



GRADE

H

**Instructional
Materials**

FOR THE

**HIGH
SCHOOL
PROFICIENCY
EXAM**

Nevada

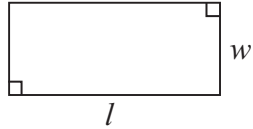
HSPE

MATHEMATICS

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

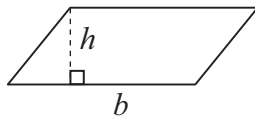


Perimeter $P = 2l + 2w$

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

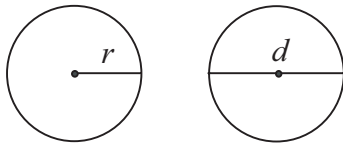
Area $A = lw$

Parallelogram



Area $A = bh$

Circle



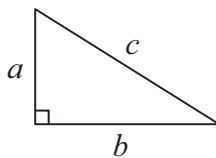
Circumference $C = 2\pi r$

$$C = \pi d$$

Area $A = \pi r^2$

Pythagorean Theorem

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

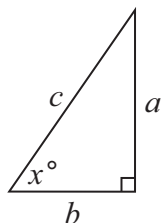


Trigonometric Ratios

$$\sin x = \frac{a}{c}$$

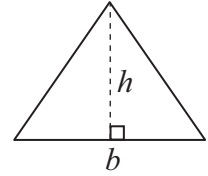
$$\cos x = \frac{b}{c}$$

$$\tan x = \frac{a}{b}$$



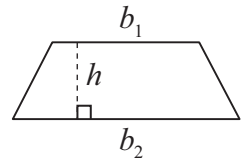
Triangle

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

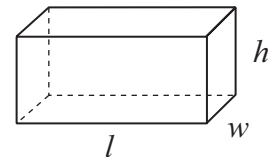


Trapezoid

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



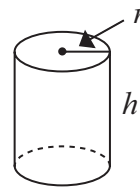
Rectangular Solid



Volume $V = lwh$

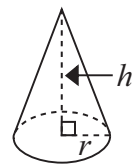
Surface Area $SA = 2lw + 2lh + 2hw$

Cylinder



Volume $V = \pi r^2 h$

Cone



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

Other Necessary Information

1 quart \approx 0.95 liters

1 inch = 2.54 centimeters

1 pound \approx 0.45 kilograms

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

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

Name: _____

Mathematics

HSPE

This booklet contains mathematics questions for you to answer. 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.

1 Simplify:

$$\sqrt{3^2 + 3^2}$$

- A $2\sqrt{3}$
- B $3\sqrt{2}$
- C 6
- D 9

2 Which equation illustrates the commutative property of addition?

- A $(4 + x) + 3x = 3x + (4 + x)$
- B $3x(4 + x) + 0 = 3x(4 + x)$
- C $(4 + x) + 3x = 4 + (x + 3x)$
- D $3x(4 + x) = 3x(4) + 3x(x)$

3 Al, Jim, and Lisa each tutor individual students and small groups of students. The list below shows information about the number of individual students and the number of small groups tutored this week.

- Al tutored 3 individuals and 2 small groups.
- Jim tutored 5 individuals and 1 small group.
- Lisa tutored 4 individuals and 2 small groups.

Which matrix shows the number of individual students and the number of small groups that Al, Jim, and Lisa tutored this week?

A

	Al	Jim	Lisa
Individuals	3	2	5
Small Groups	1	4	2

B

	Al	Jim	Lisa
Individuals	3	5	2
Small Groups	2	1	4

C

	Al	Jim	Lisa
Individuals	1	2	4
Small Groups	2	3	5

D

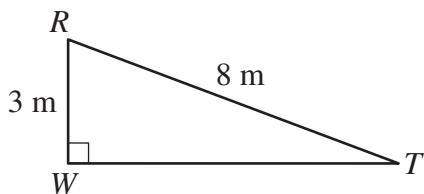
	Al	Jim	Lisa
Individuals	3	5	4
Small Groups	2	1	2



4 Lori has 3 shirts, 2 pairs of pants, and 2 pairs of socks to use to create an outfit. An outfit consists of one shirt, one pair of pants, and one pair of socks. What is the **greatest** number of different outfits Lori can create?

- A 4 outfits
- B 7 outfits
- C 8 outfits
- D 12 outfits

5 In right triangle RTW , shown below, the length of side \overline{WR} is 3 meters (m), and the length of side \overline{RT} is 8 m.



What is the length of side \overline{TW} ?

- A $\sqrt{5}$ m
- B $\sqrt{11}$ m
- C $\sqrt{55}$ m
- D $\sqrt{73}$ m

6 An equation is shown below.

$$\frac{4x^2 - 1}{2y} - \frac{9y - 5}{3} = z - 3y$$

Which is an equivalent equation solved for y ?

