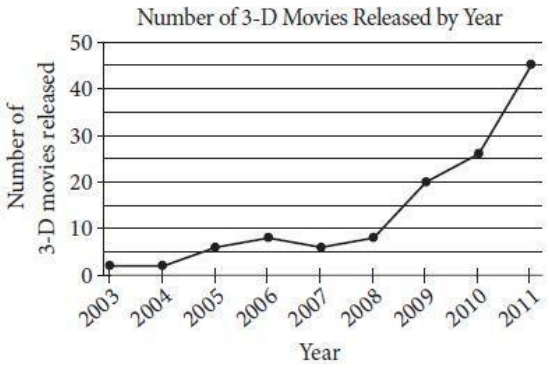
COLLEGE READINESS INITIATIVE

Test 5: Math, With Calculator

1



According to the line graph above, between which two consecutive years was there the greatest change in the number of 3-D movies released?

A) 2003–2004
B) 2008–2009
C) 2009–2010
D) 2010–2011

This can be thought of as the steepness of the line between two points

It is also that end number- initial number

Answer Choice	Change
2003-2004	2-2=0
2008-2009	20-8=12
2009-2010	25-20=5
2010-2011	45-25=20

D)

2

x	$f(x)$
1	5
3	13
5	21

Some values of the linear function f are shown in the table above. Which of the following defines f ?

A) $f(x) = 2x + 3$
B) $f(x) = 3x + 2$
C) $f(x) = 4x + 1$
D) $f(x) = 5x$

X	$f(x) = 4x + 1$
1	5
3	13
5	21

C)

3

To make a bakery's signature chocolate muffins, a baker needs 2.5 ounces of chocolate for each muffin. How many pounds of chocolate are needed to make 48 signature chocolate muffins?
(1 pound = 16 ounces)

A) 7.5
B) 10
C) 50.5
D) 120

$$2.5\ oz = 1\ muffin$$
$$16oz = 1\ lb$$

How many pounds of chocolate for 48 muffins

$$\frac{48 * 2.5}{16} = 7.5$$

A)

4

If $3(c + d) = 5$, what is the value of $c + d$?

A) $\frac{3}{5}$
B) $\frac{5}{3}$
C) 3
D) 5

$$3(c + d) = 5$$

Dividing both sides by 3

$$(c + d) = \frac{5}{3}$$

B)

5

The weight of an object on Venus is approximately $\frac{9}{10}$ of its weight on Earth. The weight of an object on Jupiter is approximately $\frac{23}{10}$ of its weight on Earth. If an object weighs 100 pounds on Earth, approximately how many more pounds does it weigh on Jupiter than it weighs on Venus?

A) 90
B) 111
C) 140
D) 230

$$V = \frac{9}{10}E$$
$$J = \frac{23}{10}E$$

$$V_{100} = \frac{9}{10}(100) = 90$$

$$J_{100} = \frac{23}{10}(100) = 230$$

$$J_{100} - V_{100} = 230 - 90 = 140$$

C)

6

An online bookstore sells novels and magazines. Each novel sells for \$4, and each magazine sells for \$1. If Sadie purchased a total of 11 novels and magazines that have a combined selling price of \$20, how many novels did she purchase?

A) 2
B) 3
C) 4
D) 5

$$Novel = \$4$$
$$Magazine = \$1$$

$$M + 4N = 20$$
$$M + N = 11$$

Subtract two equations

$$3N = 9$$
$$N = \frac{9}{3} = 3$$

B)

7

The Downtown Business Association (DBA) in a certain city plans to increase its membership by a total of n businesses per year. There were b businesses in the DBA at the beginning of this year. Which function best models the total number of businesses, y, the DBA plans to have as members x years from now?

A) $y = nx + b$

B) $y = nx - b$

C) $y = b(n)^x$

D) $y = n(b)^x$

n – number of businesses per year
b- number at the beginning of the year

nx is the number of businesses added after x years

$$y = nx + b$$

A)

8

Which of the following is an equivalent form of $(1.5x - 2.4)^2 - (5.2x^2 - 6.4)$?

