

Section 1.10 - Mathematical Modeling and Variation

1. Assume that y is directly proportional to x . Use the given x -value and y -value to find a linear model that relates y and x .

$x = 5, y = 24$

- a. $y = -\frac{24}{5}x$
- b. $y = 24x$
- c. $y = -\frac{5}{24}x$
- d. $y = \frac{24}{5}x$
- e. $y = \frac{5}{24}x$

ANSWER:

d

POINTS:

1

REFERENCES:

3.5.35

QUESTION TYPE:

Multi-Mode (Multiple choice)

HAS VARIABLES:

True

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10/7/2014 5:48 AM

2. Assume that y is directly proportional to x . Use the given x -value and y -value to find a linear model that relates y and x .

$x = 2, y = 58$

- a. $y = 29x$
- b. $y = -29x$
- c. $y = 58x$
- d. $y = -58x$
- e. $y = 29$

ANSWER:

a

POINTS:

1

REFERENCES:

3.5.36

QUESTION TYPE:

Multi-Mode (Multiple choice)

HAS VARIABLES:

True

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3. Assume that y is directly proportional to x . Use the given x -value and y -value to find a linear model that relates y and x .

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$$x = 38, y = 2400$$

- a. $y = \frac{1200}{19}x$
- b. $y = -2400x$
- c. $y = \frac{19}{1200}x$
- d. $y = -\frac{19}{1200}x$
- e. $y = -\frac{1200}{19}x$

ANSWER:

a

POINTS:

1

REFERENCES:

3.5.37

QUESTION TYPE:

Multi-Mode (Multiple choice)

HAS VARIABLES:

True

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4. The simple interest on an investment is directly proportional to the amount of the investment. By investing \$2400 in a certain bond issue, you obtained an interest payment of \$111.75 after 1 year. Find a mathematical model that gives the interest I for this bond issue after 1 year in terms of the amount invested P . (Round your answer to three decimal places.)

- a. $I = 0.047P$
- b. $I = 268,200P$
- c. $I = 21.477P$
- d. $I = 2400P$
- e. $I = 111.75P$

ANSWER:

a

POINTS:

1

REFERENCES:

3.5.39

QUESTION TYPE:

Multi-Mode (Multiple choice)

HAS VARIABLES:

True

DATE CREATED:

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5. The simple interest on an investment is directly proportional to the amount of the investment. By investing \$5800 in a municipal bond, you obtained an interest payment of \$221.25 after 1 year. Find a mathematical model that gives the interest I for this municipal bond after 1 year in terms of the amount invested P . (Round your answer to three decimal places.)

- a. $I = 26.215P$

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- b. $I = 221.25P$
- c. $I = 0.038P$
- d. $I = 1,283,250P$
- e. $I = 5800P$

ANSWER: c
POINTS: 1
REFERENCES: 3.5.40
QUESTION TYPE: Multi-Mode (Multiple choice)
HAS VARIABLES: True
DATE CREATED: 6/10/2014 4:21 PM
DATE MODIFIED: 10/14/2014 12:47 AM

6. On a yardstick with scales in inches and centimeters, you notice that 11 inches is approximately the same length as 33 centimeters. Use this information to find a mathematical model that relates centimeters y to inches x . Then use the model to find the numbers of centimeters in 60 inches and 70 inches. (Round your answer to one decimal place.)

- a. Model: $y = \frac{1}{3}x$; 20 cm, 23.3 cm
- b. Model: $y = 3x$; 180 cm, 23.3 cm
- c. Model: $y = 3x$; 20 cm, 210 cm
- d. Model: $y = 3x$; 180 cm, 210 cm
- e. Model: $y = \frac{1}{3}x$; 180 cm, 210 cm

ANSWER: d
POINTS: 1
REFERENCES: 3.5.41
QUESTION TYPE: Multi-Mode (Multiple choice)
HAS VARIABLES: True
DATE CREATED: 6/10/2014 4:21 PM
DATE MODIFIED: 10/23/2014 1:07 AM

7. When buying gasoline, you notice that 16 gallons of gasoline is approximately the same amount of gasoline as 51 liters. Use this information to find a linear model that relates liters y to gallons x . Then use the model to find the numbers of liters in 25 gallons and 45 gallons. (Round your answer to one decimal place.)

- a. Model: $y = \frac{16}{51}x$; 7.8 L, 14.1 L
- b. Model: $y = \frac{51}{16}x$; 79.7 L, 14.1 L
- c. Model: $y = \frac{51}{16}x$; 7.8 L, 143.4 L

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- d. Model: $y = \frac{51}{16}x$; 79.7 L, 143.4 L
- e. Model: $y = \frac{16}{51}x$; 79.7 L, 143.4 L

ANSWER: d
POINTS: 1
REFERENCES: 3.5.42
QUESTION TYPE: Multi-Mode (Multiple choice)
HAS VARIABLES: True
DATE CREATED: 6/10/2014 4:21 PM
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8. Property tax is based on the assessed value of a property. A house that has an assessed value of \$200,000 has a property tax of \$4,820. Find a mathematical model that gives the amount of property tax y in terms of the assessed value x of the property. Use the model to find the property tax on a house that has an assessed value of \$230,000. (Round your answer to four decimal places.)

- a. $y = 0.0241x$; \$230,000
b. $y = 0.0241x$; \$5543
c. $y = 41.4938x$; \$5543
d. $y = 41.4938x$; \$9,543,568
e. $y = 0.0241x$; \$9,543,568

ANSWER: b
POINTS: 1
REFERENCES: 3.5.43
QUESTION TYPE: Multi-Mode (Multiple choice)
HAS VARIABLES: True
DATE CREATED: 6/10/2014 4:21 PM
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9. State sales tax is based on retail price. An item that sells for \$180.99 has a sales tax of \$17.4. Find a mathematical model that gives the amount of sales tax y in terms of the retail price x . Use the model to find the sales tax on a \$589.99 purchase. (Round your answer to four decimal places.)

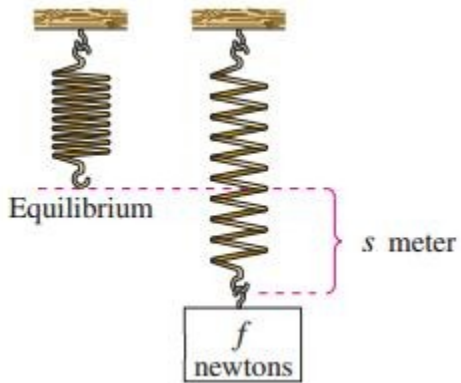
- a. $y = 10.4017x$; \$56.72
b. $y = 0.0961x$; \$56.72
c. $y = 0.0961x$; \$589.99
d. $y = 0.0961x$; \$6,137
e. $y = 10.4017x$; \$6,137

ANSWER: b
POINTS: 1
REFERENCES: 3.5.44

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QUESTION TYPE: Multi-Mode (Multiple choice)
HAS VARIABLES: True
DATE CREATED: 6/10/2014 4:21 PM
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10. A force of $f = 225$ newtons stretches a spring $s = 0.15$ meter (see figure).



How far will a force of 60 newtons stretch the spring? What force is required to stretch the spring 0.1 meter?

- a. 0.15 m; 150 N
- b. 0.15 m; 225 N
- c. 0.04 m; 150 N
- d. 0.09 m; 285 N
- e. 0.04 m; 225 N

ANSWER: c
POINTS: 1
REFERENCES: 3.5.45
QUESTION TYPE: Multi-Mode (Multiple choice)
HAS VARIABLES: True
DATE CREATED: 6/10/2014 4:21 PM
DATE MODIFIED: 10/14/2014 3:59 AM

11. A force of 270 newtons stretches a spring 0.18 meter. What force is required to stretch the spring 0.19 meter?

- a. 295 N
- b. 290 N
- c. 285 N
- d. 280 N
- e. 270 N

ANSWER: c
POINTS: 1
REFERENCES: 3.5.46
QUESTION TYPE: Multi-Mode (Multiple choice)

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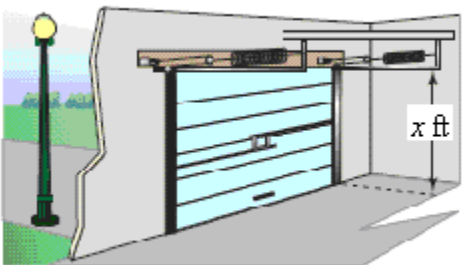
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12. The coiled spring of a toy supports the weight of a child. The spring is compressed a distance of 1.6 inches by the weight of a 35-pound child. The toy will not work properly if its spring is compressed more than 6 inches. What is the weight of the heaviest child who should be allowed to use the toy? (Round your answer to two decimal places.)

- a. 136.25 lb
- b. 126.25 lb
- c. 131.25 lb
- d. 35 lb
- e. 141.25 lb

ANSWER: c
POINTS: 1
REFERENCES: 3.5.47
QUESTION TYPE: Multi-Mode (Multiple choice)
HAS VARIABLES: True
DATE CREATED: 6/10/2014 4:21 PM
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13. An overhead garage door has two springs, one on each side of the door (see figure). A force of ²⁰ pounds is required to stretch each spring 1 foot. Because of a pulley system, the springs stretch only one-half the distance the door travels. The door moves a total of ^{x = 18} feet, and the springs are at their natural length when the door is open. Find the combined lifting force applied to the door by the springs when the door is closed.



- a. Combined lifting force = $2F = 356$ lb
- b. Combined lifting force = $2F = 360$ lb
- c. Combined lifting force = $2F = 362$ lb
- d. Combined lifting force = $2F = 358$ lb
- e. Combined lifting force = $2F = 364$ lb

ANSWER: b
POINTS: 1

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REFERENCES: 3.5.48
QUESTION TYPE: Multi-Mode (Multiple choice)
HAS VARIABLES: True
DATE CREATED: 6/10/2014 4:21 PM
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14. Find a mathematical model representing the statement. (Determine the constant of proportionality.)

y is inversely proportional to x . ($y = 7$ when $x = 5$.)

- a. $y = \frac{5}{x}$
- b. $y = \frac{x}{35}$
- c. $y = 35x$
- d. $y = \frac{35}{x}$
- e. $y = \frac{7}{x}$

ANSWER: d
POINTS: 1
REFERENCES: 3.5.69
QUESTION TYPE: Multi-Mode (Multiple choice)
HAS VARIABLES: True
DATE CREATED: 6/10/2014 4:21 PM
DATE MODIFIED: 10/14/2014 2:36 AM

15. Find a mathematical model representing the statement. (Determine the constant of proportionality.)

y varies inversely as x . ($y = 9$ when $x = 45$.)

- a. $y = \frac{9}{x}$
- b. $y = \frac{405}{x}$
- c. $y = \frac{x}{405}$
- d. $y = \frac{45}{x}$
- e. $y = 405x$

ANSWER: b
POINTS: 1

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REFERENCES: 3.5.68
QUESTION TYPE: Multi-Mode (Multiple choice)
HAS VARIABLES: True
DATE CREATED: 6/10/2014 4:21 PM
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16. Find a mathematical model representing the statement. (Determine the constant of proportionality.)

z varies jointly as x and y . ($z = 128$ when $x = 4$ and $y = 8$.)

- a. $z = \frac{4y}{x}$
- b. $z = \frac{4}{xy}$
- c. $z = \frac{xy}{4}$
- d. $z = \frac{4x}{y}$
- e. $z = 4xy$

ANSWER: e
POINTS: 1
REFERENCES: 3.5.70
QUESTION TYPE: Multi-Mode (Multiple choice)
HAS VARIABLES: True
DATE CREATED: 6/10/2014 4:21 PM
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17. Find a mathematical model representing the statement. (Determine the constant of proportionality.)

F is jointly proportional to r and the third power of s . ($F = 24750$ when $r = 18$ and $s = 5$.)

- a. $F = \frac{11r}{s^3}$
- b. $F = \frac{rs^3}{11}$
- c. $F = 11rs^3$
- d. $F = \frac{11}{rs^3}$
- e. $F = \frac{11s^3}{r}$

ANSWER: c

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POINTS: 1
REFERENCES: 3.5.71
QUESTION TYPE: Multi-Mode (Multiple choice)
HAS VARIABLES: True
DATE CREATED: 6/10/2014 4:21 PM
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18. Find a mathematical model representing the statement. (Determine the constant of proportionality.)

