

# HIGH SCHOOL PROFICIENCY EXAM



Release 2005

GRADE

# H

Mathematics

Nevada



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Beginning with the 2000-2001 school year, the Nevada High School Proficiency Examination (HSPE) has been based on State Content and Performance standards adopted by the State Board of Education in 1998 (as prioritized in 2001). The 40-item test that follows is a released form of the Nevada HSPE for Mathematics based on the 1998 standards. Forms of the HSPE math test that are currently administered to students have 60 items that are scored, and may include an additional 15 items being field tested for inclusion on future forms of the test.

The structure of the released form is based on the item specifications and test matrix that are used to develop the items and test forms that are currently being administered to students as part of their graduation requirement. The items on the released form have been part of tests taken by Nevada students. Although there are similar items on current tests, the items on the released form are no longer included on any form of the HSPE math test. The released form of the test is intended to represent the diversity of content and types of items that students experience on tests that are currently administered. The released form is not intended to be a practice test.

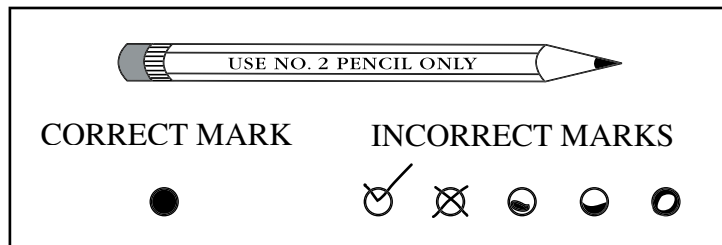
A detailed discussion of the reporting categories (e.g., C1 – Numbers and Number Sense) and ability levels (e.g., A2 – Conceptual Knowledge) is found in the Nevada HSPE Review Guide. Items on the released forms also represent the current style that is found on tests that students will be taking this year.



## Directions for Mathematics

This Test Booklet contains mathematics questions for you to answer. Do not mark your answers in the Test Booklet. **Mark your answers in the Answer Booklet.** Use a pencil to mark your answers.

The questions in the Test Booklet are all multiple-choice. For each question you will be given four answer choices—A, B, C, and D. You are to choose the correct answer from the four choices. Each question has only one right answer. After you have chosen the correct answer to a question, find the question number in your Answer Booklet and completely fill in the circle for the answer you chose. Be sure the question number in the Answer Booklet matches the question number in the Test Booklet. The example below shows how to completely fill in the circle.



If you decide to change an answer to a question, erase the wrong mark completely before filling in the circle of the new answer. Be sure you have only one answer marked for each question. **If two circles are filled in for the same question, that question will be scored as incorrect.**

If you are having difficulty answering a question, skip the question and come back to it later. Make sure you skip the circle for the question in your Answer Booklet.

You may make notes in your Test Booklet, but you must mark your final answer in your Answer Booklet. **Do not make any stray or unnecessary marks in your Answer Booklet.**

Let's work through a sample question together to be sure you understand the directions.

### Sample Question

**1**

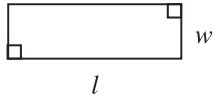
What is the capital of Nevada?

- A Elko
- B Carson City
- C Reno
- D Las Vegas

# Formula Sheet

**Note to Student:** You may use these formulas throughout this entire test. Feel free to use this Formula Sheet as needed during your testing time.