A) $-2.2x^2 + 1.6$

B) $-2.2x^2 + 11.2$

C) $-2.95x^2 - 7.2x + 12.16$

D) $-2.95x^2 - 7.2x + 0.64$

$$(1.5x - 2.4)^2 - (5.2x^2 - 6.4)$$

Multiply: $(1.5x - 2.4)(1.5x - 2.4)$

$$2.25x^2 - 7.2x + 5.76 - 5.2x^2 + 6.4$$

$$-2.95x^2 - 7.2x + 12.16$$

C)

9

In the 1908 Olympic Games, the Olympic marathon was lengthened from 40 kilometers to approximately 42 kilometers. Of the following, which is closest to the increase in the distance of the Olympic marathon, in miles? (1 mile is approximately 1.6 kilometers.)

A) 1.00

B) 1.25

C) 1.50

D) 1.75

The difference:

$$42 - 40 = 2km$$

$$\frac{2}{1.6} = 1.25\ miles$$

Unit Analysis:

$$\frac{km}{\frac{km}{mile}} = miles$$

B)

10

The density d of an object is found by dividing the mass m of the object by its volume V. Which of the following equations gives the mass m in terms of d and V ?

A) $m = dV$

B) $m = \frac{d}{V}$

C) $m = \frac{V}{d}$

D) $m = V + d$

$$d = \frac{m}{v}$$

Multiple both sides by v

$$m = dv$$

A)

11

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

In the xy-plane, the graph of which of the following equations is perpendicular to the graph of the equation above?

A) $3x + 2y = 6$

B) $3x + 4y = 6$

C) $2x + 4y = 6$

D) $2x + 6y = 3$

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

$$slope = \frac{-(-2)}{3} = \frac{2}{3}$$

Perpendicular Slope $= -\frac{3}{2}$

$$3x + 2y = 6$$
$$2y = -3x + 6$$
$$y = -\frac{3}{2}x + 3$$

A)

12

$$\frac{1}{2}y = 4$$
$$x - \frac{1}{2}y = 2$$

The system of equations above has solution (x, y). What is the value of x ?

A) 3

B) $\frac{7}{2}$

C) 4

D) 6

Solving for x, substitute for y

$$\frac{1}{2}y = 4$$
$$x - 4 = 2$$
$$x = 6$$

D)

13

$$y \leq 3x + 1$$
$$x - y > 1$$

Which of the following ordered pairs (x, y) satisfies the system of inequalities above?

A) $(-2, -1)$

B) $(-1, 3)$

C) $(1, 5)$

D) $(2, -1)$

$$y \leq 3x + 1$$
$$x - y > 1$$
$$x > y + 1$$
$$y < x - 1$$

You could graph it

$$y < 3x + 1$$
$$y < x - 1$$
$$0 < 2x + 2$$
$$-2 < 2x$$
$$-1 < x$$

0 works for X

$$y \leq 0 + 1$$

Might be answer choice D

$$-1 \leq 3(2) + 1$$
$$-1 \leq 7$$

$$2 - (-1) > 1$$
$$3 > 1$$

D)

14

Type of surgeon	Major professional activity		Total
	Teaching	Research	
General	258	156	414
Orthopedic	119	74	193
Total	377	230	607

In a survey, 607 general surgeons and orthopedic surgeons indicated their major professional activity. The results are summarized in the table above. If one of the surgeons is selected at random, which of the following is closest to the probability that the selected surgeon is an orthopedic surgeon whose indicated professional activity is research?

A) 0.122
B) 0.196
C) 0.318
D) 0.379

74 students are orthopedic surgeons who do research
607 students total

$$= \frac{74}{607}$$

$$= 0.122$$

A)

15

A polling agency recently surveyed 1,000 adults who were selected at random from a large city and asked each of the adults, "Are you satisfied with the quality of air in the city?" Of those surveyed, 78 percent responded that they were satisfied with the quality of air in the city. Based on the results of the survey, which of the following statements must be true?

I. Of all adults in the city, 78 percent are satisfied with the quality of air in the city.
II. If another 1,000 adults selected at random from the city were surveyed, 78 percent of them would report they are satisfied with the quality of air in the city.
III. If 1,000 adults selected at random from a different city were surveyed, 78 percent of them would report they are satisfied with the quality of air in the city.

A) None
B) II only
C) I and II only
D) I and III only

I- The sample size is not large enough to predict the entire city

II- The sample size is too small to make that prediction

III- This survey has nothing to do with another city

A)

Questions 16-18 refer to the following information.

Species of tree	Growth factor
Red maple	4.5
River birch	3.5
Cottonwood	2.0
Black walnut	4.5
White birch	5.0
American elm	4.0
Pin oak	3.0
Shagbark hickory	7.5

One method of calculating the approximate age, in years, of a tree of a particular species is to multiply the diameter of the tree, in inches, by a constant called the growth factor for that species. The table above gives the growth factors for eight species of trees.

