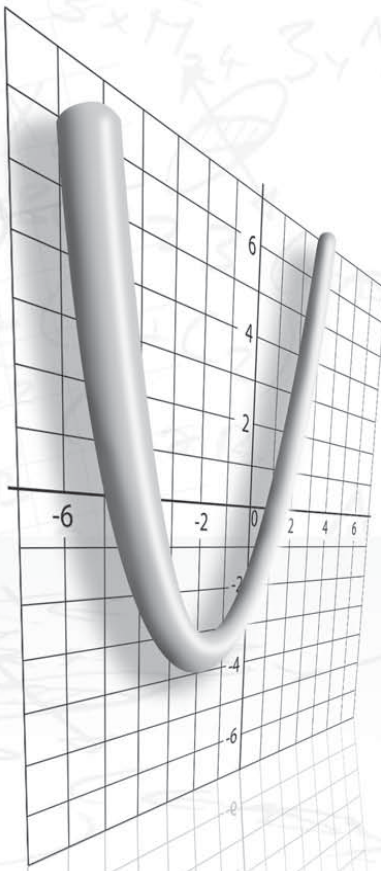
Student Name _____

Teacher Name _____

School _____

System _____



ALGEBRA II

Item Sampler

Tennessee End of Course Assessment
Algebra II Form 5

Reporting Category 5:
Data Analysis, Statistics, and Probability

PEARSON

Developed and published under contract with State of Tennessee Department of Education by the Educational Measurement group of Pearson, a business of NCS Pearson, Inc., 2510 North Dodge Street, Iowa City, Iowa 52245. Copyright © 2012 by State of Tennessee Department of Education. All rights reserved. No part of this publication may be reproduced or distributed in any form or by any means, or stored in a database or retrieval system, without the prior written permission of State of Tennessee Department of Education.

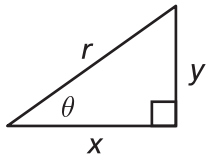
Algebra II Reference Page

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: $a_n = a_1 + (n-1)d$ 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

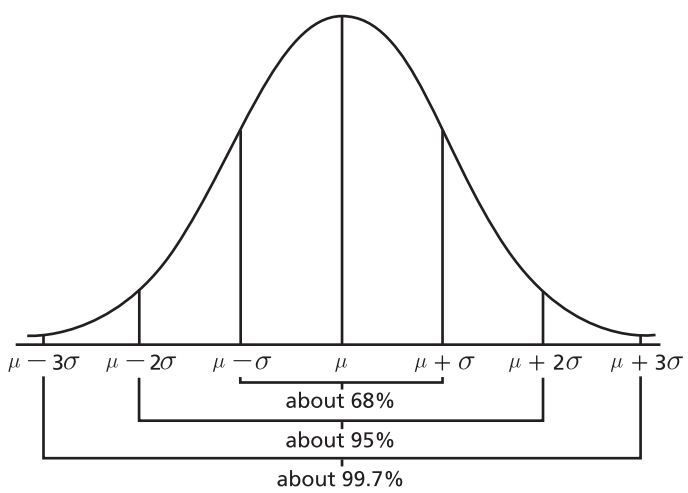
$n =$ frequency of compounding per year

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:

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

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

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

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

Contents

Introduction to Algebra II 7
Content of tests 7
Test development 7
Test administration 7
Tips for Taking the Test 9
Preparing for the test 9
Before the test 9
During the test 9
Directions for Using the Item Sampler 10
Algebra II Item Sampler 11
Answer Key with Reporting Category and Performance Indicator 33

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*, a staff of writers – composed of both teachers and professional test developers experienced in each of the content areas – researched and wrote the items. Professional editors and content specialists 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 twice as many items as were needed in the final editions of the tests.

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

Test administration

Tennessee End of Course Assessments are given to students as they near the end of 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 and answer 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.

Calculator use is optional. 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

- Review this Tennessee End of Course Item Sampler for Algebra I carefully and thoroughly.
- Acquire the Tennessee End of Course Practice Test for Algebra I, and take the test several times.
- 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.

Directions for Using the Item Sampler

This Item Sampler for Algebra II provides specific information to students and teachers. It contains examples of different item types for each Performance Indicator that may be tested in any given end of course test administration. Performance Indicators have been grouped by Reporting Categories. These Reporting Categories will be used to report information regarding performance on the end of courts test to students, teachers, schools, and systems.

The items in this Item Sampler will not be found in the end of course tests. The number of items in this Item Sampler does not reflect the emphasis of content on the test. In order to identify the emphasis of content, the End of Course Assessment Practice Test for Algebra I should be used. The Practice Test gives a better representation of content emphasis across Reporting Categories and Performance Indicators.

An Answer Key is located in Page 33. Use it to check your answers. Review items that you get wrong.

Reporting Category: Data Analysis, Statistics, and Probability

Numbers 1 through 43

Performance Indicator: 3103.5.1 Compute, compare, and explain summary statistics for distributions of data including measures of center and spread.

