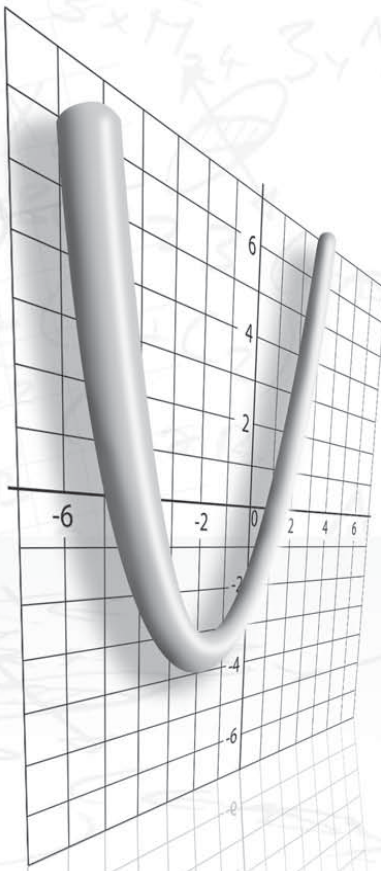
Student Name _____

Teacher Name _____

School _____

System _____



ALGEBRA II

Practice Test

Tennessee End of Course Assessment

Algebra II
Form 1

PEARSON

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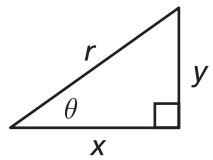
Algebra II Reference Page

Trigonometric Functions

$\sin\theta = \frac{y}{r}$, $\csc\theta = \frac{r}{y}$

$\cos\theta = \frac{x}{r}$, $\sec\theta = \frac{r}{x}$

$\tan\theta = \frac{y}{x}$, $\cot\theta = \frac{x}{y}$



$r = \sqrt{x^2 + y^2}$

Logarithm Properties

$\log_b MN = \log_b M + \log_b N$

$\log_b\left(\frac{M}{N}\right) = \log_b M - \log_b N$

$\log_b M^p = p \log_b M$

$\log_b x = y \Leftrightarrow x = b^y$

Arithmetic and Geometric Sequences and Series

$a_1 = 1^{\text{st}}$ term $\quad r =$ common ratio $\quad d =$ common difference

$a_n = n^{\text{th}}$ term $\quad n =$ number of terms in series

Arithmetic Sequence: $a_n = a_1 + (n-1)d$ $\quad$ Geometric Sequence: $a_n = a_1 r^{n-1}$

Sum of a Finite Arithmetic Series: $S_n = \frac{n(a_1 + a_n)}{2}$ or $S_n = \frac{1}{2}n[2a_1 + (n-1)d]$

Sum of a Finite Geometric Series: $S_n = \frac{a_1(1-r^n)}{1-r}$, $r \neq 1$

Sum of an Infinite Geometric Series: $S = \frac{a_1}{1-r}$ where $|r| < 1$

Combinations

$${}_nC_r = \frac{n!}{r!(n-r)!}$$

Permutations

$${}_nP_r = \frac{n!}{(n-r)!}$$

Binomial Theorem

$$(a+b)^n = \sum_{r=0}^{n} \binom{n}{r} a^{n-r} b^r$$

Quadratic Formula

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$y = ax^2 + bx + c$$

Interest Formulas

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

Continuous compound interest: $A = Pe^{rt}$

$P =$ present value

$A =$ future value

$r =$ annual interest rate

$t =$ time in years

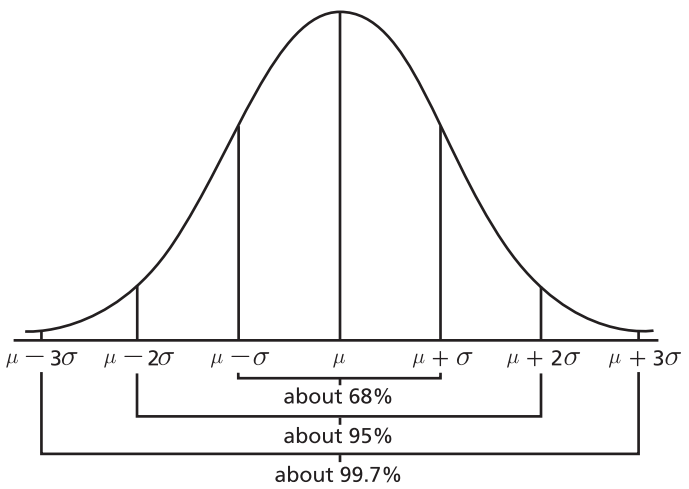
$n =$ frequency of compounding per year

Algebra II Reference Page

Conic Sections – Standard Equations

Parabola	$y = a(x-h)^2 + k$	or	$x = a(y-k)^2 + h$
	$(y-k)^2 = 4p(x-h)$	or	$(x-h)^2 = 4p(y-k)$
Circle	$(x-h)^2 + (y-k)^2 = r^2$		
Ellipse	$\frac{(x-h)^2}{a^2} + \frac{(y-k)^2}{b^2} = 1$	or	$\frac{(x-h)^2}{b^2} + \frac{(y-k)^2}{a^2} = 1$
Hyperbola	$\frac{(x-h)^2}{a^2} - \frac{(y-k)^2}{b^2} = 1$	or	$\frac{(y-k)^2}{a^2} - \frac{(x-h)^2}{b^2} = 1$

Normal Curve Distribution



Standard Deviation

The standard deviation , σ, for values $x_1, x_2, x_3, \ldots, x_n$ with mean μ is determined by the following:

$$\sigma = \sqrt{\frac{(x_1 - \mu)^2 + (x_2 - \mu)^2 + \ldots + (x_n - \mu)^2}{n}}$$

Probability Formulas

Exclusive

$$P(A \text{ or } B) = P(A) + P(B)$$

Inclusive

$$P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$$

Independent

$$P(A \text{ and } B) = P(A) \bullet P(B)$$

Dependent

$$P(A \text{ and } B) = P(A) \bullet P(B|A)$$

Conditional

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

Algebra II Reference Page

Cramer's Rule for Solving a System of Linear Equations

For a 2×2 System:

$$a_1x + b_1y = c_1$$
$$a_2x + b_2y = c_2$$

$$x = \frac{\begin{vmatrix} c_1 & b_1 \\ c_2 & b_2 \end{vmatrix}}{\begin{vmatrix} a_1 & b_1 \\ a_2 & b_2 \end{vmatrix}} \qquad y = \frac{\begin{vmatrix} a_1 & c_1 \\ a_2 & c_2 \end{vmatrix}}{\begin{vmatrix} a_1 & b_1 \\ a_2 & b_2 \end{vmatrix}}$$

For a 3×3 System:

$$a_1x + b_1y + c_1z = d_1$$
$$a_2x + b_2y + c_2z = d_2$$
$$a_3x + b_3y + c_3z = d_3$$

$$x = \frac{\begin{vmatrix} d_1 & b_1 & c_1 \\ d_2 & b_2 & c_2 \\ d_3 & b_3 & c_3 \end{vmatrix}}{\begin{vmatrix} a_1 & b_1 & c_1 \\ a_2 & b_2 & c_2 \\ a_3 & b_3 & c_3 \end{vmatrix}} \quad y = \frac{\begin{vmatrix} a_1 & d_1 & c_1 \\ a_2 & d_2 & c_2 \\ a_3 & d_3 & c_3 \end{vmatrix}}{\begin{vmatrix} a_1 & b_1 & c_1 \\ a_2 & b_2 & c_2 \\ a_3 & b_3 & c_3 \end{vmatrix}} \quad z = \frac{\begin{vmatrix} a_1 & b_1 & d_1 \\ a_2 & b_2 & d_2 \\ a_3 & b_3 & d_3 \end{vmatrix}}{\begin{vmatrix} a_1 & b_1 & c_1 \\ a_2 & b_2 & c_2 \\ a_3 & b_3 & c_3 \end{vmatrix}}$$

Converting Degrees to Radians

Multiply degree measure by $\frac{\pi}{180°}$

Converting Radians to Degrees

Multiply radian measure by $\frac{180°}{\pi}$

Definition of "i"

$$i^2 = -1$$
$$i = \sqrt{-1}$$

Absolute Value of a Complex Number

$$|a + bi| = \sqrt{a^2 + b^2}$$

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Introduction to Algebra II

Content of tests

The testing program titled the *Tennessee End of Course Assessment* was established to meet the Tennessee mandate for end of course assessments in Tennessee secondary schools. These tests measure the Tennessee State Performance Indicators. Subject areas covered by the end of course assessments include Mathematics, Language Arts, History, and Science.

Test development

For the *Tennessee End of Course Assessment,* professional item writers experienced in each of the content areas researched and wrote the items. Professional editors and test developers carefully reviewed all items and test directions for content and accuracy. To provide a large pool of items for final test selection, the test developers created approximately 50% more items as were needed in the final editions of the tests.

After items were field tested, student responses were analyzed. Professional content editors and researchers carefully reviewed items, their data, and test directions for content, suitability, and accuracy before including certain items and test directions in operational tests.

Test administration

Tennessee End of Course Assessments are given to students as they are completing courses that are included in the program. Tests may be given midyear for block schedules or at the end of the school year.

This test contains 65 multiple-choice questions.

You will have ample time to read each of the questions. The Algebra II test has been designed to be administered in one session and is not timed. The first 15 minutes are set aside to complete identifying data on the answer sheet.

A reference page, similar to the one located in this Practice Test, will be in the front of the actual test. This page includes a list of formulas, equations, and tables for use during testing.

Calculator use is recommended. Sharing calculators during testing is not permitted.

The following types of calculators/devices may **NOT** be used during the test:

- pocket organizers
- electronic writing pads or input devices
- Some examples of prohibited calculators are:
    - Casio models: CFX-9970G, Algebra FX 2.0
    - Hewlett-Packard models: HP-40G, HP-49G
    - Texas Instruments models: TI-89, TI-92, Voyage 200, TI-NSPIRE – the CAS version (The non-CAS version of TI-NSPIRE is allowable.)
- calculators that can communicate (transfer data or information) wirelessly with other student calculators/devices
- cell phones, PSPs, and/or iPods
- Students may use any four-function, scientific, or graphing calculator does not have any of the above features. The use of units that have a Computer Algebra System (CAS) is NOT allowed.

Tips for Taking the Test

Preparing for the test

- Take this Practice Test several times
- Review the Tennessee End of Course Item Sampler for Algebra II located at http://tennessee.gov/education/assessment/sec_samplers.shtml on the Tennessee Department of Education Web site.
- Become familiar with the correct way to mark answers on the answer sheet. There is a sample answer sheet in this Practice Test.