- A $y = \frac{3(4x^2 - 1)}{2(3z - 5)}$ with $z \neq \frac{5}{3}$
- B $y = \frac{2x^2 - 1}{z + 5}$ with $z \neq -5$
- C $y = \frac{2x^2 - 1}{z - 5}$ with $z \neq 5$
- D $y = \frac{3(4x^2 - 1)}{2(3z + 5)}$ with $z \neq -\frac{5}{3}$

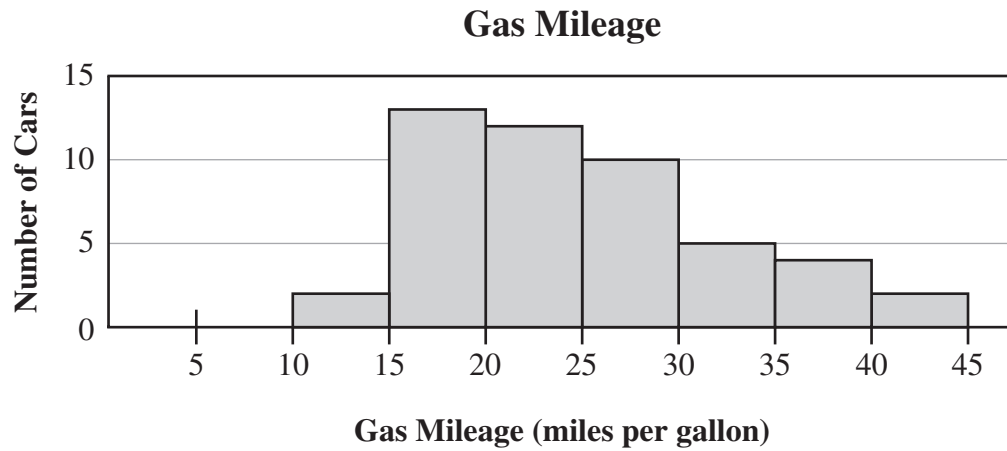
7 To determine what type of music people in a city listen to most often, employees at a radio station polled each person who entered a grocery store between 2:00 P.M. and 5:00 P.M. on Sunday. Which term **best** describes the people who were polled at the grocery store?

- A a test
- B a sample
- C a census
- D a statistic



8

Marvin records the gas mileage of 48 different cars. The histogram below displays the data Marvin records.



Based on the histogram, in which range is the **median** gas mileage of the cars?

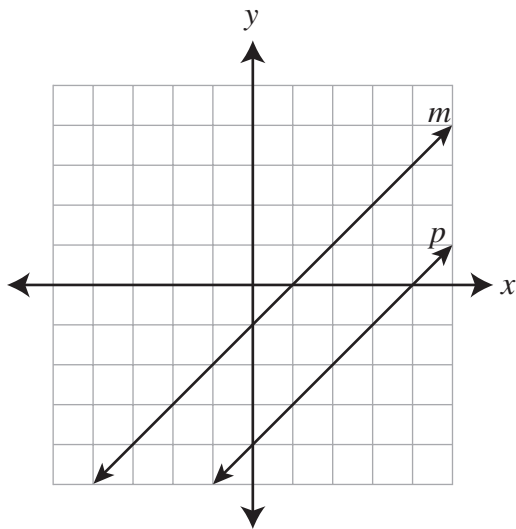
- A 15–20 miles per gallon
- B 20–25 miles per gallon
- C 25–30 miles per gallon
- D 40–45 miles per gallon



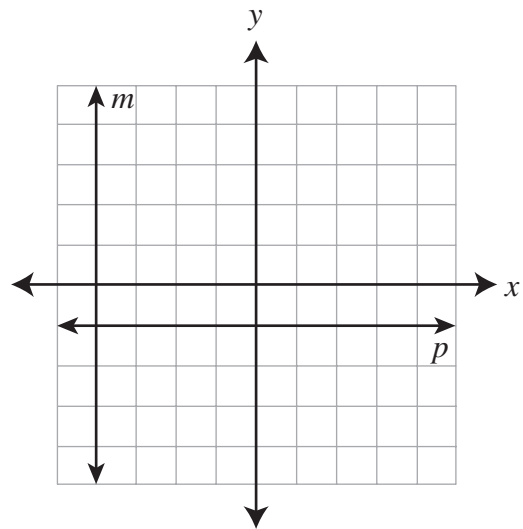
9

In which graph do line m and line p represent a system of equations that has **no** solution?