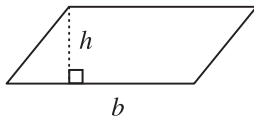
## Rectangle



Perimeter  $P = 2l + 2w$   
or  
 $P = 2(l + w)$

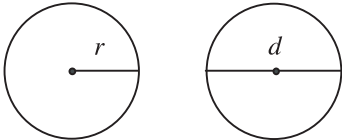
Area  $A = lw$

## Parallelogram



Area  $A = bh$

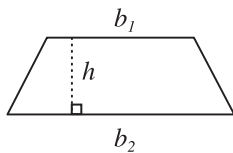
## Circle



Circumference  $C = 2r\pi$   
or  
 $C = \pi d$

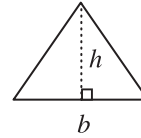
Area  $A = \pi r^2$

## Trapezoid



Area  $A = \frac{1}{2}h(b_1 + b_2)$

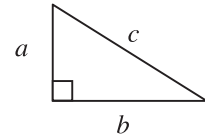
## Triangle



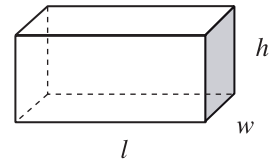
Area  $A = \frac{1}{2}bh$

## Pythagorean Theorem

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



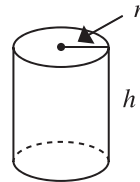
## Rectangular Solid



Volume  $V = lwh$

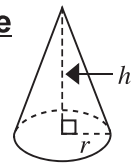
Surface Area  $SA = 2lw + 2lh + 2hw$

## Cylinder



Volume  $V = \pi r^2h$

## Cone



Volume  $V = \frac{1}{3}\pi r^2h$

## Other Necessary Information

1 quart  $\approx$  0.95 liters

1 inch = 2.54 centimeters

1 pound  $\approx$  0.45 kilograms

$$^{\circ}\text{F} = \frac{9}{5}\text{C} + 32$$

$$^{\circ}\text{C} = \frac{5}{9}(\text{F} - 32)$$

# Mathematics

Read each question in this part of the Test Booklet. Decide on the best answer to each question. In your Answer Booklet, fill in the circle for the answer you chose. If you change your answer, be sure to erase completely.

DO NOT TURN THE PAGE UNTIL INSTRUCTED TO DO SO.

**1** A bookstore manager purchased a case of 40 paperback books and a display stand that cost \$8.00. He paid \$108.00 for the total purchase. If each book cost the same amount, how much did he pay per book?

- A \$0.34
- B \$2.50
- C \$2.70
- D \$100.00

**2** Mr. Cho owns two snack shops at the local ball park. After a sold-out game, he counted his remaining soda cups. At the first snack shop, he counted 22 large cups, 6 medium cups, and 13 small cups. At the second snack shop, he counted 0 large cups, 15 medium cups, and 12 small cups. Which matrix shows the number of different size plastic cups remaining at **each** snack shop?

- A  $[22 \quad 21 \quad 25]$
- B  $\begin{bmatrix} 22 & 6 & 13 \\ 0 & 15 & 12 \end{bmatrix}$
- C  $[22 \quad 6 \quad 13 \quad 0 \quad 15 \quad 12]$
- D  $\begin{bmatrix} 41 \\ 27 \end{bmatrix}$

**3** A bag contains 3 red marbles, 2 black marbles, 4 blue marbles, and 5 white marbles. If a marble is randomly selected from the bag, what is the probability of **not** pulling out a blue or a white marble?

- A  $\frac{4}{5}$
- B  $\frac{9}{14}$
- C  $\frac{5}{9}$
- D  $\frac{5}{14}$

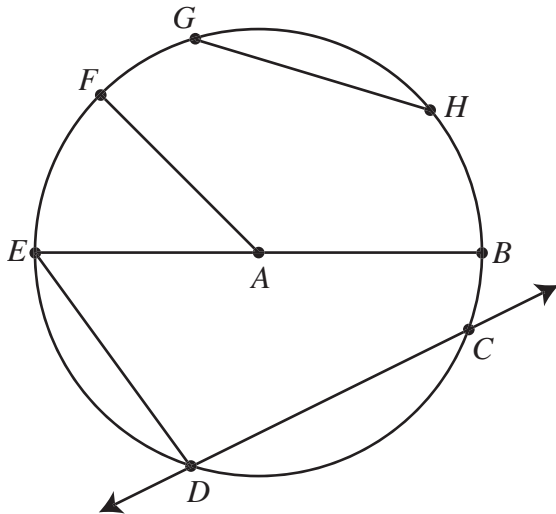
**4** After recording the racing times of her swim team, the coach calculated the racing time that occurred most often. What statistical measure did she calculate?

- A mean
- B median
- C mode
- D range



**5**

The diagram below shows a circle with center  $A$ .



Which segment has the same length as  $\overline{AF}$ ?