1. **The heights, in inches, of eleven students in a class are listed below.**

65, 63, 59, 60, 61, 60, 66, 67, 58, 64, 67

What is the interquartile range for these heights?

- **A** 3 inches
- **B** 5 inches
- **C** 6 inches
- **D** 9 inches

Performance Indicator: 3103.5.1 Compute, compare, and explain summary statistics for distributions of data including measures of center and spread.

2. **The weights, in pounds, of ten dogs are given below.**

30, 38, 44, 42, 48, 46, 55, 70, 63, 54

Which value is closest to the variance of these weights?

- **A** 11.2 pounds
- **B** 35.6 pounds
- **C** 114.9 pounds
- **D** 126.4 pounds

Go On ▶

Performance Indicator: 3103.5.1 Compute, compare, and explain summary statistics for distributions of data including measures of center and spread.

3.

The time, in minutes, that a manager spent in midyear and annual performance reviews with each of ten employees is given below.

Midyear performance review: 25, 26, 26, 28, 29, 23, 24, 25, 26, 28
Annual performance review: 20, 23, 25, 31, 26, 20, 23, 21, 24, 27

Which statement best compares the time spent in midyear performance reviews to the time spent in annual performance reviews?

- **A** The time spent on midyear performance reviews has a lesser mean and a lesser standard deviation than the time spent on annual performance reviews.
- **B** The time spent on midyear performance reviews has a lesser mean and a greater standard deviation than the time spent on annual performance reviews.
- **C** The time spent on midyear performance reviews has a greater mean and a lesser standard deviation than the time spent on annual performance reviews.
- **D** The time spent on midyear performance reviews has a greater mean and a greater standard deviation than the time spent on annual performance reviews.

Performance Indicator: 3103.5.2 Compare data sets using graphs and summary statistics.

4.

The fuel consumption, in gallons, of cars driven by two people is shown below.

Fuel Consumption

	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7
Mark	16	15	12	16	10	17	12
Sam	13	16	10	9	9	12	8

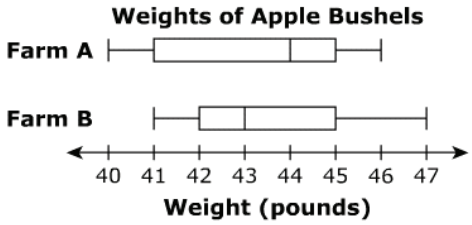
Which statement correctly compares the two data sets?

- **A** The mean for Mark's data is less than that for Sam's data.
- **B** The median for Mark's data is greater than that for Sam's data.
- **C** The standard deviation for Mark's data is greater than that for Sam's data.
- **D** The interquartile range of Mark's data is less than that of Sam's data.

Go On ▶

Performance Indicator: 3103.5.2 Compare data sets using graphs and summary statistics.

5. **The weights of bushels of apples from two farms are shown in the box-and-whisker plots below.**



Which statement correctly compares the two data sets?

- **A** The first quartile of Farm A is greater than that of Farm B.
- **B** The median of Farm B is greater than that of Farm A.
- **C** The interquartile range of Farm A is greater than that of Farm B.
- **D** The interquartile range of Farm B is equal to that of Farm A.

Performance Indicator: 3103.5.2 Compare data sets using graphs and summary statistics.

6. **The table below shows the number of visitors of different age groups to a planetarium in a week.**

Planetarium Visitors

	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Children	230	127	150	195	113	214	136
Adults	320	346	311	312	298	350	301
Seniors	142	168	250	240	296	196	158

Which list shows the interquartile range of the age groups in order from greatest to least?

- **A** Seniors, Children, Adults
- **B** Children, Seniors, Adults
- **C** Adults, Children, Seniors
- **D** Adults, Seniors, Children

Go On ▶

Performance Indicator: 3103.5.3 Analyze patterns in a scatterplot and describe relationships in both linear and nonlinear data.

7.

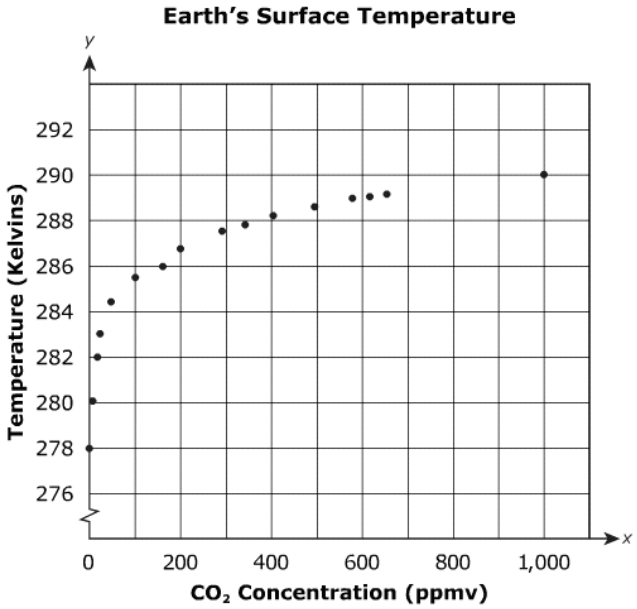
The scatterplot below shows the number of shoppers entering a store within the first three hours of the store opening.

