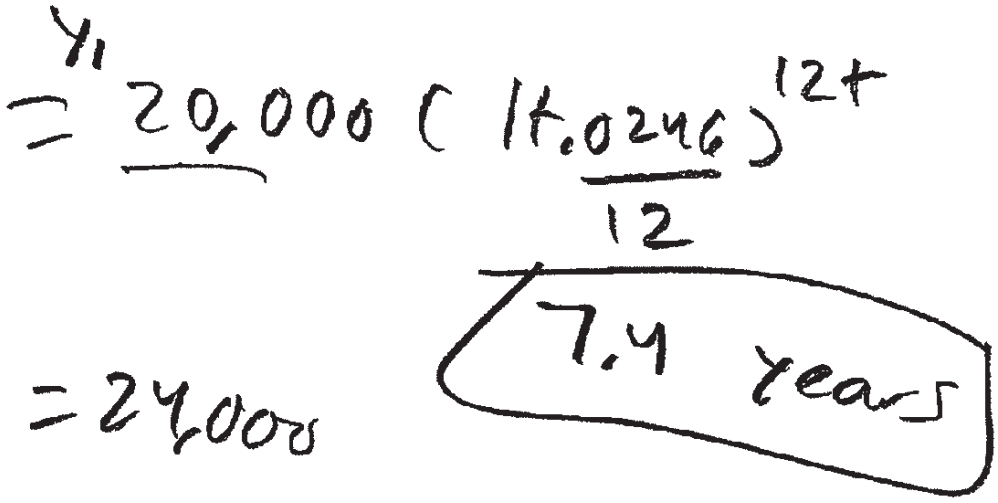
Score 2: The student made an error writing the exponential equation and did not round to the nearest tenth.

Question 34

34 Somika opens a savings account and deposits \$20,000 into the account that grows at a rate of 2.46% per year, compounded monthly. Write an exponential function, $S(t)$, that represents the amount of money in the account t years after it is opened, assuming no other money is deposited or withdrawn from the account.



Algebraically calculate the number of years, to the *nearest tenth*, it will take for her account to reach \$24,000.



Score 2: The student wrote an expression and used a method other than algebraic.

Question 34

34 Somika opens a savings account and deposits \$20,000 into the account that grows at a rate of 2.46% per year, compounded monthly. Write an exponential function, $S(t)$, that represents the amount of money in the account t years after it is opened, assuming no other money is deposited or withdrawn from the account.

$S(t)=20,000(.0246)^t$

$S(t) = 20,000(1+.0246)^t$

Algebraically calculate the number of years, to the *nearest tenth*, it will take for her account to reach \$24,000.

$24000 = 20,000(1+.0246)^t$

$4000 = 1.0246^t$

$\ln 4000 \quad \ln 1.0246$

$8.29404964 = 0.0252778 \cdot t$

$8.27 = t$

$24000 = 20000(1+0.0246)^t$

$4000 = 1.0246^t$

$8.29404964 = 0.0243025 \cdot t$

$1.5 \rightarrow x = 23998$

Score 1: The student earned one credit for the first part.

Question 34

34 Somika opens a savings account and deposits \$20,000 into the account that grows at a rate of 2.46% per year, compounded monthly. Write an exponential function, $S(t)$, that represents the amount of money in the account t years after it is opened, assuming no other money is deposited or withdrawn from the account.

$S(t) = 2000(1 + .0246)^{*}$

Algebraically calculate the number of years, to the *nearest tenth*, it will take for her account to reach \$24,000.

$\frac{24000}{20000} = \frac{20000(1.0246)^{t}}{20000}$

base II

$12 = 1.0246^{t}$

$\frac{\log 1.0246}{\log 12} \approx .01$

Score 0: The student did not satisfy the criteria for one or more credits.

Question 34

34 Somika opens a savings account and deposits \$20,000 into the account that grows at a rate of 2.46% per year, compounded monthly. Write an exponential function, $S(t)$, that represents the amount of money in the account t years after it is opened, assuming no other money is deposited or withdrawn from the account.

$S(t) = 20000(2.46)^t$

492

Algebraically calculate the number of years, to the *nearest tenth*, it will take for her account to reach \$24,000.

2.46% of 20000 = 492

1 20,492
2 20,914
3 21,406
4 21,898
5 22,396
6 22,884
7 23,386
8 23,878
9 24,370

492
492
914
492
1406
492
1898
492
2396
492
2884
492
3386
492
3878
492
4376

It would take 10 years to reach \$24,000

Score 0: The student did not satisfy the criteria for one or more credits.

Question 35

35 Solve algebraically for x:

$$\sqrt{x+4} - \sqrt{3x} = -2$$

$(\sqrt{x+4})^2 = (\sqrt{3x} - 2)^2$

$x+4 = 3x - 4\sqrt{3x} + 4$

$-2x = -4\sqrt{3x}$

$4x^2 = 48x$

$4x^2 - 48x = 0$

$4x(x-12) = 0$

$4x = 0 \quad x-12 = 0$

$x = 0 \quad x = 12$

↓

Extraneous Root

Score 4: The student gave a complete and correct response.

Question 35

35 Solve algebraically for x:

$$\sqrt{x+4} - \sqrt{3x} = -2$$

$(\sqrt{x+4})^2 = (\sqrt{3x} - 2)$

	$\sqrt{3x}$	-2
$\sqrt{3x}$	$3x$	$-\sqrt{3x}2$
-2	$-\sqrt{3x}2$	4

$x+4 = 3x - 4\sqrt{3x} + 4$

$x+4 = 3x+4-4\sqrt{3x}$

$-4 \quad -4$

$x = 3x - 4\sqrt{3x}$

$-3x \quad -3x$

$(-2x)^2 = (-4\sqrt{3x})^2$

$4x^2 = 16 \cdot 3x$

$4x^2 = 48x$

$-48x \quad -48x$

$4x^2 - 48x = 0$

$x(4x-48) = 0$

$4x - 48 = 0$

$+48 \quad +48$

$\frac{4x}{4} = \frac{48}{4}$

$x = 12$

$x = 0$

$\sqrt{(12)+4} - \sqrt{3(12)} = -2$ ✓

$\sqrt{(0)+4} - \sqrt{3(0)} \neq -2$

$\{12\}$

Score 4: The student gave a complete and correct response.

Question 35

35 Solve algebraically for x:

$$\sqrt{x+4} - \sqrt{3x} = -2$$

$(\sqrt{x+4})^2 = (-2+\sqrt{3x})^2$

$(-2+\sqrt{3x})(-2+\sqrt{3x})$

$x+4 = (4-2\sqrt{3x}-2\sqrt{3x}+3x)$

$x+4 = 4-4\sqrt{3x}+3x$

$2x-4\sqrt{3x}=0$

$(2x)^2=(4\sqrt{3x})^2$

$2x^2 = 16\cdot 3x$

$4x^2 = 48x$

$4x^2-48x=0$

$4x(x-12)=0$

$x=12,0$

$\sqrt{12+4}-\sqrt{3(12)}=-2$

$-2=-2$

$\sqrt{0+4}-\sqrt{0(12)}=-2$

$2\neq -2$

Score 3: The student did not clearly identify the solution.

