

Student Name \_\_\_\_\_

P

**Algebra II**  
**Test Booklet**

*Practice Test*

TEST BOOKLET SECURITY BARCODE



# Unit 1

**Directions:**

Today, you will take Unit 1 of the Algebra II Practice Test. Unit 1 has two sections. In the first section, you may not use a calculator. In the second section, you may use a calculator. **You will not be allowed to return to the first section of the test after you start the calculator section.** You must complete both the non-calculator and calculator sections of Unit 1 within the time allowed.

Read each question. Then, follow the directions to answer each question. Mark your answers by completely filling in the circles in your answer document. Do not make any pencil marks outside of the circles. If you need to change an answer, be sure to erase your first answer completely. If a question asks you to show or explain your work, you must do so to receive full credit. Only responses written within the provided space will be scored.

If you do not know the answer to a question, you may go on to the next question. When you finish the first section, you may review your answers and any questions you did not answer in this section **ONLY**. Once you have reviewed your answers, continue to the calculator section. When you are ready to go on to the calculator section, raise your hand to receive your calculator.

### Directions for Completing the Answer Grids

1. Work the problem and find an answer.
2. Write your answer in the boxes at the top of the grid.
3. Print only one number or symbol in each box. Do not leave a blank box in the middle of an answer.
4. Under each box, fill in the circle that matches the number or symbol you wrote above. Make a solid mark that completely fills the circle.
5. Do not fill in a circle under an unused box.
6. Fractions cannot be entered into an answer grid and will not be scored. Enter fractions as decimals.
7. See below for examples on how to correctly complete an answer grid.

### EXAMPLES

To answer  $-3$  in a question, fill in the answer grid as shown below.

-	3				
<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
0	0	0	0	0	0
1	1	1	1	1	1
2	2	2	2	2	2
<input checked="" type="radio"/>	3	3	3	3	3
4	4	4	4	4	4
5	5	5	5	5	5
6	6	6	6	6	6
7	7	7	7	7	7
8	8	8	8	8	8
9	9	9	9	9	9

To answer  $.75$  in a question, fill in the answer grid as shown below.

.	7	5			
<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
0	0	0	0	0	0
1	1	1	1	1	1
2	2	2	2	2	2
3	3	3	3	3	3
4	4	4	4	4	4
5	5	<input checked="" type="radio"/>	5	5	5
6	6	6	6	6	6
7	<input checked="" type="radio"/>	7	7	7	7
8	8	8	8	8	8
9	9	9	9	9	9

**GO ON TO NEXT PAGE**

# Unit 1 - Section 1 (Non-Calculator)

This unit has two sections: a non-calculator section and a calculator section.

You will now take the non-calculator section of this unit in which you may not use a calculator. You will not be allowed to return to the first section of the test after you start the calculator section. You must complete both sections within the time allowed for this unit.

Once you finish the non-calculator section, read the directions in your test booklet on how to continue.

1. If  $k$  is a constant, what is the value of  $k$  such that the polynomial  $k^2x^3 - 6kx + 9$  is divisible by  $x - 1$ ?

Enter your answer in the box.

2. What extraneous solution arises when the equation  $\sqrt{x + 3} = 2x$  is solved for  $x$  by first squaring both sides of the equation?

Enter your answer in the box.

3. Which expressions are equal to a real number?

Select **all** that apply.

A.  $(-4i)^{11}$

B.  $(-3i)^{12}$

C.  $(2 + 3i)^2$

D.  $(4 + 5i)(4 - 5i)$

E.  $(6 + 8i)(8 + 6i)$

4. Given that  $x > 0$ , which expression is equivalent to  $5\sqrt{xy} + 25\sqrt{x}$ ?

A.  $5(xy)^{-1} + 25x^{-1}$

B.  $25x^{\frac{1}{2}}(\sqrt{y} + 5)$

C.  $\sqrt{x}\left(25y^{\frac{1}{2}} + 5\right)$

D.  $5x^{\frac{1}{2}}\left(y^{\frac{1}{2}} + 5\right)$

5. Which equation has non-real solutions?

A.  $2x^2 + 4x - 12 = 0$

B.  $2x^2 + 3x = 4x + 12$

C.  $2x^2 + 4x + 12 = 0$

D.  $2x^2 + 4x = 0$

Use the information provided to answer Part A and Part B for question 6.