Which type of function does the data best fit?

- **A** exponential
- **B** quadratic
- **C** linear
- **D** logarithmic

Performance Indicator: 3103.5.3 Analyze patterns in a scatterplot and describe relationships in both linear and nonlinear data.

8.



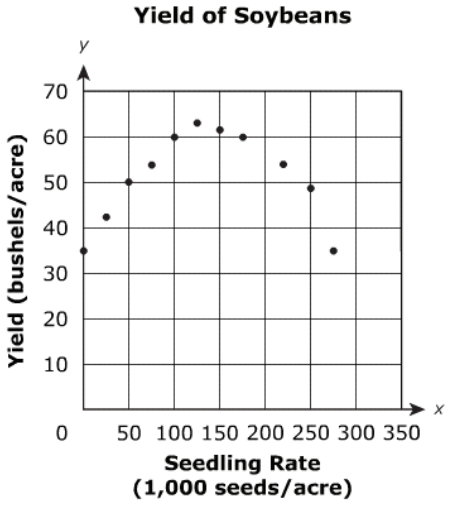
The data in the graph show how Earth's surface temperature, in Kelvins, varies depending on the carbon dioxide (CO_2) concentration, in parts per million by volume (ppmv), in the atmosphere. Which type of function best models the relationship among the data?

- **A** quadratic
- **B** cubic
- **C** linear
- **D** logarithmic

Go On ▶

Performance Indicator: 3103.5.3 Analyze patterns in a scatterplot and describe relationships in both linear and nonlinear data.

9. **The scatterplot below shows the yield of soybeans on a farm.**



Which type of function exists between the data?

- **A** linear
- **B** quadratic
- **C** cubic
- **D** exponential

Performance Indicator: 3103.5.4 Apply the characteristics of the normal distribution.

10. **Three hundred people are surveyed about the time they spend exercising each day. Based on the results, the time they spend follows a normal distribution with a mean of 40 minutes and a standard deviation of 5.5 minutes. About how many people spend 40 minutes to 51 minutes exercising each day?**

- **A** 102
- **B** 143
- **C** 150
- **D** 204

Go On ▶

Performance Indicator: 3103.5.4 Apply the characteristics of the normal distribution.

11.

The shelf life of a packaged food follows a normal distribution with a mean of 23 days and a standard deviation of 1.5 days. To the nearest hundredth, what is the probability the packaged food will last for more than 20 days?

- **A** 0.50
- **B** 0.84
- **C** 0.95
- **D** 0.98

Performance Indicator: 3103.5.5 Determine differences between randomized experiments and observational studies.

12.

Which scenario describes a randomized experiment to find out if regular exercise helps reduce sleep difficulties in older adults?

- **A** Find 100 adults who are each about 60 years old. Fifty of the adults should have been exercising regularly, and the remaining adults should have been sedentary. Over a 30-day period, collect data on sleep difficulties among the 100 adults, analyze, and draw conclusions.
- **B** Find 100 adults who are each about 60 years old. Fifty of the adults should have been exercising, but not regularly, and the remaining adults should have been sedentary. Over a 30-day period, collect data on sleep difficulties among the 100 adults, analyze, and draw conclusions.
- **C** Find 100 adults who are each about 60 years old and do not currently exercise. Randomly assign 50 of the adults to an exercise program. After six months, observe and collect data on sleep difficulties in the 100 adults over a 30-day period, analyze the data, and draw conclusions.
- **D** Find 100 adults who are each about 60 years old and exercise regularly. Randomly assign 50 of the adults to stop exercising. After six months, observe and collect data on sleep difficulties in the 100 adults over a 30-day period, analyze the data, and draw conclusions.

Go On ▶

Performance Indicator: 3103.5.5 Determine differences between randomized experiments and observational studies.

13. **Which research project would best be conducted using a randomized experiment instead of an observational study?**

- **A** Research project I – Determine the sport with the largest participation by boys under 14 years of age.
- **B** Research project II – Determine the menu item ordered most often from a restaurant.
- **C** Research project III – Determine the average number of hours adults spend watching television.
- **D** Research project IV – Determine the side effects of a new cold medicine.

Performance Indicator: 3103.5.6 Find the regression curve that best fits both linear and nonlinear data (using technology such as a graphing calculator) and use it to make predictions.

14. **The table below shows the height of an object at various distances from the point at which the object was thrown.**

Height vs. Distance

Distance (feet)	Height (feet)
0	5
5	13.75
10	20
15	23.75
20	25

Which type of curve best fits the data?