16

According to the information in the table, what is the approximate age of an American elm tree with a diameter of 12 inches?

A) 24 years
B) 36 years
C) 40 years
D) 48 years

Diameter * Growth Factor= Age

$12 * 4 = 48$

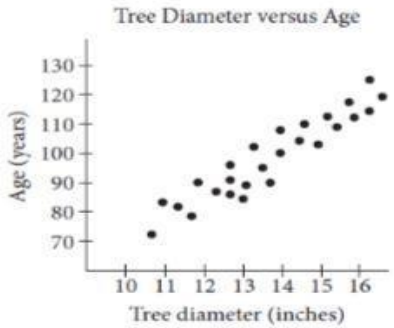
D)

Questions 16-18 refer to the following information.

Species of tree	Growth factor
Red maple	4.5
River birch	3.5
Cottonwood	2.0
Black walnut	4.5
White birch	5.0
American elm	4.0
Pin oak	3.0
Shagbark hickory	7.5

One method of calculating the approximate age, in years, of a tree of a particular species is to multiply the diameter of the tree, in inches, by a constant called the growth factor for that species. The table above gives the growth factors for eight species of trees.

17



The scatterplot above gives the tree diameter plotted against age for 26 trees of a single species. The growth factor of this species is closest to that of which of the following species of tree?

A) Red maple
B) Cottonwood
C) White birch
D) Shagbark hickory

(10,70) (16,120)

$$\frac{70}{10} = 7$$

$$\frac{120}{16} = 7.5$$

D)

18

If a white birch tree and a pin oak tree each now have a diameter of 1 foot, which of the following will be closest to the difference, in inches, of their diameters 10 years from now? (1 foot = 12 inches)

A) 1.0
B) 1.2
C) 1.3
D) 1.4

Questions 16-18 refer to the following information.

Species of tree	Growth factor
Red maple	4.5
River birch	3.5
Cottonwood	2.0
Black walnut	4.5
White birch	5.0
American elm	4.0
Pin oak	3.0
Shagbark hickory	7.5

One method of calculating the approximate age, in years, of a tree of a particular species is to multiply the diameter of the tree, in inches, by a constant called the growth factor for that species. The table above gives the growth factors for eight species of trees.

Species of Tree	Growth Factor
White Birch	5.0
Pin Oak	3.0

Get the age by multiplying diameter by Growth Factor

$$12 * 5 = 60$$

$$60 + 10 = \frac{70}{5} = 14$$

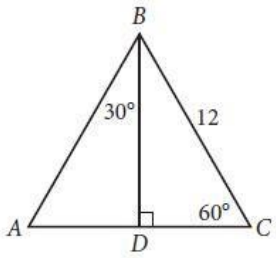
$$12 * 3 = 36$$

$$36 + 10 = \frac{46}{3} = 15.33$$

$15.3 - 14 = 1.3$

C)

19



In $\triangle ABC$ above, what is the length of $\overline{AD}$?

A) 4
B) 6
C) $6\sqrt{2}$
D) $6\sqrt{3}$

$\angle ABD = 30° \; and \; \angle DBC = 30°$ because the BD is a bisector of $\angle ABC$

$$\sin(30) = \frac{x}{12}$$

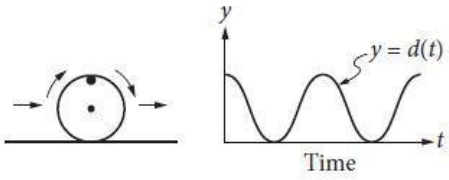
$$12\sin(30) = x$$

$Sin(30°) = 1/2$

$$x = 12\left(\frac{1}{2}\right) = 6$$

B)

20



The figure on the left above shows a wheel with a mark on its rim. The wheel is rolling on the ground at a constant rate along a level straight path from a starting point to an ending point. The graph of $y = d(t)$ on the right could represent which of the following as a function of time from when the wheel began to roll?

A) The speed at which the wheel is rolling
B) The distance of the wheel from its starting point
C) The distance of the mark on the rim from the center of the wheel
D) The distance of the mark on the rim from the ground

A) The speed of the wheel is constant
B) The distance from the start would be linear
C) The distance from the mark on the rim from the center is constant
D) The distance from the point on wheel to the ground is correct

D)

21

$$\frac{a-b}{a}=c$$

In the equation above, if a is negative and b is positive, which of the following must be true?