Consider the expression  $6x^3 - 5x^2y - 24xy^2 + 20y^3$ .

**6. Part A**

Which expression is equivalent to  $6x^3 - 5x^2y - 24xy^2 + 20y^3$ ?

- A.  $x^2(6x - 5y) + 4y^2(6x + 5y)$
- B.  $x^2(6x - 5y) + 4y^2(6x - 5y)$
- C.  $x^2(6x - 5y) - 4y^2(6x + 5y)$
- D.  $x^2(6x - 5y) - 4y^2(6x - 5y)$

**Part B**

Which expressions are factors of  $6x^3 - 5x^2y - 24xy^2 + 20y^3$ ?

Select **all** that apply.

- A.  $x^2 + 4y^2$
- B.  $6x - 5y$
- C.  $x + 2y$
- D.  $6x + 5y$
- E.  $x - 2y$

**7.** Solve the equation  $27^x = 9^{x-3}$  for  $x$ .

Enter your answer in the box.



8. The functions  $f$  and  $g$  are defined by  $f(x) = x^2$  and  $g(x) = 2x$ , respectively. Which equation is equivalent to  $h(x) = \frac{f(2x)g(-2x)}{2}$ ?

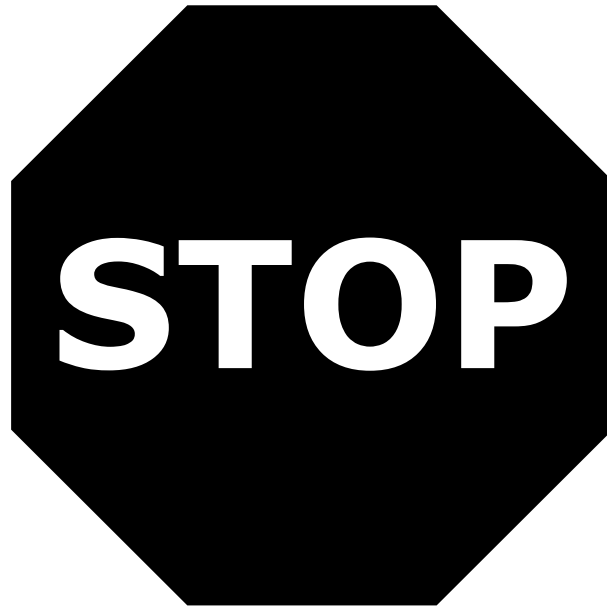
A.  $h(x) = -2x^3$

B.  $h(x) = -8x^3$

C.  $h(x) = x^2 - 2x$

D.  $h(x) = 2x^2 + 2x$





**You have come to the end of the non-calculator section in Unit 1 of the test.**

- **You may review your answers in the non-calculator section ONLY. You will not be allowed to return to the non-calculator section once you have received your calculator.**
- **When you are ready to go on to the calculator section, raise your hand to receive your calculator.**





# Unit 1 - Section 2 (Calculator)

Once you have received your calculator, continue into the calculator section.



Use the information provided to answer Part A and Part B for question 9.

DeShawn is in his fifth year of employment as a patrol officer for the Metro Police. His salary for his first year of employment was \$47,000. Each year after the first, his salary increased by 4% of his salary the previous year.

**9. Part A**

What is the sum of DeShawn's salaries for his first five years of service?

- A.** \$101,983
- B.** \$188,000
- C.** \$219,932
- D.** \$254,567

**Part B**

If DeShawn continues his employment at the same rate of increase in yearly salary, for which year will the sum of his salaries first exceed \$1,000,000? Give your answer to the nearest integer.

Enter your answer in the box.



Use the information provided to answer Part A and Part B for question 10.

A city plans to implement a composting program. In the composting program, food waste will be collected from residents and sent to one of these compost collection sites.

Composting Program		
Collection Site	Distance from City Center (miles)	Fee (dollars per ton)
FW Processing	12	50
Hayward Ecology	60	36
Jasper Organics	70	45
Northwestern Recycling	95	40
Milton Recycling	26	65

- Operating the trucks used to transport the waste costs \$1.25 per mile driven.
- Each truck can hold 20 tons of waste.

**10. Part A**

Based on the given information, determine which composting collection site is cheapest. Describe the steps used to determine which composting site is cheapest and explain any assumptions made. Create a model that can be used to find the total cost of disposing food waste based on the number of tons of composting with the cheapest composting program. Describe the steps used to create your model.