Question 35

35 Solve algebraically for x:

$(\sqrt{x+4} - \sqrt{3x})^2 = (-2)^2$

$(\sqrt{x+4})^2 = (-2+\sqrt{3x})^2$

$x+4 = 9x - 4\sqrt{3x} + 4$

$-4 \quad\quad -4$

$x = 9x - 4\sqrt{3x}$

$-9x \quad -9x$

$(-8x)^2 = (-4\sqrt{3x})^2$

$64x^2 = 16 \cdot 3x$

$64x^2 = 48x$

$64x^2 - 48x = 0$

$8x(8x - 6) = 0$

$8x = 0 \quad\quad 8x - 6 = 0$

$x = 0 \quad\quad +6 \quad +6$

$\frac{8x}{8} = \frac{6}{8}$

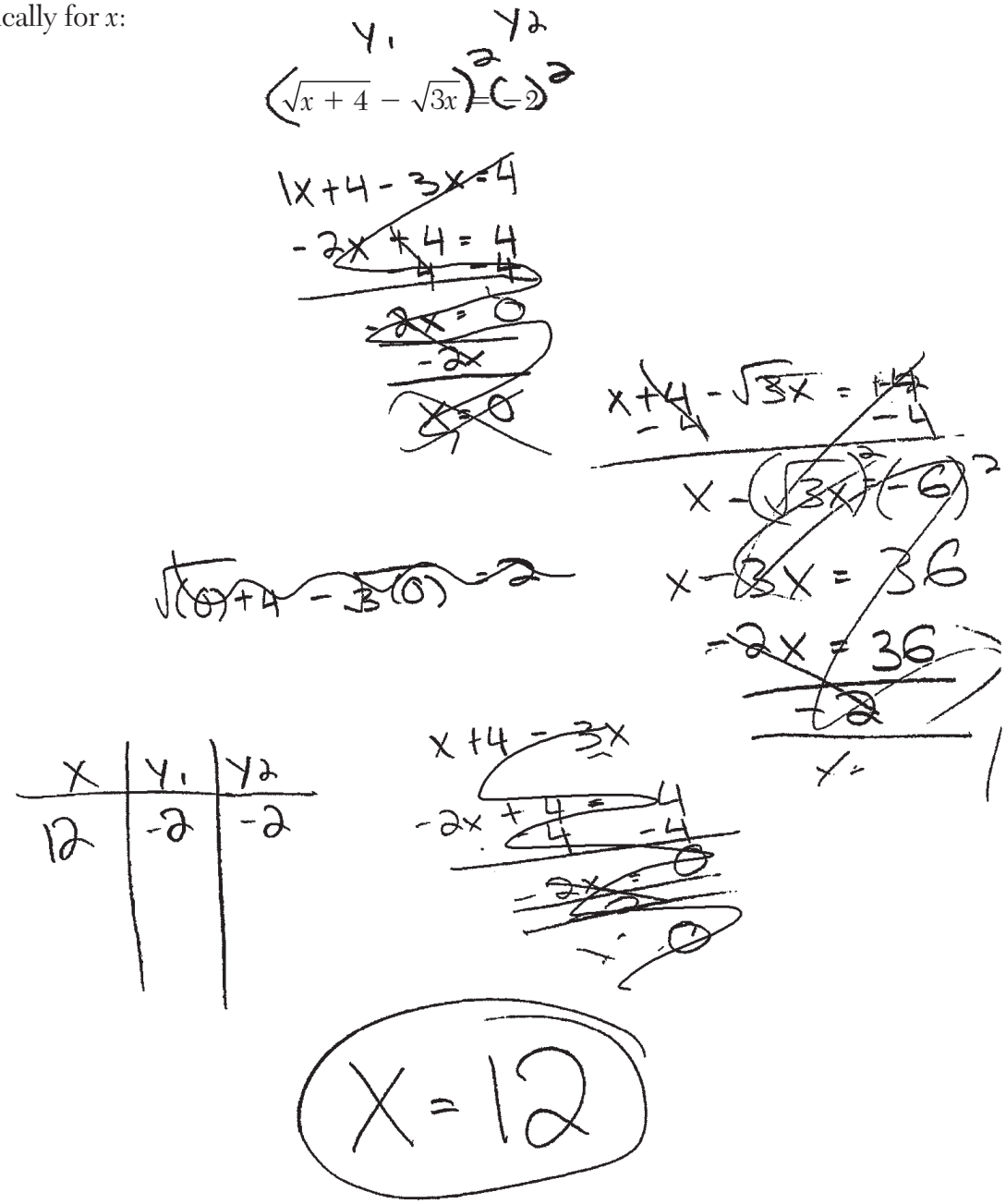
$x = \frac{3}{4}$

	-2	$\sqrt{3x}$
-2	4	$-2\sqrt{3x}$
$\sqrt{3x}$	$-2\sqrt{3x}$	$9x$

Score 2: The student made a computational error in line 2 and then did not reject the solutions.

Question 35

35 Solve algebraically for x:



Score 2: The student used a method other than algebraic.

Question 35

35 Solve algebraically for x:

$$\sqrt{x+4} - \sqrt{3x} = -2$$

$+\sqrt{3x}$ $+\sqrt{3x}$

$(\sqrt{x+4})^2 = (-2+\sqrt{3x})^2$

$(-2+\sqrt{3x})(-2+\sqrt{3x})$

$4-2\sqrt{3x}-2\sqrt{3x}+3x$

$x+4 = 4-4\sqrt{3x}+3x$

$-4+4 \quad -3x$

$-4+4-3x$ $\quad 4-4\sqrt{3}x+3x$

$x+4-3x = -4\sqrt{3}x$

$-4 \qquad -4$

Score 1: The student correctly squared the equation the first time.

Question 35

35 Solve algebraically for x:

$$\sqrt{x+4} - \sqrt{3x} = -2$$

$\sqrt{x+4} - \sqrt{3x} = -2^2$

$x + 4 - \sqrt{3x}^2 = 4$

$x + 4 - 3x = 16$

$x + 4 - 3x - 16 = 0$

$-2x - 12 = 0$

$\frac{-2x}{-2} = \frac{12}{-2}$

$x = -6$

Score 0: The student did not show enough relevant course-level work to receive any credit.

Question 35

35 Solve algebraically for x:

$$\sqrt{x+4} - \sqrt{3x} = -2$$

$\sqrt{x+4} - \sqrt{3x} = -2$

$+\sqrt{3x} \quad = -2 + \sqrt{3x}$

$\left(\sqrt{x+4}\right)^2 = \left(-2+\sqrt{3x}\right)^2$

$x+4 = 4+3x$

$-3x \quad -4 \quad -4 \quad -3x$

$\frac{-2x}{-2} = \frac{0}{-2}$

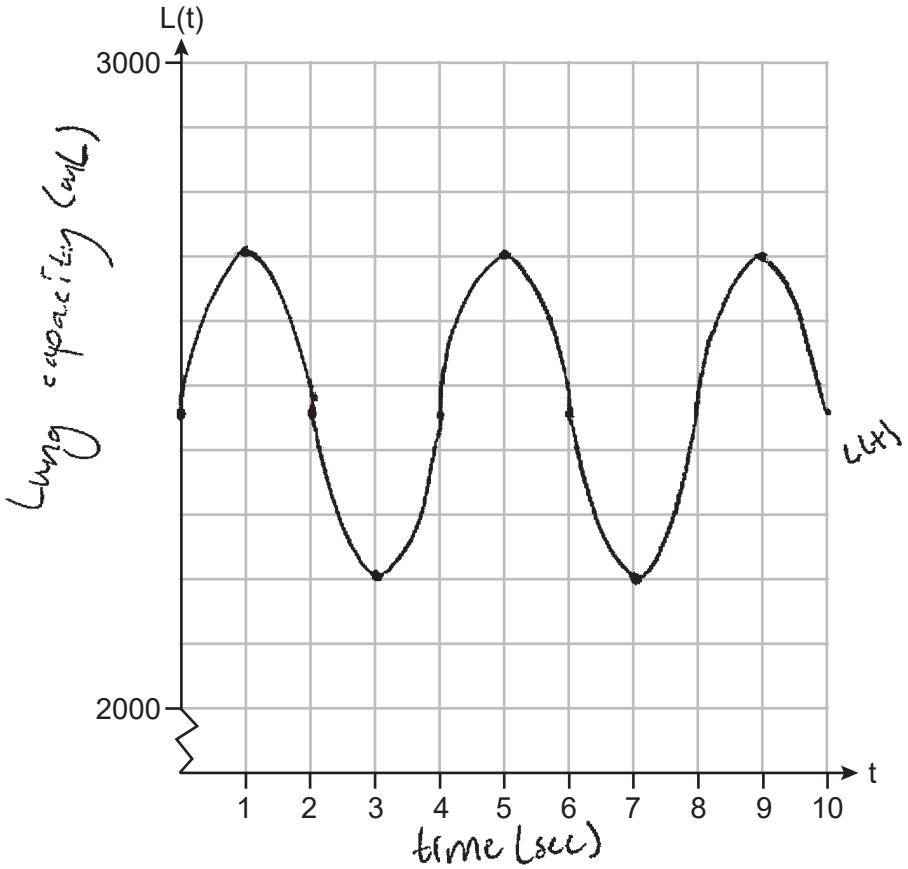
$x = 0$

Score 0: The student did not show enough relevant course-level work to receive any credit.