A) $c > 1$

B) $c = 1$

C) $c = -1$

D) $c < -1$

$$a = -1$$
$$b = 1$$
$$\frac{-1-1}{-1} = c$$
$$-\frac{2}{-1} = 2 = c$$
$$c > 1$$

A)

22

In State X, Mr. Camp's eighth-grade class consisting of 26 students was surveyed and 34.6 percent of the students reported that they had at least two siblings. The average eighth-grade class size in the state is 26. If the students in Mr. Camp's class are representative of students in the state's eighth-grade classes and there are 1,800 eighth-grade classes in the state, which of the following best estimates the number of eighth-grade students in the state who have fewer than two siblings?

A) 16,200

B) 23,400

C) 30,600

D) 46,800

26 students surveyed
34.6% of the students have a least two siblings
This is representative of 8th grade class

1800 students in class

How many have one or fewer siblings?

$$1 - 0.346 = 0.654$$

$$0.654 * 1800 * 26 = 30607.2$$

C)

Questions 23 and 24 refer to the following information.

Townsend Realty Group Investments		
Property address	Purchase price (dollars)	Monthly rental price (dollars)
Clearwater Lane	128,000	950
Driftwood Drive	176,000	1,310
Edgemont Street	70,000	515
Glenview Street	140,000	1,040
Hamilton Circle	450,000	3,365

The Townsend Realty Group invested in the five different properties listed in the table above. The table shows the amount, in dollars, the company paid for each property and the corresponding monthly rental price, in dollars, the company charges for the property at each of the five locations.

23

The relationship between the monthly rental price r, in dollars, and the property's purchase price p, in thousands of dollars, can be represented by a linear function. Which of the following functions represents the relationship?

A) $r(p) = 2.5p - 870$

B) $r(p) = 5p + 165$

C) $r(p) = 6.5p + 440$

D) $r(p) = 7.5p - 10$

Selecting the largest ordered pair and the smallest ordered pair

$$m = \frac{3365 - 515}{450 - 70,} = \frac{2850}{380} = 7.5$$

Selecting smallest ordered pair, using point-slope form

$$y - y_0 = m(x - x_0)$$
$$y - 515 = 7.5(x - 70)$$
$$y = 7.5x - 525 + 515$$
$$y = 7.5x - 10$$

D)

Questions 23 and 24 refer to the following information.

Townsend Realty Group Investments		
Property address	Purchase price (dollars)	Monthly rental price (dollars)
Clearwater Lane	128,000	950
Driftwood Drive	176,000	1,310
Edgemont Street	70,000	515
Glenview Street	140,000	1,040
Hamilton Circle	450,000	3,365

The Townsend Realty Group invested in the five different properties listed in the table above. The table shows the amount, in dollars, the company paid for each property and the corresponding monthly rental price, in dollars, the company charges for the property at each of the five locations.

24

Townsend Realty purchased the Glenview Street property and received a 40% discount off the original price along with an additional 20% off the discounted price for purchasing the property in cash. Which of the following best approximates the original price, in dollars, of the Glenview Street property?

A) $350,000

B) $291,700

C) $233,300

D) $175,000

40% discount → $1 - 0.4 = 0.6$

Additional 20% discount→ $1 - 0.2 = 0.8$

Multiply the two discounts together

$$0.6 * 0.8 = 0.48$$

Divide the purchase price by this decimal

$$\frac{140{,}000}{0.48} = 291{,}666.7$$

B)

25

A psychologist set up an experiment to study the tendency of a person to select the first item when presented with a series of items. In the experiment, 300 people were presented with a set of five pictures arranged in random order. Each person was asked to choose the most appealing picture. Of the first 150 participants, 36 chose the first picture in the set. Among the remaining 150 participants, p people chose the first picture in the set. If more than 20% of all participants chose the first picture in the set, which of the following inequalities best describes the possible values of p ?

A) $p > 0.20(300 - 36)$, where $p \leq 150$

B) $p > 0.20(300 + 36)$, where $p \leq 150$

C) $p - 36 > 0.20(300)$, where $p \leq 150$

D) $p + 36 > 0.20(300)$, where $p \leq 150$

300 people were presented

Asked to choose the most appealing picture

First 150:
36 chose 1st picture

The of the remaining 150 participants, p participants chose

If the end had more than 20%, what describes the possible values of p

The amount needed to break 20%

$$p + 36$$

20% of 300:

$$0.2(300)$$

$$p + 36 > 0.2(300)$$

D)

26

The surface area of a cube is $6\left(\frac{a}{4}\right)^2$, where a is a positive constant. Which of the following gives the perimeter of one face of the cube?