- A  $\overline{EB}$
- B  $\overline{GH}$
- C  $\overline{AE}$
- D  $\overline{ED}$

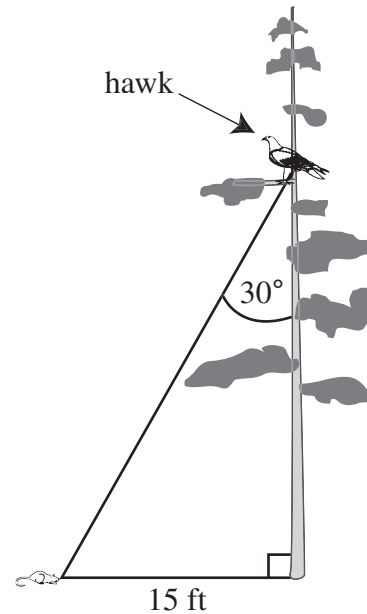
**6**

If  $3x^2 = 48$ , what is the value of  $x$ ?

- A  $\pm 4$
- B  $\pm 8$
- C  $\pm 16$
- D 0 or 4

**7**

Use the diagram below to answer the question.



A hawk sitting on a tree branch spots a mouse on the ground 15 feet from the base of the tree. The hawk swoops down toward the mouse at an angle of  $30^\circ$ . What is the distance from the tree branch to the mouse?

- A 7.5 ft
- B 15 ft
- C  $15\sqrt{3}$  ft
- D 30 ft

**8**

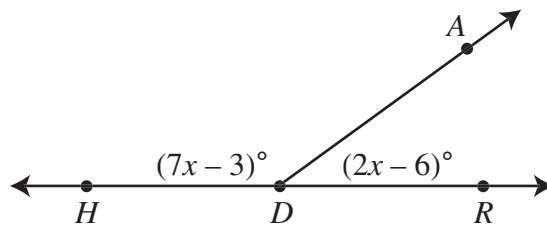
To purchase feed for his cattle, Nelson took out a 1-year loan at 8% simple interest. If he borrowed \$2,000, how much must he pay back to the bank at the end of the year?

- A \$2,008
- B \$2,100
- C \$2,160
- D \$2,800

**9** Kim took 30 **minutes** to ride her bike up a 4-mile hill. What was her average rate of speed, in **miles per hour**, up the hill?

- A 4 mph
- B 7.5 mph
- C 8 mph
- D 15 mph

**10** In the diagram below,  $\angle HDA$  and  $\angle ADR$  are supplementary.



What is the value of  $x$  ?

- A 21
- B 18
- C 11
- D 9

**11** The table below compares altitude ( $h$ ) measured in feet with the speed of sound ( $v$ ) measured in feet per second.

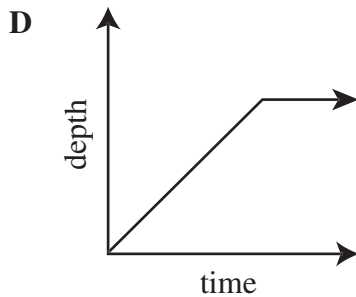
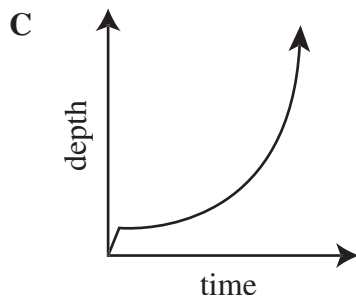
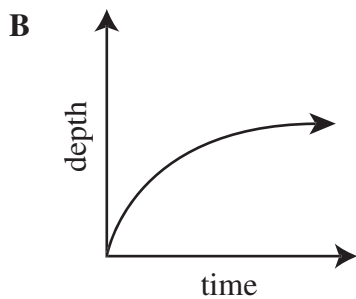
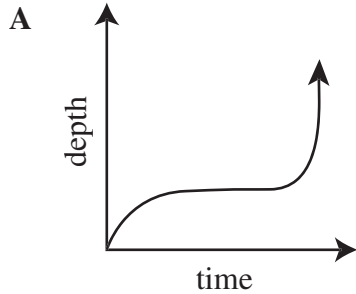
$h$	0	5,000	10,000	15,000	20,000	25,000	30,000
$v$	1,116	1,097	1,077	1,057	1,036	1,015	995

Which is the **best** ESTIMATE of the altitude when the speed of sound is 1,005 feet per second?

- A 30,000 ft
- B 27,000 ft
- C 25,000 ft
- D 22,000 ft



**12** Water is poured into an empty cylinder at a constant rate. Which graph models the level of the water in the cylinder over time?