P varies directly as x and inversely as the square of y . ($P = \frac{3}{2}$ when $x = 25$ and $y = 10$.)

- a. $P = \frac{xy^2}{6}$
- b. $P = \frac{6x}{y}$
- c. $P = \frac{6x}{y^2}$
- d. $P = \frac{6y^2}{x}$
- e. $P = 6xy^2$

ANSWER: c
POINTS: 1
REFERENCES: 3.5.72
QUESTION TYPE: Multi-Mode (Multiple choice)
HAS VARIABLES: True
DATE CREATED: 6/10/2014 4:21 PM
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19. The work W (in joules) done when lifting an object varies jointly with the mass m (in kilograms) of the object and the height h (in meters) that the object is lifted. The work done when a 120-kilogram object is lifted 1.8 meters is 2116.8 joules. How much work is done when lifting a 200-kilogram object 1.5 meters?

- a. 2960 J
- b. 2920 J
- c. 2940 J
- d. 2950 J
- e. 2930 J

ANSWER: c
POINTS: 1
REFERENCES: 3.5.79
QUESTION TYPE: Multi-Mode (Multiple choice)

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HAS VARIABLES: True
DATE CREATED: 6/10/2014 4:21 PM
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20. Assume that y is directly proportional to x . Use the given x -value and y -value to find a linear model that relates y and x .

$$x = 5, y = 380$$

- a. $y = 76x$
- b. $y = -76x$
- c. $y = \frac{1}{76}x$
- d. $y = -\frac{1}{76}x$
- e. $y = -380x$

ANSWER: a
POINTS: 1
REFERENCES: 3.5.38
QUESTION TYPE: Multi-Mode (Multiple choice)
HAS VARIABLES: True
DATE CREATED: 6/10/2014 4:21 PM
DATE MODIFIED: 5/18/2015 1:59 AM

21. Determine whether the variation model is of the form $y = kx$ or $y = \frac{k}{x}$ and find k . Then write a model that relates y and x .

x	4	8	12	16	20
y	1	$\frac{1}{2}$	$\frac{1}{3}$	$\frac{1}{4}$	$\frac{1}{5}$

- a. $y = 4x$
- b. $y = \frac{1}{x}$
- c. $y = \frac{4}{x}$
- d. $y = x$
- e. $y = \frac{x}{4}$

ANSWER: c
POINTS: 1
REFERENCES: 3.5.31
QUESTION TYPE: Multi-Mode (Multiple choice)

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HAS VARIABLES: True
DATE CREATED: 6/10/2014 4:21 PM
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22. Determine whether the variation model is of the form $y = kx$ or $y = \frac{k}{x}$ and find k . Then write a model that relates y and x .

x	9	18	27	36	45
y	2	4	6	8	10

a. $y = \frac{2}{9}x$

b. $y = \frac{9}{x}$

c. $y = \frac{2}{9x}$

d. $y = \frac{9}{2x}$

e. $y = \frac{9}{2}x$

ANSWER: a
POINTS: 1
REFERENCES: 3.5.32
QUESTION TYPE: Multi-Mode (Multiple choice)
HAS VARIABLES: True
DATE CREATED: 6/10/2014 4:21 PM
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23. Determine whether the variation model is of the form $y = kx$ or $y = \frac{k}{x}$ and find k . Then write a model that relates y and x .

x	5	10	15	20	25
y	-1.5	-3	-4.5	-6	-7.5

a. $y = -\frac{3}{10x}$

b. $y = \frac{10}{3}x$

c. $y = -\frac{3}{10}x$

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d. $y = \frac{3}{10}x$

e. $y = -\frac{10}{3}x$

ANSWER: c
 POINTS: 1
 REFERENCES: 3.5.33
 QUESTION TYPE: Multi-Mode (Multiple choice)
 HAS VARIABLES: True
 DATE CREATED: 6/10/2014 4:21 PM
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24. Determine whether the variation model is of the form $y = kx$ or $y = \frac{k}{x}$ and find k . Then write a model that relates y and x .

x	5	10	15	20	25
y	26	13	$\frac{26}{3}$	$\frac{13}{2}$	$\frac{26}{5}$

a. $y = \frac{130}{x}$

b. $y = \frac{x}{130}$

c. $y = \frac{1}{x}$

d. $y = 130x$

e. $y = x$

ANSWER: a
 POINTS: 1
 REFERENCES: 3.5.34
 QUESTION TYPE: Multi-Mode (Multiple choice)
 HAS VARIABLES: True
 DATE CREATED: 6/10/2014 4:21 PM
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25. Use the given value of k to complete the table for the direct variation model

$y = kx^2$

Plot the points on a rectangular coordinate system.

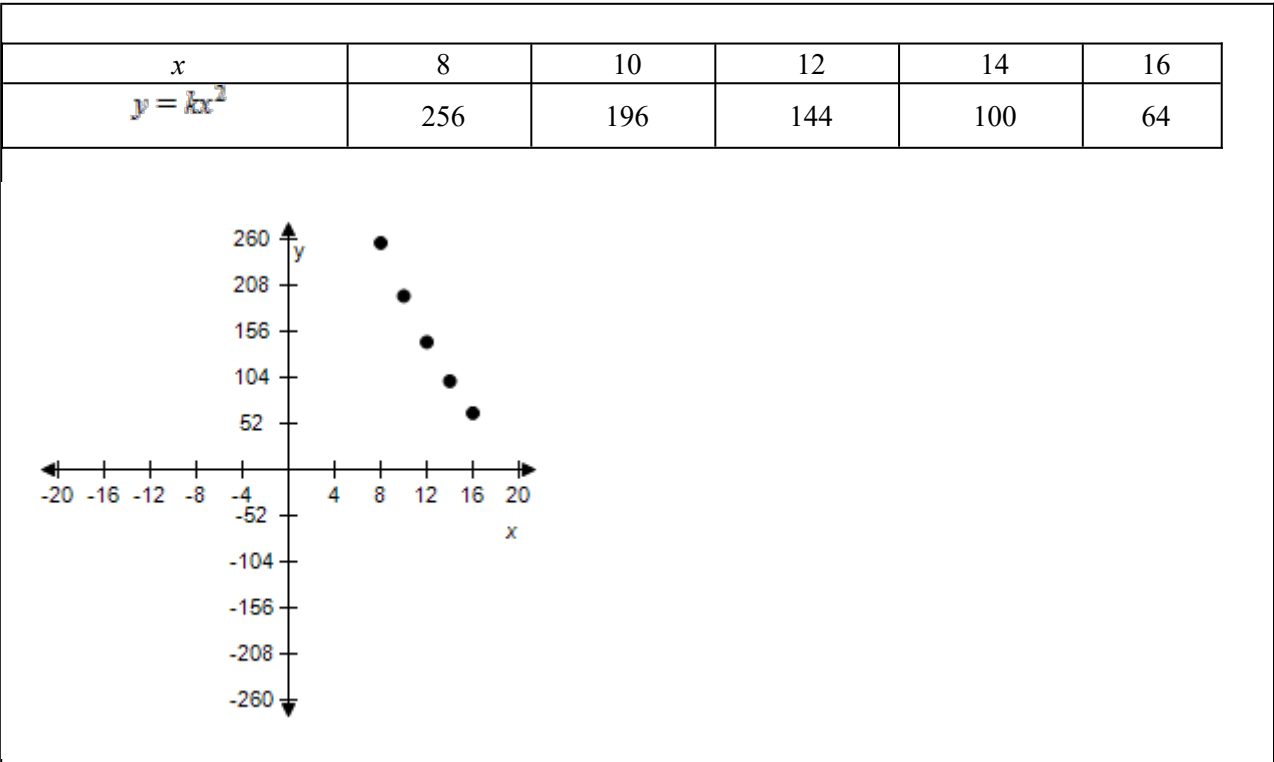
x	8	10	12	14	16
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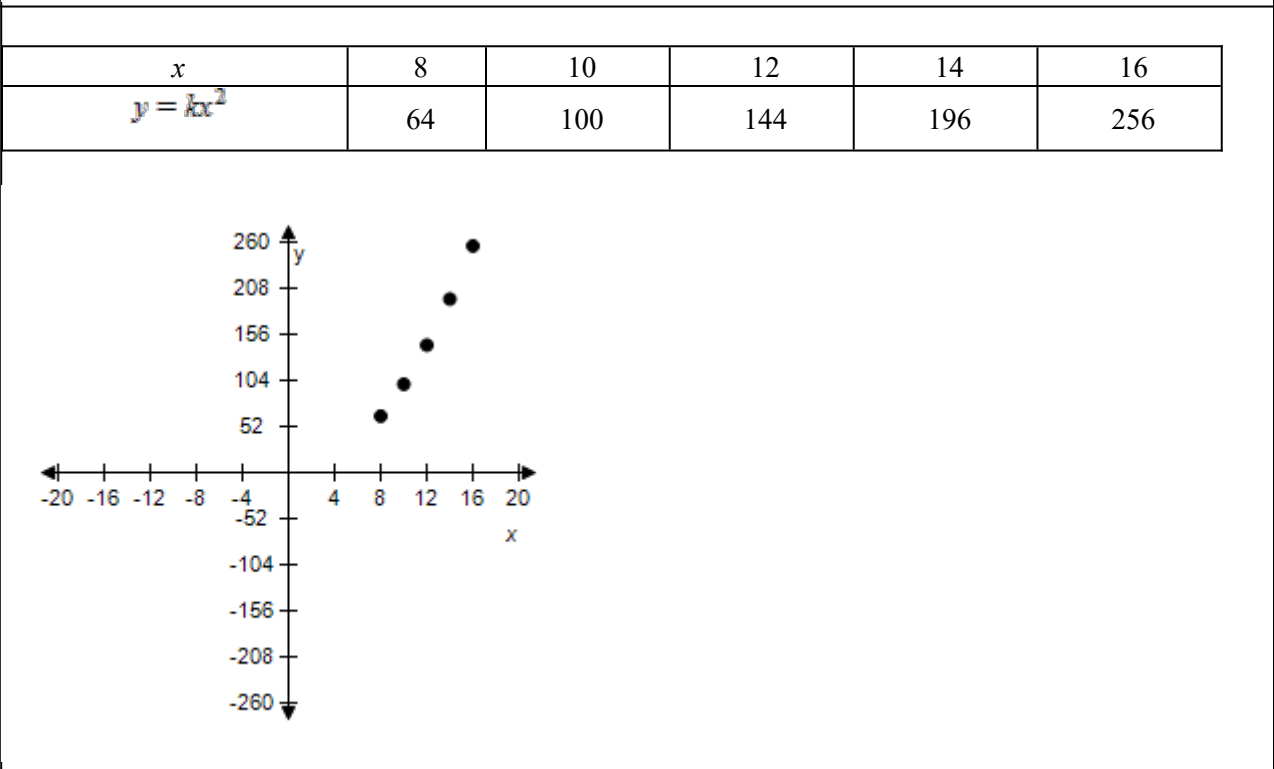
$y = kx^2$					
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$k = 1$

a.



b.

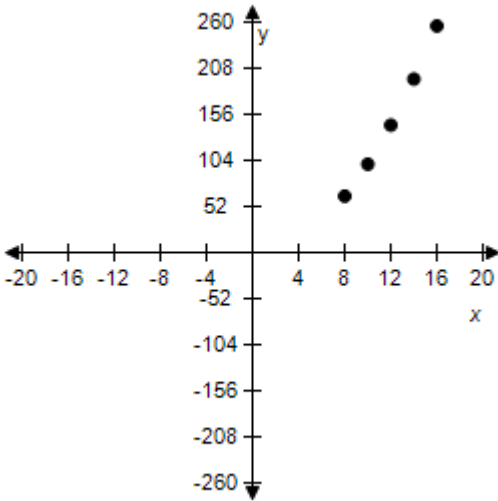


c.

x	8	10	12	14	16
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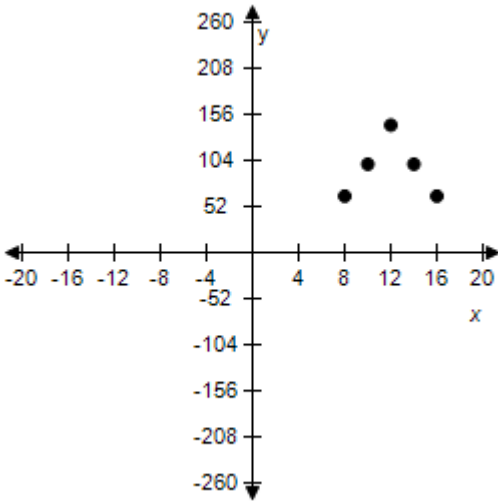
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$y = kx^2$	64	64	64	64	64
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d.