Before the test

- Get a good night's sleep. To do your best, you need to be rested.

During the test

- Relax. It is normal to be somewhat nervous before the test. Try to relax and not worry.
- Listen. Listen to and read the test directions carefully. Ask for an explanation of the directions if you do not understand them.
- Plan your time. Do not spend too much time on any one question. If a question seems to take too long, skip it and return to it later. First answer all questions that you are sure about.
- Think. If you are not sure how to answer a question, read it again and try your best to answer the question. Rule out answer choices that you know are incorrect and choose from those that remain.

Answer Sheet for the Practice Test

1 Ⓐ Ⓑ Ⓒ Ⓓ	14 Ⓐ Ⓑ Ⓒ Ⓓ	27 Ⓐ Ⓑ Ⓒ Ⓓ	40 Ⓐ Ⓑ Ⓒ Ⓓ	53 Ⓐ Ⓑ Ⓒ Ⓓ
2 Ⓐ Ⓑ Ⓒ Ⓓ	15 Ⓐ Ⓑ Ⓒ Ⓓ	28 Ⓐ Ⓑ Ⓒ Ⓓ	41 Ⓐ Ⓑ Ⓒ Ⓓ	54 Ⓐ Ⓑ Ⓒ Ⓓ
3 Ⓐ Ⓑ Ⓒ Ⓓ	16 Ⓐ Ⓑ Ⓒ Ⓓ	29 Ⓐ Ⓑ Ⓒ Ⓓ	42 Ⓐ Ⓑ Ⓒ Ⓓ	55 Ⓐ Ⓑ Ⓒ Ⓓ
4 Ⓐ Ⓑ Ⓒ Ⓓ	17 Ⓐ Ⓑ Ⓒ Ⓓ	30 Ⓐ Ⓑ Ⓒ Ⓓ	43 Ⓐ Ⓑ Ⓒ Ⓓ	56 Ⓐ Ⓑ Ⓒ Ⓓ
5 Ⓐ Ⓑ Ⓒ Ⓓ	18 Ⓐ Ⓑ Ⓒ Ⓓ	31 Ⓐ Ⓑ Ⓒ Ⓓ	44 Ⓐ Ⓑ Ⓒ Ⓓ	57 Ⓐ Ⓑ Ⓒ Ⓓ
6 Ⓐ Ⓑ Ⓒ Ⓓ	19 Ⓐ Ⓑ Ⓒ Ⓓ	32 Ⓐ Ⓑ Ⓒ Ⓓ	45 Ⓐ Ⓑ Ⓒ Ⓓ	58 Ⓐ Ⓑ Ⓒ Ⓓ
7 Ⓐ Ⓑ Ⓒ Ⓓ	20 Ⓐ Ⓑ Ⓒ Ⓓ	33 Ⓐ Ⓑ Ⓒ Ⓓ	46 Ⓐ Ⓑ Ⓒ Ⓓ	59 Ⓐ Ⓑ Ⓒ Ⓓ
8 Ⓐ Ⓑ Ⓒ Ⓓ	21 Ⓐ Ⓑ Ⓒ Ⓓ	34 Ⓐ Ⓑ Ⓒ Ⓓ	47 Ⓐ Ⓑ Ⓒ Ⓓ	60 Ⓐ Ⓑ Ⓒ Ⓓ
9 Ⓐ Ⓑ Ⓒ Ⓓ	22 Ⓐ Ⓑ Ⓒ Ⓓ	35 Ⓐ Ⓑ Ⓒ Ⓓ	48 Ⓐ Ⓑ Ⓒ Ⓓ	61 Ⓐ Ⓑ Ⓒ Ⓓ
10 Ⓐ Ⓑ Ⓒ Ⓓ	23 Ⓐ Ⓑ Ⓒ Ⓓ	36 Ⓐ Ⓑ Ⓒ Ⓓ	49 Ⓐ Ⓑ Ⓒ Ⓓ	62 Ⓐ Ⓑ Ⓒ Ⓓ
11 Ⓐ Ⓑ Ⓒ Ⓓ	24 Ⓐ Ⓑ Ⓒ Ⓓ	37 Ⓐ Ⓑ Ⓒ Ⓓ	50 Ⓐ Ⓑ Ⓒ Ⓓ	63 Ⓐ Ⓑ Ⓒ Ⓓ
12 Ⓐ Ⓑ Ⓒ Ⓓ	25 Ⓐ Ⓑ Ⓒ Ⓓ	38 Ⓐ Ⓑ Ⓒ Ⓓ	51 Ⓐ Ⓑ Ⓒ Ⓓ	64 Ⓐ Ⓑ Ⓒ Ⓓ
13 Ⓐ Ⓑ Ⓒ Ⓓ	26 Ⓐ Ⓑ Ⓒ Ⓓ	39 Ⓐ Ⓑ Ⓒ Ⓓ	52 Ⓐ Ⓑ Ⓒ Ⓓ	65 Ⓐ Ⓑ Ⓒ Ⓓ

Directions for Taking the Practice Test

In this Practice Test, you will answer various mathematical operations. You may use your calculator and Reference Page located in the front of this book to help you solve the problems. You may write in the open spaces in this book to work the problems, but remember to fill in the circle on your answer sheet that goes with the answer you choose for each question. Fill in the circle completely and make your mark heavy and dark. If you want to change an answer, erase the mark you made and make a new mark.

You will do the items in this Practice Test by yourself. Remember to read all the directions carefully. When you have finished, you may check for answers.

On your answer sheet, find Number 1. Mark your answers beginning with Number 1.

You may begin.

Stop when you have finished the test.

At the end of the Practice Test, make sure that all your marks are heavy and dark and that you have completely erased any marks that you do not want.

Turn to 77 and locate the Answer Key. Check your answers and review those items that you marked incorrectly.

1. **Which expression is equivalent to $(18z^2 + 7z - 12) - (-5z^2 + 13z + 21)$?**

A $13z^2 - 6z - 33$

B $13z^2 + 20z + 9$

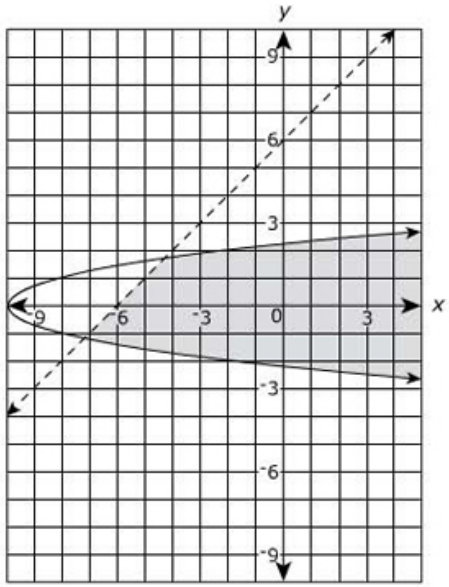
C $23z^2 - 6z - 33$

D $23z^2 + 20z + 9$

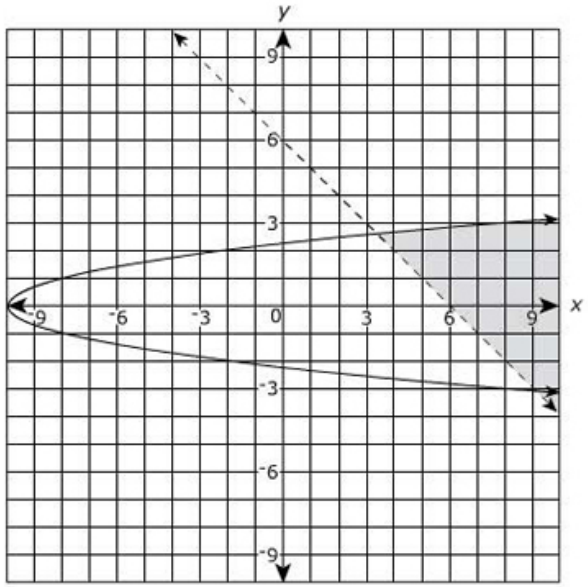
2. **Which graph <u>best</u> represents the system of inequalities below?**

$$-x + y > 6$$
$$-x + 2y^2 \leq 10$$

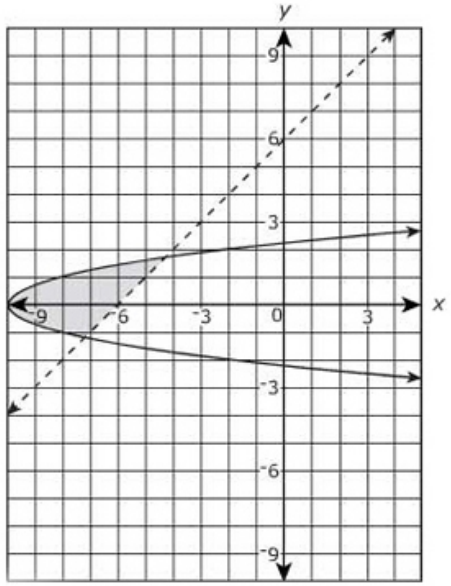
A



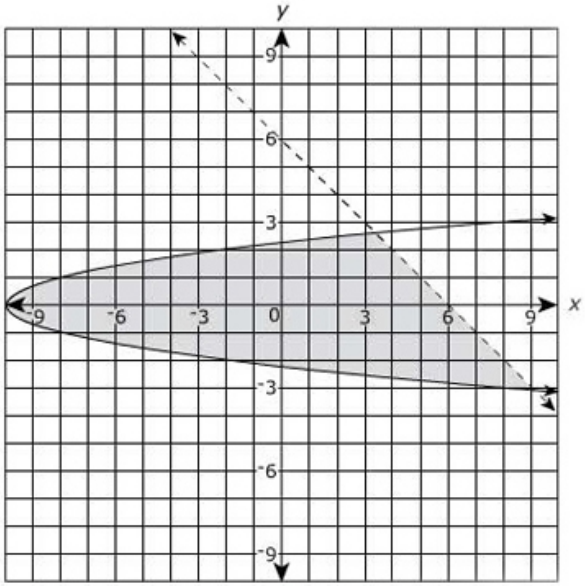
C



B



D



3. **A factory tests a certain type of concrete slab for breaking strength to determine reliability. The strength of concrete is measured in megapascals (MPa). The breaking strength of the type of concrete being tested is normally distributed with a mean of 35 MPa and standard deviation of 3 MPa. Any breaking strength less than 32 MPa is considered defective. What is closest to the probability that a random concrete sample from this distribution is defective?**