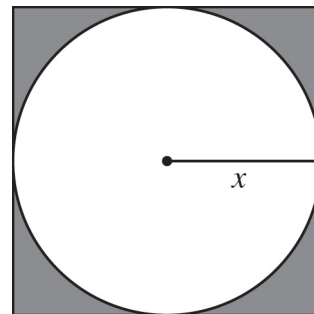
**13** In the repeating decimal  $0.\overline{384615}$ , what is the digit in the 40th decimal place?

- A 8
- B 6
- C 4
- D 1

**14** In the inequality  $\frac{1}{2}x - 5 \geq 20$ , what is the value of  $x$ ?

- A  $x \geq 7.5$
- B  $x \geq 12.5$
- C  $x \geq 30$
- D  $x \geq 50$

**15** The diagram below shows a circle inscribed in a square. The region around the circle is shaded.



Which expression represents the area of the shaded region?

- A  $4x^2 - \pi x^2$
- B  $2x^2 - \pi x^2$
- C  $4x^2 - 2\pi x$
- D  $2x^2 - 2\pi x$

16

Nicholas bought five work shirts for \$100.00 (excluding tax). He also bought a sweatshirt. The average price of all six shirts was \$19.25 . What was the price of the sweatshirt?

- A \$15.50
- B \$19.25
- C \$19.88
- D \$20.00

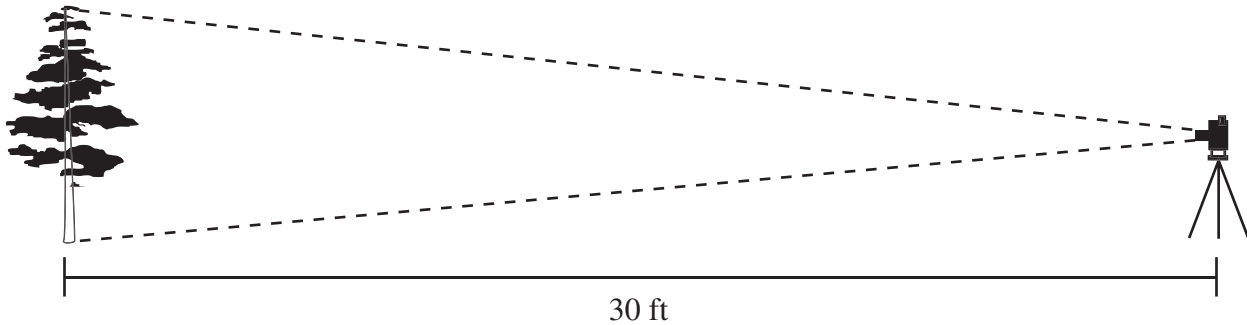
17

Two model trains begin at the toy train station and travel continuously on two circular tracks of equal length. The first train completes a circuit in 20 seconds and the second train in 15 seconds. If both trains leave the station at the same time, after how many seconds will the two trains first meet again?

- A 35 seconds
- B 60 seconds
- C 120 seconds
- D 300 seconds

18

Use the diagram below to answer the question.



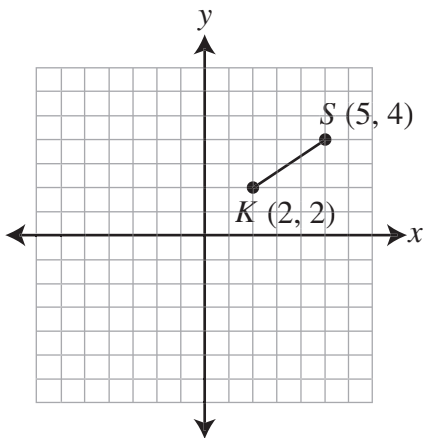
A camera is placed 30 feet (ft) from a small tree. At this distance, the image of the tree in the camera is 24 millimeters (mm) tall. The height of the image is **inversely proportional** to the distance from the tree to the camera. How far from the tree should the camera be placed so that the height of the image is 6 mm tall?

- A 4.8 ft
- B 7.5 ft
- C 36 ft
- D 120 ft

**19** Triangle  $ARM$  is a right triangle.  $\overline{AR}$  is the hypotenuse and has a length of 9 feet.  $\overline{MA}$  has a length of 7 feet. The length of  $\overline{MR}$  is

- A greater than 5 but less than 7 .
- B greater than 7 but less than 9 .
- C greater than 49 but less than 81 .
- D greater than 81 .