Question 36

36 A spirometer is used to measure lung capacity, in mL, of air while breathing. During rest, the lung capacity, L, in mL, can be approximately modeled by $L(t) = 250\sin\left(\frac{\pi}{2}t\right) + 2450$, where t is time in seconds.

Graph $L(t)$ for $0 \leq t \leq 10$.



Use $L(t)$ to state the first time, to the *nearest tenth of a second*, on the interval $0 \leq t \leq 10$ when the lung capacity is 2350 mL.

First intersection between $L(t) = 250\sin\left(\frac{\pi}{2}t\right) + 2450$ and $y = 2350$ (2.2619789, 2350) ∴ the first time is 2.3 seconds

Question 36 is continued on the next page.

Score 6: The student gave a complete and correct response.

Question 36 continued

Determine the average rate of change, in mL per second, from $t = 3$ to $t = 5$.

$$\frac{f(b) - f(a)}{b - a} \qquad \frac{2700 - 2200}{5 - 3} \qquad \frac{500}{2} \qquad 250$$

Explain what this means in the context of the problem.

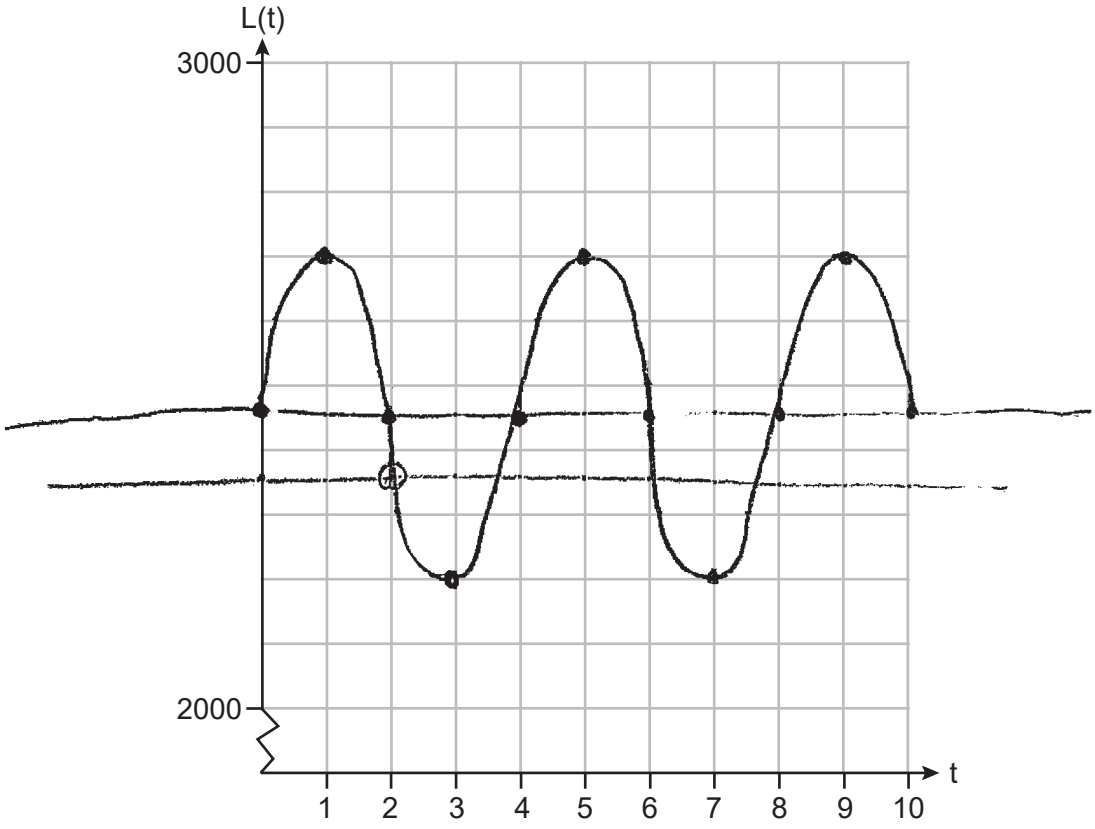
AROC is 250 means lung capacity increases ~250 mL per second going from 3 to 5 sec.

Question 36

36 A spirometer is used to measure lung capacity, in mL, of air while breathing. During rest, the lung capacity, L, in mL, can be approximately modeled by $L(t) = 250\sin\left(\frac{\pi}{2}t\right) + 2450$, where t is time in seconds.

$2\pi \cdot \frac{2}{\pi} = 4$

Graph $L(t)$ for $0 \leq t \leq 10$.



Use $L(t)$ to state the first time, to the *nearest tenth of a second*, on the interval $0 \leq t \leq 10$ when the lung capacity is 2350 mL.

$L(t) = 2350$ mL

$y = 2350$ mL

2.3 sec

Question 36 is continued on the next page.

Score 6: The student gave a complete and correct response.

Question 36 continued

Determine the average rate of change, in mL per second, from $t = 3$ to $t = 5$.

$L(3) = 2200$
$L(5) = 2700$

$$\frac{2700 - 2200}{5 - 3} = 250.$$

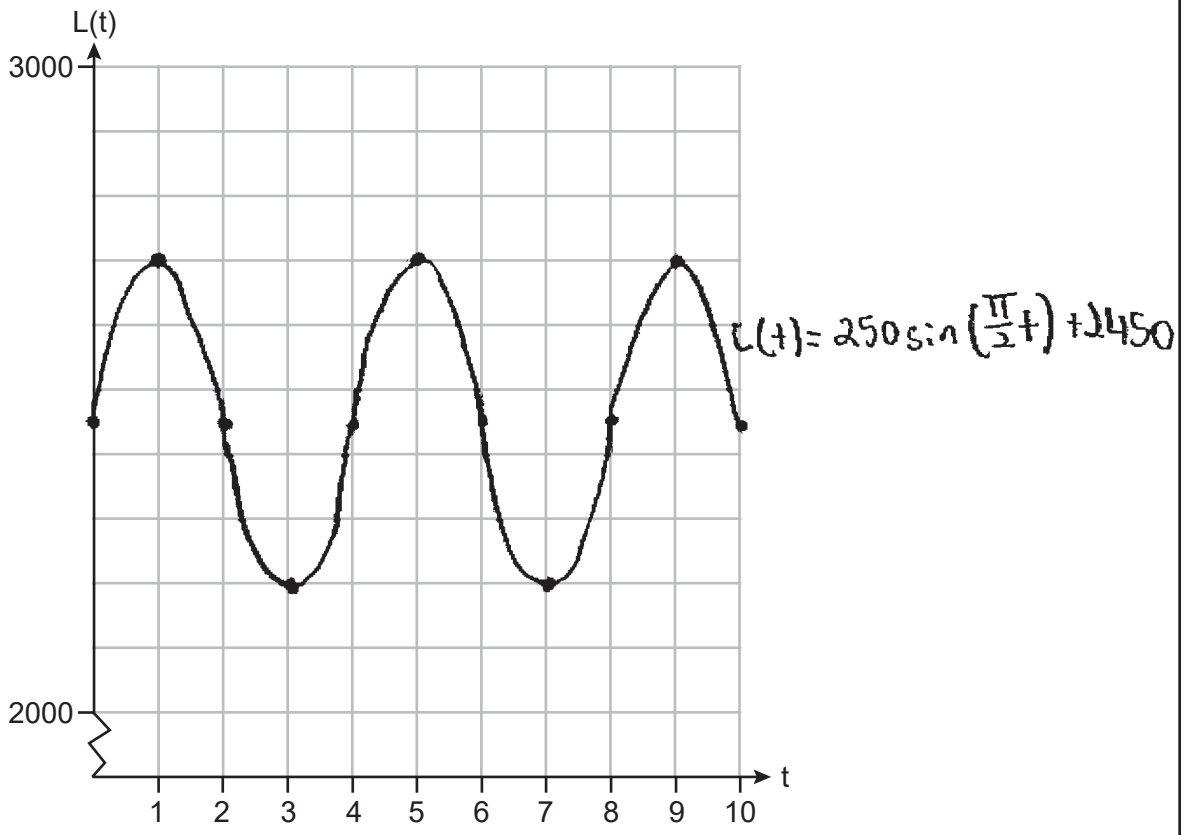
Explain what this means in the context of the problem.

on average the lung capacity changes by 250. ml per second, from 3 to 5 seconds

Question 36

36 A spirometer is used to measure lung capacity, in mL, of air while breathing. During rest, the lung capacity, L, in mL, can be approximately modeled by $L(t) = 250\sin\left(\frac{\pi}{2}t\right) + 2450$, where t is time in seconds.