Enter your answer, model, explanation, and assumptions in the space provided.

**Part B**

During the previous year, the city sent 290,000 tons of waste to landfills. The cost of disposing waste at a landfill is \$75 per ton.

This year, the composting program will send 10% of the waste to composting sites instead of sending the waste to landfills. Determine the amount of money the city will save in waste disposal costs based on 290,000 tons of waste using the composting site you chose in Part A.

Show the process you used to determine your answer.

Enter your answer and your work in the space provided.



11. Functions  $f$  and  $g$  are defined below.

$$\begin{cases} f(x) = \frac{1}{2x} \\ g(x) = x^2 \end{cases}$$

The graphs of  $y = f(x)$  and  $y = g(x)$  intersect at point  $P$ .

Determine the  $x$ -coordinate of  $P$ . Round your answer to the nearest tenth.

Enter your answer in the box.

12. Let  $f(x) = ax^2$  where  $a > 0$ , and let  $g(x) = mx + b$  where  $m > 0$  and  $b < 0$ .

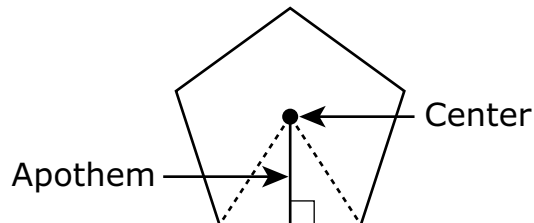
The equation  $f(x) = g(x)$  has  $n$  distinct real solution(s). What are **all** the possible values of  $n$ ? Justify your answers.

Enter your answers and your justification in the space provided.





- 13.** The apothem of a regular polygon is the distance from the center to any side.



If the length of the apothem remains constant at 10 inches, the formula for the perimeter of a regular polygon as a function of the number of sides  $n$  is

$$P(n) = 10\left(\tan\frac{360^\circ}{2n}\right)(2n).$$

As the regular polygon changes from a pentagon (5 sides) to an octagon (8 sides), what is the approximate average rate of change in the perimeter?

- A.** decrease of 0.80 inches for each additional side
- B.** decrease of 2.13 inches for each additional side
- C.** decrease of 4.56 inches for each additional side
- D.** decrease of 6.38 inches for each additional side



Use the information provided to answer Part A and Part B for question 14.

The two-way table shows the classification of students in a mathematics class by gender and dominant hand. A student who is ambidextrous uses both hands equally well.

	Right-handed	Left-handed	Ambidextrous	Total
Male	11	4	1	16
Female	12	2	0	14
Total	23	6	1	30

**14. Part A**

What is the probability that a randomly selected student in the class is female given that the student is right-handed?

- A.  $\frac{1}{12}$
- B.  $\frac{12}{30}$
- C.  $\frac{12}{23}$
- D.  $\frac{23}{30}$

**Part B**

One student will be selected at random from the class.

Consider the events:

$X$ : the selected student is female

$Y$ : the selected student is right-handed

Which statement about events  $X$  and  $Y$  is true?

- A.** The events are independent because the number of right-handed students in the class is larger than the number of female students.
- B.** The events are independent because the number of categories for dominant hand is different from the number of categories for gender.
- C.** The events are not independent because for one of the dominant hand categories the number of female students is 0.
- D.** The events are not independent because the probability of  $X$  is not equal to the probability of  $X$  given  $Y$ .



15. Paul started to train for a marathon. The table shows the number of miles Paul ran during each of the first three weeks after he began training.

Week	1	2	3
Distance (miles)	10	12	14.4

If this pattern continues, which of the listed statements could model the number of miles Paul runs  $a_n$ , in terms of the number of weeks,  $n$ , after he began training?

Select **all** that apply.

- A.  $a_n = 10 + 2(n - 1)$
  - B.  $a_n = 10n^2$
  - C.  $a_n = 10(1.2)^{n-1}$
  - D.  $a_1 = 10, a_n = 1.2a_{n-1}$
  - E.  $a_1 = 10, a_n = 2 + a_{n-1}$
16. The heights of the male students at a college are approximately normally distributed. Within this curve, 95% of the heights, centered about the mean, are between 62 inches and 78 inches. The standard deviation is 4 inches. Use this information to estimate the mean height of the males. Approximate the probability that a male student is taller than 74 inches. Explain how you determined your answers.