A 0.16

B 0.32

C 0.68

D 0.84

4. **Which expression is equivalent to tan 390°?**

A $\cot(-30°)$

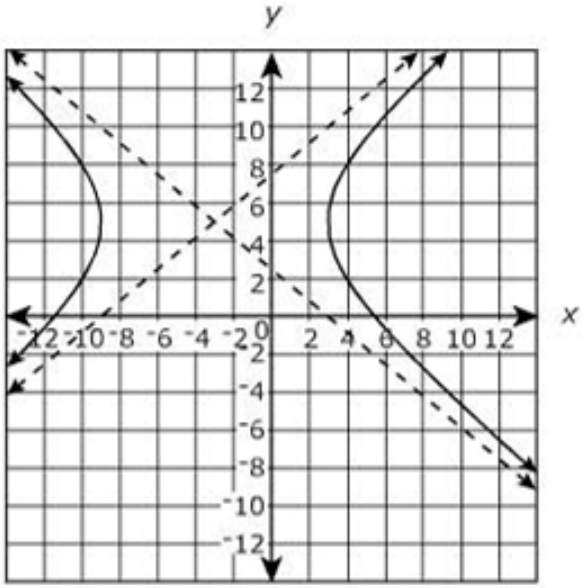
B $\tan(-30°)$

C $\tan 30°$

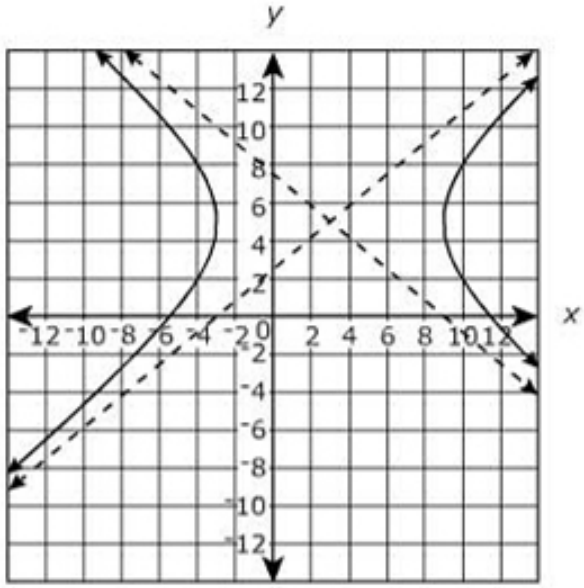
D $\cot 30°$

5. **Which graph <u>best</u> represents the equation $\frac{(x+3)^2}{36} - \frac{(y+5)^2}{25} = 1$?**

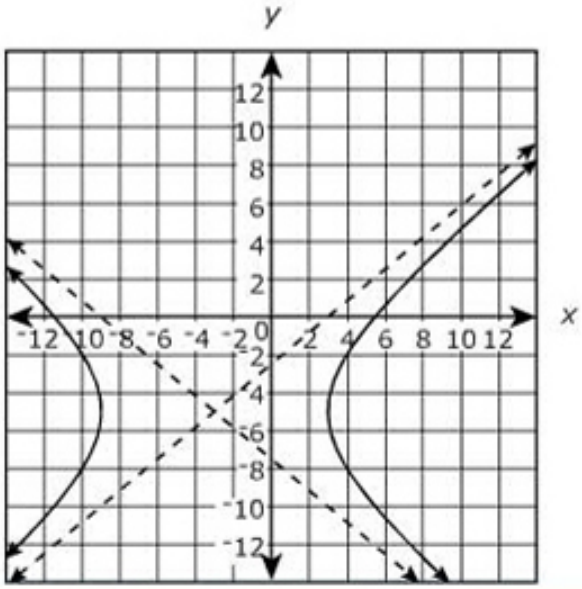
A



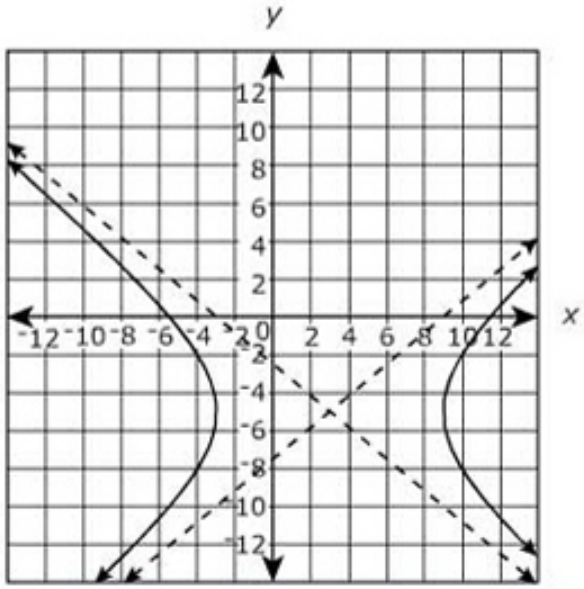
C



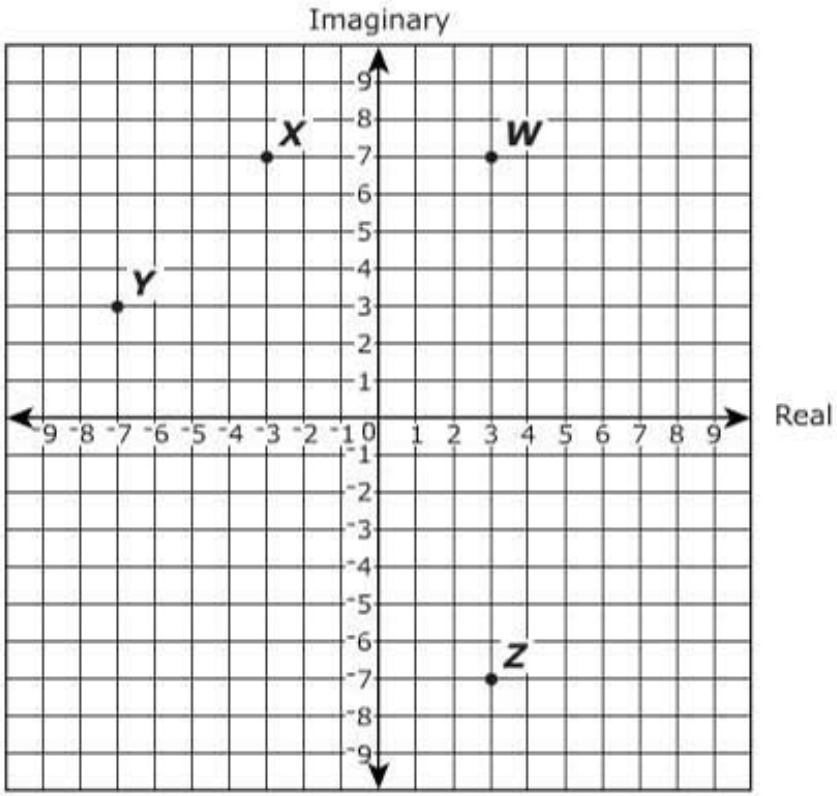
B



D



6. **The grid below represents a complex plane.**



Which point represents the complex number 3 – 7*i*?

A Point *W*

B Point *X*

C Point *Y*

D Point *Z*

7. **The table below gives the cumulative emissions of carbon in the atmosphere.**

Cumulative Carbon Emissions

Years After 1870	Cumulative Carbon Emissions (billion metric tons)
0	18.3
40	50.7
80	140.0
120	388.0

The data is modeled by an exponential function. Based on these results, approximately how many billion metric tons of carbon were emitted by the year 1900?

A 30 billion metric tons

B 40 billion metric tons

C 43 billion metric tons

D 64 billion metric tons

8. **A system of equations is given below.**

$$x + y + z = 50$$
$$x + 3y + 5z = 100$$
$$x + 3y + 10z = 120$$

What is the solution to this system of equations?

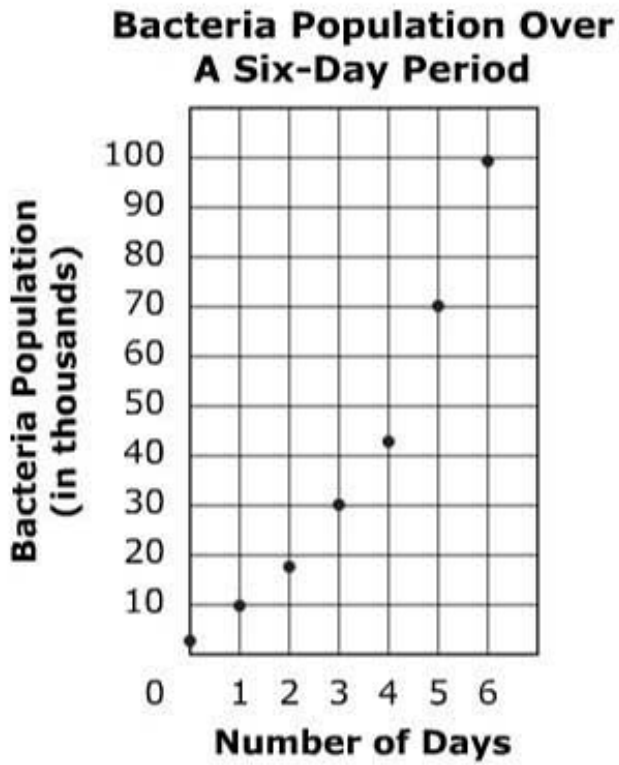
A $\begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 29 \\ 17 \\ 4 \end{bmatrix}$

B $\begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 35 \\ 5 \\ 10 \end{bmatrix}$

C $\begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 1 \\ 53 \\ -4 \end{bmatrix}$

D $\begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 12 \\ 34 \\ 4 \end{bmatrix}$

9. **The scatterplot below shows the bacteria population in a sample over a six-day period.**



Which type of function do the data points <u>best</u> represent?

A linear

B quadratic

C exponential

D logarithmic

10. Which expression is equivalent to $\left(\frac{x^{\frac{7}{4}}y^{\frac{4}{3}}}{24}\right) \div \left(\frac{x^{\frac{5}{3}}}{36y^{\frac{2}{3}}}\right)$ for all $x, y \neq 0$?

A $\frac{3x^{\frac{1}{12}}y^{2}}{2}$

B $\frac{3x^{\frac{41}{12}}y^{\frac{2}{3}}}{2}$

C $\frac{x^{\frac{1}{12}}y^{2}}{864}$

D $\frac{x^{\frac{41}{12}}y^{\frac{2}{3}}}{864}$

11. **Jessica, Amy, and Kelly each rode the bus five days. The number of minutes the girls rode for each day is listed below.**

Jessica: 14, 17, 15, 15, 19
Amy: 19, 12, 17, 10, 13
Kelly: 15, 12, 11, 18, 20

Which list orders the girls from greatest to least based on each girl's mean number of minutes?