Graph $L(t)$ for $0 \leq t \leq 10$.



Use $L(t)$ to state the first time, to the *nearest tenth of a second*, on the interval $0 \leq t \leq 10$ when the lung capacity is 2350 mL.

x	Y
2.2	2312.7
2.25	2354.3
2.3	2336.5

2.3 seconds

Question 36 is continued on the next page.

Score 5: The student's explanation is incomplete because it lacked context.

Question 36 continued

Determine the average rate of change, in mL per second, from $t = 3$ to $t = 5$.

$\frac{\Delta y}{\Delta x}$ $\frac{2700-2200}{5-3} = \frac{500}{2} =$

250

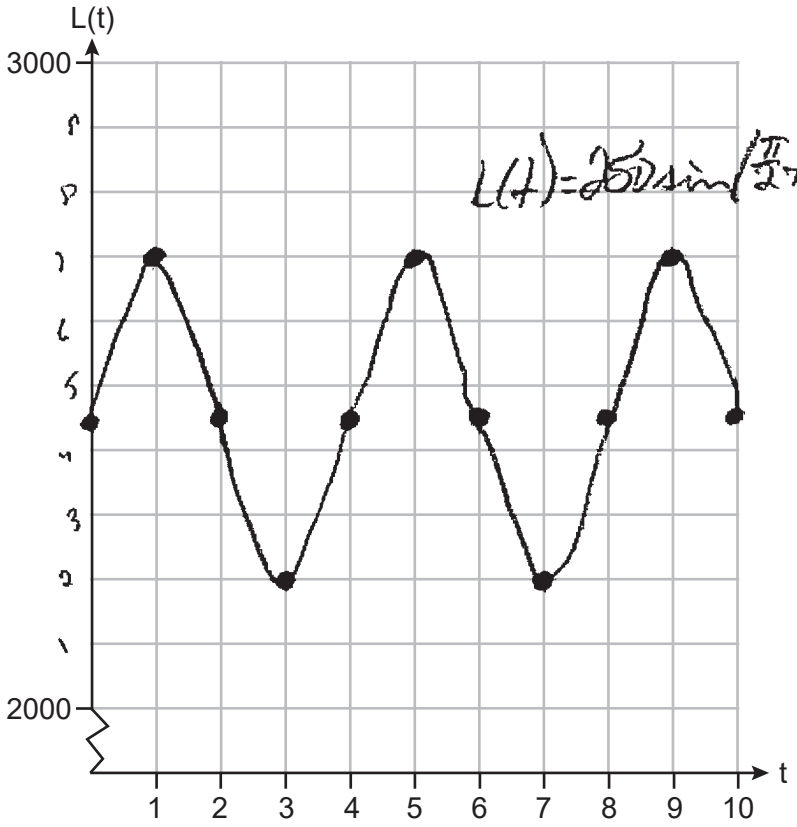
Explain what this means in the context of the problem.

250. mL per second is the average rate of change from 3 seconds to 5 seconds.

Question 36

36 A spirometer is used to measure lung capacity, in mL, of air while breathing. During rest, the lung capacity, L, in mL, can be approximately modeled by $L(t) = 250\sin\left(\frac{\pi}{2}t\right) + 2450$, where t is time in seconds.

Graph $L(t)$ for $0 \leq t \leq 10$.



L(t)

X	Y
0	2450
1	2700
2	2450
3	2200
4	2450
5	2700
6	2450
7	2200
8	2450
9	2700
10	2450

Use $L(t)$ to state the first time, to the *nearest tenth of a second*, on the interval $0 \leq t \leq 10$ when the lung capacity is 2350 mL.

2.3s

Question 36 is continued on the next page.

Score 5: The student's explanation is incomplete.

Question 36 continued

Determine the average rate of change, in mL per second, from $t = 3$ to $t = 5$.

$$\frac{2700 - 2200}{5 - 3} = 250$$

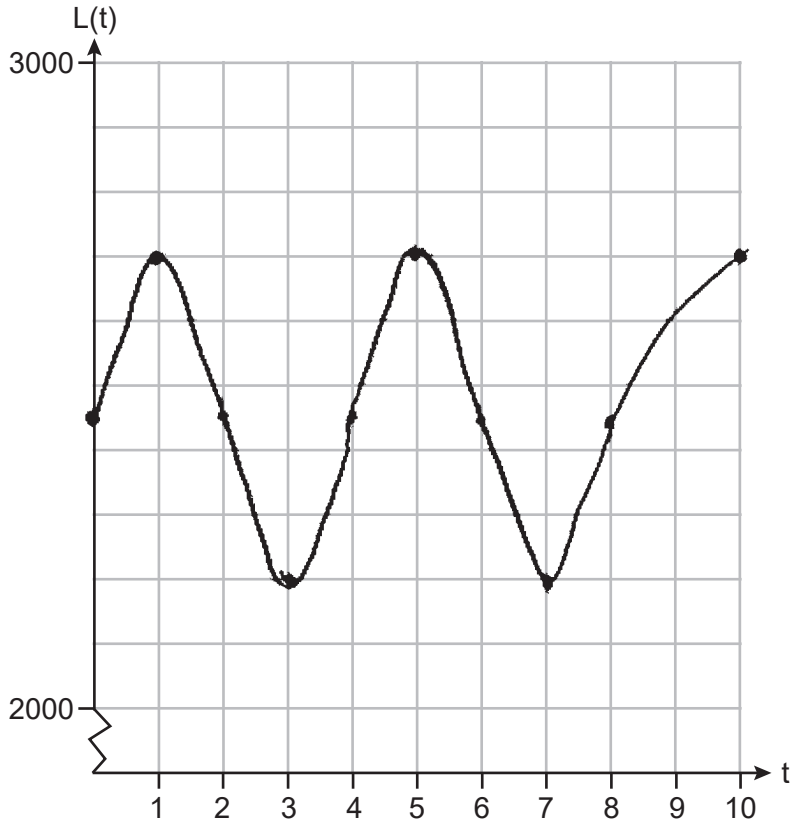
Explain what this means in the context of the problem.

From 3s to 5s, the lung capacity was increasing at a rate of 250.

Question 36

36 A spirometer is used to measure lung capacity, in mL, of air while breathing. During rest, the lung capacity, L, in mL, can be approximately modeled by $L(t) = 250\sin\left(\frac{\pi}{2}t\right) + 2450$, where t is time in seconds.

Graph $L(t)$ for $0 \leq t \leq 10$.



Use $L(t)$ to state the first time, to the *nearest tenth of a second*, on the interval $0 \leq t \leq 10$ when the lung capacity is 2350 mL.

$2350 = 250\sin\left(\frac{\pi}{2}t\right) + 2450$

$-2450 \quad -2450$

$-100 = 250\sin\left(\frac{\pi}{2}t\right)$

$\frac{-100}{250} = \sin\left(\frac{\pi}{2}t\right)$

$-.4 = \sin\left(\frac{\pi}{2}t\right)$

≈ 2.3

Question 36 is continued on the next page.

Score 4: The student had a graphing error and an incomplete explanation.

Question 36 continued

Determine the average rate of change, in mL per second, from $t = 3$ to $t = 5$.