Enter your answers and your explanation in the space provided.





**You have come to the end of the calculator section in Unit 1 of the test.**

- **Review your answers in the calculator section of Unit 1 only.**
- **Then, close your test booklet and answer document and raise your hand to turn in your test materials.**





# Unit 2 (Calculator)

**Directions:**

Today, you will take Unit 2 of the Algebra II Practice Test. You will be able to use a calculator.

Read each question. Then, follow the directions to answer each question. Mark your answers by completely filling in the circles in your answer document. Do not make any pencil marks outside of the circles. If you need to change an answer, be sure to erase your first answer completely. If a question asks you to show or explain your work, you must do so to receive full credit. Only responses written within the provided space will be scored.

If you do not know the answer to a question, you may go on to the next question. If you finish early, you may review your answers and any questions you did not answer in this unit ONLY. Do not go past the stop sign.



**Directions for Completing the Answer Grids**

1. Work the problem and find an answer.
2. Write your answer in the boxes at the top of the grid.
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5. Do not fill in a circle under an unused box.
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7. See below for examples on how to correctly complete an answer grid.

**EXAMPLES**

To answer  $-3$  in a question, fill in the answer grid as shown below.

-	3				
<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
0	0	0	0	0	0
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7	7	7	7	7	7
8	8	8	8	8	8
9	9	9	9	9	9

To answer  $.75$  in a question, fill in the answer grid as shown below.

.	7	5			
<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
0	0	0	0	0	0
1	1	1	1	1	1
2	2	2	2	2	2
3	3	3	3	3	3
4	4	4	4	4	4
5	5	<input checked="" type="radio"/>	5	5	5
6	6	6	6	6	6
7	<input checked="" type="radio"/>	7	7	7	7
8	8	8	8	8	8
9	9	9	9	9	9



17. Angle  $\theta$  is in Quadrant II, and  $\sin\theta = \frac{4}{5}$ . What is the value of  $\cos\theta$ ?

- A.  $\frac{4}{5}$
- B.  $\frac{3}{5}$
- C.  $-\frac{3}{5}$
- D.  $-\frac{4}{5}$