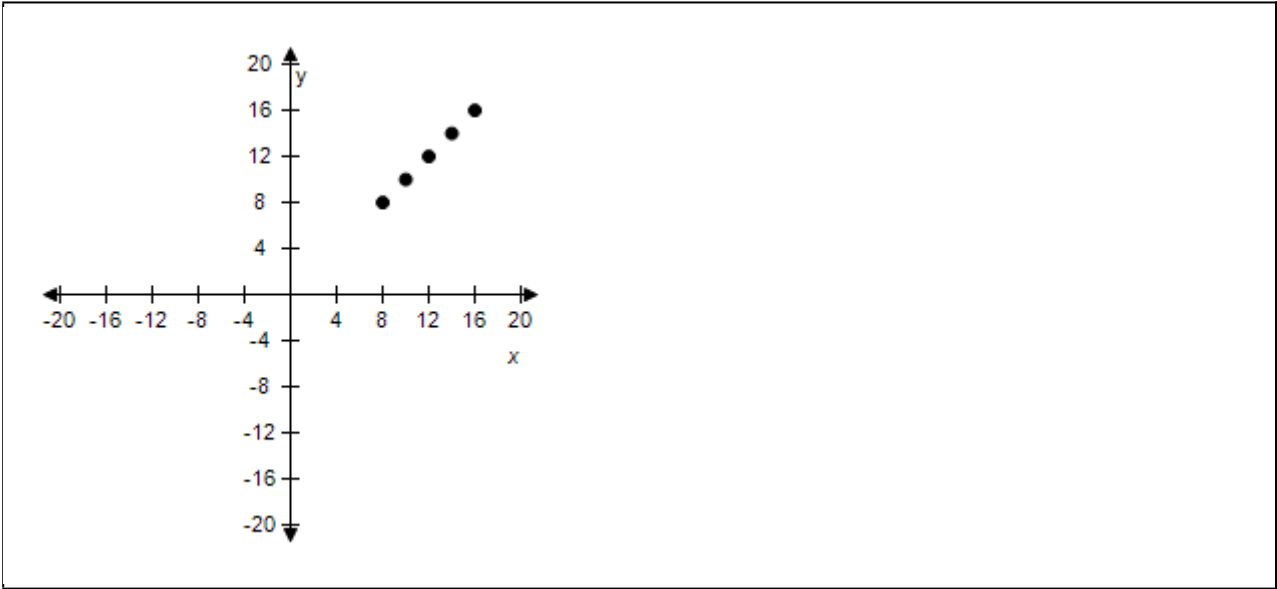
x	8	10	12	14	16
$y = kx^2$	64	100	144	196	256



e.

x	8	10	12	14	16
$y = kx^2$	8	10	12	14	16

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ANSWER: b

POINTS: 1

REFERENCES: 3.5.23

QUESTION TYPE: Multi-Mode (Multiple choice)

HAS VARIABLES: True

DATE CREATED: 10/22/2014 11:56 PM

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26. Use the given value of k to complete the table for the direct variation model

$y = kx^2$

Plot the points on a rectangular coordinate system.

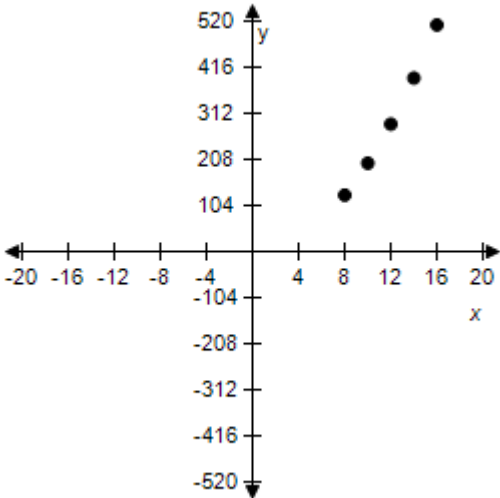
x	8	10	12	14	16
$y = kx^2$					

$k = 2$

a.

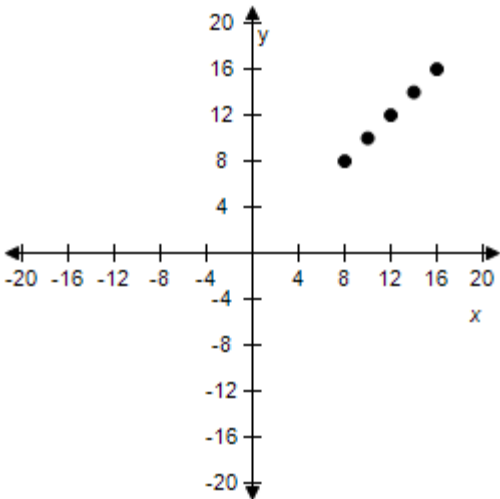
x	8	10	12	14	16
$y = kx^2$	128	200	288	392	512

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b.

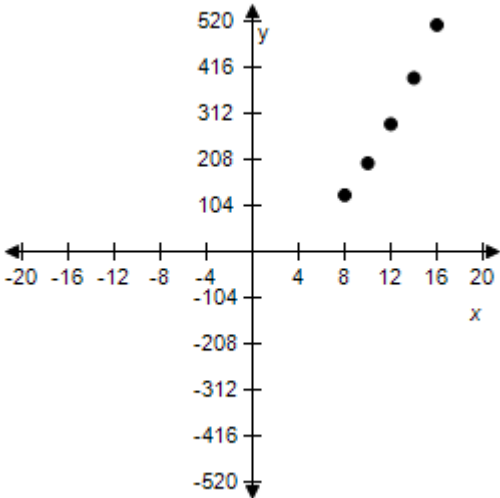
x	8	10	12	14	16
$y = kx^2$	8	10	12	14	16



c.

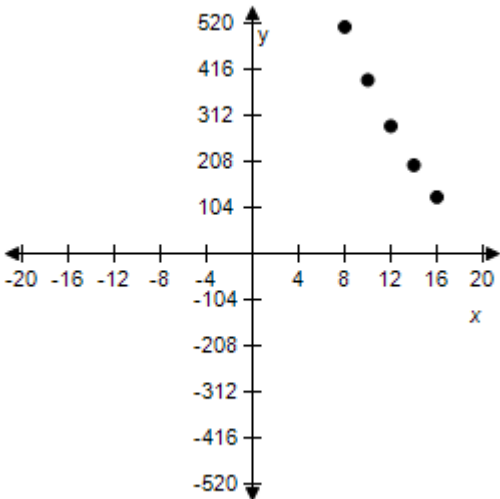
x	8	10	12	14	16
$y = kx^2$	128	128	128	128	128

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d.

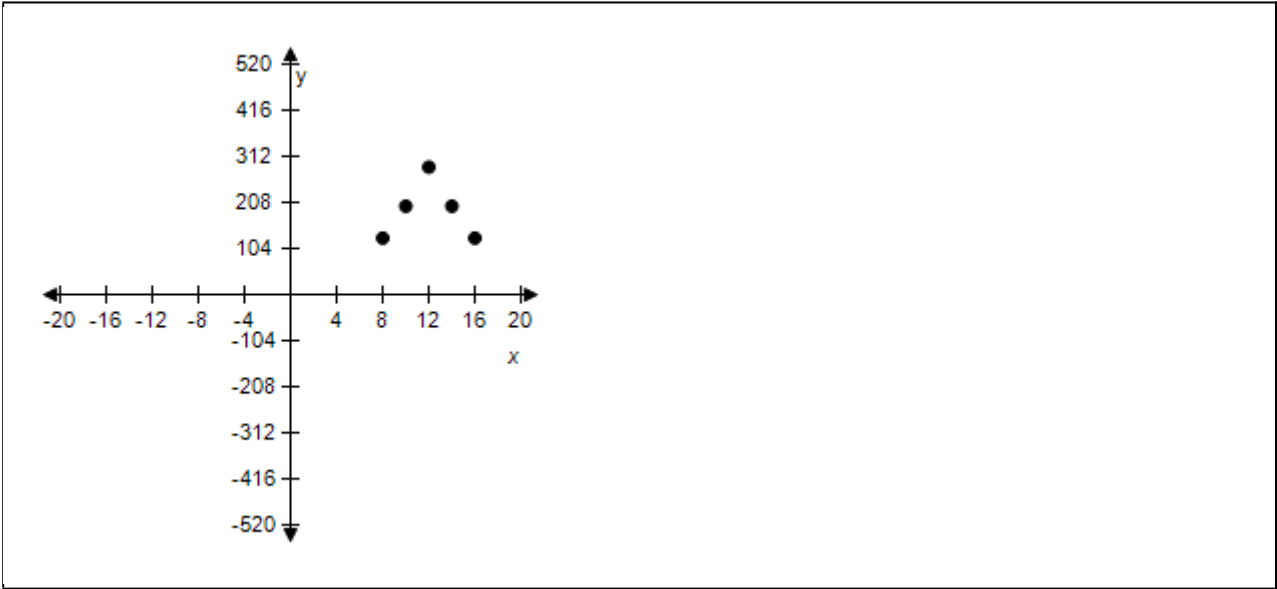
x	8	10	12	14	16
$y = kx^2$	512	392	288	200	128



e.

x	8	10	12	14	16
$y = kx^2$	128	200	288	200	128

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ANSWER: a

POINTS: 1

REFERENCES: 3.5.24

QUESTION TYPE: Multi-Mode (Multiple choice)

HAS VARIABLES: True

DATE CREATED: 10/22/2014 11:38 PM

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27. Use the given value of k to complete the table for the direct variation model

$y = kx^2$

Plot the points on a rectangular coordinate system.

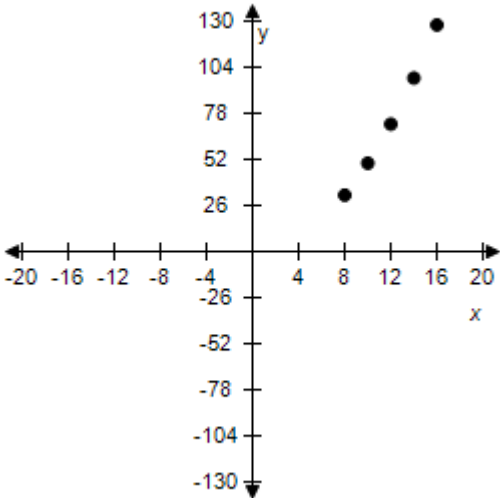
x	8	10	12	14	16
$y = kx^2$					

$k = \frac{1}{2}$

a.

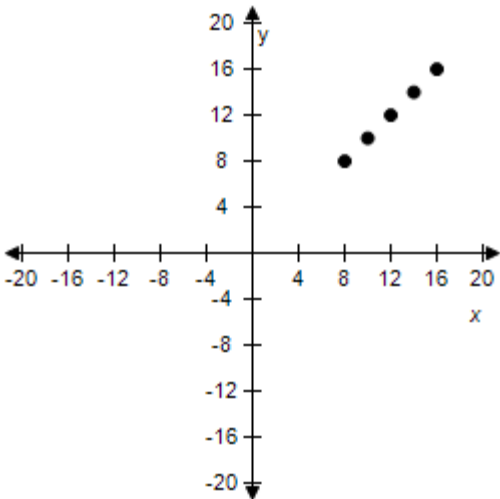
x	8	10	12	14	16
$y = kx^2$	32	50	72	98	128

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b.

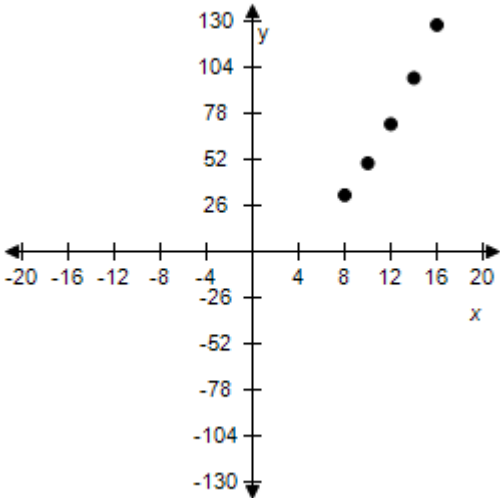
x	8	10	12	14	16
$y = kx^2$	8	10	12	14	16



c.