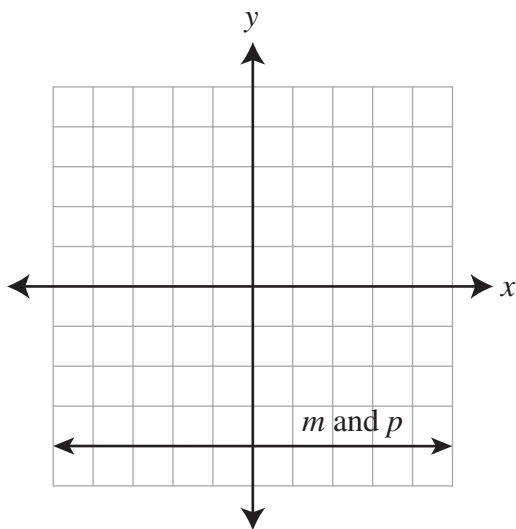
A



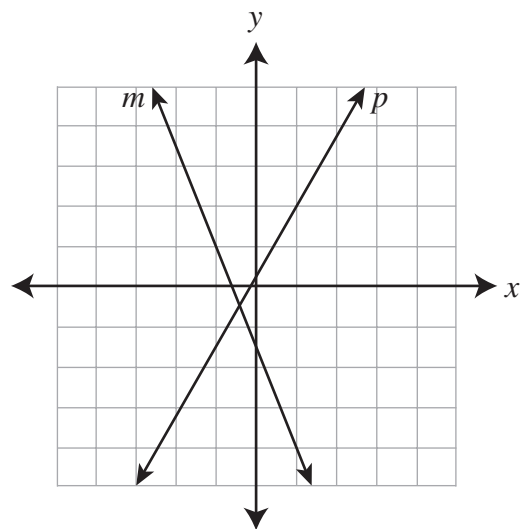
C



B

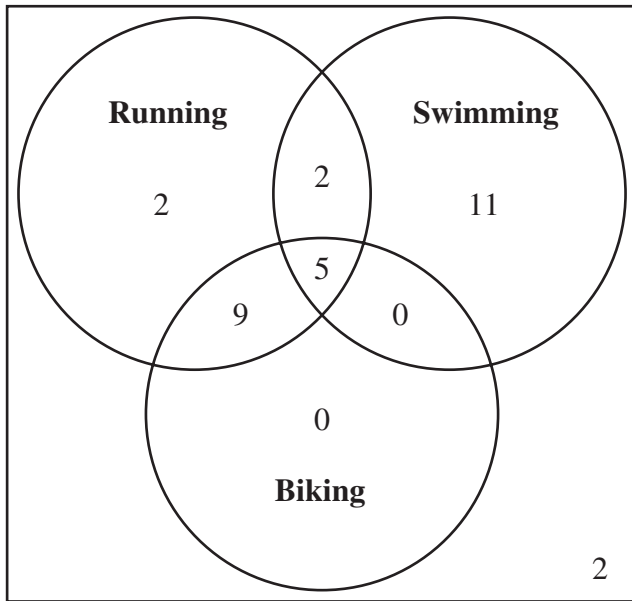


D



- 10** Bart is training for a race in which he will run, swim, and bike. The Venn diagram below shows the number of days in July that Bart trained for each part of the race.

Days of Training



Based on the Venn diagram, which statement is true?

- A Every day in July that Bart trained for running, he also trained for biking.
- B Bart trained for running or swimming every day in July.
- C Bart trained for swimming on more days in July than he trained for running.
- D Every day in July that Bart trained for biking, he also trained for running.

- 11** The value of $3\sqrt{180}$ is between which two integers?

- A 12 and 15
- B 22 and 25
- C 39 and 42
- D 58 and 61

- 12** The formula for calculating the volume (V) of a sphere with a given radius (r) is shown below.

$$V = \frac{4}{3}\pi r^3$$

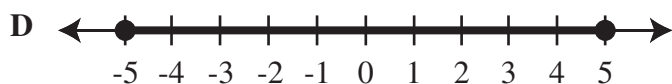
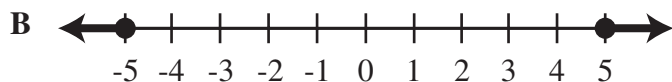
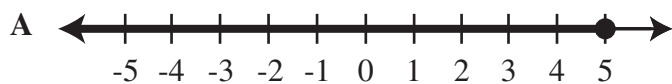
The volume of a sphere is $36\pi \text{ cm}^3$. What is the **diameter** of the sphere?

- A 3 cm
- B 6 cm
- C $6\sqrt{3}$ cm
- D 18 cm

- 13** Look at the inequality below.

$$|x| \leq 5$$

Which graph represents all of the solutions of the inequality?