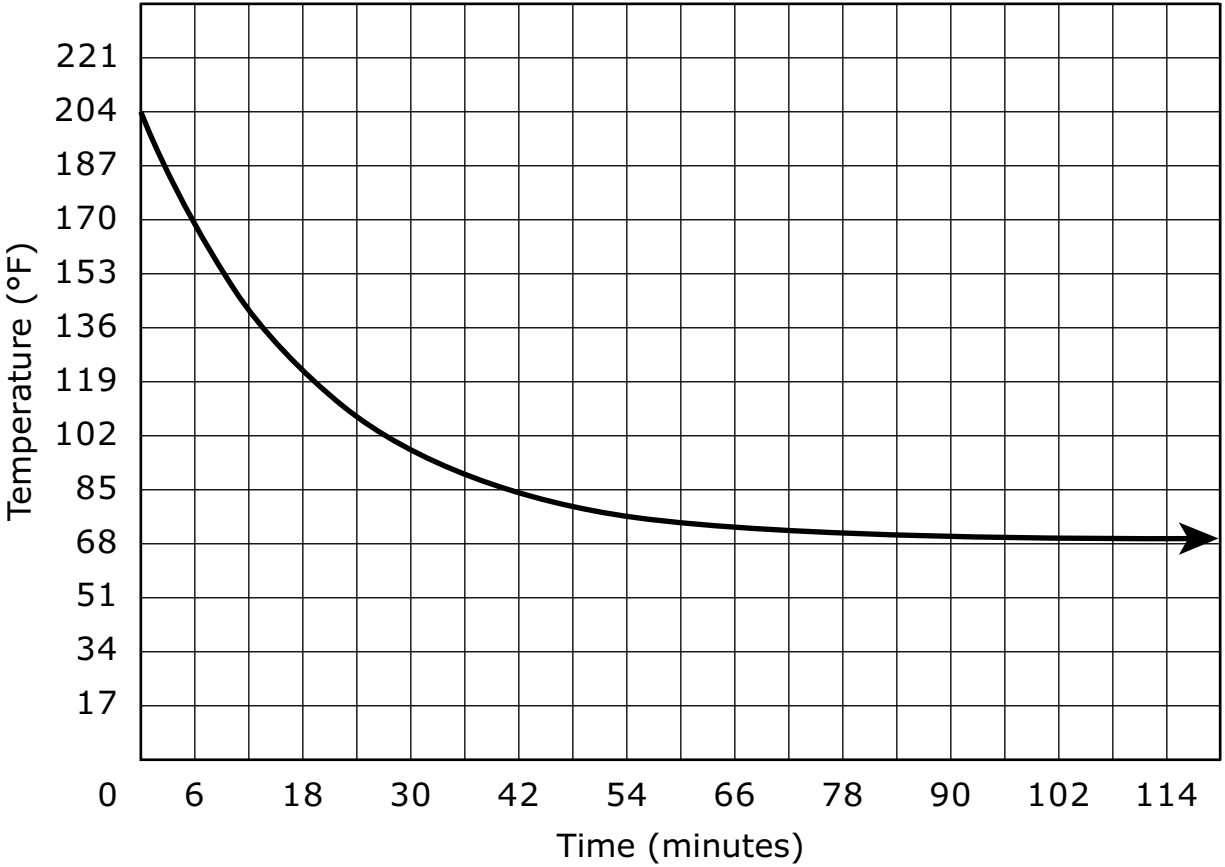


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Use the information provided to answer Part A and Part B for question 18.

The graph represents the temperature, in degrees Fahrenheit ( $^{\circ}\text{F}$ ), of tea for the first 120 minutes after it was poured into a cup.



**18. Part A**

Based on the graph, what was the temperature of the tea when it was first poured into the cup?

- A.  $68^{\circ}$
- B.  $114^{\circ}$
- C.  $136^{\circ}$
- D.  $204^{\circ}$

**Part B**

Based on the graph, as the number of minutes increased, what temperature did the tea approach?

- A.  $68^\circ$
- B.  $114^\circ$
- C.  $136^\circ$
- D.  $204^\circ$

**19. Part A**

A bank offers a savings account that accrues simple interest annually based on an initial deposit of \$500. If  $S(t)$  represents the money in the account at the end of  $t$  years and  $S(5) = 575$ , write a function that could be used to determine the amount of money in the account over time. Show your work or explain your reasoning.

Enter your equation and your reasoning in the space provided.

**Part B**

Another bank offers a savings account that accrues compound interest annually at a rate of 3%.

What is the initial amount needed in this account so that it will have the same amount of money at the end of 10 years as the account in Part A at the end of 10 years? Show your work or explain your reasoning.

Enter your answer and your reasoning in the space provided.



Use the information provided to answer Part A and Part B for question 20.

The manager of food services at a local high school is interested in assessing student opinion about a new lunch menu in the school cafeteria. The manager is planning to conduct a sample survey of the student population.

**20. Part A**

Which of the listed methods of sample selection would be the **most** effective at reducing bias?

- A. Randomly select one day of the week and then select the first 30 students who enter the cafeteria on that day.
- B. Post the survey on the school Web site and use the first 30 surveys that are submitted.
- C. Randomly select 30 students from a list of all the students in the school.
- D. Randomly select one classroom in the school and then select the first 30 students who enter that classroom.

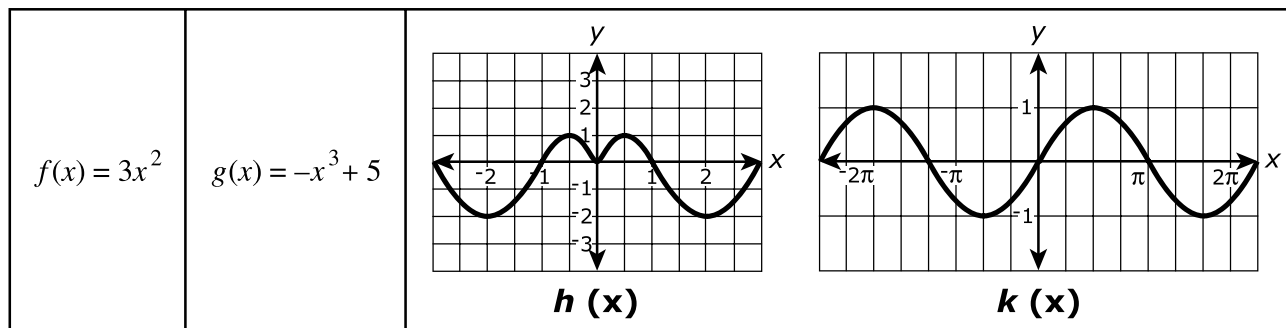
**Part B**

The manager wants to know if a student’s gender is related to the student’s opinion about the menu. Which statement **best** describes the study?