A Amy, Jessica, Kelly

B Amy, Kelly, Jessica

C Jessica, Amy, Kelly

D Jessica, Kelly, Amy

12. **The height, $h(t)$, in meters, of a certain projectile as a function of time, t, in seconds, is given by $h(t) = 20t - 4.9t^2$. Which is closest to the domain of the function $h(t)$ in this situation?**

A all real numbers

B all real numbers greater than or equal to 0

C all real numbers greater than or equal to 0 and less than or equal to 4.082

D all real numbers greater than or equal to 0 and less than or equal to 20.408

13. **What is the product of $(17x^2y^2 - 7xy + 9x^2 - 2y^2)$ and $(-3x^3y)$?**

A $-51x^6y^2 + 21x^3y - 27x^6 + 6y^2$

B $-51x^5y^3 + 21x^4y^2 - 27x^5y + 6x^3y^3$

C $14x^5y^3 - 10x^4y^2 + 6x^5y - 5x^3y^3$

D $14x^6y^2 - 10x^3y + 6x^6 - 5y^2$

14. **Ms. Carlisle collected donations of $50, $100, $120, $210, $50, $75, $150, $200, $115, and $180 for charity. What is the mean value of the donations?**

A $50

B $118

C $125

D $160

15. **Which value of x makes this equation true?**

$$4(2x - 3)^{\frac{7}{2}} = 8{,}748$$

A 3

B 5

C 6

D 9

16. **The number of e-books sold by an online book retailer was 1.7 million in 2005 with an increase in sales of approximately 70% each year. The number of e-books sold (in millions) is modeled by the exponential function $f(t) = 1.7(1.70)^t$, where t represents the number of years since 2005. Which table of values <u>best</u> represents this equation?**

A

t	$f(t)$
1	2.89
2	5.78
3	8.67
4	11.56

C

t	$f(t)$
1	1.70
2	3.40
3	5.10
4	6.80

B

t	$f(t)$
1	2.89
2	4.91
3	8.35
4	14.20

D

t	$f(t)$
1	1.70
2	5.52
3	11.00
4	17.95

17. **What is the simplified form of the expression $\frac{40a^3+4a^2+33a+27}{5a+3}$ if $a \neq -\frac{3}{5}$?**

A $8a^2 - 4a + 9$

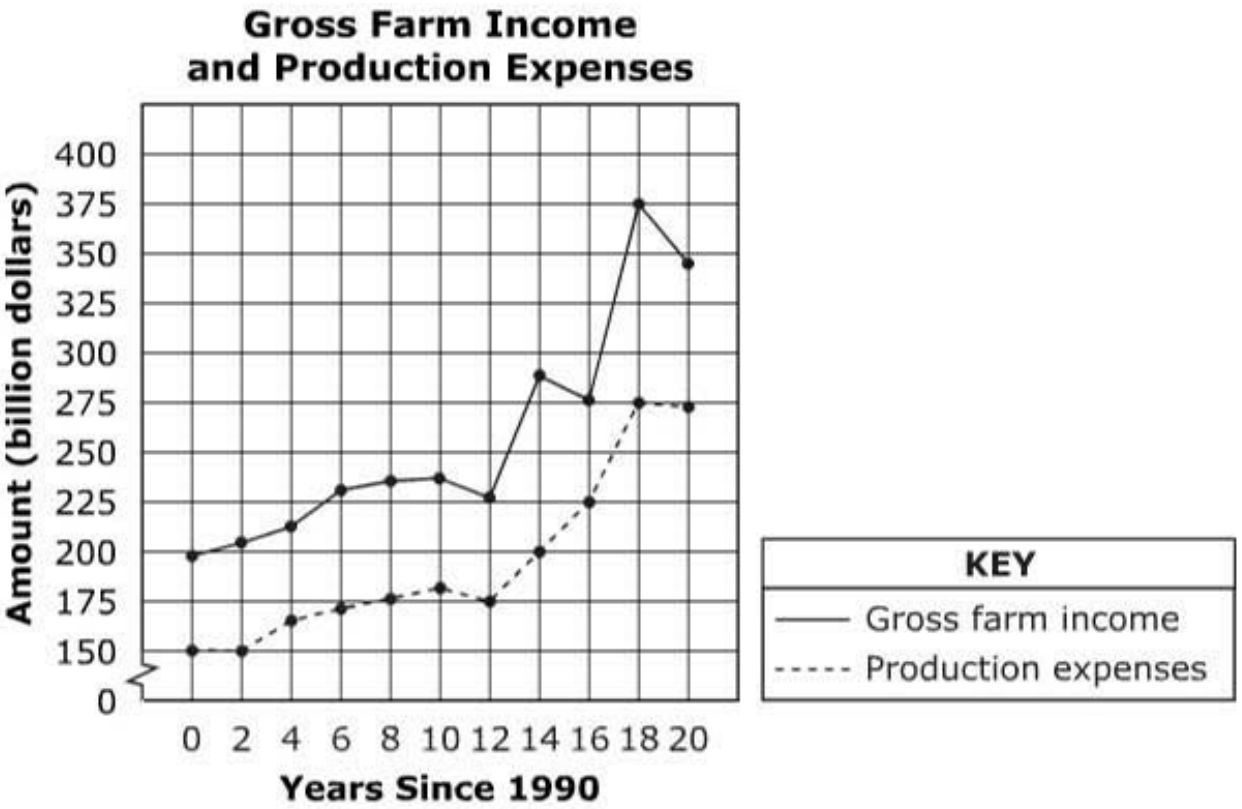
B $8a^2 + 4a + 9$

C $8a^2 + 4a - 9$

D $8a^2 - 4a - 9$

18.

The graph below shows the gross farm income and production expenses since 1990.



Which statement <u>best</u> describes the given data?

A The gross farm income reached a minimum in 2004, and the production expenses reached a maximum in 2008.

B The gross farm income reached a maximum in 2008, and the production expenses reached a minimum in 2002.

C The percent increase of gross farm income is greater from 2002 to 2004 than from 2006 to 2008.

D The percent decrease of gross farm income is greater than the percent decrease of production expenses from 2008 to 2010.

19. **What is the inverse of $f(x) = (3x - 5)^4$ for all $x \geq \frac{5}{3}$?**

A $f^{-1}(x) = \frac{1}{(3x-5)^4}, x \geq \frac{5}{3}$

B $f^{-1}(x) = (3x - 5)^{\frac{1}{4}}, x \geq \frac{5}{3}$

C $f^{-1}(x) = \frac{\sqrt[4]{x}+5}{3}, x \geq 0$

D $f^{-1}(x) = \frac{\sqrt[4]{x+5}}{3}, x \geq -5$

20. **The table below shows the number of juniors and seniors participating in four after-school activities.**

After-School Activity Participation

Activity	Juniors	Seniors
Band	42	32
Choir	15	24
Drama	35	47
Track	52	25

Which statement about the data is true?

A The mean number of juniors is less than the mean number of seniors.

B The median number of seniors is less than the median number of juniors.

C The interquartile range for the number of seniors is greater than the interquartile range for the number of juniors.

D The standard deviation for the number of seniors is greater than the standard deviation for the number of juniors.

21. **Which pair of functions are inverses of each other?**

A $f(x) = 4x^2 + 7x + 8$ and $g(x) = 4x^2 - 7x + 8$

B $f(x) = \frac{7}{8+x}$ and $g(x) = -\frac{7}{8+x}$

C $f(x) = \frac{x^3}{4}$ and $g(x) = \frac{4}{x^3}$

D $f(x) = \sqrt{9x + 8}$ and $g(x) = \frac{x^2-8}{9}$

22. **A survey was conducted to find the time a person waits at a spa. The waiting times are normally distributed. The average time spent waiting is 20 minutes with a standard deviation of 4 minutes. What is the probability that the waiting time for a randomly selected person is less than 28 minutes?**

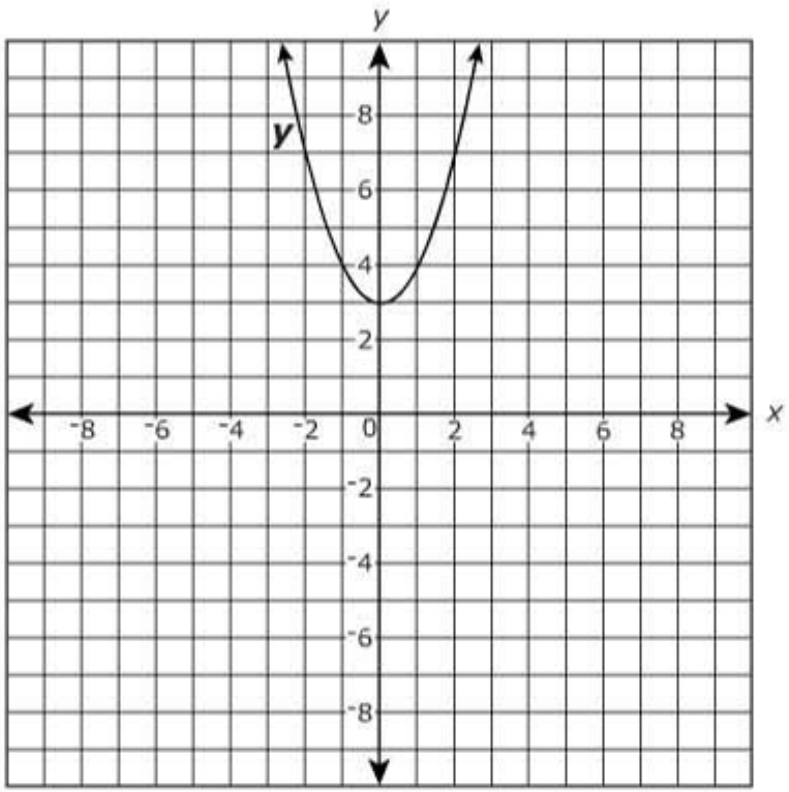
A 0.025

B 0.84

C 0.95

D 0.975

23. **The graph of the equation $y = x^2 + 3$ is shifted 5 units down and reflected over the x-axis to form a new graph y'.**



Which equation <u>best</u> represents the graph of y'?