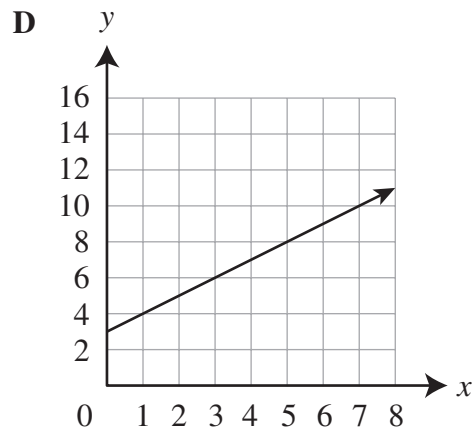
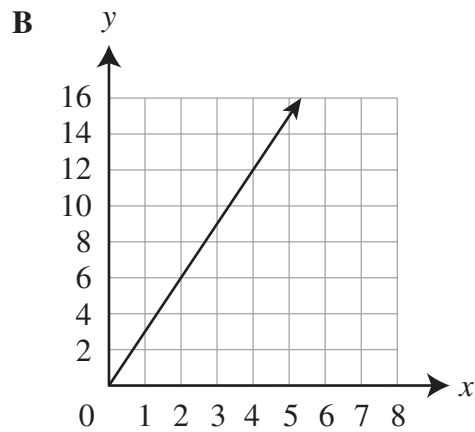
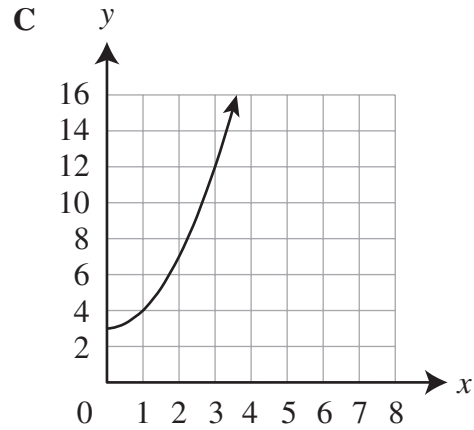
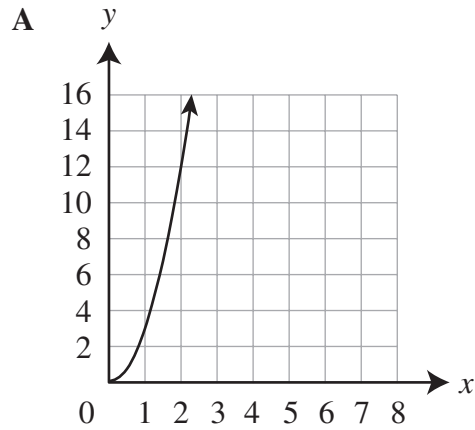


- 14** There are 200 students in a high school senior class. Of the students in the senior class, 70 are taking physics and 120 are taking chemistry. Of the students in those two groups, 50 are taking both physics and chemistry. What is the probability that a randomly selected senior is taking **neither** physics nor chemistry?

- A 0.10
B 0.25
C 0.30
D 0.35

15

A painter is designing a mural. The mural will be shaped like a rectangle. The length of the mural will be 3 times the width of the mural. Which graph shows the relationship between the **width** of the mural (x) and the **area** of the mural (y)?



16 Factor:

$$x^2 - 10x - 24$$

- A $(x - 6)(x + 4)$
- B $(x - 4)(x + 6)$
- C $(x - 2)(x + 12)$
- D $(x - 12)(x + 2)$

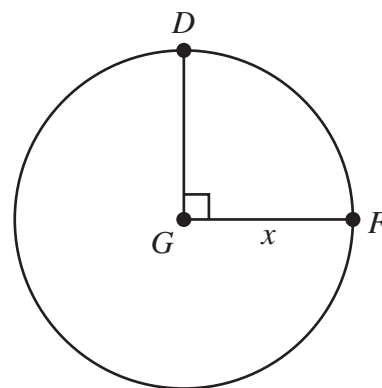
17 The first four terms of a sequence are shown below.

$$\frac{1}{2} \quad \frac{1}{8} \quad \frac{1}{18} \quad \frac{1}{32}$$

The sequence continues. What is the seventh term of the sequence?

- A $\frac{1}{256}$
- B $\frac{1}{98}$
- C $\frac{1}{64}$
- D $\frac{1}{60}$

18 In the diagram below, point D and point F are on circle G .



Which expression describes the length of minor arc DF ?

- A $\frac{\pi x}{2}$
- B $\frac{\pi x^2}{4}$
- C $x\sqrt{2}$
- D $x\sqrt{3}$

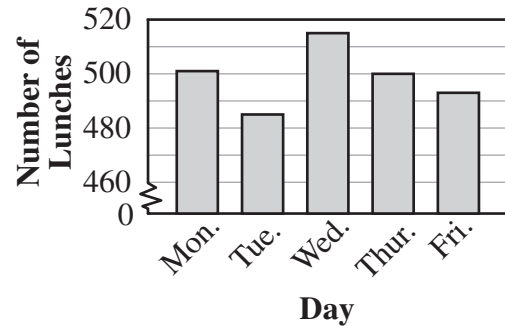
19

A chart and a bar graph are shown below. The chart shows the number of students who purchased a school lunch each day of the week for three weeks. The bar graph represents only part of the data in the chart.

School Lunches

	Mon.	Tue.	Wed.	Thur.	Fri.
Week 1	425	400	476	500	478
Week 2	501	478	404	456	493
Week 3	417	485	515	468	475

School Lunches



Which statement about the bar graph is true?

- A The bar graph only represents data from week 1 .
- B The bar graph only represents data from week 2 .
- C The bar graph represents the least number of students who purchased a school lunch each day of the week for the three weeks.
- D The bar graph represents the greatest number of students who purchased a school lunch each day of the week for the three weeks.