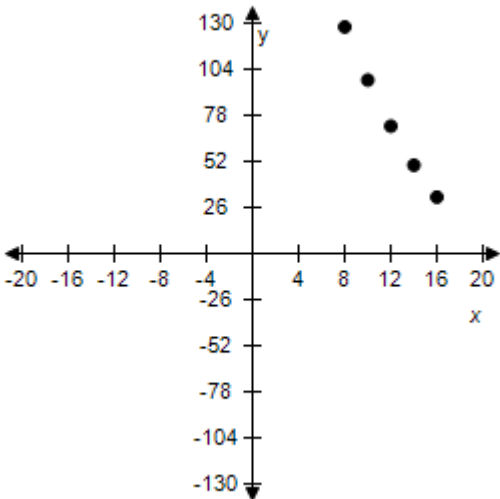
x	8	10	12	14	16
$y = kx^2$	32	32	32	32	32

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d.

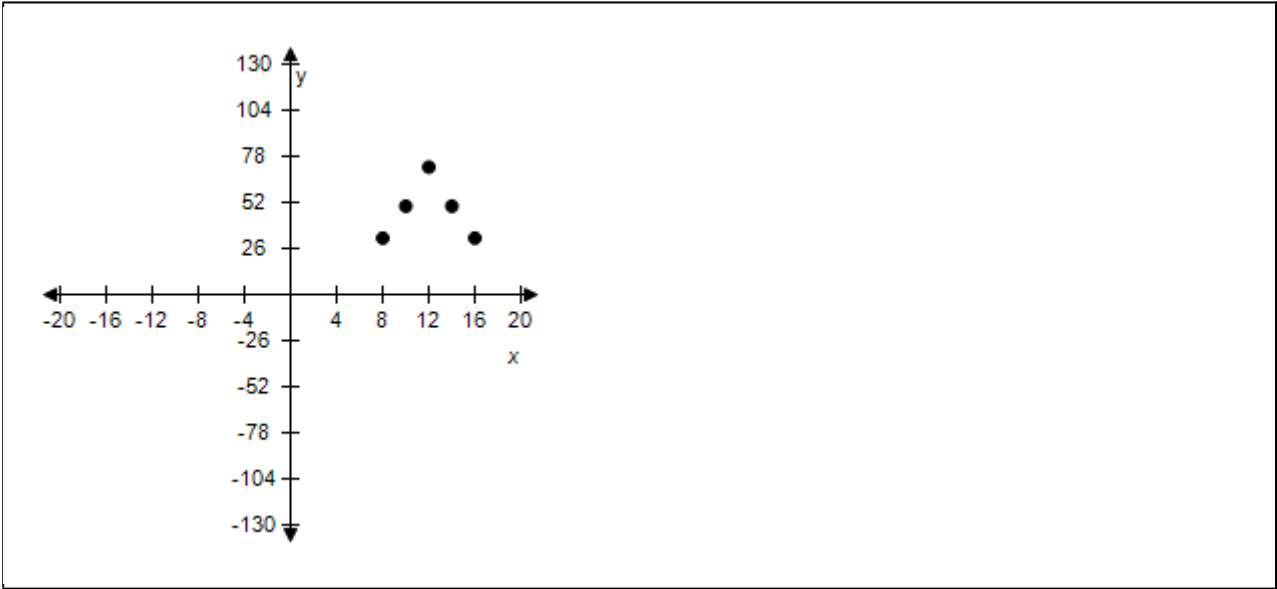
x	8	10	12	14	16
$y = kx^2$	128	98	72	50	32



e.

x	8	10	12	14	16
$y = kx^2$	32	50	72	50	32

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ANSWER: a

POINTS: 1

REFERENCES: 3.5.25

QUESTION TYPE: Multi-Mode (Multiple choice)

HAS VARIABLES: True

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28. Use the given value of k to complete the table for the direct variation model

$y = kx^2$

Plot the points on a rectangular coordinate system.

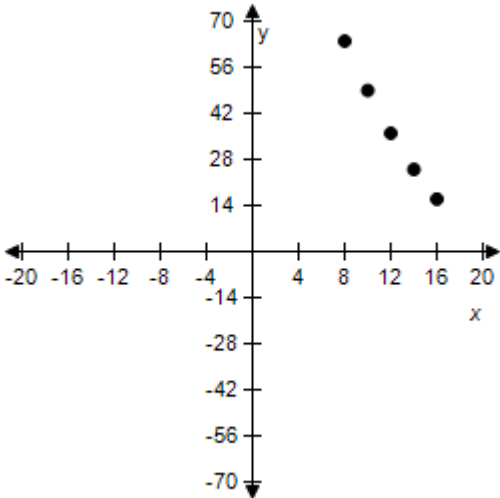
x	8	10	12	14	16
$y = kx^2$					

$k = \frac{1}{4}$

a.

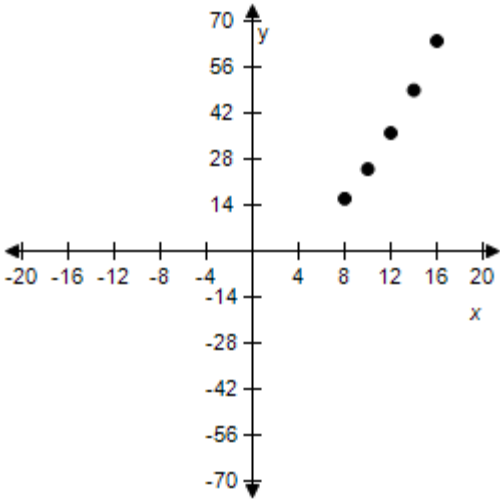
x	8	10	12	14	16
$y = kx^2$	64	49	36	25	16

Section 1.10 - Mathematical Modeling and Variation



b.

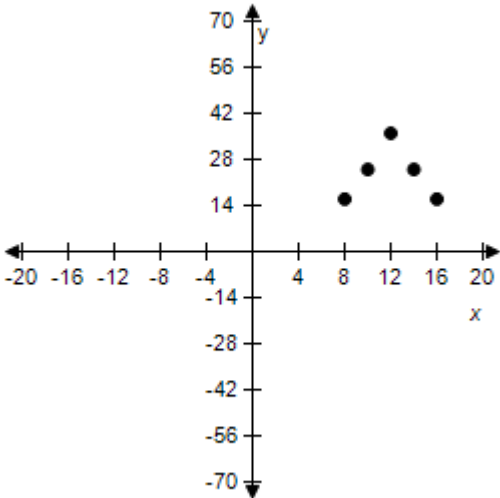
x	8	10	12	14	16
$y = kx^2$	16	16	16	16	16



c.

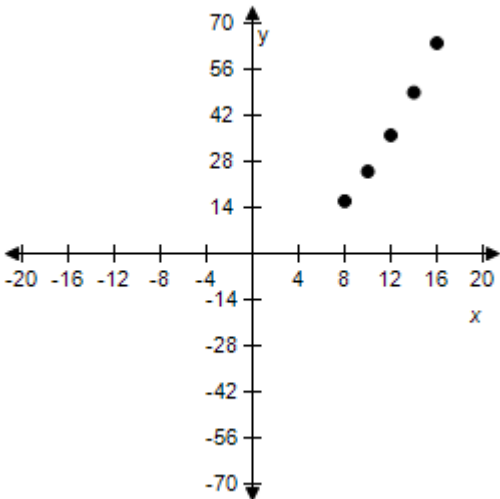
x	8	10	12	14	16
$y = kx^2$	16	25	36	25	16

Section 1.10 - Mathematical Modeling and Variation



d.

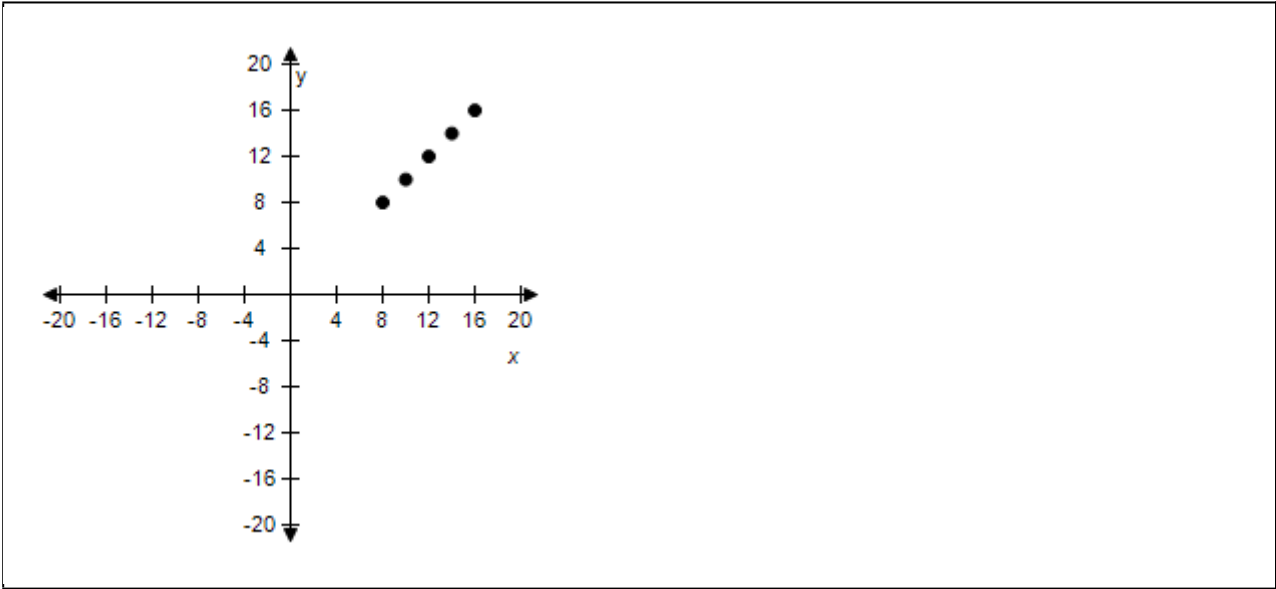
x	8	10	12	14	16
$y = kx^2$	16	25	36	49	64



e.

x	8	10	12	14	16
$y = kx^2$	8	10	12	14	16

Section 1.10 - Mathematical Modeling and Variation



ANSWER:

d

POINTS:

1

REFERENCES:

3.5.26

QUESTION TYPE:

Multi-Mode (Multiple choice)

HAS VARIABLES:

True

DATE CREATED:

10/22/2014 6:50 AM

DATE MODIFIED:

5/18/2015 11:43 PM

29. Use the given value of k to complete the table for the inverse variation model

$y = \frac{k}{x^2}$

Plot the points on a rectangular coordinate system.

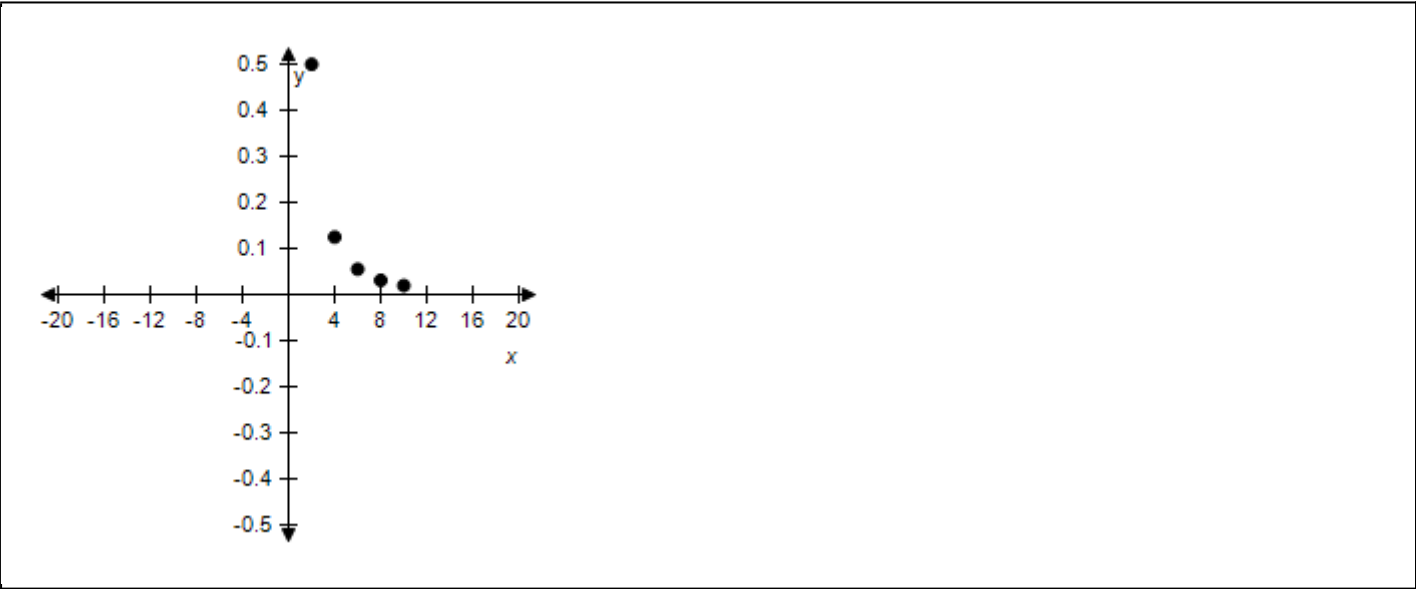
x	2	4	6	8	10
$y = \frac{k}{x^2}$					

$k = 2$

a.