**20** Use the diagram below to answer the question.



What is the slope of a line parallel to  $\overline{KS}$  on the graph above?

- A  $-\frac{3}{2}$
- B  $-\frac{2}{3}$
- C  $\frac{2}{3}$
- D  $\frac{3}{2}$

**21** The depth of a rectangular wading pool is 2 feet. The volume of the pool is 16 cubic feet. What is the area in square feet of the bottom of the pool?

- A 4
- B 8
- C 14
- D 32

**22** A sports store sells three brands of skates for boys and girls. The prices for the boys' skates are \$25.25, \$30.50, and \$36.00 . The prices for the girls' skates are \$25.00, \$30.00, and \$34.50 . The manager plans to raise the price on all the skates by \$5.00 . Which matrix models the new skate prices?

- A Boys  $\begin{bmatrix} 25.25 & 30.50 & 36.00 \end{bmatrix}$   
Girls  $\begin{bmatrix} 25.00 & 30.00 & 34.50 \end{bmatrix}$
- B Boys  $\begin{bmatrix} 30.25 & 35.50 & 41.00 \end{bmatrix}$   
Girls  $\begin{bmatrix} 30.00 & 35.00 & 39.50 \end{bmatrix}$
- C Boys  $\begin{bmatrix} 26.52 & 32.03 & 37.80 \end{bmatrix}$   
Girls  $\begin{bmatrix} 26.25 & 31.50 & 36.23 \end{bmatrix}$
- D Boys  $\begin{bmatrix} 30.25 & 41.00 & 35.00 \end{bmatrix}$   
Girls  $\begin{bmatrix} 35.50 & 30.00 & 39.50 \end{bmatrix}$

**23**

Which equation describes the pattern in the table?

$x$	1	2	3	4	5
$y$	7	11	15	19	23

- A  $y = 3x - 4$
- B  $y = 3x + 4$
- C  $y = 4x - 3$
- D  $y = 4x + 3$

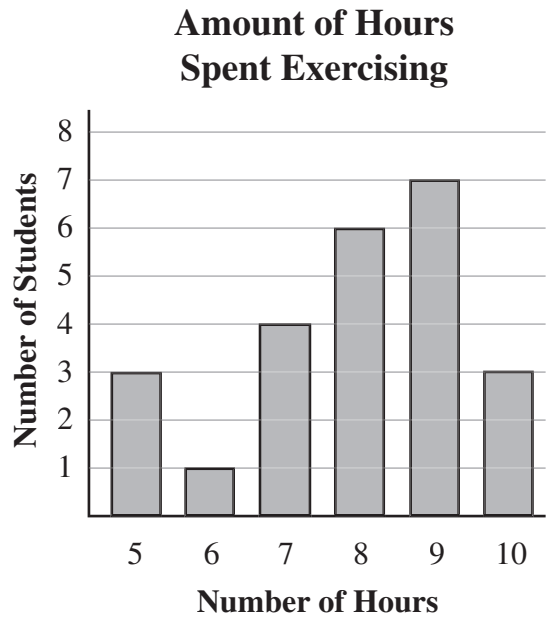
**24**

In the manufacturing of 4-inch bolts, it is required that the actual length of each bolt be within 0.1 inch of the standard 4 inches. Which measurement meets this requirement?

- A 3.75 in
- B 3.88 in
- C 4.02 in
- D 4.12 in

**25**

Use the graph below to answer the question.



The graph above shows the results of a survey in which students were asked how many hours they exercised each week. How many students were surveyed?

- A 45
- B 36
- C 30
- D 24

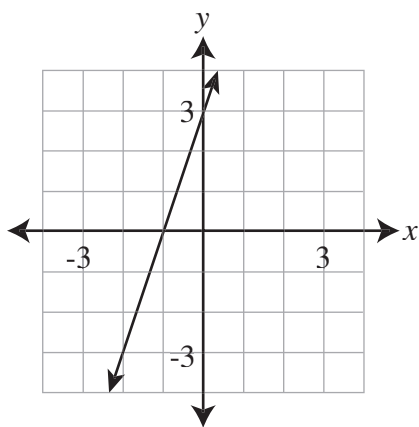


**26** Last November, it rained 8 days and snowed 3 other days. The remaining 19 days were sunny. If the same weather pattern occurs this year, what is the probability of having snow on November 7th?