$\frac{2700 - 2200}{2}$ $\frac{500}{2}$ 250

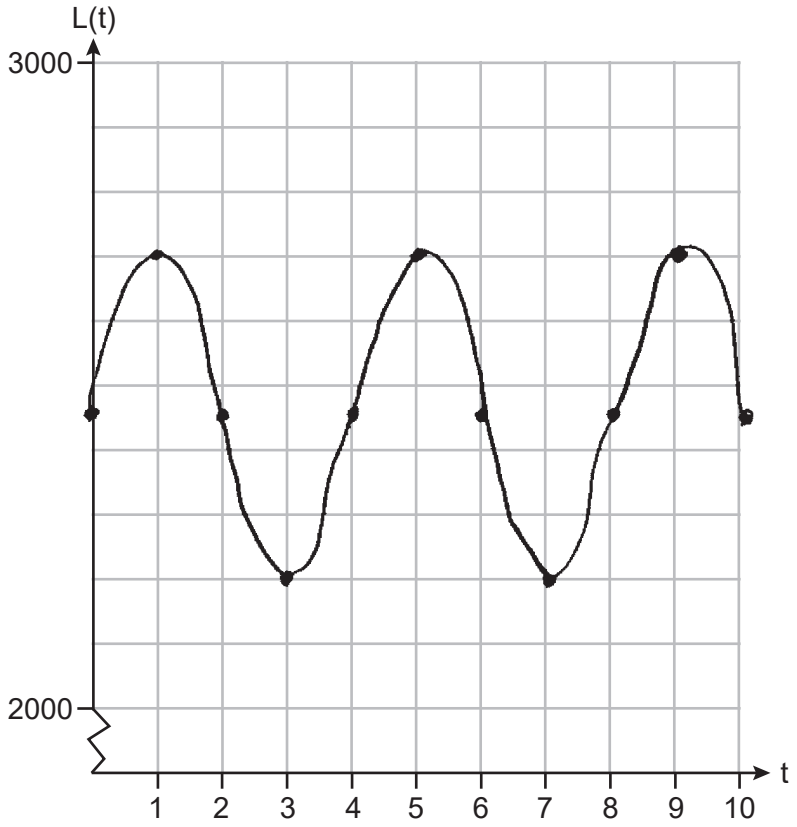
Explain what this means in the context of the problem.

You can inhale 250 mL of air per second

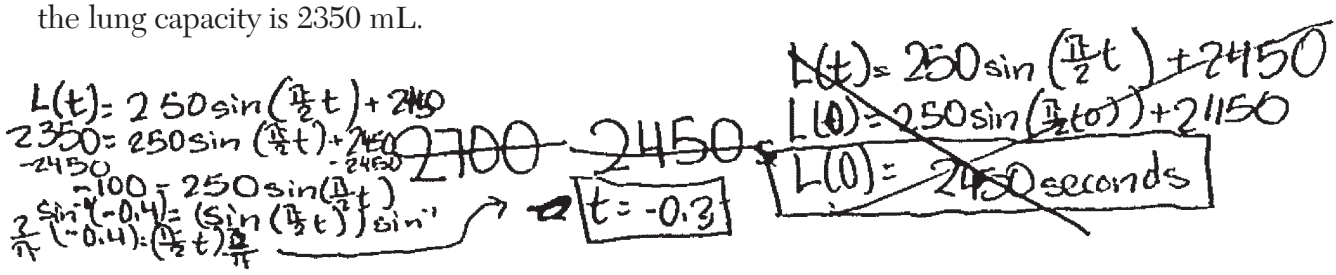
Question 36

36 A spirometer is used to measure lung capacity, in mL, of air while breathing. During rest, the lung capacity, L, in mL, can be approximately modeled by $L(t) = 250\sin\left(\frac{\pi}{2}t\right) + 2450$, where t is time in seconds.

Graph $L(t)$ for $0 \leq t \leq 10$.



Use $L(t)$ to state the first time, to the *nearest tenth of a second*, on the interval $0 \leq t \leq 10$ when the lung capacity is 2350 mL.



Question 36 is continued on the next page.

Score 4: The student did not state 2.3 and the explanation is incomplete.

Question 36 continued

Determine the average rate of change, in mL per second, from $t = 3$ to $t = 5$.

$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{2700 - 2200}{5 - 3} = \frac{500}{2} = 250$ mL/s

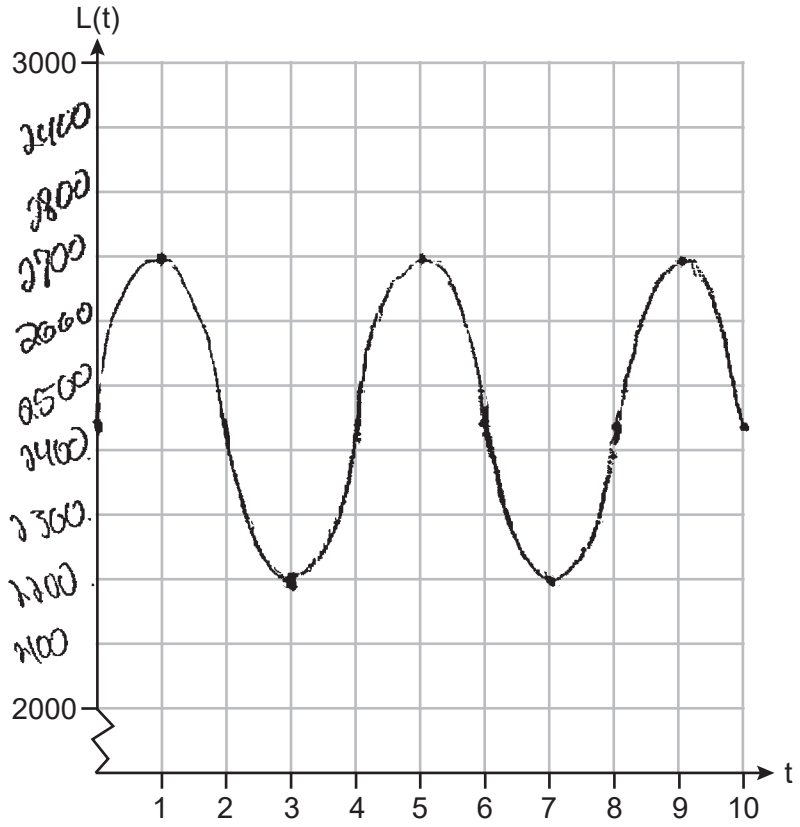
Explain what this means in the context of the problem.

This ~~was~~ means the lung capacity increases by 250 mL.

Question 36

36 A spirometer is used to measure lung capacity, in mL, of air while breathing. During rest, the lung capacity, L, in mL, can be approximately modeled by $L(t) = 250\sin\left(\frac{\pi}{2}t\right) + 2450$, where t is time in seconds.

Graph $L(t)$ for $0 \leq t \leq 10$.



Use $L(t)$ to state the first time, to the *nearest tenth of a second*, on the interval $0 \leq t \leq 10$ when the lung capacity is 2350 mL.

$250\sin\left(\frac{\pi}{2}2.3\right) + 2450 = 2336.502375$

2.3 seconds

Question 36 is continued on the next page.

Score 3: The student earned 3 credits on the first two parts.

Question 36 continued

Determine the average rate of change, in mL per second, from $t = 3$ to $t = 5$.