- **A** linear
- **B** quadratic
- **C** logarithmic
- **D** exponential

Go On ▶

Performance Indicator: 3103.5.6 Find the regression curve that best fits both linear and nonlinear data (using technology such as a graphing calculator) and use it to make predictions.

15. **The table below shows the number of boxes packed per week by an individual worker.**

Number of Boxes Packed per Week

Week	1	2	3	4	5	6	7	8
Number of Boxes	100	90	95	118	125	105	97	112

Using the line of best fit for these data, which is the <u>best</u> estimation of the number of boxes packed by the worker in the 10th week?

- **A** 105
- **B** 115
- **C** 127
- **D** 142

Performance Indicator: 3103.5.6 Find the regression curve that best fits both linear and nonlinear data (using technology such as a graphing calculator) and use it to make predictions.

16. **The table below gives the height of a ball after each of four bounces.**

Height of a Ball vs. Bounce

Bounce	**Height (feet)**
0	5
1	4
2	3.2
3	2.6
4	2

Which type of curve <u>best</u> fits the data?

- **A** linear
- **B** quadratic
- **C** logarithmic
- **D** exponential

Performance Indicator: 3103.5.6 Find the regression curve that best fits both linear and nonlinear data (using technology such as a graphing calculator) and use it to make predictions.

17. **The table below shows the number of Internet users per 100 inhabitants in developed countries from 1997 to 2007.**

Internet Users per 100 Inhabitants

Year, *x*	1997	1999	2001	2003	2005	2007
Number of Users, *y*	11	24	36	46	56	62

If a power function of the form $y = ax^b$ fits the data, which is the <u>best</u> estimate of the number of Internet users per 100 inhabitants in the year 2012?

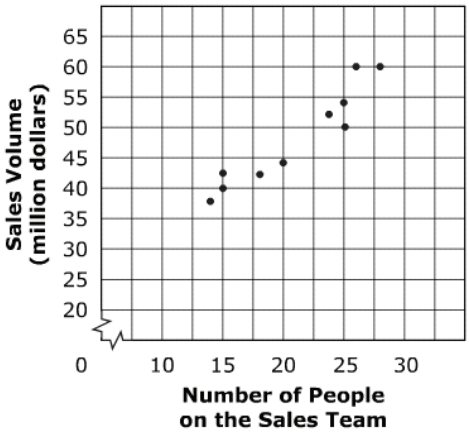
- **A** 68
- **B** 84
- **C** 90
- **D** 174

Performance Indicator: 3103.5.7 Determine/recognize when the correlation coefficient measures goodness of fit.

18. **The table and the graph below display the relationship between the number of people on the sales team and the volume of sales at an electronics company.**

Sales Volume vs. Number of People on the Sales Team

Number of People on the Sales Team	**Sales Volume (million dollars)**
14	38
25	54
26	60
15	40
18	42
25	50
20	44
24	52
28	60
15	42



Which value is the <u>best</u> estimate for the correlation coefficient between the number of people on the sales team and the sales volume?

- **A** 0.95
- **B** 0.90
- **C** 0.47
- **D** 0

Go On ▶

Performance Indicator: 3103.5.7 Determine/recognize when the correlation coefficient measures goodness of fit.

19.

Ms. Thompson gives quarterly and midterm exams. She observed that students who obtained high scores on the quarterly exam obtained high scores on the midterm exam, and students who obtained low scores on the quarterly exam obtained low scores on the midterm exam. Which correlation is a reasonable estimate of the relationship between the scores on the quarterly exam and the scores on the midterm exam?

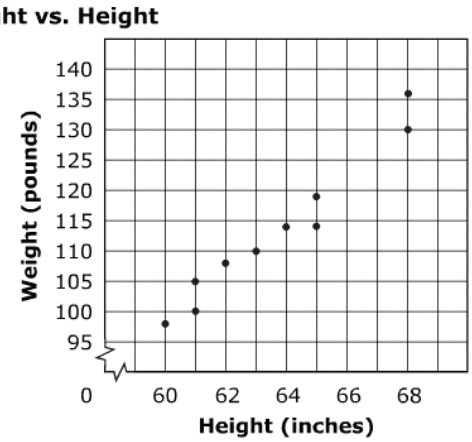
- **A** 1.00
- **B** 0.75
- **C** −0.75
- **D** −1.00

Performance Indicator: 3103.5.7 Determine/recognize when the correlation coefficient measures goodness of fit.

20.

A doctor recorded the heights and weights of 10 females ages 18 to 24 for a study. The data are shown in the table and the graph below.

Height (inches)	Weight (pounds)
60	98
61	100
61	105
62	108
63	110
64	114
65	119
65	114
68	130
68	136



Which value is the <u>best</u> estimate for the correlation coefficient between the heights of the females and their weights?

- **A** 0.98
- **B** 0.95
- **C** −0.95
- **D** −0.98

Performance Indicator: 3103.5.8 Apply probability concepts such as conditional probability and independent events to calculate simple probability.