- A. This is an observational study, and therefore, the manager will be able to establish a cause-and-effect relationship between gender and opinion.
- B. This is an observational study, and therefore, the manager will not be able to establish a cause-and-effect relationship between gender and opinion.
- C. This is an experimental study, and therefore, the manager will be able to establish a cause-and-effect relationship between gender and opinion.
- D. This is an experimental study, and therefore, the manager will not be able to establish a cause-and-effect relationship between gender and opinion.



21. Consider the functions  $f(x)$  and  $g(x)$  described by the equations and the functions  $h(x)$  and  $k(x)$  shown by graphs.



Which of the statements are true? Select **all** that apply.

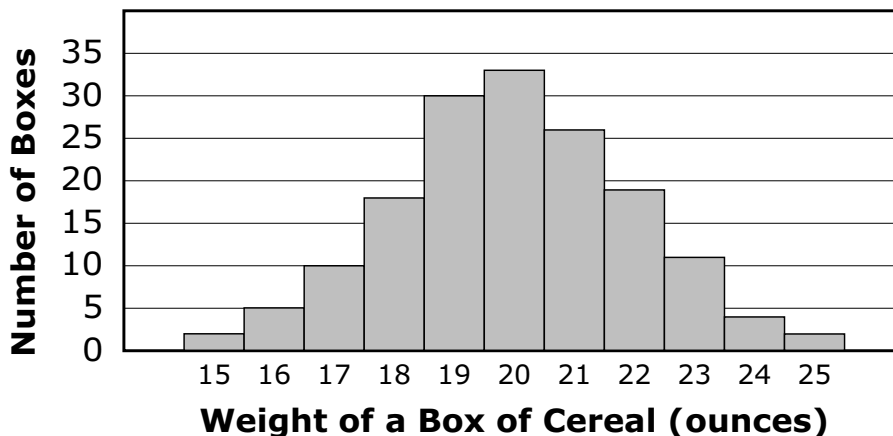
- A.  $f$  is an odd function.
- B.  $f$  is neither an even nor odd function.
- C.  $g$  is an even function.
- D.  $g$  is neither an even nor odd function.
- E.  $h$  is an even function.
- F.  $h$  is an odd function.
- G.  $k$  is an odd function.
- H.  $k$  is neither an even nor odd function.



Use the information provided to answer Part A and Part B for question 22.

The distribution of weights (rounded to the nearest whole number) of all boxes of a certain cereal is approximately normal with mean 20 ounces and standard deviation 2 ounces.

A sample of the cereal boxes was selected, and the weights of the selected boxes are summarized in the histogram shown.



**22. Part A**

If  $w$  is the weight of a box of cereal, which range of weights includes all of the weights of cereal boxes that are within 1.5 standard deviations of the mean?

- A.  $17 \leq w \leq 23$
- B.  $18.5 \leq w \leq 21.5$
- C.  $19 \leq w \leq 21$
- D.  $20 \leq w \leq 23$

**Part B**

Which of these values is the **best** estimate of the number of boxes in the sample with weights that are more than 1.5 standard deviations above the mean?

- A. 2
- B. 6
- C. 17
- D. 36

- 23.** For a statistics project, a group of students decide to collect data in order to approximate the percent of people in the town who are left-handed. They ask every third student entering the school cafeteria whether he or she is left-handed or right-handed. What type of method did this group use? Explain which population the group can draw a conclusion about based on their method. Suggest a better method that would allow the students to draw a conclusion about all the residents in their town.

Enter your answers and your explanation in the space provided.