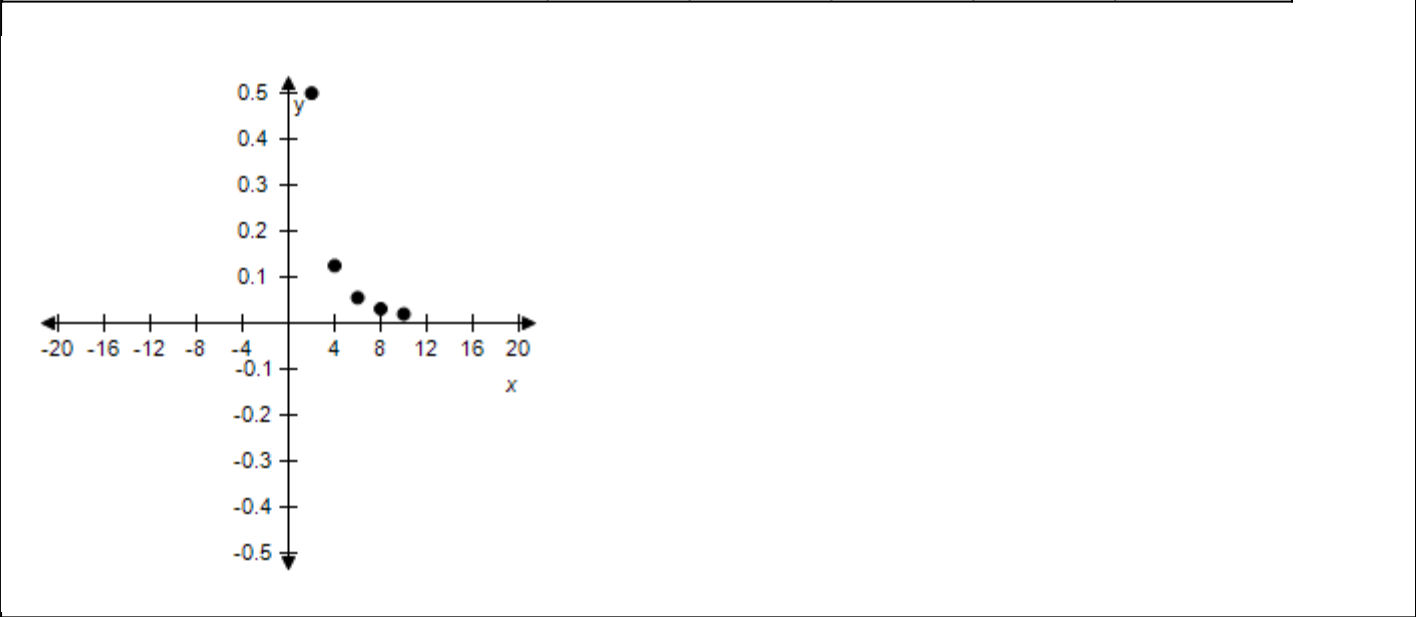
x	2	4	6	8	10
$y = \frac{k}{x^2}$	$\frac{1}{2}$	$\frac{1}{8}$	$\frac{1}{18}$	$\frac{1}{32}$	$\frac{1}{50}$

Section 1.10 - Mathematical Modeling and Variation



b.

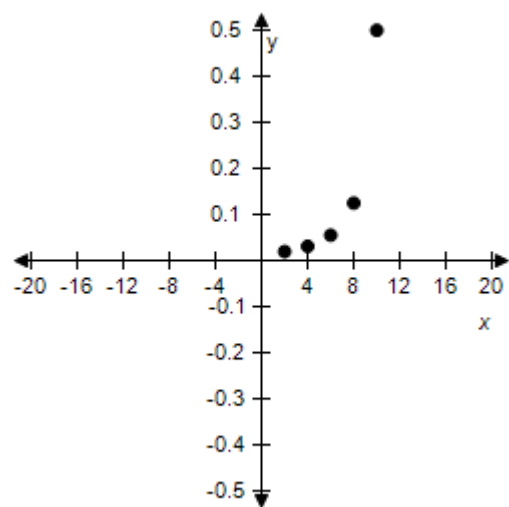
x	2	4	6	8	10
$y = \frac{k}{x^2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$



c.

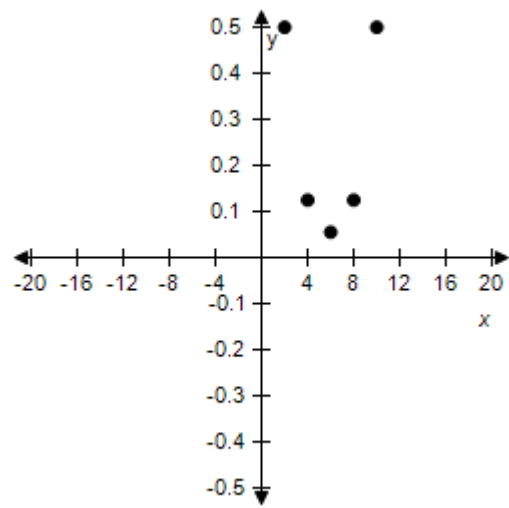
x	2	4	6	8	10
$y = \frac{k}{x^2}$	$\frac{1}{50}$	$\frac{1}{32}$	$\frac{1}{18}$	$\frac{1}{8}$	$\frac{1}{2}$

Section 1.10 - Mathematical Modeling and Variation



d.

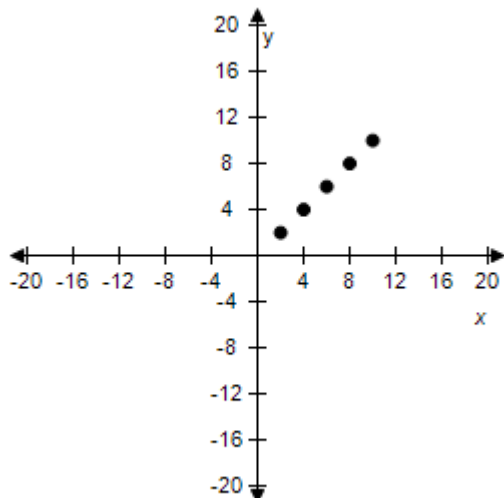
x	2	4	6	8	10
$y = kx^2$	$\frac{1}{2}$	$\frac{1}{8}$	$\frac{1}{18}$	$\frac{1}{8}$	$\frac{1}{2}$



e.

x	2	4	6	8	10
$y = \frac{k}{x^2}$	2	4	6	8	10

Section 1.10 - Mathematical Modeling and Variation



ANSWER:

a

POINTS:

1

REFERENCES:

3.5.27

QUESTION TYPE:

Multi-Mode (Multiple choice)

HAS VARIABLES:

True

DATE CREATED:

10/22/2014 5:52 AM

DATE MODIFIED:

5/19/2015 1:10 AM

30. Use the given value of k to complete the table for the inverse variation model

$$y = \frac{k}{x^2}$$

Plot the points on a rectangular coordinate system.

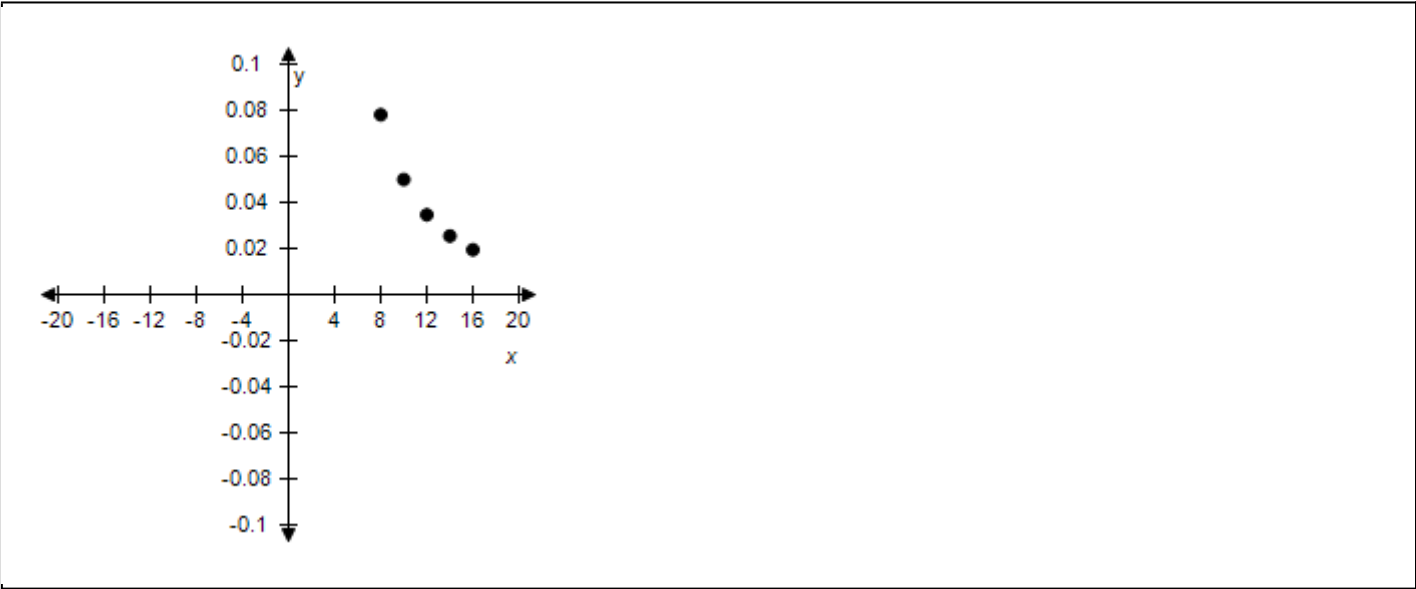
x	8	10	12	14	16
$y = \frac{k}{x^2}$					

$$k = 5$$

a.