2700
-2200

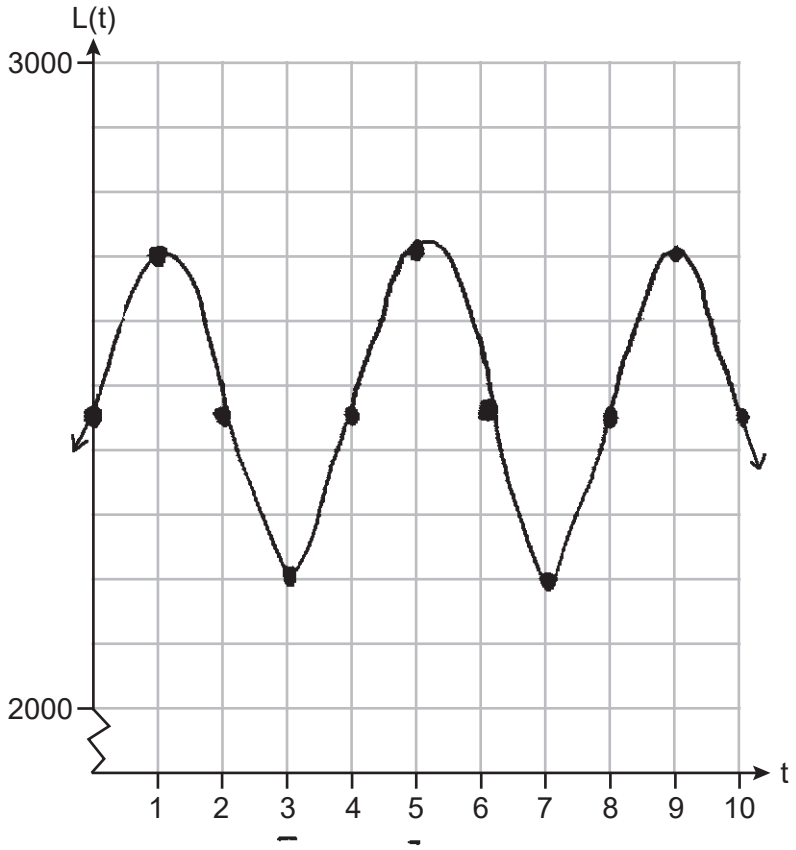
Explain what this means in the context of the problem.

In 2 seconds the patient exhails 250ml and inhails 250ml of air.

Question 36

36 A spirometer is used to measure lung capacity, in mL, of air while breathing. During rest, the lung capacity, L, in mL, can be approximately modeled by $L(t) = 250\sin\left(\frac{\pi}{2}t\right) + 2450$, where t is time in seconds.

Graph $L(t)$ for $0 \leq t \leq 10$.



Use $L(t)$ to state the first time, to the *nearest tenth of a second*, on the interval $0 \leq t \leq 10$ when the lung capacity is 2350 mL.

2.4 seconds

Question 36 is continued on the next page.

Score 3: The student earned one credit for the graph and correctly found the rate of change.

Question 36 continued

Determine the average rate of change, in mL per second, from $t = 3$ to $t = 5$.

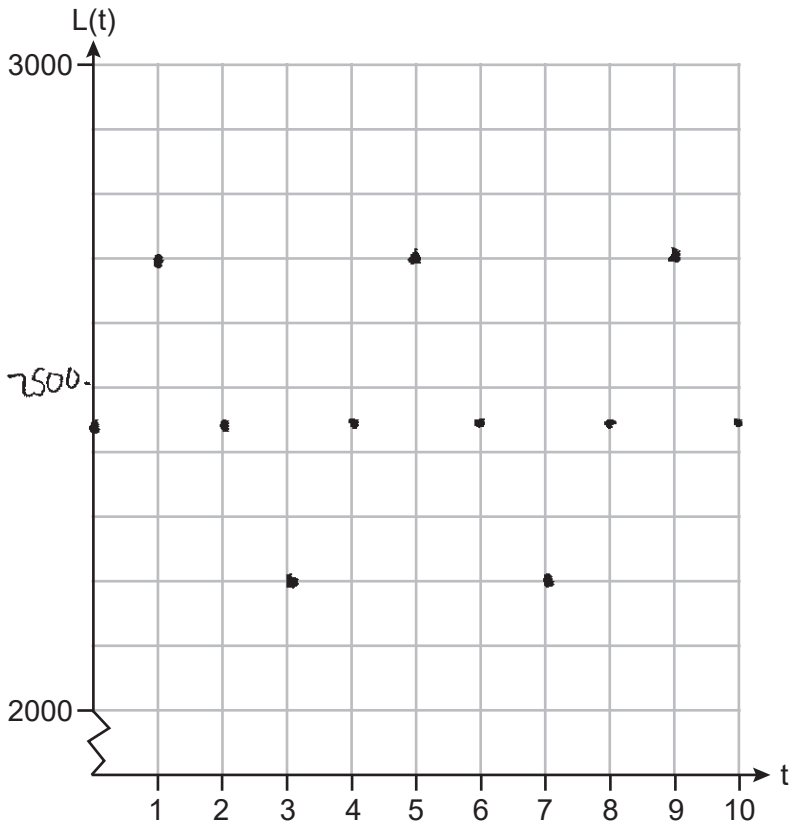
$\frac{2700 - 2200}{2} = \frac{500}{2} = 250$ avg rate of change

Explain what this means in the context of the problem.

Question 36

36 A spirometer is used to measure lung capacity, in mL, of air while breathing. During rest, the lung capacity, L, in mL, can be approximately modeled by $L(t) = 250\sin\left(\frac{\pi}{2}t\right) + 2450$, where t is time in seconds.

Graph $L(t)$ for $0 \leq t \leq 10$.



Use $L(t)$ to state the first time, to the *nearest tenth of a second*, on the interval $0 \leq t \leq 10$ when the lung capacity is 2350 mL.

2.3

Question 36 is continued on the next page.

Score 3: The student earned one credit for the graph, stated 2.3, and stated 250.

Question 36 continued

Determine the average rate of change, in mL per second, from $t = 3$ to $t = 5$.

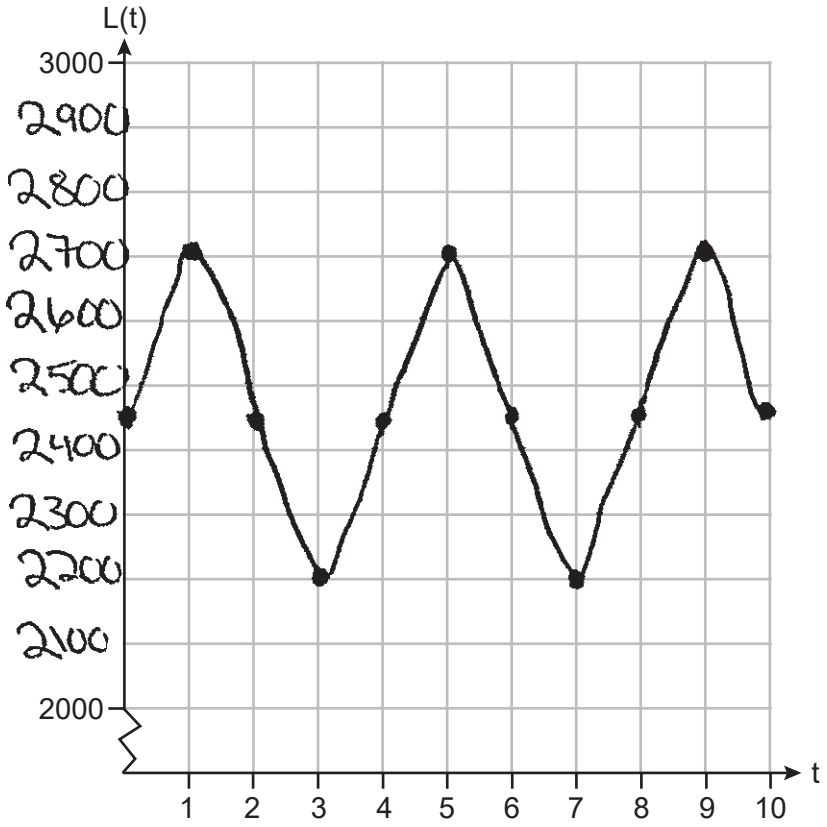
plus 250 mL per second
rate of change

Explain what this means in the context of the problem.

Question 36

36 A spirometer is used to measure lung capacity, in mL, of air while breathing. During rest, the lung capacity, L, in mL, can be approximately modeled by $L(t) = 250\sin\left(\frac{\pi}{2}t\right) + 2450$, where t is time in seconds.

Graph $L(t)$ for $0 \leq t \leq 10$.



Use $L(t)$ to state the first time, to the *nearest tenth of a second*, on the interval $0 \leq t \leq 10$ when the lung capacity is 2350 mL.

2.5

Question 36 is continued on the next page.