A $y' = -x^2 + 2$

B $y' = x^2 - 2$

C $y' = -x^2 - 8$

D $y' = x^2 + 8$

24. **Which set of values of x makes this equation true?**

$$-\frac{x}{x+7} - \frac{7}{x-5} = 1$$

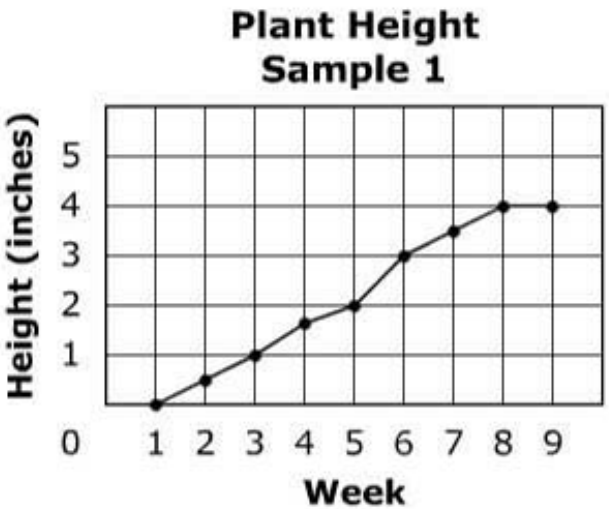
A $\{-1 + 6i, -1 - 6i\}$

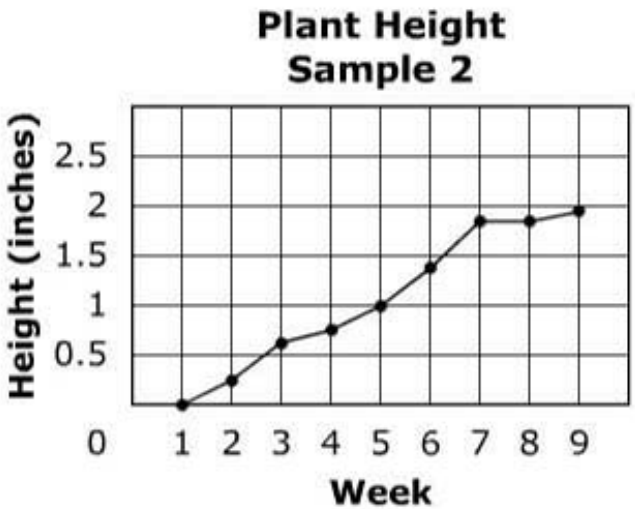
B $\{1 + 6i, 1 - 6i\}$

C $\{1 + \sqrt{6}i, 1 - \sqrt{6}i\}$

D $\{-1 + \sqrt{6}i, -1 - \sqrt{6}i\}$

25. **A biologist records the height of two samples of plants growing under different conditions and plots the data on the graphs shown below. The biologist claims that the growth of the two plants is about the same.**





Which statement is the <u>best</u> explanation of why the biologist's statement is misleading?

A The vertical scales are in inches instead of centimeters.

B The horizontal scales are in weeks instead of days.

C The vertical scales on the graphs are different.

D The data are connected by line segments.

26. **What are all the roots of $x^3 + 10x^2 + 19x - 30 = 0$?**

A 1, −5, and 6

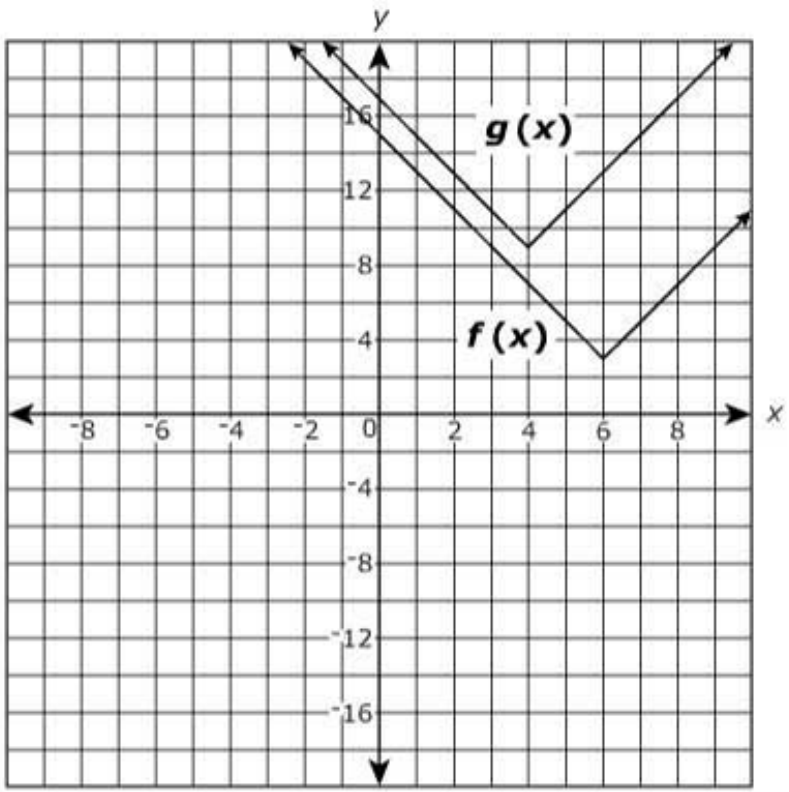
B 1, −5, and −6

C −1, 5, and 6

D −1, 5, and −6

27.

On the grid below, the graph of the equation $f(x) = 2|x - 6| + 3$ is transformed to create $g(x)$.



Which equation <u>best</u> represents the transformed graph?

A $g(x) = f(x + 2) + 6$

B $g(x) = f(x - 2) + 6$

C $g(x) = f(x + 2) - 6$

D $g(x) = f(x - 2) - 6$

28. **The resulting sums of rolling two number cubes 25 times are shown in the table below.**

Resulting Sums of Rolling Two Number Cubes

Sums	2	3	4	5	6	7	8	9	10	11	12
Number of Times	3	4	4	2	1	2	1	5	1	1	1

Which is closest to the value of the variance of the sums?

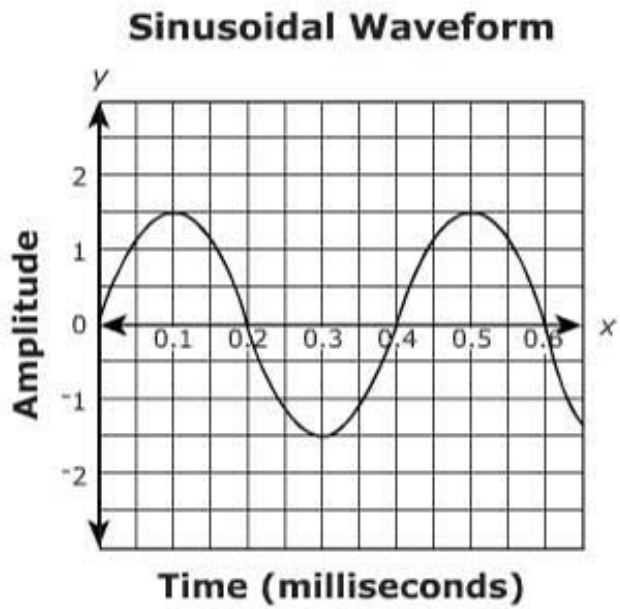
A 3.0

B 6.0

C 9.2

D 15.2

29. **The graph shows the sinusoidal waveform represented as varying amplitude, *y*, over time, *x*, in milliseconds.**



The function describing this graph is a transformation of the parent sine function $y = \sin x$. Which value is <u>closest</u> to the period of this transformed function?

A 0.6 millisecond

B 0.4 millisecond

C 0.3 millisecond

D 0.2 millisecond

30. **Solve:** $x^2 - 14x + 41 = 0$

A $x = -14 + 4\sqrt{2}$ or $x = -14 - 4\sqrt{2}$

B $x = 14 + 4\sqrt{2}$ or $x = 14 - 4\sqrt{2}$

C $x = -7 + 2\sqrt{2}$ or $x = -7 - 2\sqrt{2}$

D $x = 7 + 2\sqrt{2}$ or $x = 7 - 2\sqrt{2}$

31. **What is the sum of the infinite geometric series below?**

$$-\frac{5}{4} + \frac{5}{16} - \frac{5}{64} + \cdots$$

A $-\frac{25}{16}$

B -1

C 1

D $\frac{25}{16}$

32. **Simplify:** $\frac{(7+3i)}{(2-6i)} \bullet \frac{(-4i)}{(2+6i)}$

A $\frac{-5i}{8}$

B $\frac{25i}{32}$

C $\frac{3+7i}{8}$

D $\frac{3-7i}{10}$

33. **Which ordered pair is a solution to this system of equations?**

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

A (−3, −3)

B (−3, −15)

C (3, 3)

D (3, 15)

34. **The table below shows the international arrivals to the United States from 2003 to 2007.**

International Arrivals

Number of years since 2003	0	1	2	3	4
Number of arrivals (in millions)	18.026	20.322	21.679	21.668	23.892

Assuming a cubic regression, which is the <u>most</u> reasonable estimate for the number of international arrivals in 2011?

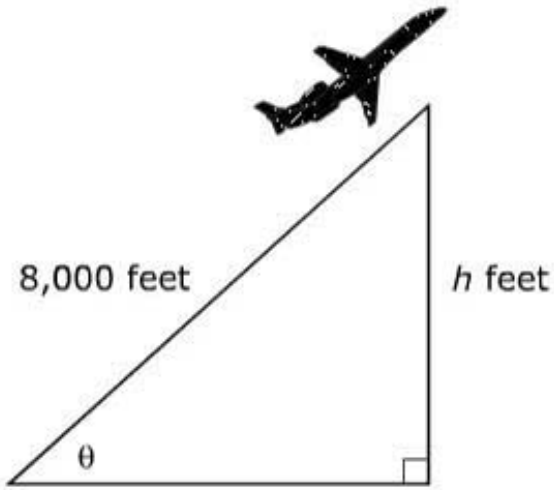
A 25 million

B 54 million

C 77 million

D 209 million

35. **An air traffic controller observes an airplane taking off. The airplane steadily climbs at an angle of θ and travels 8,000 feet along its flight path as shown below.**



Which function represents the height, *h*, of the airplane?