21. **Sam was asked three multiple-choice questions on a quiz. Each question had four answer options of which only one was correct. If Sam randomly chose an option for each question, what is the probability that he chose the correct option on all three questions?**

- **A** $\frac{1}{64}$
- **B** $\frac{27}{64}$
- **C** $\frac{1}{4}$
- **D** $\frac{3}{4}$

Performance Indicator: 3103.5.8 Apply probability concepts such as conditional probability and independent events to calculate simple probability.

22. **The table below shows the percent of teenagers who own skateboards and roller skates in a particular town.**

Percent of Teenagers who Own Skateboards and Roller Skates

Age Group	Skateboard	Roller Skates
13 – 15	25%	32%
16 – 18	16%	28%

If a randomly selected teenager is in the 16–18 age group, what is the probability the teenager owns a skateboard?

- **A** $\frac{4}{11}$
- **B** $\frac{16}{41}$
- **C** $\frac{41}{100}$
- **D** $\frac{4}{25}$

Go On ▶

Performance Indicator: 3103.5.1 Compute, compare, and explain summary statistics for distributions of data including measures of center and spread.

23. **The points scored by a team in a series of basketball games are as follows:**

45, 60, 62, 60, 50, 65, 58, 68, 44, 48

Which is closest to the value of the standard deviation of the points scored?

- **A** 2.6
- **B** 6.6
- **C** 7.5
- **D** 8.1

Performance Indicator: 3103.5.1 Compute, compare, and explain summary statistics for distributions of data including measures of center and spread.

24. **The table below shows the sales of books at a bookstore each month.**

Monthly Sales of Books

Month	Jan	Feb	Mar	Apr	May	Jun
Books	125	79	92	100	97	107

What is the variance of the data?

- **A** 46
- **B** 100
- **C** 198
- **D** 200

Performance Indicator: 3103.5.1 Compute, compare, and explain summary statistics for distributions of data including measures of center and spread.

25. **The time, in minutes, it takes each of eleven students to get ready for school is as follows:**

34, 45, 23, 28, 27, 37, 40, 42, 29, 26, 38

What is the interquartile range for the above data?

- **A** 13
- **B** 22
- **C** 23
- **D** 27

Performance Indicator: 3103.5.2 Compare data sets using graphs and summary statistics.

26. **The average daily Internet usage times, in hours, of two groups of users are listed below.**

Group A: 1, 2, 3, 4, 4, 4, 5, 6, 6, 8, 8, 9

Group B: 2, 3, 3, 4, 4, 4, 5, 6, 6, 6, 8, 9

Based on these data, which statement is true?

- **A** The standard deviation of Group A is greater than the standard deviation of Group B, but the mean is the same for both groups.
- **B** The mean for Group A is greater than the mean for Group B, but the standard deviation is the same for both groups.
- **C** Both the mean and standard deviation are the same for both groups.
- **D** Both the mean and standard deviation are different for both groups.

Go On ▶

Performance Indicator: 3103.5.2 Compare data sets using graphs and summary statistics.

27. **The line plots below show the typing speeds of two groups of data-entry operators.**

Which value is the same for both groups?

- **A** first quartile
- **B** median
- **C** third quartile
- **D** interquartile range

Performance Indicator: 3103.5.2 Compare data sets using graphs and summary statistics.

28. **The table below shows the number of new magazine subscribers over a 4-week period.**

Magazine Subscribers

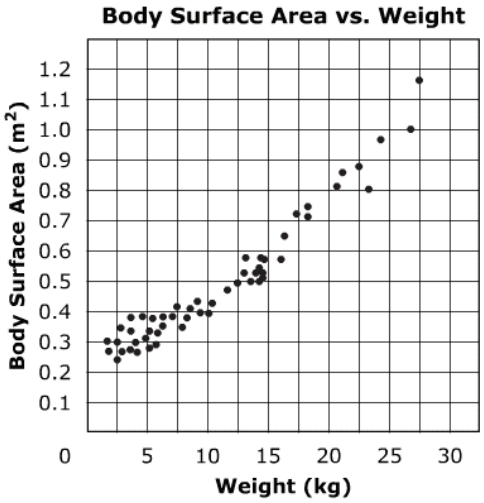
	M	T	W	Th	F	S	Su
Week 1	50	60	20	52	58	62	48
Week 2	49	51	52	51	54	47	46
Week 3	32	35	40	42	38	37	42
Week 4	49	52	47	44	49	53	56

Which week has the <u>greatest</u> standard deviation?

- **A** Week 1
- **B** Week 2
- **C** Week 3
- **D** Week 4

Performance Indicator: 3103.5.3 Analyze patterns in a scatterplot and describe relationships in both linear and nonlinear data.