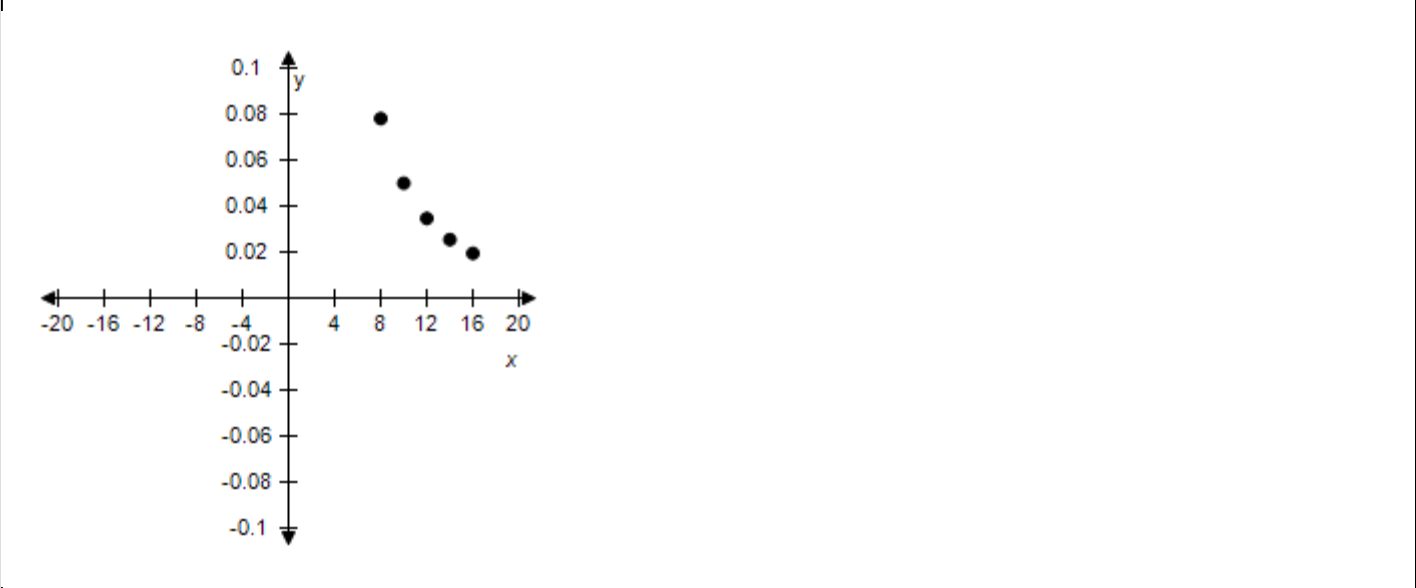
x	8	10	12	14	16
$y = \frac{k}{x^2}$	$\frac{5}{64}$	$\frac{1}{20}$	$\frac{5}{144}$	$\frac{5}{196}$	$\frac{5}{256}$

Section 1.10 - Mathematical Modeling and Variation



b.

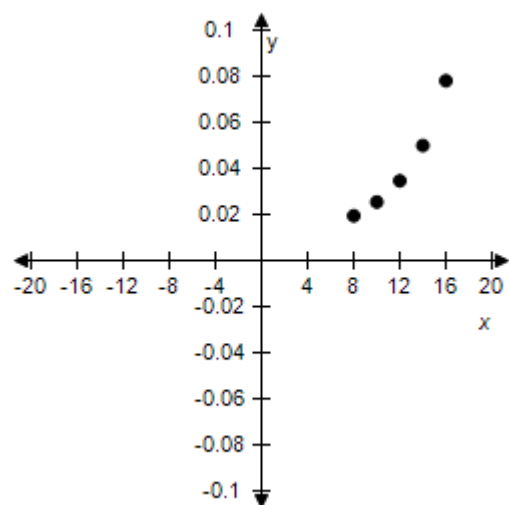
x	8	10	12	14	16
$y = \frac{k}{x^2}$	$\frac{5}{64}$	$\frac{5}{64}$	$\frac{5}{64}$	$\frac{5}{64}$	$\frac{5}{64}$



c.

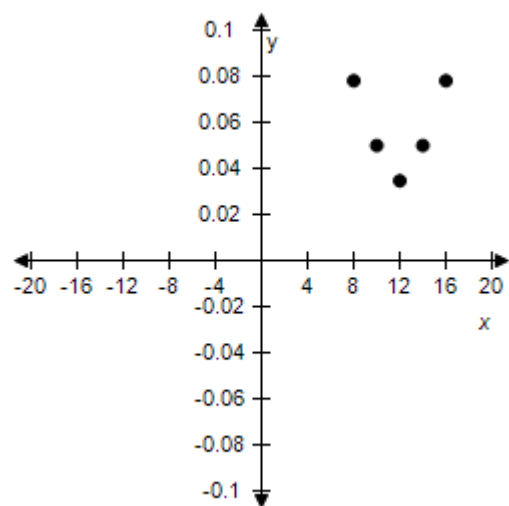
x	8	10	12	14	16
$y = \frac{k}{x^2}$	$\frac{5}{256}$	$\frac{5}{196}$	$\frac{5}{144}$	$\frac{1}{20}$	$\frac{5}{64}$

Section 1.10 - Mathematical Modeling and Variation



d.

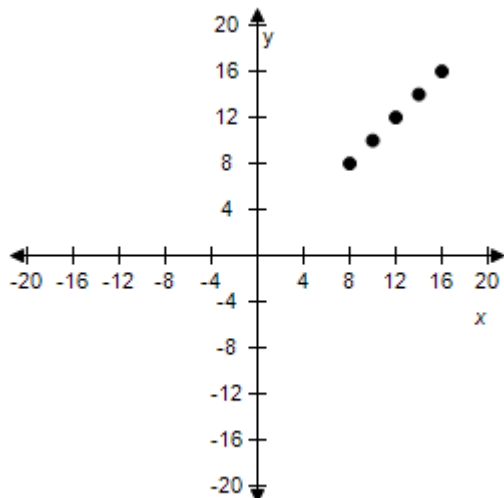
x	8	10	12	14	16
$y = \frac{k}{x^2}$	$\frac{5}{64}$	$\frac{1}{20}$	$\frac{5}{144}$	$\frac{1}{20}$	$\frac{5}{64}$



e.

x	8	10	12	14	16
$y = \frac{k}{x^2}$	8	10	12	14	16

Section 1.10 - Mathematical Modeling and Variation



ANSWER:

a

POINTS:

1

REFERENCES:

3.5.28

QUESTION TYPE:

Multi-Mode (Multiple choice)

HAS VARIABLES:

True

DATE CREATED:

10/22/2014 4:52 AM

DATE MODIFIED:

5/19/2015 1:08 AM

31. Use the given value of k to complete the table for the inverse variation model

$$y = \frac{k}{x^2}$$

Plot the points on a rectangular coordinate system.

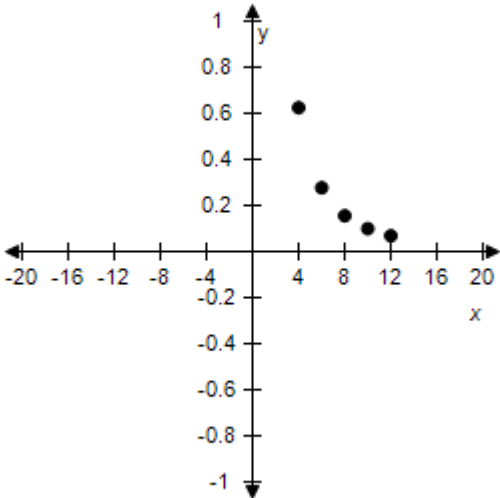
x	4	6	8	10	12
$y = \frac{k}{x^2}$					

$k = 10$

a.

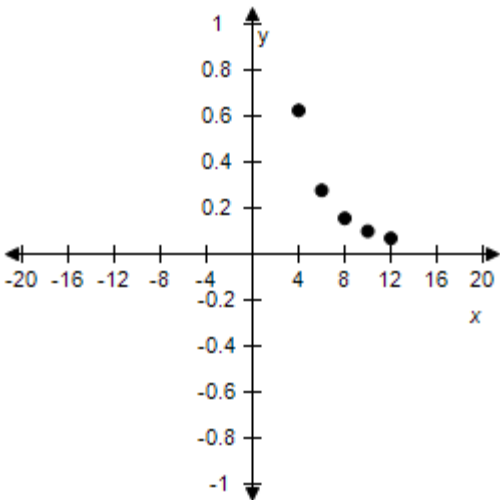
x	4	6	8	10	12
$y = \frac{k}{x^2}$ ☐	$\frac{5}{8}$	$\frac{5}{18}$	$\frac{5}{32}$	$\frac{1}{10}$	$\frac{5}{72}$

Section 1.10 - Mathematical Modeling and Variation



b.

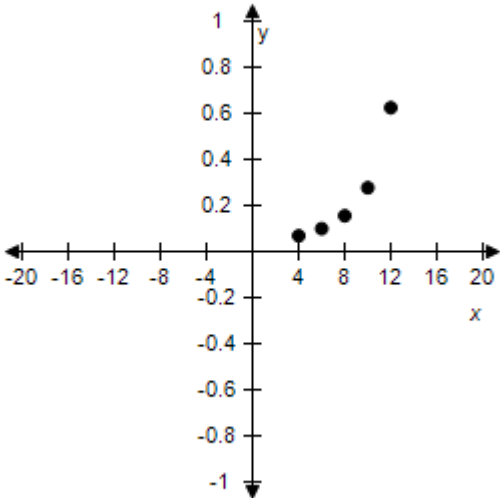
x	4	6	8	10	12
$y = \frac{k}{x^2}$	$\frac{5}{8}$	$\frac{5}{8}$	$\frac{5}{8}$	$\frac{5}{8}$	$\frac{5}{8}$



c.

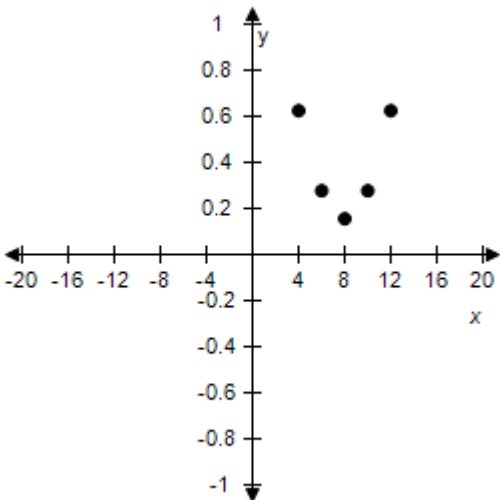
x	4	6	8	10	12
$y = \frac{k}{x^2}$	$\frac{5}{72}$	$\frac{1}{10}$	$\frac{5}{32}$	$\frac{5}{18}$	$\frac{5}{8}$

Section 1.10 - Mathematical Modeling and Variation



d.

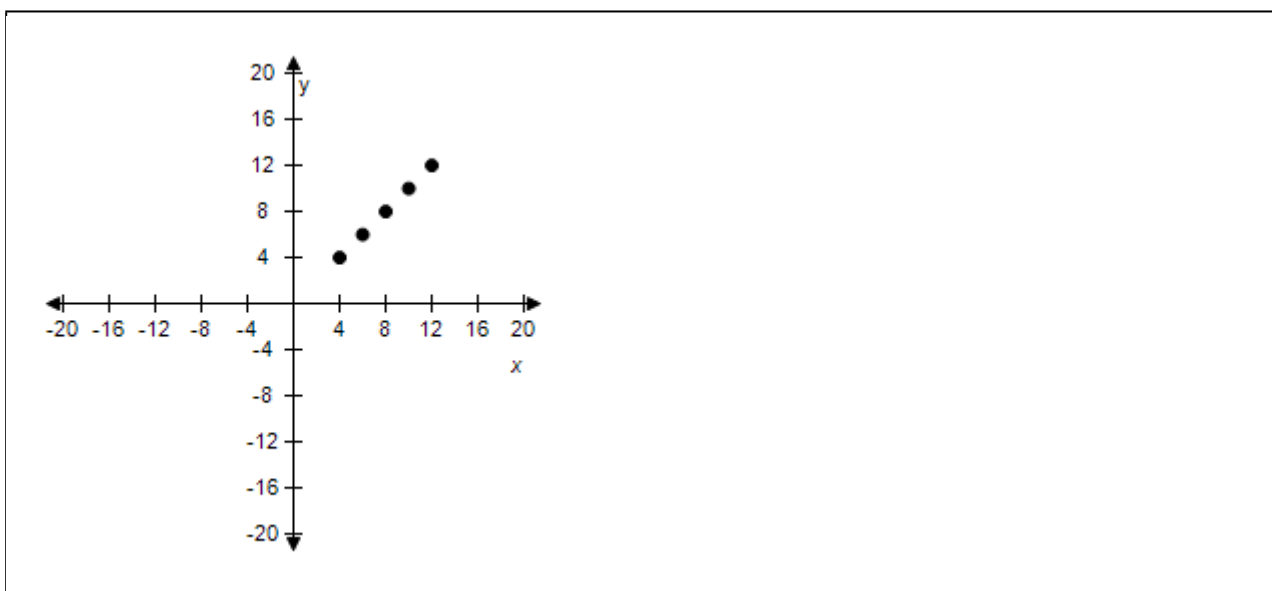
x	4	6	8	10	12
$y = \frac{k}{x^2}$	$\frac{5}{8}$	$\frac{5}{18}$	$\frac{5}{32}$	$\frac{5}{18}$	$\frac{5}{8}$



e.

x	4	6	8	10	12
$y = \frac{k}{x^2}$	4	6	8	10	12

Section 1.10 - Mathematical Modeling and Variation



ANSWER: a
 POINTS: 1
 REFERENCES: 3.5.29
 QUESTION TYPE: Multi-Mode (Multiple choice)
 HAS VARIABLES: True
 DATE CREATED: 6/10/2014 4:21 PM
 DATE MODIFIED: 5/19/2015 12:55 AM

32. Use the given value of k to complete the table for the inverse variation model

$$y = \frac{k}{x^2}$$

Plot the points on a rectangular coordinate system.