20 Multiply:

$$-3 \begin{bmatrix} -1 & 3 \\ 4 & 7 \\ 2 & -2 \end{bmatrix}$$

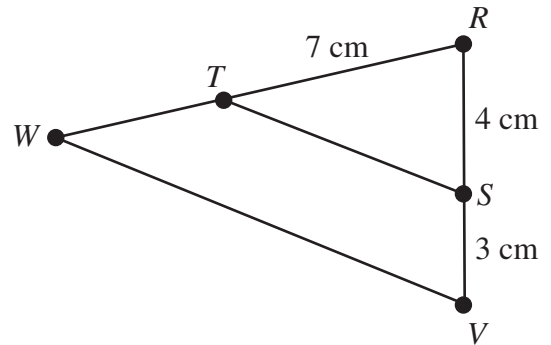
A $\begin{bmatrix} 3 & -9 \\ -12 & -21 \\ -6 & 6 \end{bmatrix}$

B $\begin{bmatrix} 3 & 3 \\ -12 & 7 \\ -6 & -2 \end{bmatrix}$

C $\begin{bmatrix} -1 & 3 \\ -12 & -21 \\ 2 & -2 \end{bmatrix}$

D $\begin{bmatrix} -4 & 0 \\ 1 & 4 \\ -1 & -5 \end{bmatrix}$

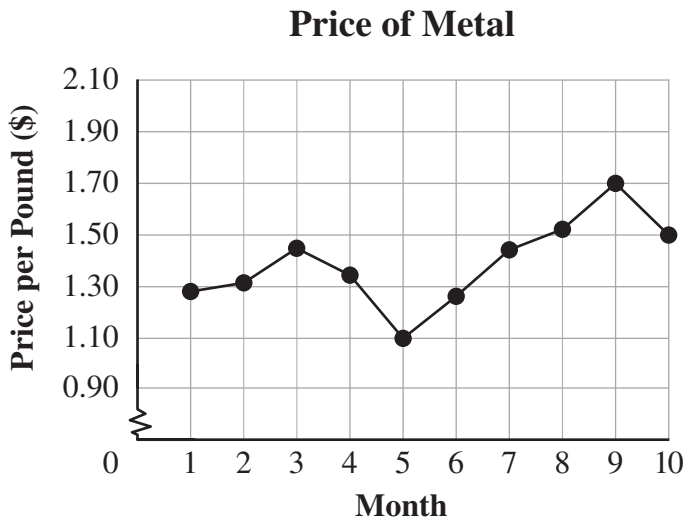
21 In the diagram below, triangle RST is similar to triangle RVW .



What is the length of side \overline{RW} ?

- A** 5.25 cm
- B** 10 cm
- C** 12.25 cm
- D** 13 cm

- 22** The graph below shows the price of one pound of a certain type of metal. The points on the graph represent the price of the metal on the first day of each month.



Based on the graph, what is the **range** of the prices of the metal?

- A \$0.20
- B \$0.60
- C \$1.20
- D \$1.70

- 23** A system of equations is shown below.

$$\begin{cases} 2x - 4y = -5 \\ 3x + 5y = 9 \end{cases}$$

What is the solution of the system of equations?

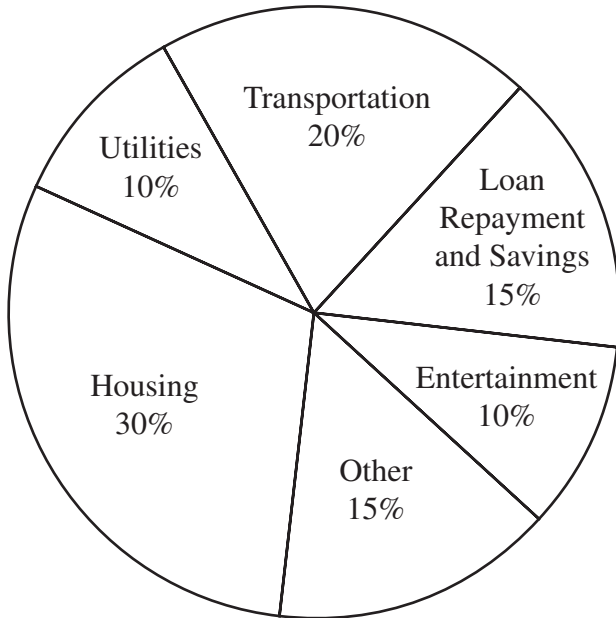
- A (2, 2.25)
- B (0.5, 1.5)
- C (-0.5, 1)
- D (-2, 3)

- 24** Kevin has 5 cubes. Each cube is a different color. Kevin will arrange the cubes side by side in a row. What is the total number of different arrangements of the 5 cubes that Kevin can make?

- A 1
- B 15
- C 25
- D 120

- 25** The circle graph below shows an average budget for a household in the state where Mario will live.

Average Budget for a Household



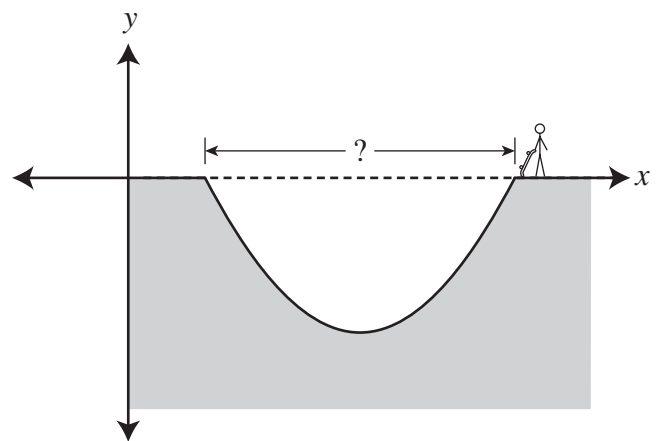
Mario finds an apartment he can rent for \$750 per **month**. Based on the circle graph, what is the minimum **annual** salary Mario needs to earn so he can afford to rent the apartment?