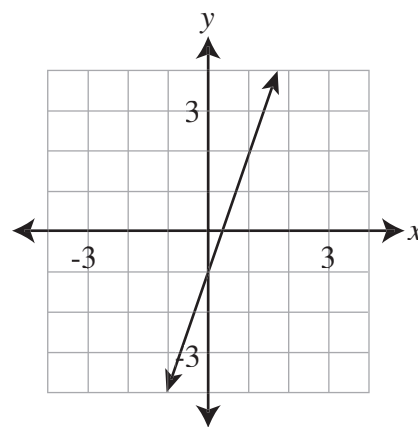
- A  $\frac{1}{30}$
- B  $\frac{1}{10}$
- C  $\frac{3}{19}$
- D  $\frac{11}{19}$

**27** Which graph represents the equation  $y = 3x - 1$ ?

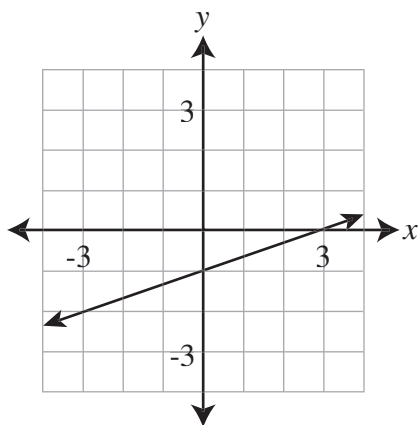
A



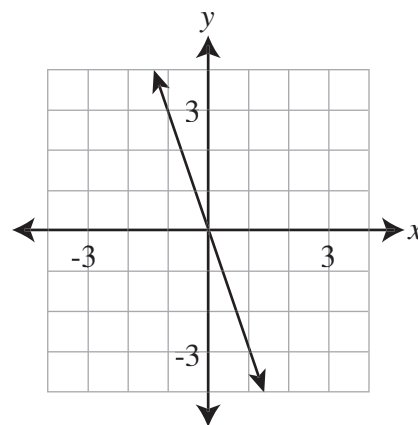
C



B



D



**28**

Jacob’s real estate agent researched the market value of homes in Jacob’s neighborhood. The values are listed below.

House	A	\$96,000
House	B	\$100,000
House	C	\$89,000
House	D	\$112,000
House	E	\$93,000

Jacob’s house sold for \$101,000 . By what amount does the selling price of Jacob’s house differ from the **mean** market value of houses in his neighborhood?

- A \$3,000
- B \$5,000
- C \$11,000
- D \$30,000

**29**

Each week, Bob gets paid \$20 per hour for his first 40 hours of work, plus \$30 per hour for every hour worked over 40 hours. How much will Bob earn for working 65 hours in 1 week?

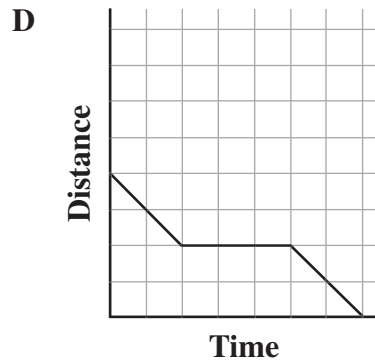
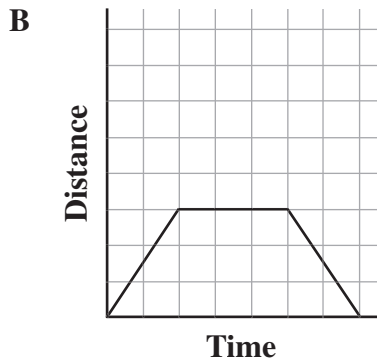
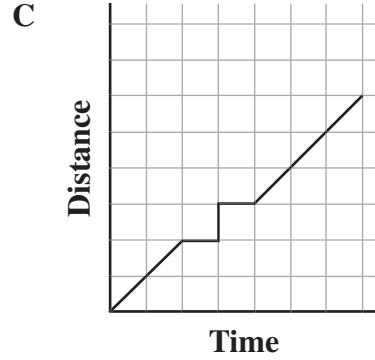
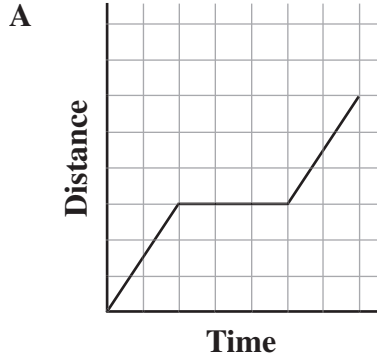
- A \$1,150
- B \$1,200
- C \$1,300
- D \$1,550