29. **The scatterplot below shows how the average body surface area of children, in square meters (m^2) varies with their weight, in kilograms (kg).**

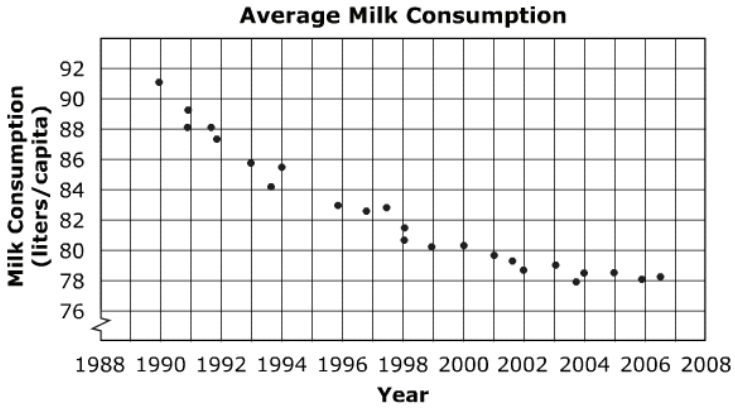


What type of function best models the relationship between body surface area and weight?

- **A** linear
- **B** quadratic
- **C** exponential
- **D** logarithmic

Performance Indicator: 3103.5.3 Analyze patterns in a scatterplot and describe relationships in both linear and nonlinear data.

30. **The data in the graph below show the average milk consumption per capita for a period of time.**



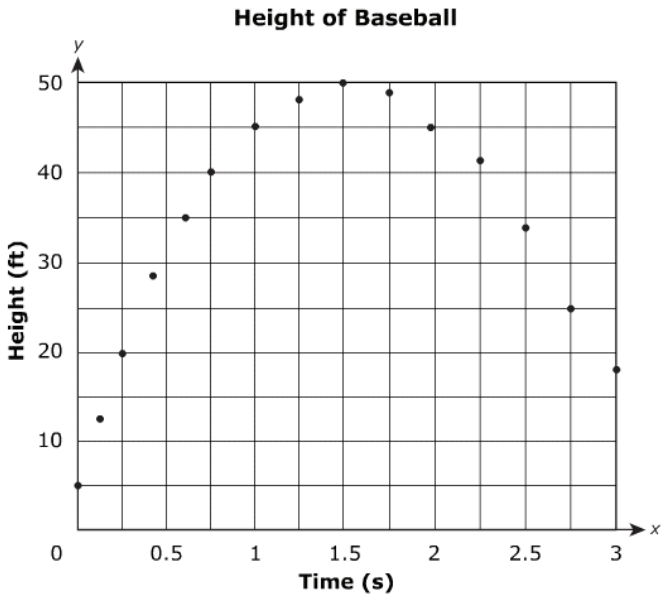
Which type of function best models the data?

- **A** quadratic
- **B** cubic
- **C** linear
- **D** exponential

Go On ▶

Performance Indicator: 3103.5.3 Analyze patterns in a scatterplot and describe relationships in both linear and nonlinear data.

31. **The data in the graph below show the height of a baseball, in feet (ft), hit up in the air, over time, in seconds (s).**



What type of relationship exists between the data?

- **A** quadratic
- **B** cubic
- **C** linear
- **D** logarithmic

Performance Indicator: 3103.5.4 Apply the characteristics of the normal distribution.

32. **A farmer weighs and packs the apples grown on his farm into bushels. He observes that the weight of bushels is normally distributed with a mean of 49.5 pounds and a standard deviation of 3.5 pounds. What is the probability that a randomly chosen bushel will weigh between 46 pounds and 53 pounds?**

- **A** 0.34
- **B** 0.48
- **C** 0.68
- **D** 0.95

Go On ▶

Performance Indicator: 3103.5.4 Apply the characteristics of the normal distribution.

33. **A set of data is normally distributed with a standard deviation of 2.5. If the value 65 in the data set is two standard deviations above the mean, what is the mean value?**

- **A** 60
- **B** 62.5
- **C** 67.5
- **D** 70

Performance Indicator: 3103.5.5 Determine differences between randomized experiments and observational studies.

34. **A psychologist is studying the effect of watching television on children's behavior. Which scenario describes an observational study?**

- **A** Find 100 children who are each about 2 years old and have been watching television for less than 2 hours daily. Choose 50 of the children and have them watch television for more than 2 hours daily. Collect data on the children's behavior, analyze the data, and draw conclusions.
- **B** Find 50 children who are each about 2 years old and have been watching television for less than 2 hours daily. Find 50 more children of the same age who have been watching television for more than 2 hours daily. Collect data on the children's behavior, analyze the data, and draw conclusions.
- **C** Find 100 children who are each about 2 years old and have been watching television for more than 2 hours daily. Randomly choose 50 of the children and have them watch television for less than 2 hours daily. Do not allow the rest of the children to watch television. Collect data on the children's behavior, analyze the data, and draw conclusions.
- **D** Find 50 children who are each about 2 years old and have been watching television. Randomly choose 25 of the children and have them watch television for less than 2 hours daily. Have the rest of the children watch television for more than 2 hours daily. Collect data on the children's behavior, analyze the data, and draw conclusions.