A) $\frac{a}{4}$

B) a

C) $4a$

D) $6a$

A cube has 6 sides:

So $\left(\frac{a}{4}\right)^2$ is the area of one side

So $\frac{a}{4}$ is the length of one side

The perimeter of one cube is 4 times the length of one side

$$4\left(\frac{a}{4}\right) = a$$

B)

27

The mean score of 8 players in a basketball game was 14.5 points. If the highest individual score is removed, the mean score of the remaining 7 players becomes 12 points. What was the highest score?

A) 20

B) 24

C) 32

D) 36

Mean of 8 players is 14.5

$$14.5 * 8 = 116$$

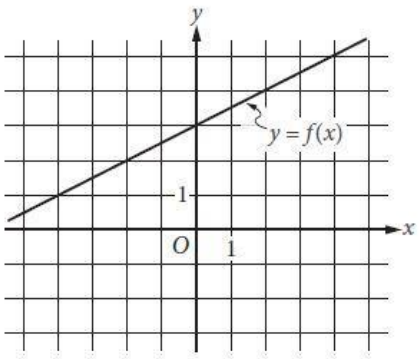
Mean without the highest score is 12

$$12 * 7 = 84$$

$$116 - 94 = 32$$

C)

28



The graph of the linear function f is shown in the xy-plane above. The slope of the graph of the linear function g is 4 times the slope of the graph of f. If the graph of g passes through the point $(0, -4)$, what is the value of $g(9)$?

A) 5
B) 9
C) 14
D) 18

The slope of g(x) is 4 times the slope of f(x)

The slope of f(x) is $\frac{1}{2}$

$$4\left(\frac{1}{2}\right) = 2$$

$$y - y_0 = m(x - x_0)$$

$$y - (-4) = 2(x - 0)$$
$$y + 4 = 2x$$
$$y = 2x - 4$$

$$g(x) = 2x - 4$$

$$g(9) = 2(9) - 4$$
$$g(9) = 18 - 4 = 14$$

C)

29

$$x^2 + 20x + y^2 + 16y = -20$$

The equation above defines a circle in the xy-plane. What are the coordinates of the center of the circle?

A) $(-20, -16)$
B) $(-10, -8)$
C) $(10, 8)$
D) $(20, 16)$

$$x^2 + 20x + y^2 + 16y = -20$$
$$x^2 + 20x + 100 + y^2 + 16y + 64 = -20 + 100 + 64$$
$$(x + 10)^2 + (y + 8)^2 = 144$$

Center= $(-10, -8)$

B)

30

$$y = x^2 - a$$

In the equation above, a is a positive constant and the graph of the equation in the xy-plane is a parabola. Which of the following is an equivalent form of the equation?

A) $y = (x + a)(x - a)$

B) $y = (x + \sqrt{a})(x - \sqrt{a})$

C) $y = \left(x + \frac{a}{2}\right)\left(x - \frac{a}{2}\right)$

D) $y = (x + a)^2$

$$y = x^2 - a$$
$$y = (x + \sqrt{a})(x - \sqrt{a})$$

A)

31

Horsepower and watts are units of measure of power. They are directly proportional such that 5 horsepower is equal to 3730 watts. How much power, in watts, is equal to 2 horsepower?

Directly Proportional: $y = kx$

$$3730 = k(5)$$
$$k = \frac{3730}{5}$$
$$k = 746$$

$$y = 2(746) = 1492$$

1492

32

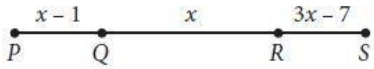
The painting *The Starry Night* by Vincent van Gogh is rectangular in shape with height 29 inches and width 36.25 inches. If a reproduction was made where each dimension is $\frac{1}{3}$ the corresponding original dimension, what is the height of the reproduction, in inches?

29 inches height
36.25 inches

$\frac{29}{3} = 9.66$

$\frac{29}{3}, 9.66$

33



Note: Figure not drawn to scale.

On $\overline{PS}$ above, $PQ = RS$. What is the length of $\overline{PS}$?