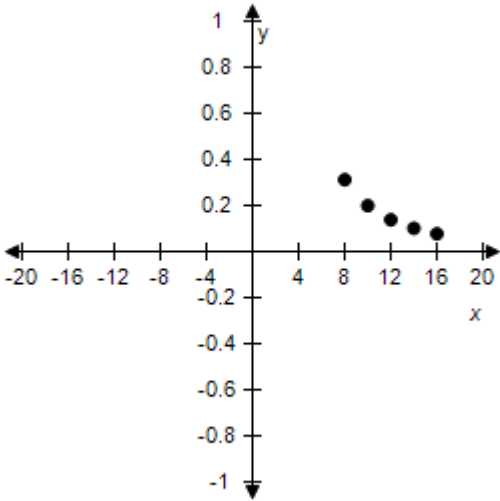
x	8	10	12	14	16
$y = \frac{k}{x^2}$					

$$k = 20$$

a.

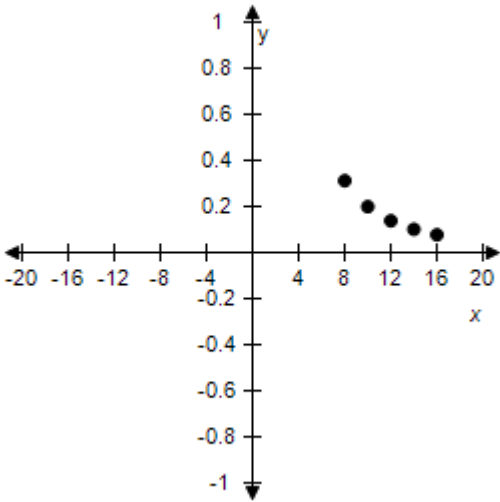
x	8	10	12	14	16
$y = \frac{k}{x^2}$	$\frac{5}{16}$	$\frac{1}{5}$	$\frac{5}{36}$	$\frac{5}{49}$	$\frac{5}{64}$

Section 1.10 - Mathematical Modeling and Variation



b.

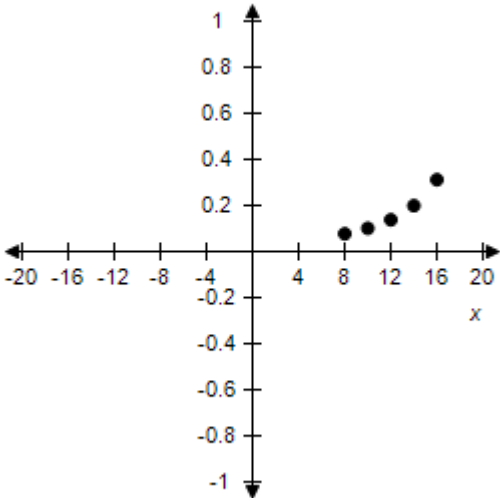
x	8	10	12	14	16
$y = \frac{k}{x^2}$	$\frac{5}{16}$	$\frac{5}{16}$	$\frac{5}{16}$	$\frac{5}{16}$	$\frac{5}{16}$



c.

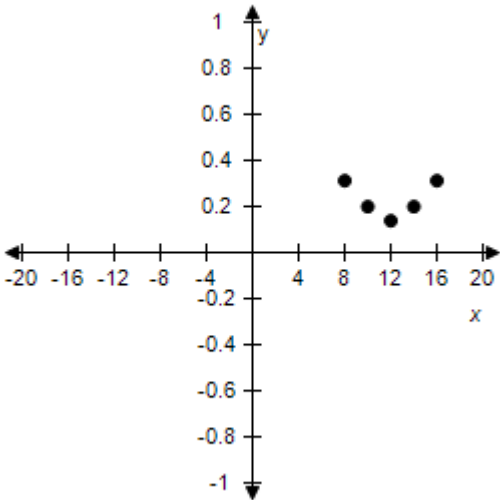
x	8	10	12	14	16
$y = \frac{k}{x^2}$	$\frac{5}{64}$	$\frac{5}{49}$	$\frac{5}{36}$	$\frac{1}{5}$	$\frac{5}{16}$

Section 1.10 - Mathematical Modeling and Variation



d.

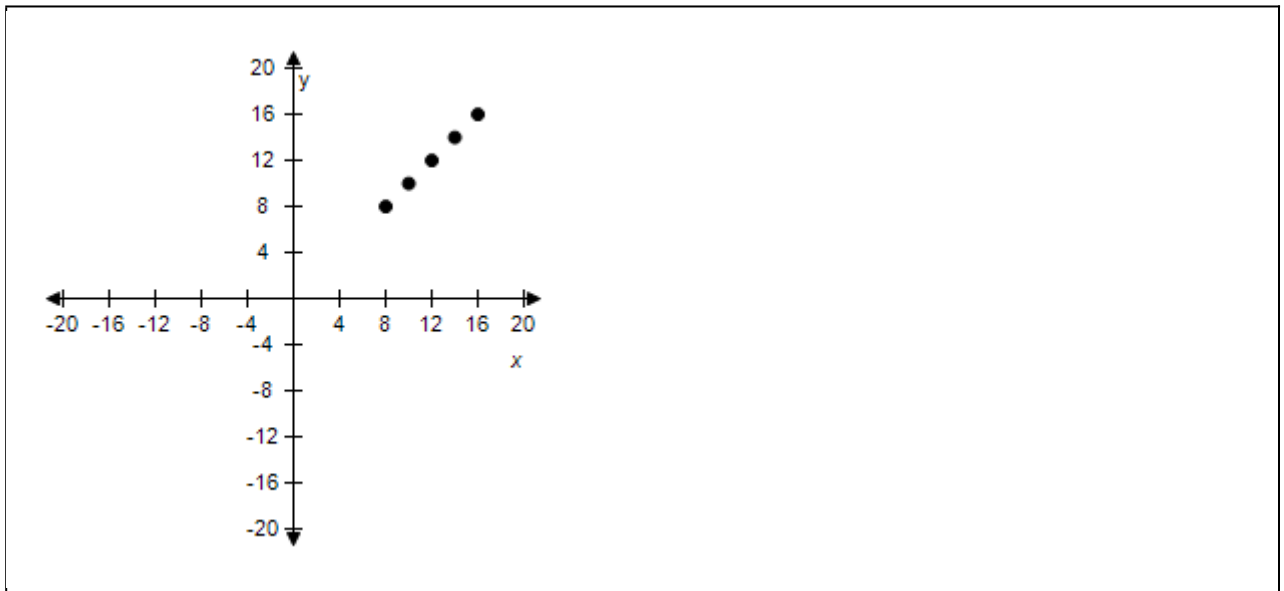
x	8	10	12	14	16
$y = kx^2$	$\frac{5}{16}$	$\frac{1}{5}$	$\frac{5}{36}$	$\frac{1}{5}$	$\frac{5}{16}$



e.

x	8	10	12	14	16
$y = \frac{k}{x^2}$	8	10	12	14	16

Section 1.10 - Mathematical Modeling and Variation



ANSWER: a
POINTS: 1
REFERENCES: 3.5.30
QUESTION TYPE: Multi-Mode (Multiple choice)
HAS VARIABLES: True
DATE CREATED: 6/10/2014 4:21 PM
DATE MODIFIED: 5/19/2015 1:00 AM

33. Find a mathematical model representing the statement. (Determine the constant of proportionality.)

z varies directly as the square of x and inversely as y . ($z = 36$ when $x = 9$ and $y = 3$.)

- a. $z = \frac{3x^2}{4y}$
- b. $z = \frac{4x}{3y}$
- c. $z = \frac{4x^2}{3y}$
- d. $z = -\frac{3x^2}{4y}$
- e. $z = -\frac{4x^2}{3y}$

ANSWER: c
POINTS: 1
REFERENCES: 3.5.73
QUESTION TYPE: Multi-Mode (Multiple choice)
HAS VARIABLES: True

Section 1.10 - Mathematical Modeling and Variation

DATE CREATED: 6/10/2014 4:21 PM

DATE MODIFIED: 10/21/2014 3:15 AM

34. Find a mathematical model representing the statement. (Determine the constant of proportionality.)

v varies jointly as p and q and inversely as the square of s . ($v = 1.4$ when $p = 4.4$, $q = 7.3$ and $s = 1.8$.)

- a. $v = \frac{0.141p}{qs^2}$
- b. $v = -\frac{pq}{0.141s^2}$
- c. $v = \frac{0.141pq}{s^2}$
- d. $v = \frac{pq}{0.141s^2}$
- e. $v = -\frac{0.141pq}{s^2}$

ANSWER:

c

POINTS:

1

REFERENCES:

3.5.74

QUESTION TYPE:

Multi-Mode (Multiple choice)

HAS VARIABLES:

True

DATE CREATED:

6/10/2014 4:21 PM

DATE MODIFIED:

10/21/2014 4:00 AM

35. Use the fact that the diameter of the largest particle that can be moved by a stream varies approximately directly as the square of the velocity of the stream.

$$\frac{1}{5}$$

A stream with a velocity of $\frac{1}{5}$ mile per hour can move coarse sand particles about 0.07 inch in diameter. Approximate the velocity required to carry particles 0.2 inch in diameter. (Round your answer to two decimal places.)

- a. About 0.84 mi/h
- b. About 0.19 mi/h
- c. About -0.16 mi/h
- d. About 0.49 mi/h
- e. About 0.34 mi/h

ANSWER:

e

POINTS:

1

REFERENCES:

3.5.75

QUESTION TYPE:

Multi-Mode (Multiple choice)

HAS VARIABLES:

True

Section 1.10 - Mathematical Modeling and Variation

DATE CREATED: 6/10/2014 4:21 PM

DATE MODIFIED: 10/23/2014 2:18 AM

36. Use the fact that the resistance of a wire carrying an electrical current is directly proportional to its length and inversely proportional to its cross-sectional area.

If #28 copper wire (which has a diameter of 0.0126 inch) has a resistance of 68.17 ohms per thousand feet, what length of #28 copper wire will produce a resistance of 30.5 ohms?

- a. About 447 ft
- b. About 442 ft
- c. About 432 ft
- d. About 452 ft
- e. About 462 ft

ANSWER: a

POINTS: 1

REFERENCES: 3.5.77

QUESTION TYPE: Multi-Mode (Multiple choice)

HAS VARIABLES: True

DATE CREATED: 6/10/2014 4:21 PM

DATE MODIFIED: 10/23/2014 2:44 AM

37. Use the fact that the resistance of a wire carrying an electrical current is directly proportional to its length and inversely proportional to its cross-sectional area.

A 10-foot piece of copper wire produces a resistance of 0.2 ohm. Use the constant of proportionality $k = 0.000833$ to find the diameter of the wire.

(Round the answer up to three decimal places.)

- a. 0.23 ft
- b. 0.58 ft
- c. 0.38 ft
- d. 0.48 ft
- e. 0.73 ft

ANSWER: a

POINTS: 1

REFERENCES: 3.5.78

QUESTION TYPE: Multi-Mode (Multiple choice)

HAS VARIABLES: True

DATE CREATED: 6/10/2014 4:21 PM

DATE MODIFIED: 10/23/2014 3:33 AM

38. The frequency of vibrations of a piano string varies directly as the square root of the tension on the string and inversely as the length of the string. The middle A string has a frequency of 430 vibrations per second. Find

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the frequency of a string that has 1.25 times as much tension and is 1.4 times as long.