Score 2: The student correctly graphed the function.

Question 36 continued

Determine the average rate of change, in mL per second, from $t = 3$ to $t = 5$.

$250\sin\left(\frac{\pi}{2}(3)\right) + 2450 = 2200$

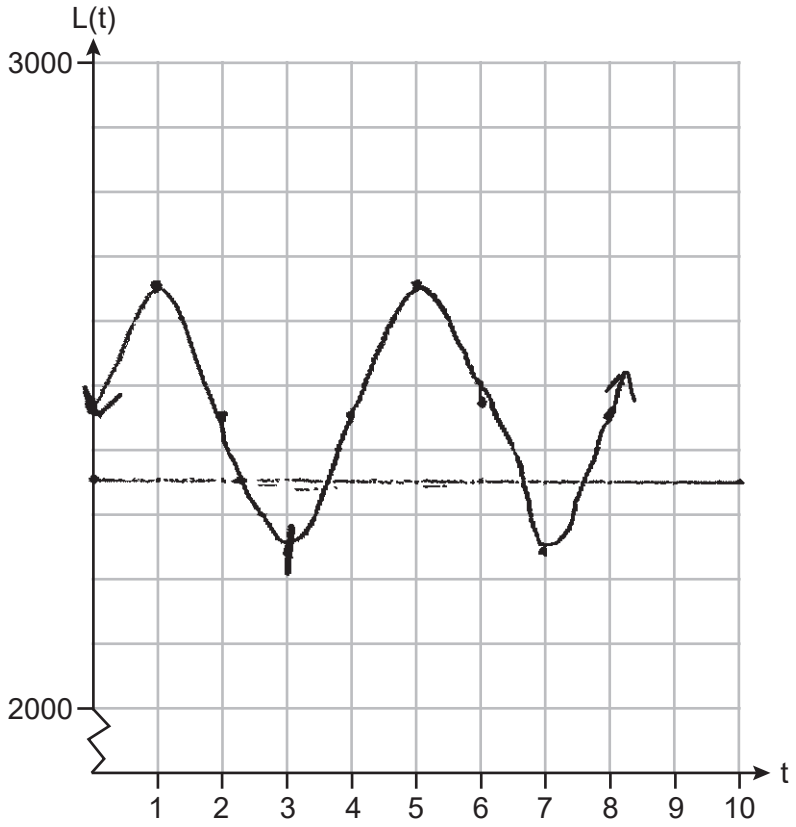
$250\sin\left(\frac{\pi}{2}(5)\right) + 2450 = 2700$

Explain what this means in the context of the problem.

Question 36

36 A spirometer is used to measure lung capacity, in mL, of air while breathing. During rest, the lung capacity, L, in mL, can be approximately modeled by $L(t) = 250\sin\left(\frac{\pi}{2}t\right) + 2450$, where t is time in seconds.

Graph $L(t)$ for $0 \leq t \leq 10$.



Use $L(t)$ to state the first time, to the *nearest tenth of a second*, on the interval $0 \leq t \leq 10$ when the lung capacity is 2350 mL.

7.7 seconds

Question 36 is continued on the next page.

Score 2: The student correctly found the average rate of change.

Question 36 continued

Determine the average rate of change, in mL per second, from $t = 3$ to $t = 5$.

$m = \frac{y_2 - y_1}{x_2 - x_1}$ $m = \frac{2700 - 2200}{5 - 3}$ $m = \frac{500}{2}$

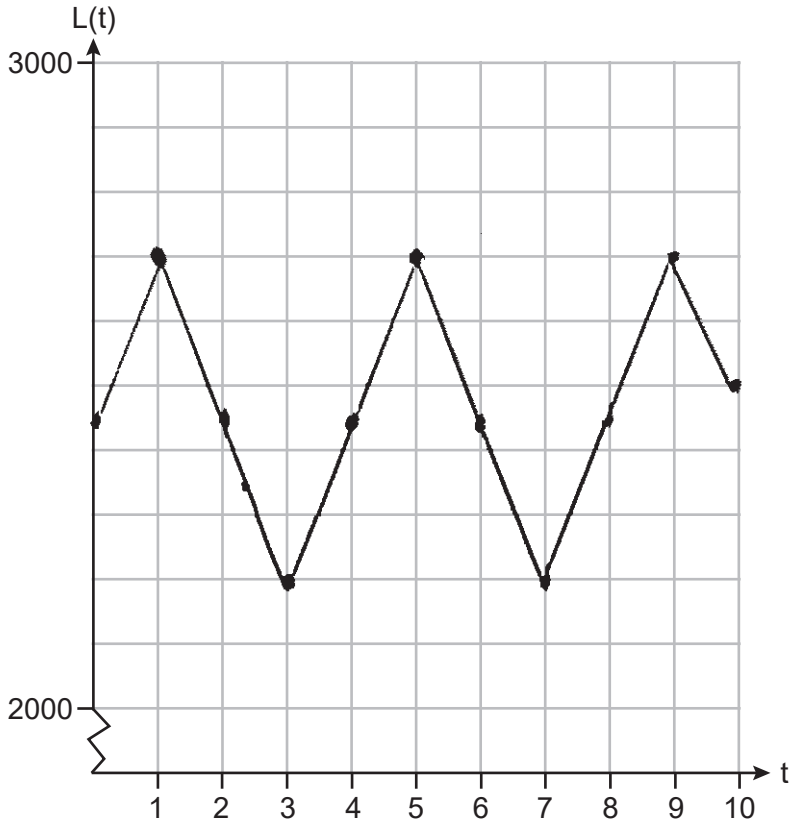
Explain what this means in the context of the problem.

$m = 250$
This represents the rate that scrubbies hands fill

Question 36

36 A spirometer is used to measure lung capacity, in mL, of air while breathing. During rest, the lung capacity, L, in mL, can be approximately modeled by $L(t) = 250\sin\left(\frac{\pi}{2}t\right) + 2450$, where t is time in seconds.

Graph $L(t)$ for $0 \leq t \leq 10$.



Use $L(t)$ to state the first time, to the *nearest tenth of a second*, on the interval $0 \leq t \leq 10$ when the lung capacity is 2350 mL.

2.3

Question 36 is continued on the next page.

Score 1: The student earned one credit for stating 2.3.

Question 36 continued

Determine the average rate of change, in mL per second, from $t = 3$ to $t = 5$.

Average rate of change is

$\frac{1}{2450}$ $\frac{3}{\text{no#03}}$ $\frac{1}{170}$ $\Rightarrow$ $\boxed{\frac{170}{1}}$

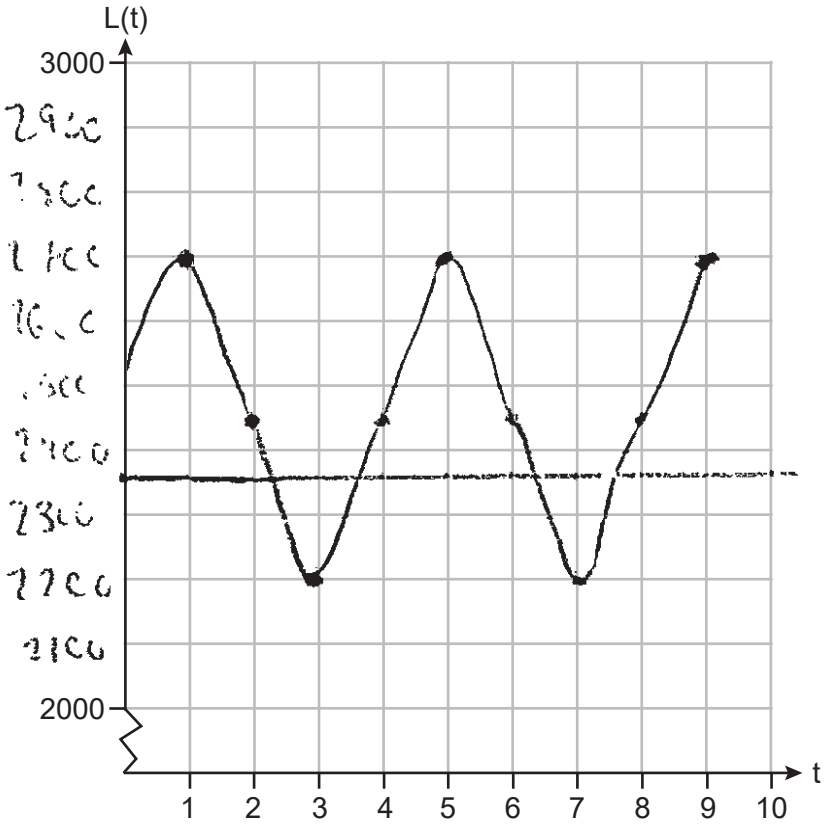
Explain what this means in the context of the problem.