Go On ▶

Performance Indicator: 3103.5.5 Determine differences between randomized experiments and observational studies.

35.

Which research project would best be conducted using an observational study instead of a randomized experiment?

- **A** Research project I – Determine if a daily dose of vitamin C helps prevent a cold.
- **B** Research project II – Determine if regular meditation enhances the immune system.
- **C** Research project III – Determine the factor that lowers cholesterol more: a special diet or a drug.
- **D** Research project IV – Determine if the employees of a company are using the new company gym.

Performance Indicator: 3103.5.6 Find the regression curve that best fits both linear and nonlinear data (using technology such as a graphing calculator) and use it to make predictions.

36.

The table below shows the number of hours Nyesha spent listening to music.

Number of Hours Spent Listening to Music

Day	1	2	3	4	5	6	7
Hours	5	6	2	7	6	4	3

Using the line of best fit for these data, which is the best estimation of the number of hours Nyesha spent listening to music on day 8?

- **A** 2 hours
- **B** 3 hours
- **C** 4 hours
- **D** 5 hours

Performance Indicator: 3103.5.6 Find the regression curve that best fits both linear and nonlinear data (using technology such as a graphing calculator) and use it to make predictions.

37. **The stopping distances of a car at different speeds are shown in the table below.**

Stopping Distance in Relation to Speed

Speed (feet/sec)	35	50	62	74	86
Stopping Distance (feet)	43	88	135	192	259

Assuming quadratic growth, which is the <u>best</u> prediction for the stopping distance if the car's speed is 95 feet per second?

- **A** 326 feet
- **B** 316 feet
- **C** 309 feet
- **D** 286 feet

Performance Indicator: 3103.5.6 Find the regression curve that best fits both linear and nonlinear data (using technology such as a graphing calculator) and use it to make predictions.

38. **The table below shows the growth in the number of bacteria present in a culture.**

Growth of Bacteria

Time (hours)	0	1	2	3	4	5
Number of Bacteria	100	250	625	1,560	3,900	9,750

Assuming exponential growth, which is the <u>most</u> reasonable estimate for the number of bacteria after 8 hours?

- **A** 152,600
- **B** 61,000
- **C** 27,300
- **D** 24,400

Go On ▶

Performance Indicator: 3103.5.7 Determine/recognize when the correlation coefficient measures goodness of fit.

39. **Which correlation coefficient indicates the weakest relationship between two variables?**

- **A** 0.01
- **B** 0.10
- **C** −0.11
- **D** −1.00

Performance Indicator: 3103.5.7 Determine/recognize when the correlation coefficient measures goodness of fit.

40. **Which correlation coefficient indicates the strongest relationship between two random variables for a fixed sample size?**

- **A** 0.78
- **B** 0.59
- **C** −0.65
- **D** −0.89

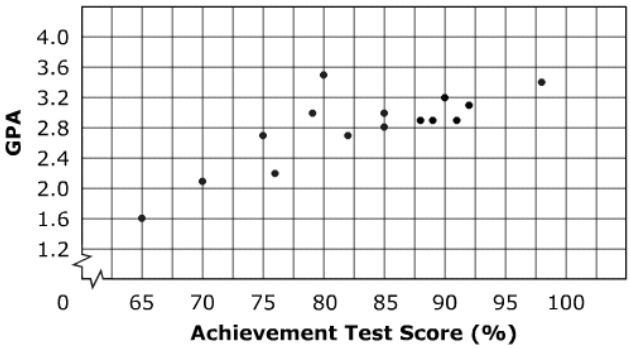
Performance Indicator: 3103.5.7 Determine/recognize when the correlation coefficient measures goodness of fit.

41.

The table and the graph below show the relationship between the score on an achievement test for each student in Mr. Daniel's class and the grade point average (GPA) of each student computed over the entire year.

GPA vs. Achievement Test Score

Achievement Test Score (%)	92	85	90	76	88	70	65	89	91	98	82	75	79	80	85
GPA	3.1	2.8	3.2	2.2	2.9	2.1	1.6	2.9	2.9	3.4	2.7	2.7	3.0	3.5	3.0



Which value is the best estimate for the correlation coefficient?

- **A** −0.88
- **B** 0.04
- **C** 0.63
- **D** 0.79

Performance Indicator: 3103.5.8 Apply probability concepts such as conditional probability and independent events to calculate simple probability.

42.

A survey found the number of baseball and basketball players in a group of 30 junior and senior athletes. The table below represents the collected data.

Number of Junior and Senior Baseball and Basketball Players

	Junior	Senior
Baseball	8	7
Basketball	6	9

If a randomly selected student is a senior, what is the probability that the student is a basketball player?

- **A** $\frac{3}{10}$
- **B** $\frac{1}{2}$
- **C** $\frac{9}{16}$
- **D** $\frac{3}{5}$

Performance Indicator: 3103.5.8 Apply probability concepts such as conditional probability and independent events to calculate simple probability.