- a. 373.4 vibrations / sec
- b. 343.4 vibrations / sec
- c. 353.4 vibrations / sec
- d. 383.4 vibrations / sec
- e. 363.4 vibrations / sec

ANSWER:

b

POINTS:

1

REFERENCES:

3.5.80

QUESTION TYPE:

Multi-Mode (Multiple choice)

HAS VARIABLES:

True

DATE CREATED:

6/10/2014 4:21 PM

DATE MODIFIED:

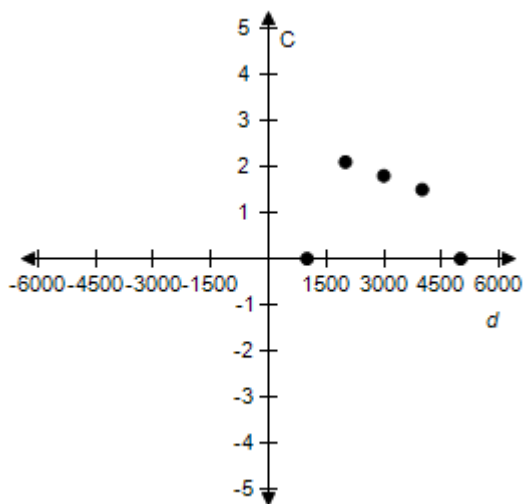
10/21/2014 2:38 AM

39. An oceanographer took readings of the water temperatures C (in degrees Celsius) at several depths d (in meters). The data collected are shown in the table.

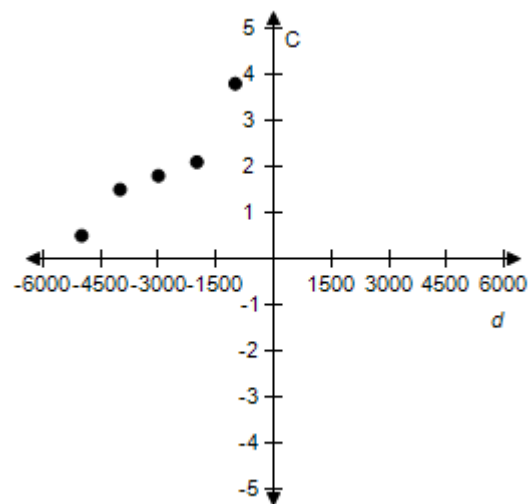
Depth, d	Temperature, C
1000	3.8°
2000	2.1°
3000	1.8°
4000	1.5°
5000	0.5°

Sketch a scatter plot of the data.

a.

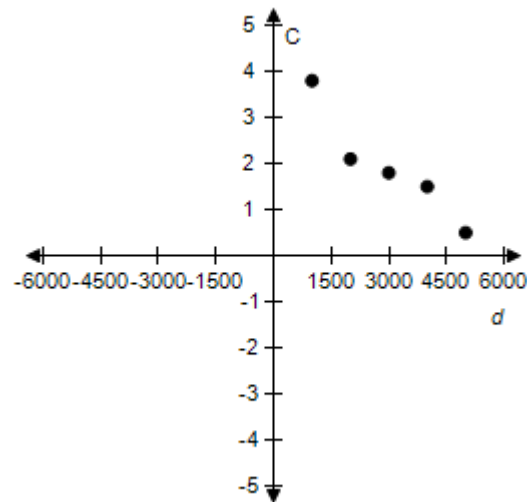


b.

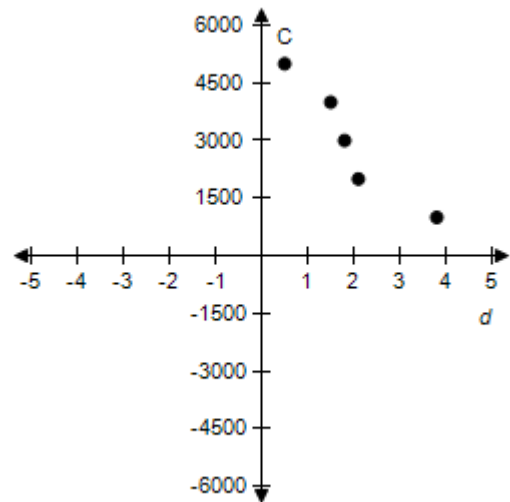


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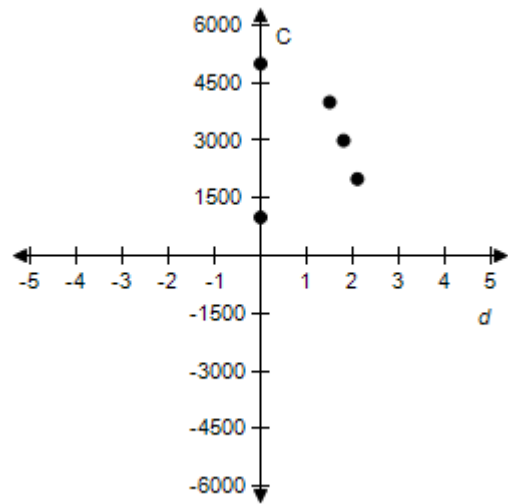
c.



d.



e.



ANSWER:

POINTS:

REFERENCES:

QUESTION TYPE:

HAS VARIABLES:

DATE CREATED:

DATE MODIFIED:

c

1

3.5.83a

Multi-Mode (Multiple choice)

True

6/10/2014 4:21 PM

10/23/2014 3:46 AM

40. Determine whether the variation model below is of the form $y = kx$ or $y = \frac{k}{x}$.

x	13	26	39	52	65
y	3	6	9	12	15

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a. $y = kx$

b. $y = \frac{k}{x}$

ANSWER:

a

POINTS:

1

REFERENCES:

3.5.31

QUESTION TYPE:

Multi-Mode (Multiple choice)

HAS VARIABLES:

True

DATE CREATED:

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DATE MODIFIED:

10/23/2014 12:36 AM

41. After determining whether the variation model below is of the form $y = kx$ or $y = \frac{k}{x}$, find the value of k .

x	154	161	168	175	182
y	66	69	72	75	78

- a. $k = 7$
- b. $k = \frac{7}{3}$
- c. $k = \frac{1}{7}$
- d. $k = \frac{3}{7}$
- e. $k = \frac{7}{66}$

ANSWER:

d

POINTS:

1

REFERENCES:

3.5.32

QUESTION TYPE:

Multi-Mode (Multiple choice)

HAS VARIABLES:

True

DATE CREATED:

6/10/2014 4:21 PM

DATE MODIFIED:

5/19/2015 1:16 AM

42. After determining whether the variation model below is of the form $y = kx$ or $y = \frac{k}{x}$, find the value of k .

x	20	40	60	80	100
y	$\frac{1}{30}$	$\frac{1}{60}$	$\frac{1}{90}$	$\frac{1}{120}$	$\frac{1}{150}$

- a. $k = \frac{1}{20}$
- b. $k = \frac{3}{2}$

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- c. $k = \frac{5}{4}$
- d. $k = \frac{1}{10}$
- e. $k = \frac{2}{3}$

ANSWER: e
 POINTS: 1
 REFERENCES: 3.5.33
 QUESTION TYPE: Multi-Mode (Multiple choice)
 HAS VARIABLES: True
 DATE CREATED: 6/10/2014 4:21 PM
 DATE MODIFIED: 5/19/2015 1:15 AM

43. Determine whether the variation model below is of the form $y = kx$ or $y = \frac{k}{x}$.

x	12	24	36	48	60
y	$\frac{1}{18}$	$\frac{1}{36}$	$\frac{1}{54}$	$\frac{1}{72}$	$\frac{1}{90}$

a. $y = kx$

b. $y = \frac{k}{x}$

ANSWER: b
 POINTS: 1
 REFERENCES: 3.5.34
 QUESTION TYPE: Multi-Mode (Multiple choice)
 HAS VARIABLES: True
 DATE CREATED: 6/10/2014 4:21 PM
 DATE MODIFIED: 10/23/2014 12:31 AM

44. Assume that y is directly proportional to x . If $x = 28$ and $y = 21$, determine a linear model that relates y and x .

- a. $y = \frac{3}{5}x$
- b. $y = \frac{4}{3}x$
- c. $y = \frac{3}{4}x$
- d. $y = \frac{2}{3}x$
- e. $y = \frac{3}{2}x$

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ANSWER: c
POINTS: 1
REFERENCES: 3.5.36
QUESTION TYPE: Multi-Mode (Multiple choice)
HAS VARIABLES: True
DATE CREATED: 6/10/2014 4:21 PM
DATE MODIFIED: 10/21/2014 7:10 AM

45. The simple interest on an investment is directly proportional to the amount of the investment. By investing \$6000 in a certain certificate of deposit, you obtained an interest payment of \$276.00 after 1 year. Determine a mathematical model that gives the interest, I , for this CD after 1 year in terms of the amount invested, P .

- a. $I = (0.050)P$
- b. $I = (0.041)P$
- c. $I = (0.049)P$
- d. $I = (0.046)P$
- e. $I = (0.044)P$

ANSWER: d
POINTS: 1
REFERENCES: 3.5.39
QUESTION TYPE: Multi-Mode (Multiple choice)
HAS VARIABLES: True
DATE CREATED: 6/10/2014 4:21 PM
DATE MODIFIED: 10/21/2014 7:13 AM

46. The sales tax on an item with a retail price of \$972 is \$68.04. Create a variational model that gives the retail price, y , in terms of the sales tax, x , and use it to determine the retail price of an item that has a sales tax of \$82.62.

- a. \$1182.28
- b. \$1151.92
- c. \$1180.29
- d. \$1192.52
- e. \$1124.60

ANSWER: c
POINTS: 1
REFERENCES: 3.5.44
QUESTION TYPE: Multi-Mode (Multiple choice)
HAS VARIABLES: True
DATE CREATED: 6/10/2014 4:21 PM
DATE MODIFIED: 10/21/2014 7:15 AM

47. Hooke's law states that the magnitude of force, F , required to stretch a spring x units beyond its natural length is directly proportional to x . If a force of 3 pounds stretches a spring from its natural length of 10 inches

Section 1.10 - Mathematical Modeling and Variation

to a length of 10.7 inches, what force will stretch the spring to a length of 11.5 inches? Round your answer to the nearest hundredth.

- a. $F = 5.52$
- b. $F = 6.43$
- c. $F = 5.70$
- d. $F = 7.29$
- e. $F = 6.14$

ANSWER:

b

POINTS:

1

REFERENCES:

3.5.45b

QUESTION TYPE:

Multi-Mode (Multiple choice)

HAS VARIABLES:

True

DATE CREATED:

6/10/2014 4:21 PM

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10/21/2014 11:49 PM

48. Find a mathematical model for the verbal statement:

" Q is jointly proportional to the cube of h and the square root of m ."

- a. $Q = kh^3\sqrt{m}$
- b. $Q = k\sqrt{h^3m}$
- c. $Q = kh^2\sqrt[3]{m}$
- d. $Q = k\sqrt[3]{hm^2}$
- e. $Q = k\sqrt[3]{hm}$

ANSWER:

a

POINTS:

1

REFERENCES:

3.5.57

QUESTION TYPE:

Multi-Mode (Multiple choice)

HAS VARIABLES:

False

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49. Find a mathematical model for the verbal statement:

" m varies directly as the square of w and inversely as s ."

- a. $m = k\left(\frac{w}{s}\right)^2$
- b. $m = \frac{kw^2}{s}$

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- c. $m = kw^2s$
- d. $m = kws^2$
- e. $m = k\left(\frac{s}{w}\right)^2$

ANSWER: b
POINTS: 1
REFERENCES: 3.5.53
QUESTION TYPE: Multi-Mode (Multiple choice)
HAS VARIABLES: True
DATE CREATED: 6/10/2014 4:21 PM
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50. The electrical resistance, R , of a wire is directly proportional to its length, l , and inversely proportional to the square of its diameter, d . A wire 150 meters long of diameter 5 millimeters has a resistance of 12 ohms. Find the resistance of a wire made of the same material that has a diameter of 2 millimeters and is 24 meters long.

- a. $R = 14.5$ ohms
- b. $R = 12$ ohms
- c. $R = 15.8$ ohms
- d. $R = 15.5$ ohms
- e. $R = 0.083$ ohms

ANSWER: b
POINTS: 1
REFERENCES: 3.5.77
QUESTION TYPE: Multi-Mode (Multiple choice)
HAS VARIABLES: True
DATE CREATED: 6/10/2014 4:21 PM
DATE MODIFIED: 10/22/2014 12:18 AM