- A \$9,000
- B \$22,500
- C \$30,000
- D \$270,000

- 26** Fiona is designing a skateboard park. One skating area in the park will be shaped like the parabola that is described by the equation below.

$$y = \frac{1}{6}(x^2 - 18x + 45)$$

A sketch of Fiona’s design for the skating area is shown below.



What is the distance across the top of the skating area?

- A 12 units
- B 14 units
- C 15 units
- D 18 units

27 Which integer is **closest** to the value of $\sqrt{5^3}$?

- A 3
- B 8
- C 11
- D 15

28 The diameter of each tire produced by a factory is measured in inches (in). Each diameter (x) must be within the range shown below.

$$30.010 \leq x \leq 30.020$$

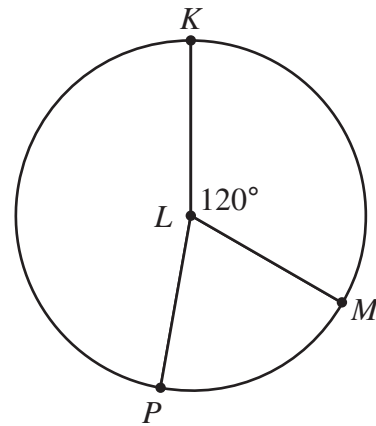
What is the tolerance range of the diameter of a tire produced by the factory?

- A 30.015 ± 0.005 in
- B 30.010 ± 0.010 in
- C 30.015 ± 0.010 in
- D 30.010 ± 0.015 in

29 Three fair coins are tossed. What is the probability that all three coins land with heads facing up?

- A $\frac{1}{9}$
- B $\frac{1}{8}$
- C $\frac{1}{6}$
- D $\frac{1}{2}$

30 Circle L is shown below.



What is the measure of \widehat{KPM} ?

- A 60°
- B 120°
- C 180°
- D 240°

31 The first five terms of a sequence are shown below.

4 10 28 82 244

The sequence continues. What is the sixth term of the sequence?

- A 368
- B 486
- C 730
- D 732



- 32** A system of equations is shown below.

$$\begin{cases} 3x - 2y = 8 \\ -x + 3y = -5 \end{cases}$$

What is the solution of the system of equations?

- A (4, 2)
 B (2, -1)
 C $\left(8, -\frac{5}{2}\right)$
 D $\left(\frac{14}{3}, 3\right)$

- 33** An equation is shown below.

$$T = 2\pi\sqrt{\frac{m}{K}}$$

Which shows the equation correctly solved for m ?

- A $m = \frac{KT^2}{4\pi^2}$
 B $m = \frac{K\sqrt{T}}{2\pi}$
 C $m = \frac{KT^2}{2\pi}$
 D $m = K\sqrt{\frac{T}{4\pi}}$

- 34** Jim bought a new car several years ago and now wants to sell it. Some information about the car is listed below.

- The **new** car cost \$30,000 .
- The current value of the car is 27% of the cost of the new car.
- The car is currently in fair condition.
- The cost of repairs needed to put the car in good condition is 8% of the **current** value of the car.
- By repairing the car, Jim will be able to sell it for a price that is 29% of the cost of the new car.

How much money will Jim save by selling the car in its current fair condition instead of repairing the car and selling it in good condition?

- A \$48
 B \$188
 C \$600
 D \$1,800

- 35** An equation is shown below.

$$5x^2 = 125$$

What is the solution set of the equation?

- A {5}
 B {-5, 5}
 C {25}
 D {-12.5, 12.5}

36 A high school principal wants to determine the average amount of time that all students at the high school spend riding school buses each day. Which group of students could be surveyed to get the **least** biased sample?

- A students at the bike rack in the afternoon
- B students who do not have a driver's license
- C students on every sixth bus that arrives at school
- D students in one social studies class from each grade

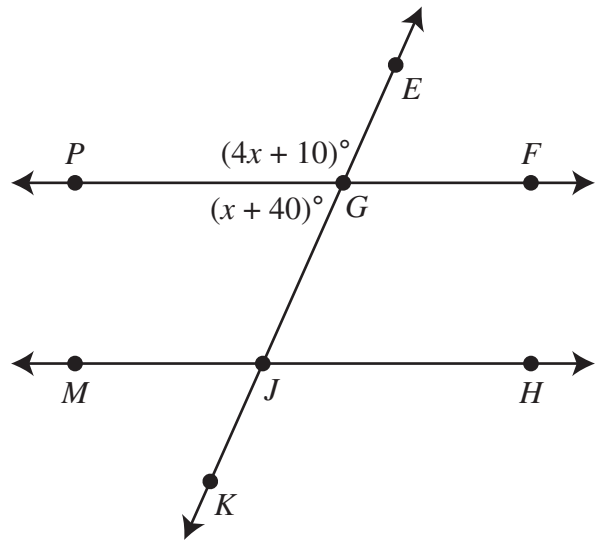
37 The equation below illustrates a property of real numbers.

$$3(7x + 9) = 21x + 27$$

Which property is illustrated by the equation?