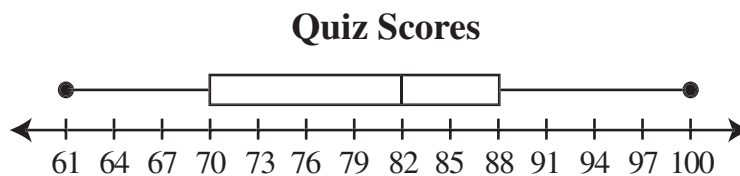
30

One afternoon Sam left home and walked to the library using a specific route. While at the library, he read a magazine. He then walked home at the same pace using the same route. Which graph best represents Sam's **distance from home** at any given time during that afternoon?



31

A quiz was given to 36 students. The results of the quiz are graphed on the box-and-whiskers plot below.



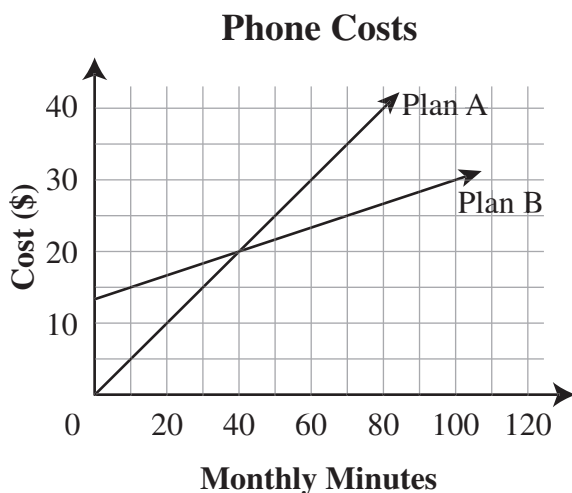
What was the **median** score?

- A 88
- B 82
- C 79
- D 70

**32** The area of a certain square is  $x^2 + 4x + 4$ . The area of a certain triangle is  $3x + 12$ . What is the difference in the areas of the two shapes?

- A  $x^2 + x - 8$
- B  $x^2 + 4x - 8$
- C  $x^2 + x + 16$
- D  $x^2 + 7x + 16$

**33** Use the graph below to answer the question.



The graph above shows the costs of two phone plans. How many minutes does a person need to call each month so that Plan B is the less expensive plan to use?

- A less than 10 minutes
- B more than 10 minutes but less than 20 minutes
- C more than 30 minutes but less than 40 minutes
- D more than 40 minutes

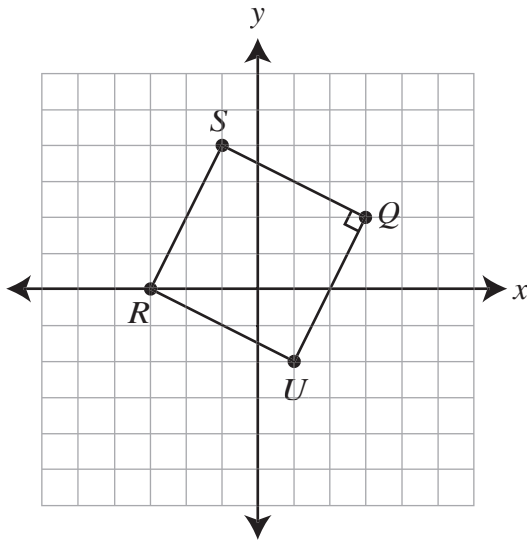
**34** Donna took out a loan of \$300.00 from her bank to pay dental bills. She paid back the entire loan in 6 months. The interest on the loan was 9% per year. What was the total amount of money Donna paid back?