A $h = 8{,}000 \sin \theta$

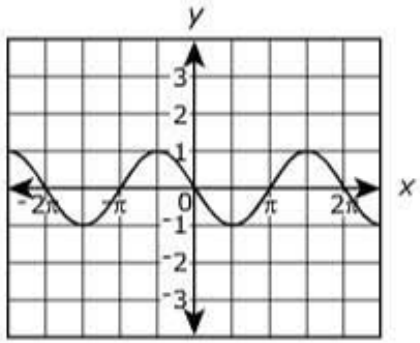
B $h = 8{,}000 \cos \theta$

C $h = 8{,}000 \tan \theta$

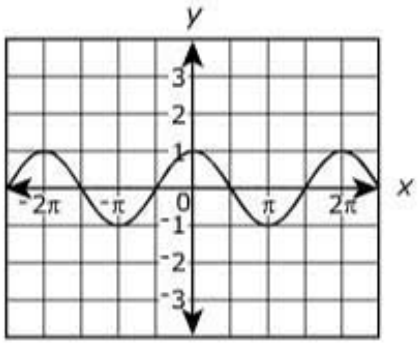
D $h = 8{,}000 \cot \theta$

36. Which graph <u>best</u> represents $f(x) = \sin\left(x + \frac{\pi}{2}\right)$?

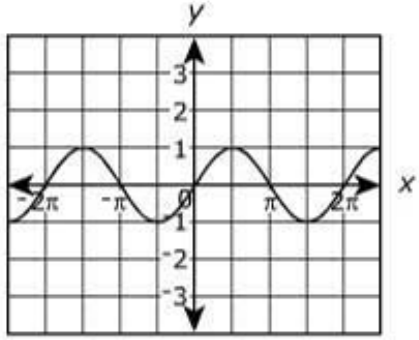
A



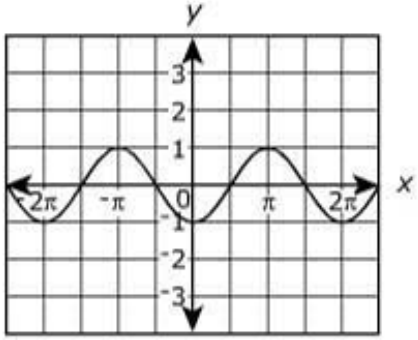
C



B



D



37. **The function $C(n) = \frac{18n+125{,}000}{n}$ gives the mean cost of producing n number of lampshades by a certain manufacturing unit. What is the domain of the function $C(n)$ in this situation?**

A all real numbers

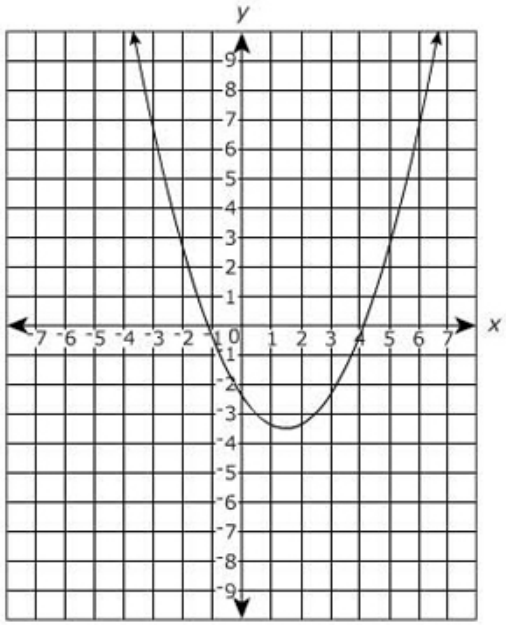
B all real numbers greater than 0

C all integers

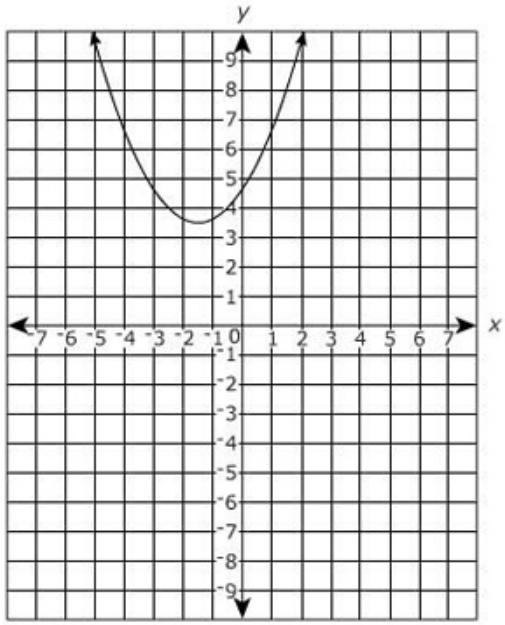
D all positive integers

38. Which graph <u>best</u> represents the equation $y = \frac{1}{2}x^2 - \frac{3}{2}x - \frac{19}{8}$?

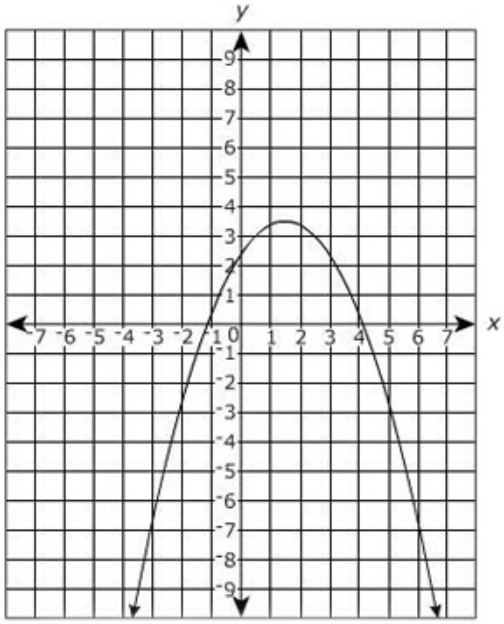
A



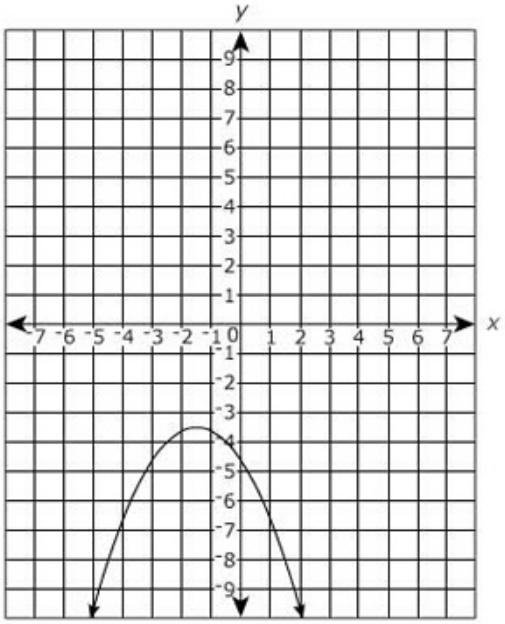
C



B



D



39. **Which expression is equivalent to** $\frac{2p^2+9pq-18q^2}{8p-12q} - \frac{6p^2-pq-q^2}{12p-18q}$**?**

A $\frac{-6p^2+25pq-56q^2}{12(2p-3q)}$

B $\frac{-6p^2+29pq-52q^2}{12(2p-3q)}$

C $\frac{-4p^2+10pq-17q^2}{12(2p-3q)}$

D $\frac{18p^2+25pq-56q^2}{12(2p-3q)}$

40.

The table below shows the amount of radioactive radium, in grams, that remains after every hundred years, based on an initial sample of 250 grams.

Amount of Radium

Time (years), t	Amount of Radium (grams), a
0	250
100	240
200	230
300	220
400	211
500	202

Which regression equation <u>best</u> fits these data?

A $a = 250(2)^{-\frac{t}{1,620}}$

B $a = 250\left(\frac{1}{2}\right)^{-\frac{t}{1,620}}$

C $a = -0.1t + 250$

D $a = -0.096t + 250$

41. **Which expression is equivalent to sin (-330°)?**

A $\cos(-30^\circ)$

B $\sin(-30^\circ)$

C $\sin 30^\circ$

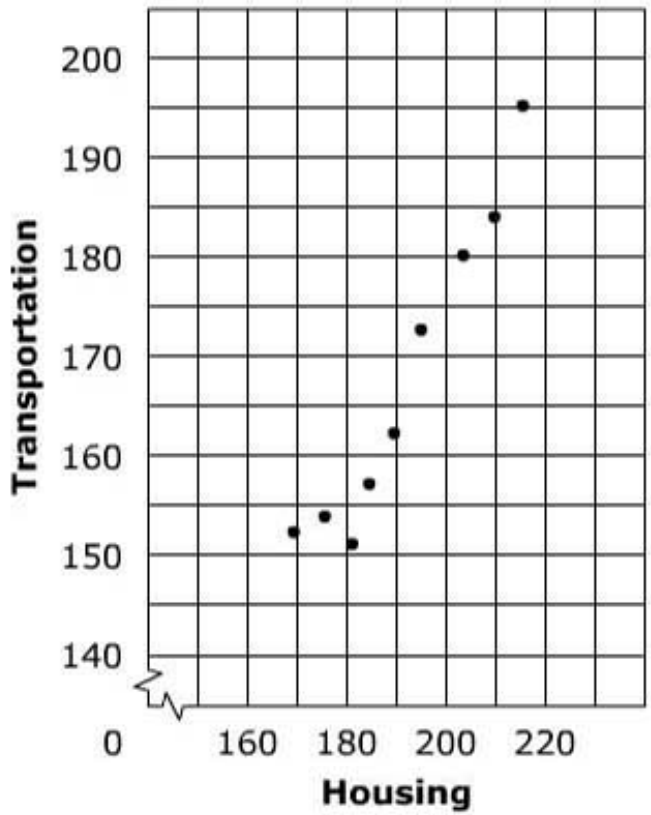
D $\cos 30^\circ$

42.

The table and graph below show the consumer price index for housing and transportation during the period 2000 to 2008.

Consumer Price Index

Year	Housing	Transportation
2000	169.6	153.3
2001	176.4	154.3
2002	180.3	152.9
2003	184.8	157.6
2004	189.5	163.1
2005	195.7	173.9
2006	203.2	180.9
2007	209.6	184.7
2008	216.3	195.5



Which value is the <u>best</u> estimate for the correlation coefficient between the housing index and the transportation index?

A −0.97

B −0.9

C 0.9

D 0.97

43. Which expression is equivalent to $\left(\dfrac{x^{\frac{6}{5}}}{8x^{\frac{12}{7}}y^{\frac{9}{4}}}\right)^{-\frac{1}{3}}$ for all x, $y \neq 0$?