- A associative property
- B commutative property
- C distributive property
- D identity property

38 In the diagram below, \overline{PF} and \overline{MH} are parallel lines intersected by \overline{EK} .



What is the measure of $\angle GJH$?

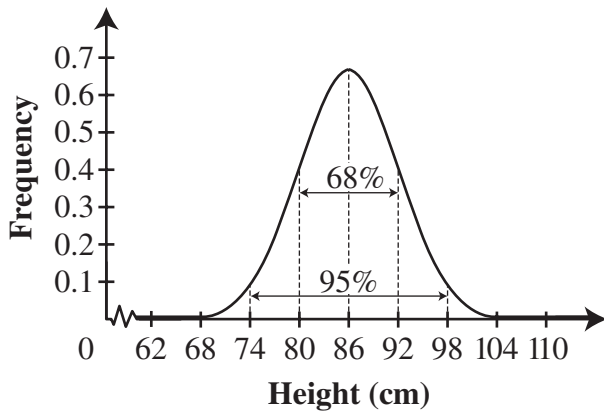
- A 48°
- B 50°
- C 66°
- D 114°



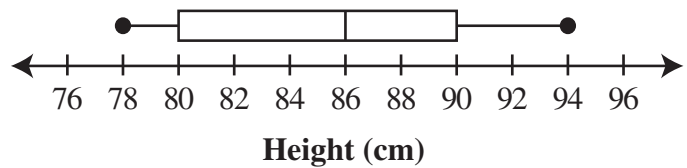
39

A scientist measures the heights of plants growing in two different areas. The normal distribution curve below shows information about the heights of the plants in the first area. The box-and-whisker plot below shows information about the heights of the plants in the second area.

**Distribution of Plant Heights
in First Area**



**Distribution of Plant Heights
in Second Area**



Which statement about the plant heights is **most** likely true?

- A The mean height of the plants in each area is the same.
- B The percentage of plants between 80 cm and 86 cm in height is the same in each area.
- C The first area contains more plants that are exactly 86 cm in height than the second area.
- D The percentage of plants that are 86 cm or greater in height is 50% in both areas.



40 What are the solutions of the inequality $|3x - 4| > 5$?

- A $x < -3$ or $x > \frac{1}{3}$
- B $x < -\frac{1}{3}$ or $x > 3$
- C $-3 < x < \frac{1}{3}$
- D $-\frac{1}{3} < x < 3$

41 The table below shows the total distance and the number of hours Don rode his bicycle on each of four days.

Don's Bicycle Rides

Day	Distance (miles)	Number of Hours
Monday	38	2.0
Wednesday	33	1.5
Friday	18	0.75
Saturday	45	2.25

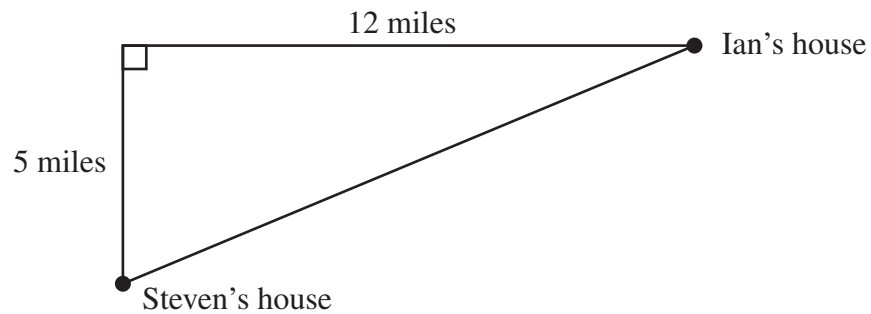
Based on the table, on which day did Don ride at the **greatest** average speed?

- A Monday
- B Wednesday
- C Friday
- D Saturday

42 There are two routes that may be used to drive from Steven's house to Ian's house. The routes are described below.

- Route 1: Drive 5 miles north and then 12 miles east.
- Route 2: Drive the straight road that goes directly to Ian's house.

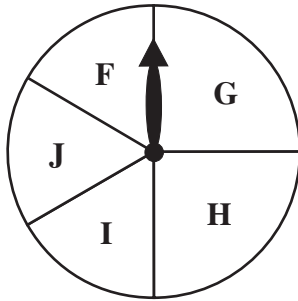
The two routes are shown in the diagram below.



How much longer is route 1 than route 2 ?

- A** 4 miles
- B** 7 miles
- C** 13 miles
- D** 17 miles

- 43** A spinner is divided into five sections. Section F, section J, and section I are all the same size. All together, these three sections cover half of the spinner, as shown below.