24.

$$\begin{cases} y = 1 - x^2 \\ y = 2 - x \end{cases}$$

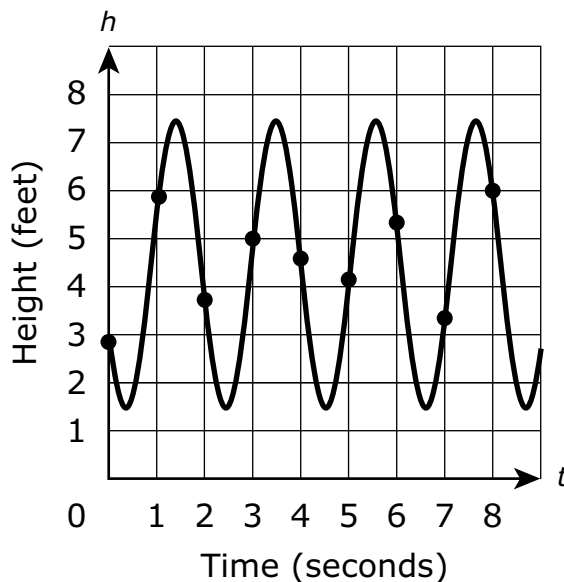
How many points of intersection does the given system of equations have?

- A. none
- B. one
- C. two
- D. infinitely many





25. The graph models the height,  $h$ , above the ground, in feet, at time  $t$ , in seconds, of a person swinging on a swing. Each point indicated on the graph represents the height of the person above the ground at the end of each one-second interval.



Select **two** time intervals for which the average rate of change in the height of the person is approximately  $-\frac{1}{2}$  feet per second.

- A. from 0 seconds to 1 second
- B. from 1 second to 2 seconds
- C. from 2 seconds to 3 seconds
- D. from 3 seconds to 4 seconds
- E. from 4 seconds to 5 seconds
- F. from 5 seconds to 6 seconds
- G. from 6 seconds to 7 seconds
- H. from 7 seconds to 8 seconds



Use the information provided to answer Part A and Part B for question 26.

To investigate housing needs in the future, a town planning committee created a model to help predict the growth of the population of the town. The committee created a model based on data about the population of the town for five years. The data are shown in the table.

Year	Population (in thousands)
1985	5.35
1990	6.01
1995	6.91
2000	8.07
2005	9.45
2010	11.06

**26. Part A**

Which model for  $P(t)$ , the population of the town  $t$  years after 1985, **best** fits the data?

- A.  $P(t) = 4.95 + 0.229t$
- B.  $P(t) = 5.35 + 0.228t$
- C.  $P(t) = 5.24(1.030)^t$
- D.  $P(t) = 5.35(1.029)^t$

**Part B**

Consider the value predicted by the model for the year 2010. Which statement is true?

- A.** The model overpredicts the actual population of the town by fewer than 1,000 people.
- B.** The model overpredicts the actual population of the town by more than 1,000 people.
- C.** The model underpredicts the actual population of the town by fewer than 1,000 people.
- D.** The model underpredicts the actual population of the town by more than 1,000 people.



27. A scientist places 7.35 grams of a radioactive element in a dish. The half-life of the element is 2 days. After  $d$  days, the number of grams of the element remaining in the dish is given by the function  $R(d) = 7.35\left(\frac{1}{2}\right)^{\frac{d}{2}}$ . Which statement is true about the equation when it is rewritten without a fractional exponent?

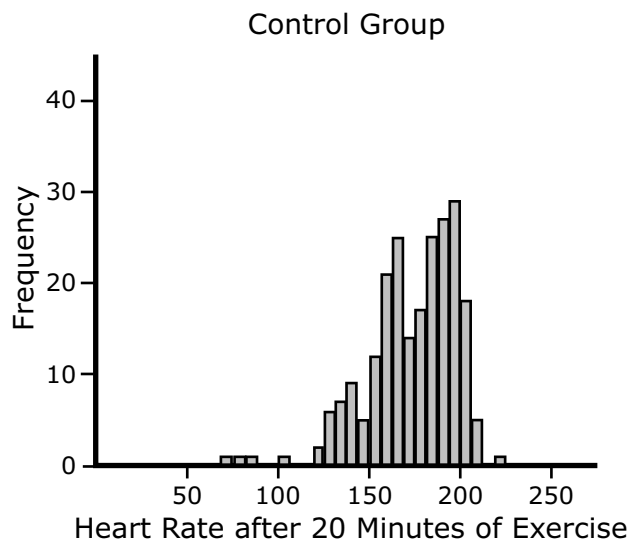
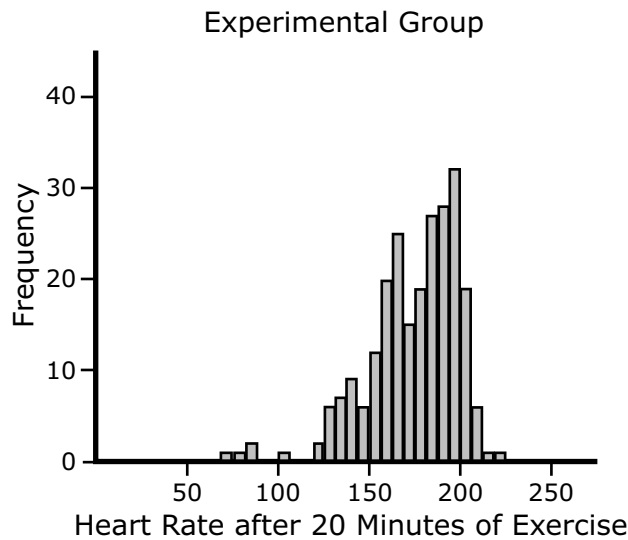
Select **all** that apply.