- A \$273.00
- B \$286.50
- C \$313.50
- D \$327.00

**35** Given the equation  $3(x + 4) = 33$ , what is the value of  $x$ ?

- A 7
- B 15
- C  $\frac{29}{3}$
- D  $\frac{37}{3}$

- 36** On the graph below, points  $S$ ,  $Q$ ,  $U$ , and  $R$  are connected to form a square. The slope of  $\overline{SQ}$  is  $-\frac{1}{2}$ . What is the slope of  $\overline{UR}$ ?



- A -2
- B  $-\frac{1}{2}$
- C  $\frac{1}{2}$
- D 2

- 37** The temperature in the desert was  $95^{\circ}\text{F}$ . What is this temperature in degrees Celsius?

- A  $20.8^{\circ}\text{C}$
- B  $35^{\circ}\text{C}$
- C  $77.2^{\circ}\text{C}$
- D  $203^{\circ}\text{C}$

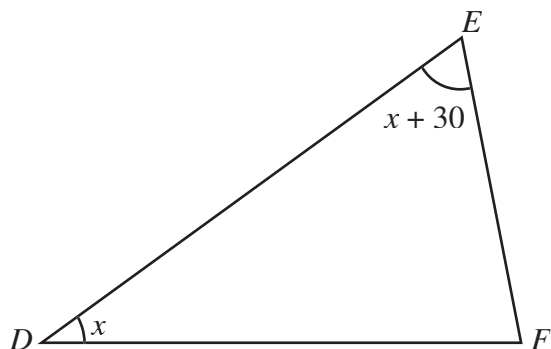
- 38** Which set of ordered pairs  $(x, y)$  could represent a function of  $x$ ?

- A  $\{(-3, 5), (-3, 6), (-3, 7)\}$
- B  $\{(-3, 5), (0, 6), (0, 11)\}$
- C  $\{(-3, 5), (-2, 5), (-2, 8)\}$
- D  $\{(-3, 5), (0, 6), (5, 11)\}$

- 39** Ms. Perez said that half of her employees earn more than \$28,000 per year and the other half earn less. What statistical measure did she use to reach her conclusion?

- A mean
- B median
- C mode
- D range

- 40** Use the diagram below to answer the question.



In  $\triangle DEF$  above, the measure of  $\angle F$  is  $24^\circ$  less than the sum of the measures of  $\angle D$  and  $\angle E$ . Which expression represents the measure of  $\angle F$ ?

- A  $x - 24$
- B  $2x - 24$
- C  $2x + 6$
- D  $-2x - 6$



**This is the end of the test.**

You may want to go back and check your answers or answer questions you did not complete in the test. When finished, close your Test Booklet.

**DO NOT GO ON.**



Question Number	Answer Key	Reporting Category	Ability Level
1	B	C1	A2
2	B	C2	A1
3	D	C4	A2
4	C	C4	A1
5	C	C3	A1
6	A	C2	A2
7	D	C3	A3
8	C	C1	A3
9	C	C3	A3
10	A	C3	A3
11	B	C4	A3
12	D	C2	A1
13	B	C2	A2
14	D	C2	A2
15	A	C3	A2
16	A	C4	A3
17	B	C1	A3
18	D	C2	A2
19	A	C3	A2
20	C	C3	A1

Question Number	Answer Key	Reporting Category	Ability Level
21	B	C3	A3
22	B	C2	A3
23	D	C2	A1
24	C	C3	A3
25	D	C4	A1
26	B	C4	A2
27	C	C2	A1
28	A	C4	A3
29	D	C1	A3
30	B	C2	A1
31	B	C4	A1
32	A	C2	A2
33	D	C4	A3
34	C	C3	A3
35	A	C2	A2
36	B	C3	A1
37	B	C3	A2
38	D	C2	A1
39	B	C4	A1
40	C	C2	A2





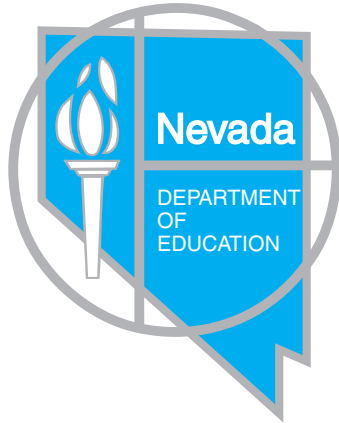
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**Criterion Referenced Test**