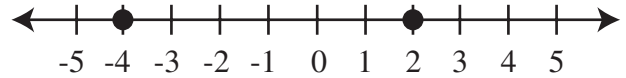
The arrow on the spinner is spun one time. What is the probability that the arrow stops in section F?

- A $\frac{1}{6}$
- B $\frac{1}{5}$
- C $\frac{1}{4}$
- D $\frac{1}{3}$

- 44** Maya swims in a pool that is 75 feet long. She swims the length of the pool 20 times each day. At this rate, about how many days will it take Maya to swim a total distance of 1 mile? (1 mile = 5,280 feet)

- A 1 day
- B 4 days
- C 56 days
- D 70 days

- 45** The graph below represents the solution set of an equation.



Which of these is the equation?

- A $|x| = 2$
- B $|x| = 4$
- C $|x + 1| = 3$
- D $|x + 4| = 0$

46 Which equation shows the use of the inverse property of multiplication?

- A $7x \cdot \frac{1}{7x} = 1$
- B $7x \cdot 1 = 7x$
- C $7x \cdot 0 = 0$
- D $7x \cdot \frac{1}{7} = \frac{1}{7} \cdot 7x$

47 A person is 7 feet tall. In which group is the person’s height **not** likely an outlier when compared to the heights of all the other people in the group?

- A a girl scout troop
- B a men’s professional basketball team
- C a middle school math class
- D a women’s professional gymnastics team

48 The table below shows the total amount a repair company charges for five different jobs based on the number of hours each job takes to complete.

Repair Company Charges

Number of Hours to Complete Job	Total Amount Charged (\$)
3	195
5	275
12	555
16	715
19	835

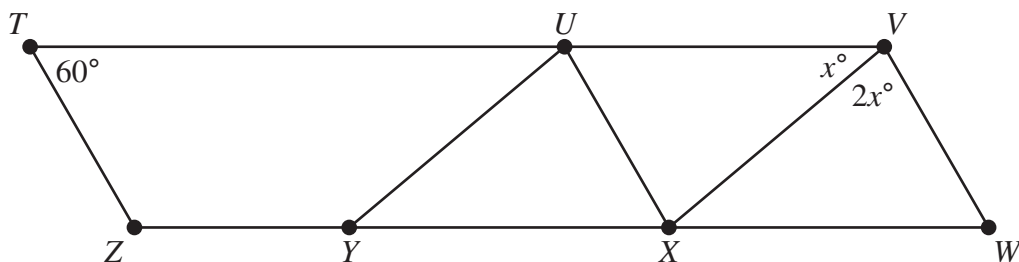
The relationship between the number of hours a job takes to complete and the total amount the repair company charges continues. What is the least number of hours the repair company could take to complete a job and charge a total amount that is **greater** than \$5,000 ?

- A 77 hours
- B 114 hours
- C 124 hours
- D 126 hours



49

In the figure below, $\overline{TV} \parallel \overline{ZW}$, $\overline{UY} \parallel \overline{VX}$, $\overline{UX} \parallel \overline{VW}$, and $\overline{TZ} \parallel \overline{VW}$.



What is the measure of $\angle ZYU$?

- A 80°
- B 100°
- C 120°
- D 140°

50

Terra takes four different measurements of the length of her calculator. Terra's four measurements are listed below.

14.8 cm 15 cm 148.6 mm 149 mm

Which measurement is the **most** precise?

- A 14.8 cm
- B 15 cm
- C 148.6 mm
- D 149 mm





You may want to go back and check your answers or answer questions you did not complete.



GRADE

H

Appendix I

Scoring Support Materials

Nevada

HSPE

MATHEMATICS

Correct Answers for Multiple-choice Items

Item Number	Correct Answer	Content Cluster	DOK
1	B	C1	1
2	A	C1	1
3	D	C4	1
4	D	C4	2
5	C	C3	1
6	A	C2	2
7	B	C4	1
8	B	C4	2
9	A	C3	1
10	D	C3	3
11	C	C1	2
12	B	C3	2
13	D	C2	1
14	C	C4	3
15	A	C2	2
16	D	C2	1
17	B	C2	2
18	A	C3	2
19	D	C4	2
20	A	C1	1
21	C	C3	1
22	B	C4	1
23	B	C2	2
24	D	C4	2
25	C	C3	2

Item Number	Correct Answer	Content Cluster	DOK
26	A	C2	2
27	C	C1	2
28	A	C3	2
29	B	C4	2
30	D	C3	1
31	C	C2	3
32	B	C2	2
33	A	C2	1
34	A	C3	3
35	B	C2	1
36	D	C4	2
37	C	C1	1
38	C	C3	2
39	D	C4	3
40	B	C2	2
41	C	C3	2
42	A	C3	2
43	A	C4	1
44	B	C3	1
45	C	C2	2
46	A	C1	1
47	B	C4	2
48	C	C2	3
49	D	C3	2
50	C	C3	1

Detailed objectives for Content Standards and Depth of Knowledge (DOK) descriptions can be found on the Nevada Department of Education Website.