If PQ= RS then:

$$x - 1 = 3x - 7$$
$$6 = 2x$$
$$x = \frac{6}{2}$$
$$x = 3$$
$$Length = x - 1 + x + 3x - 7$$
$$Length = 5x - 8$$
$$Length = 15 - 8 = 7$$

7

34

In the xy-plane, the point $(2, 5)$ lies on the graph of the function f. If $f(x) = k - x^2$, where k is a constant, what is the value of k ?

$$5 = k - 2^2$$
$$k = 9$$

9

35

A landscaper is designing a rectangular garden. The length of the garden is to be 5 feet longer than the width. If the area of the garden will be 104 square feet, what will be the length, in feet, of the garden?

Length is 5ft longer than the width

$$L = w + 5$$

Area=L*W

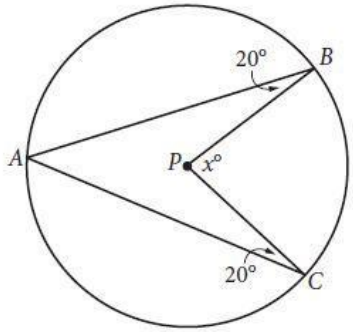
$$w(w + 5) = 104$$
$$w^2 + 5w - 104 = 0$$
$$w^2 + 12w - 7w - 104) = 0$$
$$w(w + 12) - 7(w + 12) = 0$$
$$(w - 7)(w + 12) = 0$$

W=7

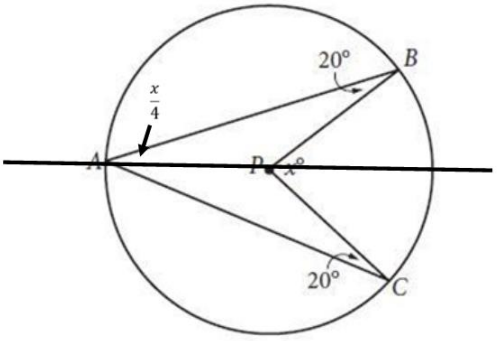
$$L = 7 + 5 = 12$$

So Length=12

36



Point P is the center of the circle in the figure above. What is the value of x ?



$\angle A = \frac{x}{2}$, half of that is $\frac{x}{4}$

$$\frac{x}{4} + 20 = \frac{x}{2}$$

This is true because two interior angles will add to the other exterior angle

Multiplying both sides by 4:

$$x + 80 = 2x$$

$$x = 80$$

80

Questions 37 and 38 refer to the following information.

Ms. Simon's Workday Morning Drive

Segment of drive	Distance (miles)	Average driving speed with no traffic delay (mph)
From home to freeway entrance	0.6	25
From freeway entrance to freeway exit	15.4	50
From freeway exit to workplace	1.4	35

Ms. Simon drives her car from her home to her workplace every workday morning. The table above shows the distance, in miles, and her average driving speed, in miles per hour (mph), when there is no traffic delay, for each segment of her drive.

37

One morning, Ms. Simon drove directly from her home to her workplace in 24 minutes. What was her average speed, in miles per hour, during her drive that morning?

$$Average\ Speed = \frac{Total\ Distance}{Total\ Time}$$

$$Average\ Speed = \frac{0.6 + 15.4 + 1.4}{\frac{24}{60}}$$

$$Average\ Speed = \frac{17.4}{\frac{24}{60}} = 43.5$$

Questions 37 and 38 refer to the following information.

Ms. Simon's Workday Morning Drive

Segment of drive	Distance (miles)	Average driving speed with no traffic delay (mph)
From home to freeway entrance	0.6	25
From freeway entrance to freeway exit	15.4	50
From freeway exit to workplace	1.4	35

Ms. Simon drives her car from her home to her workplace every workday morning. The table above shows the distance, in miles, and her average driving speed, in miles per hour (mph), when there is no traffic delay, for each segment of her drive.

38

If Ms. Simon starts her drive at 6:30 a.m., she can drive at her average driving speed with no traffic delay for each segment of the drive. If she starts her drive at 7:00 a.m., the travel time from the freeway entrance to the freeway exit increases by 33% due to slower traffic, but the travel time for each of the other two segments of her drive does not change. Based on the table, how many more minutes does Ms. Simon take to arrive at her workplace if she starts her drive at 7:00 a.m. than if she starts her drive at 6:30 a.m.? (Round your answer to the nearest minute.)

Departure Time	Time on Freeway
6:30am	$\frac{15.4}{50} * 60 = 18.48$
7:00am	$18.48 * 1.33 = 27.574$

$$27.574 - 18.48 = 6.1$$

6 mins