43.

Two sets of letter cards are placed into separate bags as shown below.

Bag 1: I L H A U

Bag 2: L R J E C A I

Christopher randomly picks one card from each bag. What is the probability that the letter on the card picked from Bag 1 is a vowel and the letter on the card picked from Bag 2 is a consonant?

- **A** $\frac{12}{35}$
- **B** $\frac{1}{12}$
- **C** $\frac{1}{3}$
- **D** $\frac{6}{35}$

Reporting Category 5: Data Analysis, Statistics, and Probability		
Item Number	**Correct Answer**	**Performance Indicator**
1	C	3103.5.1 Compute, compare, and explain summary statistics for distributions of data including measures of center and spread.
2	D	3103.5.1 Compute, compare, and explain summary statistics for distributions of data including measures of center and spread.
3	C	3103.5.1 Compute, compare, and explain summary statistics for distributions of data including measures of center and spread.
4	B	3103.5.2 Compare data sets using graphs and summary statistics.
5	C	3103.5.2 Compare data sets using graphs and summary statistics.
6	A	3103.5.2 Compare data sets using graphs and summary statistics.
7	C	3103.5.3 Analyze patterns in a scatterplot and describe relationships in both linear and nonlinear data.
8	D	3103.5.3 Analyze patterns in a scatterplot and describe relationships in both linear and nonlinear data.
9	B	3103.5.3 Analyze patterns in a scatterplot and describe relationships in both linear and nonlinear data.
10	B	3103.5.4 Apply the characteristics of the normal distribution.
11	D	3103.5.4 Apply the characteristics of the normal distribution.
12	C	3103.5.5 Determine differences between randomized experiments and observational studies.

13	D	3103.5.5 Determine differences between randomized experiments and observational studies.
14	B	3103.5.6 Find the regression curve that best fits both linear and nonlinear data (using technology such as a graphing calculator) and use it to make predictions.
15	B	3103.5.6 Find the regression curve that best fits both linear and nonlinear data (using technology such as a graphing calculator) and use it to make predictions.
16	D	3103.5.6 Find the regression curve that best fits both linear and nonlinear data (using technology such as a graphing calculator) and use it to make predictions.
17	B	3103.5.6 Find the regression curve that best fits both linear and nonlinear data (using technology such as a graphing calculator) and use it to make predictions.
18	A	3103.5.7 Determine/recognize when the correlation coefficient measures goodness of fit.
19	B	3103.5.7 Determine/recognize when the correlation coefficient measures goodness of fit.
20	A	3103.5.7 Determine/recognize when the correlation coefficient measures goodness of fit.
21	A	3103.5.8 Apply probability concepts such as conditional probability and independent events to calculate simple probability.
22	A	3103.5.8 Apply probability concepts such as conditional probability and independent events to calculate simple probability.
23	D	3103.5.1 Compute, compare, and explain summary statistics for distributions of data including measures of center and spread.
24	C	3103.5.1 Compute, compare, and explain summary statistics for distributions of data including measures of center and spread.
25	A	3103.5.1 Compute, compare, and explain summary statistics for distributions of data including measures of center and spread.

26	A	3103.5.2 Compare data sets using graphs and summary statistics.
27	D	3103.5.2 Compare data sets using graphs and summary statistics.
28	A	3103.5.2 Compare data sets using graphs and summary statistics.
29	A	3103.5.3 Analyze patterns in a scatterplot and describe relationships in both linear and nonlinear data.
30	D	3103.5.3 Analyze patterns in a scatterplot and describe relationships in both linear and nonlinear data.
31	A	3103.5.3 Analyze patterns in a scatterplot and describe relationships in both linear and nonlinear data.
32	C	3103.5.4 Apply the characteristics of the normal distribution.
33	A	3103.5.4 Apply the characteristics of the normal distribution.
34	B	3103.5.5 Determine differences between randomized experiments and observational studies.
35	D	3103.5.5 Determine differences between randomized experiments and observational studies.
36	C	3103.5.6 Find the regression curve that best fits both linear and nonlinear data (using technology such as a graphing calculator) and use it to make predictions.
37	B	3103.5.6 Find the regression curve that best fits both linear and nonlinear data (using technology such as a graphing calculator) and use it to make predictions.
38	A	3103.5.6 Find the regression curve that best fits both linear and nonlinear data (using technology such as a graphing calculator) and use it to make predictions.
39	A	3103.5.7 Determine/recognize when the correlation coefficient measures goodness of fit.

40	D	3103.5.7 Determine/recognize when the correlation coefficient measures goodness of fit.
41	D	3103.5.7 Determine/recognize when the correlation coefficient measures goodness of fit.
42	C	3103.5.8 Apply probability concepts such as conditional probability and independent events to calculate simple probability.
43	A	3103.5.8 Apply probability concepts such as conditional probability and independent events to calculate simple probability.