Every second the lung capacity goes up 1

Question 36

36 A spirometer is used to measure lung capacity, in mL, of air while breathing. During rest, the lung capacity, L, in mL, can be approximately modeled by $L(t) = 250\sin\left(\frac{\pi}{2}t\right) + 2450$, where t is time in seconds.

Graph $L(t)$ for $0 \leq t \leq 10$.



Use $L(t)$ to state the first time, to the *nearest tenth of a second*, on the interval $0 \leq t \leq 10$ when the lung capacity is 2350 mL.

−0.3

Question 36 is continued on the next page.

Score 1: The student earned one credit for the average rate of change.

Question 36 continued

Determine the average rate of change, in mL per second, from $t = 3$ to $t = 5$.

$2700 - 1200 = \frac{500}{3} = 166.\overline{66}$

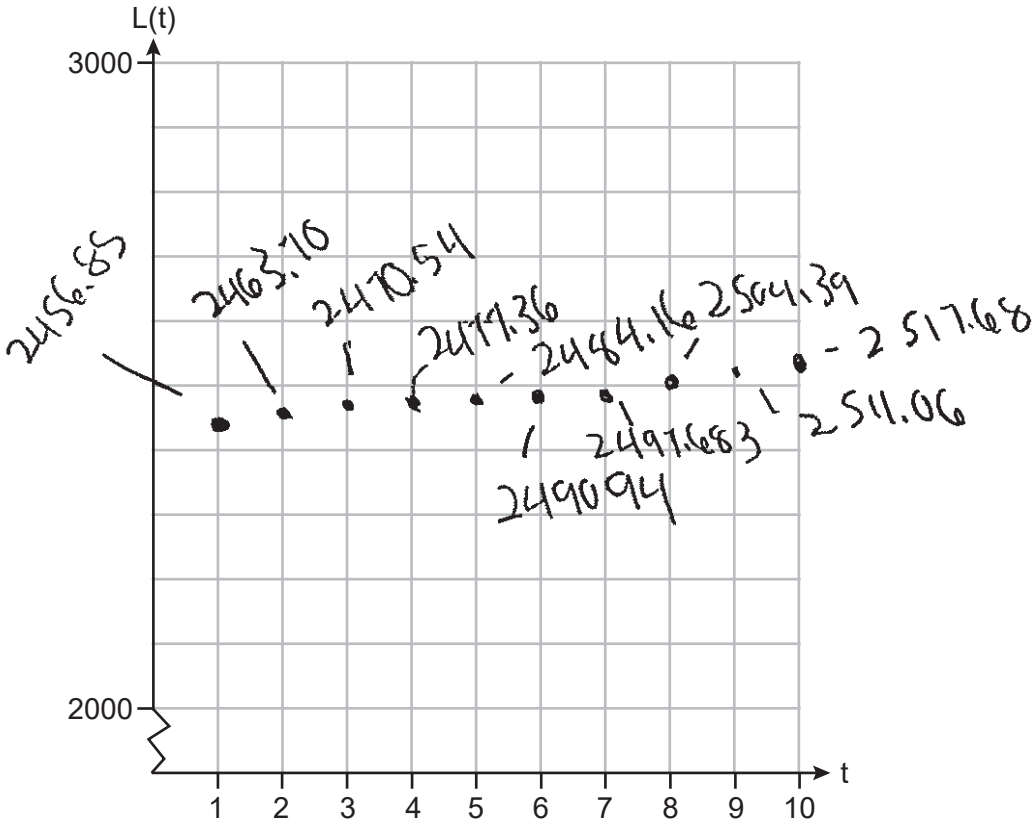
Explain what this means in the context of the problem.

Every third of a second is 166.66 mL

Question 36

36 A spirometer is used to measure lung capacity, in mL, of air while breathing. During rest, the lung capacity, L, in mL, can be approximately modeled by $L(t) = 250\sin\left(\frac{\pi}{2}t\right) + 2450$, where t is time in seconds.

Graph $L(t)$ for $0 \leq t \leq 10$.



Use $L(t)$ to state the first time, to the *nearest tenth of a second*, on the interval $0 \leq t \leq 10$ when the lung capacity is 2350 mL.

- 25.1 seconds

Question 36 is continued on the next page.

Score 0: The student did not satisfy the criteria for one or more credits.

Question 36 continued

Determine the average rate of change, in mL per second, from $t = 3$ to $t = 5$.

average rate of change 6.9

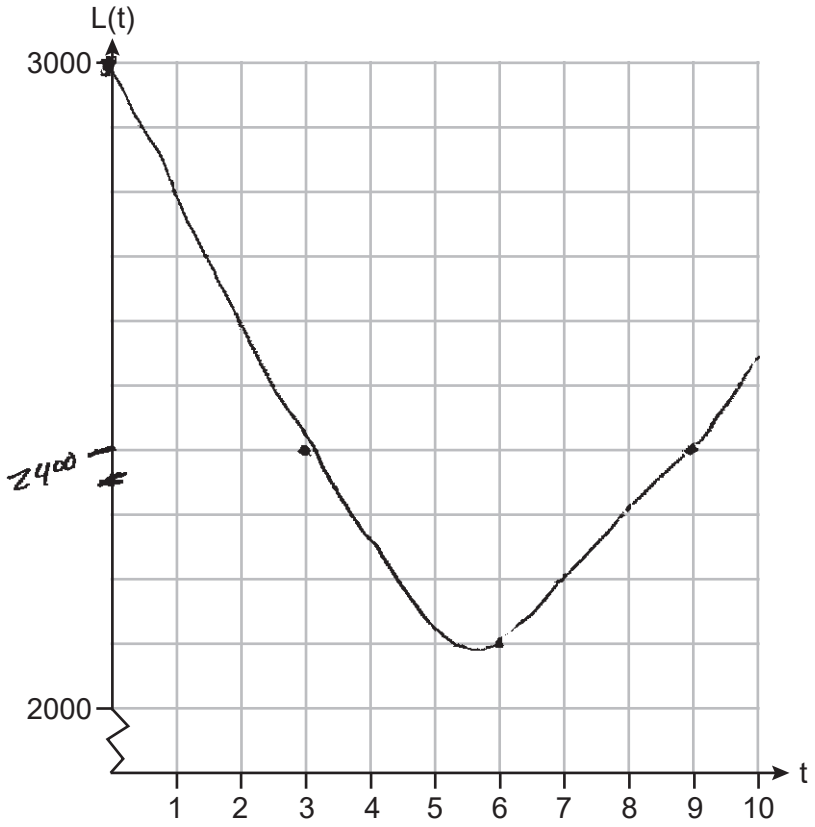
Explain what this means in the context of the problem.

every second the capacity grows by 6.9 ml

Question 36

36 A spirometer is used to measure lung capacity, in mL, of air while breathing. During rest, the lung capacity, L, in mL, can be approximately modeled by $L(t) = 250\sin\left(\frac{\pi}{2}t\right) + 2450$, where t is time in seconds.

Graph $L(t)$ for $0 \leq t \leq 10$.



Use $L(t)$ to state the first time, to the *nearest tenth of a second*, on the interval $0 \leq t \leq 10$ when the lung capacity is 2350 mL.

3.5 Seconds

Question 36 is continued on the next page.

Score 0: The student did not satisfy the criteria for one or more credits.

Question 36 continued

Determine the average rate of change, in mL per second, from $t = 3$ to $t = 5$.

2400 - 2150

Explain what this means in the context of the problem.