A $2x^{\frac{6}{35}}y^{\frac{3}{4}}$

B $2x^{\frac{34}{35}}y^{\frac{3}{4}}$

C $\dfrac{x^{\frac{6}{35}}y^{\frac{3}{4}}}{8}$

D $\dfrac{8}{x^{\frac{6}{35}}y^{\frac{3}{4}}}$

44. If $f(x) = \frac{3x^2}{4}$ and $g(x) = \sqrt{15 - 4x}$, which expression represents $g(f(x))$?

A $\frac{3(15-4x)}{4}$

B $\frac{9(15-4x)}{4}$

C $\sqrt{60 - 3x^2}$

D $\sqrt{15 - 3x^2}$

45. **In which quadrant does the conjugate of the complex number $6 - 11i$ lie?**

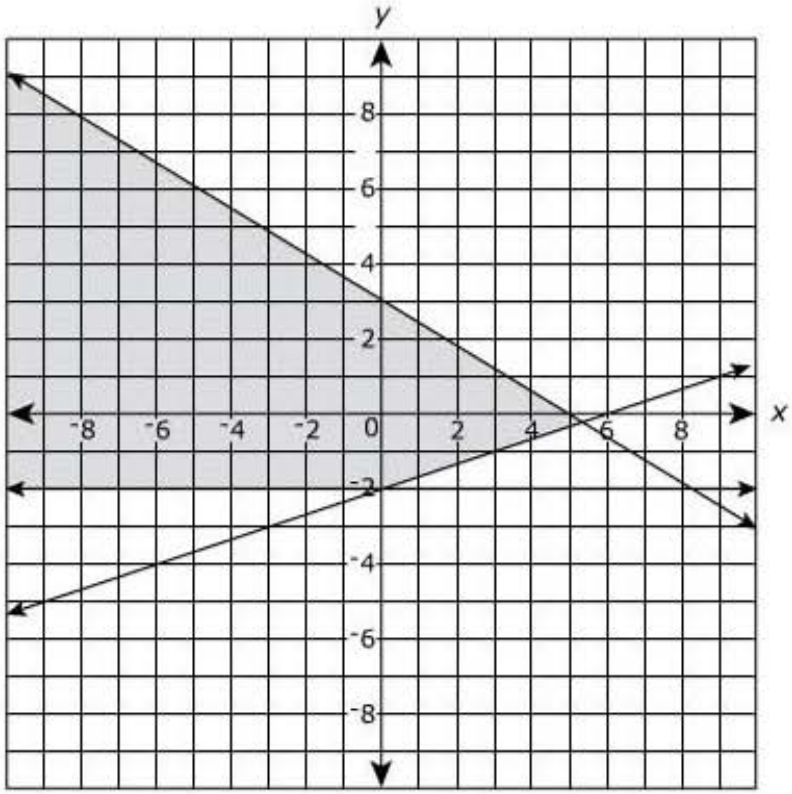
A Quadrant I

B Quadrant II

C Quadrant III

D Quadrant IV

46. **Which system of inequalities is <u>best</u> represented by the shaded region below?**



A $\begin{cases} 2x - 6y < 12 \\ 3x + 5y < 15 \\ y > -2 \end{cases}$

B $\begin{cases} 2x - 6y \geq 12 \\ 3x + 5y \leq 15 \\ y \geq -2 \end{cases}$

C $\begin{cases} 2x - 6y \leq 12 \\ 3x + 5y \leq 15 \\ y \geq -2 \end{cases}$

D $\begin{cases} 2x - 6y > 12 \\ 3x + 5y > 15 \\ y > -2 \end{cases}$

47. What is the value of $\sum_{n=2}^{13}\left(3n - \frac{2}{5}\right)$?

A $243\frac{1}{10}$

B $265\frac{1}{5}$

C $486\frac{1}{5}$

D $530\frac{2}{5}$

48. **What is the solution to the following system of equations?**

$$\begin{bmatrix} 3 & 4 & -8 \\ 4 & -2 & 5 \\ -1 & 2 & 9 \end{bmatrix}\begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 34 \\ -31 \\ -17 \end{bmatrix}$$

A $\begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} -2 \\ -4 \\ 3 \end{bmatrix}$

B $\begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} -2 \\ -4 \\ -3 \end{bmatrix}$

C $\begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 2 \\ -4 \\ 3 \end{bmatrix}$

D $\begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} -2 \\ 4 \\ -3 \end{bmatrix}$

49. Which project would be <u>best</u> conducted using an observational study instead of a randomized experiment?

A Project I: Do cars get better mileage with premium gasoline or with regular unleaded gasoline?

B Project II: Does using a particular fertilizer increase the yield of potatoes?

C Project III: Does using a certain brand of shampoo reduce hair loss?

D Project IV: Does the sun affect the growth of moss on trees?

50. **Which number is equivalent to $(\sqrt{-144} - 7)(\sqrt{-4} + 7)$?**

A $-73 + 70i$

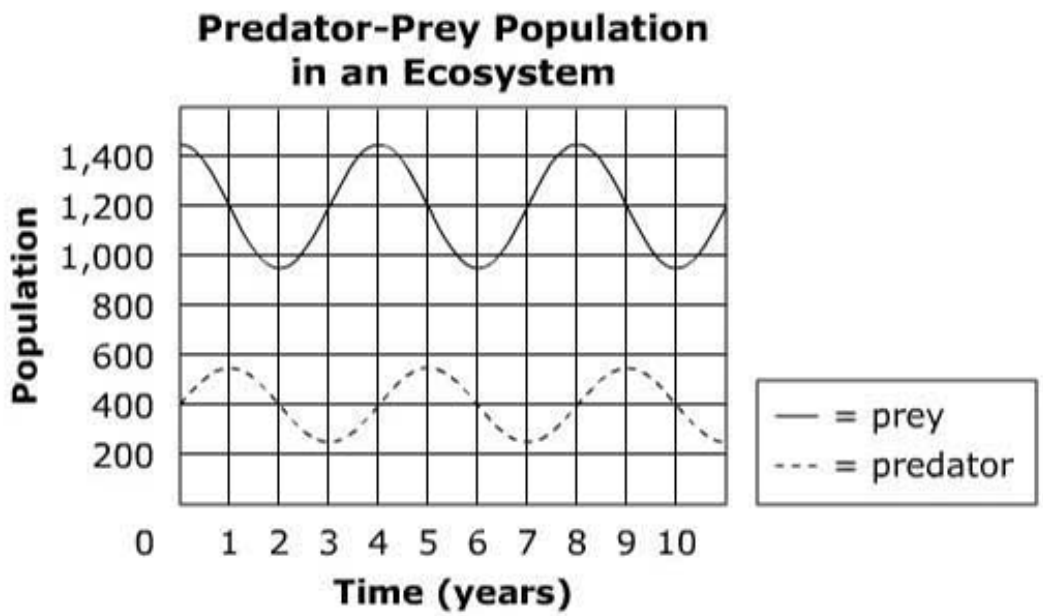
B $-73 - 70i$

C $-25 + 70i$

D $-25 - 70i$

51.

The graph below models the population of a species of a predator and its prey in an ecosystem as a function of time *t*, in years since January 1, 2000.



A function describing each of these graphs is a transformation of the parent sine function, $y = \sin x$. Which value <u>best</u> describes the period for the transformed function that represents the population of the prey?

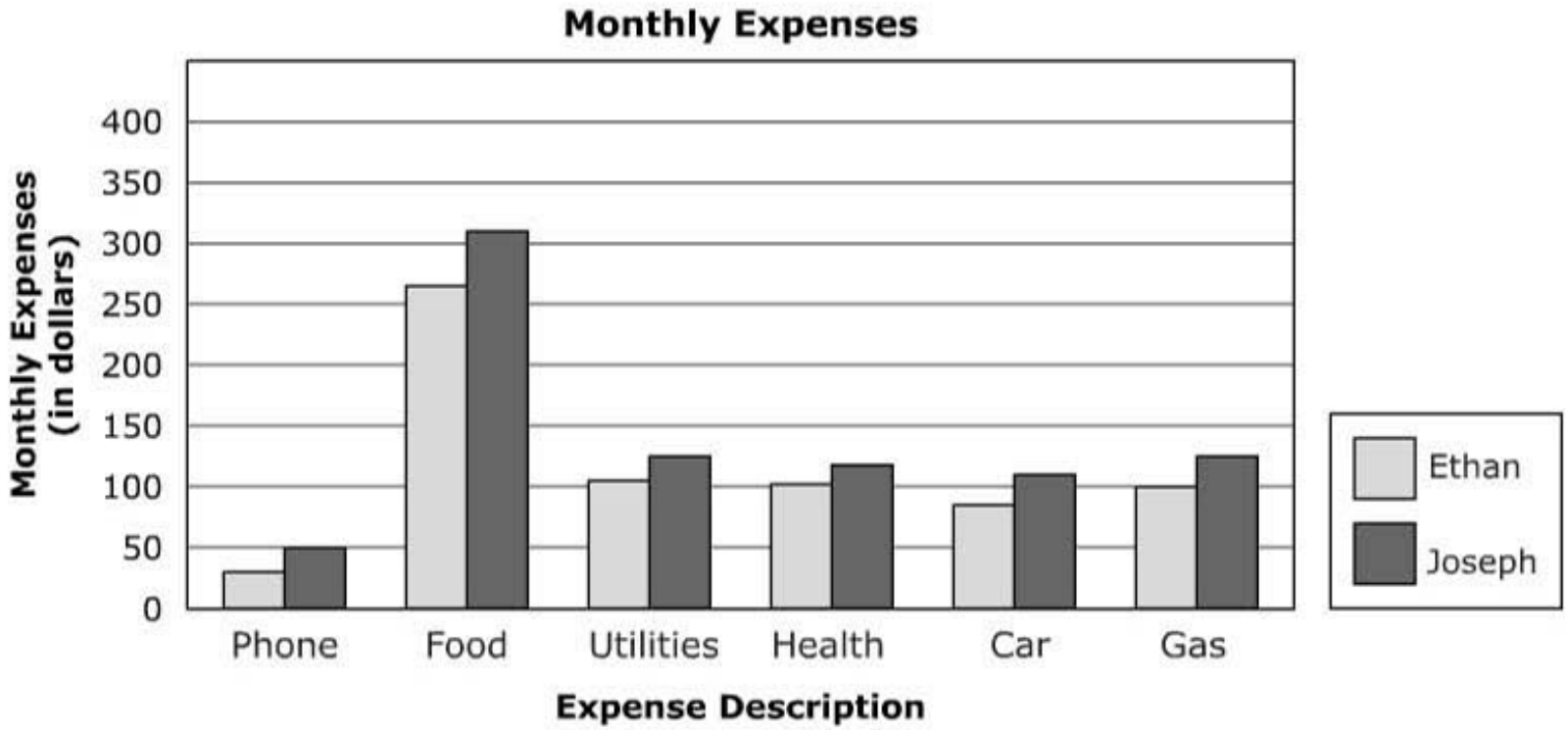
A 1 year

B 2 years

C 4 years

D 10 years

52. **The graph shows the monthly expenses of Ethan and Joseph.**



Which statement <u>best</u> supports the data given in the graph?

A Ethan spends more on phone, food, and health than Joseph spends on food and utilities.

B Ethan spends less on car and gas than Joseph spends on health.

C Ethan's total monthly expenses are greater than Joseph's total monthly expenses.