- A. An approximately equivalent equation is  $R(d) = 7.35(0.250)^d$ .
- B. An approximately equivalent equation is  $R(d) = 7.35(0.707)^d$ .
- C. The base of the exponent in this form of the equation can be interpreted to mean that the element decays by 0.250 grams per day.
- D. The base of the exponent in this form of the equation can be interpreted to mean that the element decays by 0.707 grams per day.
- E. The base of the exponent in this form of the equation can be interpreted to mean that about 25% of the element remains from one day to the next day.
- F. The base of the exponent in this form of the equation can be interpreted to mean that about 70.7% of the element remains from one day to the next day.



**28. Part A**

The histograms show the distribution of heart rates of randomly selected adult males between the ages of 40 and 45 after 20 minutes of continuous exercise. The adult males were randomly assigned to use either a new elliptical machine (Experimental Group) or a traditional treadmill machine (Control Group).



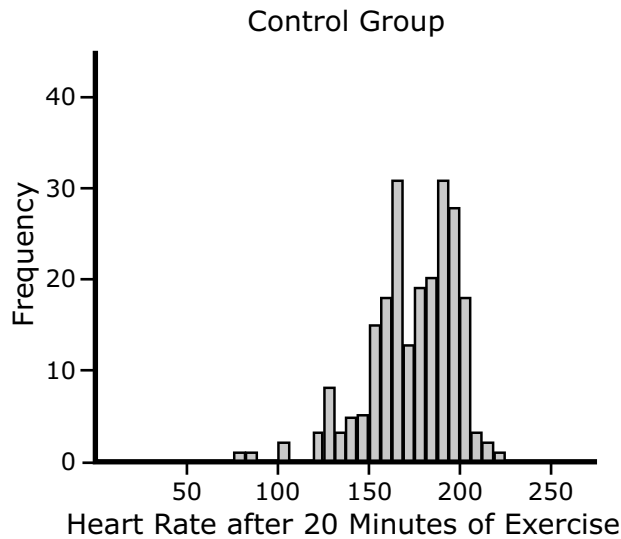
What conclusion about the difference between the distributions of the heart rates for these two groups can be drawn? Justify your answer.

Enter your answer and your justification in the space provided.



Part B

After the participants worked out three times per week for four weeks solely on their assigned machines, participants' heart rates were collected again after 20 minutes of continuous exercise. The data are shown in the histograms.





What conclusion about the difference between the distributions of the heart rates for the two groups can be drawn? Justify your answer.

If the target heart rate range for adult males aged between 40 and 45 after 20 minutes of exercise is around 175 beats per minute, what recommendation would you make in terms of which machine to use? Justify your answer.

Based upon these data, what conclusion about exercise machines in general can be made?

Enter your answers and your justification in the space provided.

- 29.** Select **each** statement that is true about the graph of  $f(x) = \sin(x + 3) - 2$ .
- A.** amplitude: 1
  - B.** amplitude: 2
  - C.** midline:  $y = 2$
  - D.**  $y$ -intercept:  $(0, -2)$
  - E.**  $x$ -intercept:  $(0, 0)$





**You have come to the end of Unit 2 of the test.**

- **Review your answers from Unit 2 only.**
- **Then, close your test booklet and answer document and raise your hand to turn in your test materials.**













# ALG II

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