D Ethan's mean monthly expenses are less than Joseph's mean monthly expenses.

53. **The table below shows the number of people who regularly exercise for 15 minutes and 30 minutes.**

Number of People Who Regularly Exercise

	Exercise for 15 Minutes	Exercise for 30 Minutes	Total
Male	16	14	30
Female	9	11	20
Total	25	25	50

If a randomly selected person who exercises regularly is female, what is the probability she exercises for 15 minutes?

A 0.55

B 0.45

C 0.22

D 0.18

54. **The population of Tennessee in 1990 was 4,877,185, and the population in 2010 was 6,346,105. Using the formula $P = P_o(1 + r)^t$, which growth rate <u>best</u> represents the change in population between 1990 and 2010?**

A 1.262%

B 1.325%

C 2.422%

D 2.668%

55. **A ball is rolled and its position is recorded at five different times.**

Position of Rolling Ball

Time (in seconds)	Position (in feet)
1	29.5
2	39.4
4	55.6
6	68.9
8	85.3

Using the line of best fit, which is the <u>best</u> estimation of the location of the ball at 20 seconds, assuming no friction is acting on the ball?

A 179 feet

B 181 feet

C 184 feet

D 218 feet

56. **A company's steel production, y, in million tons can be represented by the equation $y = 10(2)^{\frac{x}{2}}$, where x represents the number of years since 1960. In which year did the company produce approximately 320 million tons of steel?**

A 1965

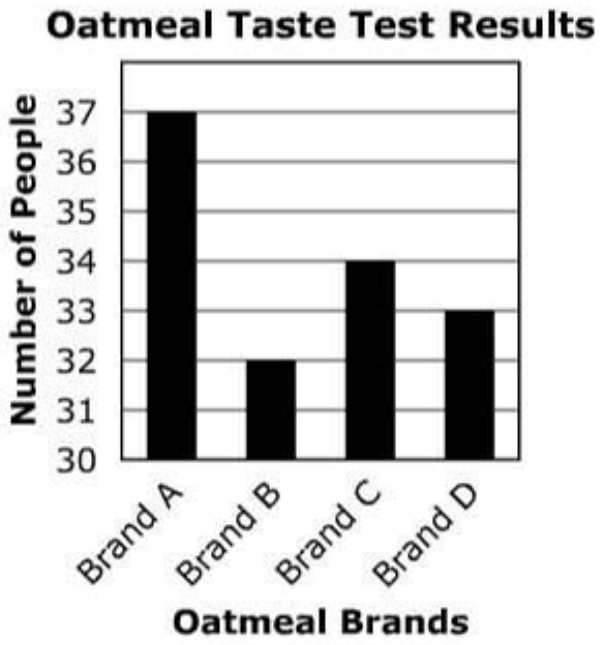
B 1967

C 1970

D 1992

57.

A food company that manufactures four different brands of oatmeal claims that Brand A was widely preferred in a recent blind taste test. The company offers the graph below in support of this claim.



Which statement regarding the graph is true?

A The graph is accurate because sufficient numbers of people were tested before making a conclusion.

B The graph is accurate because it shows a clear preference of Brand A over other brands.

C The graph is misleading because the bar for Brand A appears first in the graph.

D The graph is misleading because the labels along the vertical axis start at 30 instead of 0.

58. **John, Sarah, and Joel buy packs of hooks, washers, and nails. The table below shows the number of packs purchased and the total cost.**

Cost of Hooks, Washers, and Nails

	Number of Packs of Hooks at *x* Dollars Per Pack	Number of Packs of Washers at *y* Dollars Per Pack	Number of Packs of Nails at *z* Dollars Per Pack	Total Cost
John	8	3	8	$230
Sarah	12	5	4	$190
Joel	5	4	3	$125

The cost of each pack of hooks, washers, and nails is *x*, *y*, and *z*, respectively. What is the cost of 2 packs of hooks, 3 packs of washers, and 5 packs of nails?

A $95

B $105

C $120

D $140

59. **The table below shows the number of students serving on two school committees.**

Number of Students Serving on Committees

Committee	Juniors	Seniors
Music	11	14
Dance	15	10

If a randomly selected student is a junior, what is the probability the student serves on the music committee?

A $\frac{11}{50}$

B $\frac{11}{26}$

C $\frac{11}{25}$

D $\frac{11}{15}$

60. **What is the binomial expansion of $\left(2x^6 + \frac{1}{3}x^4\right)^3$?**

A $8x^{18} + 4x^{16} + \frac{2}{3}x^{14} + \frac{1}{27}x^{12}$

B $8x^{18} + \frac{4}{3}x^{16} + \frac{2}{9}x^{14} + \frac{1}{27}x^{12}$

C $8x^{18} + 12x^{12} + 6x^6 + \frac{1}{27}x^{12}$

D $8x^{18} + 6x^{16} + 6x^{14} + \frac{1}{27}x^{12}$

61. **Which step below is the first incorrect step to solve $2\sqrt{x} + 1 = 7$?**

Step 1: $2\sqrt{x} = 7 - 1$

Step 2: $\left(2\sqrt{x}\right)^2 = 6^2$

Step 3: $2x^2 = 36$

Step 4: $x = \sqrt{18}$

A Step 1

B Step 2

C Step 3

D Step 4

62. If $h(x) = x + 10$ and $g(x) = x^2 - 2x + 1$, what is the value of $g(h(-3))$?

A 36

B 26

C 16

D 7

63. **A company produces bags of different colors. Twenty percent of the bags are blue. If a worker randomly packs 15 bags, which expression represents the probability that exactly 8 of them are blue?**

A $(0.80)^7(0.20)^8$

B $120(0.80)^8(0.20)^7$

C $6,435(0.80)^7(0.20)^8$

D $6,435(0.80)^8(0.20)^7$

64. **Which correlation coefficient indicates the stronger linear relationship between two random variables for a fixed sample size?**

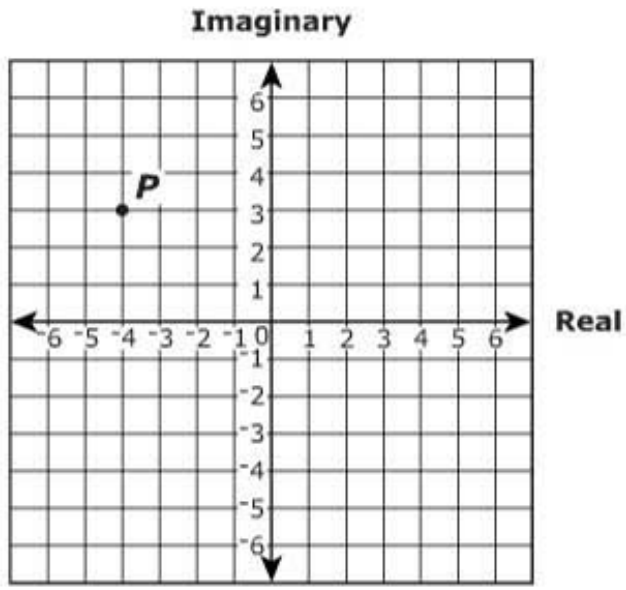
A 0.089

B −0.099

C −0.09

D 0.09

65. **Which complex number is represented by the point *P*?**



A $3 - 4i$

B $-4 + 3i$

C $-3 + 4i$

D $4 + 3i$

Answer Key

Item Number	Correct Answer
1	C
2	B
3	A
4	C
5	B
6	D
7	B
8	A
9	C
10	A
11	D
12	C
13	B
14	C
15	C
16	B
17	A
18	D
19	C
20	B
21	D
22	D

Item Number	Correct Answer
23	A
24	D
25	C
26	B
27	A
28	C
29	B
30	D
31	B
32	D
33	C
34	C
35	A
36	C
37	D
38	A
39	B
40	A
41	C
42	D
43	A
44	D

Item Number	Correct Answer
45	A
46	C
47	B
48	D
49	D
50	A
51	C
52	D
53	B
54	B
55	A
56	C
57	D
58	D
59	B
60	A
61	C
62	A
63	C
64	B
65	B

Reporting Categories

Below you will find that each item has been linked to its corresponding Reporting Category. These five Reporting Categories will be used to report scores from the actual test.

You can find the Reporting Categories and their Performance Indicators grouped together in the Tennessee End of Course Item Sampler for Algebra II located on the Tennessee Department of Education Web site at http://tennessee.gov/education/assessment/sec_samplers.shtml.

Item	Reporting Category
1	3 -Algebra
2	3 -Algebra
3	5 -Data Analysis, Statistics, and Probability
4	4- Geometry and Measurement
5	3 -Algebra
6	2- Number and Operations
7	1 - Mathematical Processes
8	3 -Algebra
9	5 -Data Analysis, Statistics, and Probability
10	3 -Algebra
11	5 -Data Analysis, Statistics, and Probability
12	3 -Algebra
13	3 -Algebra
14	5 -Data Analysis, Statistics, and Probability
15	2- Number and Operations
16	1 - Mathematical Processes
17	3 -Algebra
18	3 -Algebra
19	3 -Algebra
20	5 -Data Analysis, Statistics, and Probability
21	3 -Algebra
22	5 -Data Analysis, Statistics, and Probability

Item	Reporting Category
23	3 -Algebra
24	2- Number and Operations
25	1 - Mathematical Processes
26	3 -Algebra
27	3 -Algebra
28	5 -Data Analysis, Statistics, and Probability
29	4- Geometry and Measurement
30	3 -Algebra
31	3 -Algebra
32	2- Number and Operations
33	3 -Algebra
34	5 -Data Analysis, Statistics, and Probability
35	1 - Mathematical Processes
36	4- Geometry and Measurement
37	3 -Algebra
38	3 -Algebra
39	3 -Algebra
40	1 - Mathematical Processes
41	4- Geometry and Measurement
42	5 -Data Analysis, Statistics, and Probability
43	3 -Algebra
44	3 -Algebra
45	2- Number and Operations
46	3 -Algebra
47	3 -Algebra
48	3 -Algebra
49	5 -Data Analysis, Statistics, and Probability
50	2- Number and Operations
51	4- Geometry and Measurement
52	3 -Algebra
53	5 -Data Analysis, Statistics, and Probability

Item	Reporting Category
54	3 -Algebra
55	5 -Data Analysis, Statistics, and Probability
56	2 - Number and Operations
57	1 - Mathematical Processes
58	3 -Algebra
59	5 -Data Analysis, Statistics, and Probability
60	3 -Algebra
61	1 - Mathematical Processes
62	3 -Algebra
63	3 -Algebra
64	5 -Data Analysis, Statistics, and Probability
65	2 - Number and Operations