Math

2019

Algebra II

Released Items

1. **VH079825**

Consider the equation $(x-2)^2 = -3x + 6$.

Part A

Which expressions are factors of both $(x-2)^2$ and $-3x+6$?

Select **all** that apply.

- A. 2
- B. 3
- C. $x+2$
- D. $x-2$
- E. $(x-2)^2$

Part B

What are the solutions of the equation $(x-2)^2 = -3x + 6$?

Select **all** that apply.

- A. $x = -3$
- B. $x = -2$
- C. $x = -1$
- D. $x = 0$
- E. $x = 1$
- F. $x = 2$
- G. $x = 3$

2. **VH179881**

Which value is a solution of the equation $x^2 = \frac{2x}{x+1}$?

Select **all** that apply.

- A. $x = -2$
- B. $x = -1$
- C. $x = 0$
- D. $x = 1$
- E. $x = 2$

3. **M44318P**

Consider the function $f(x) = \log(x)$. Which two transformations can be used to move the graph of $f(x)$ to the graph of $-f(x+4)$?

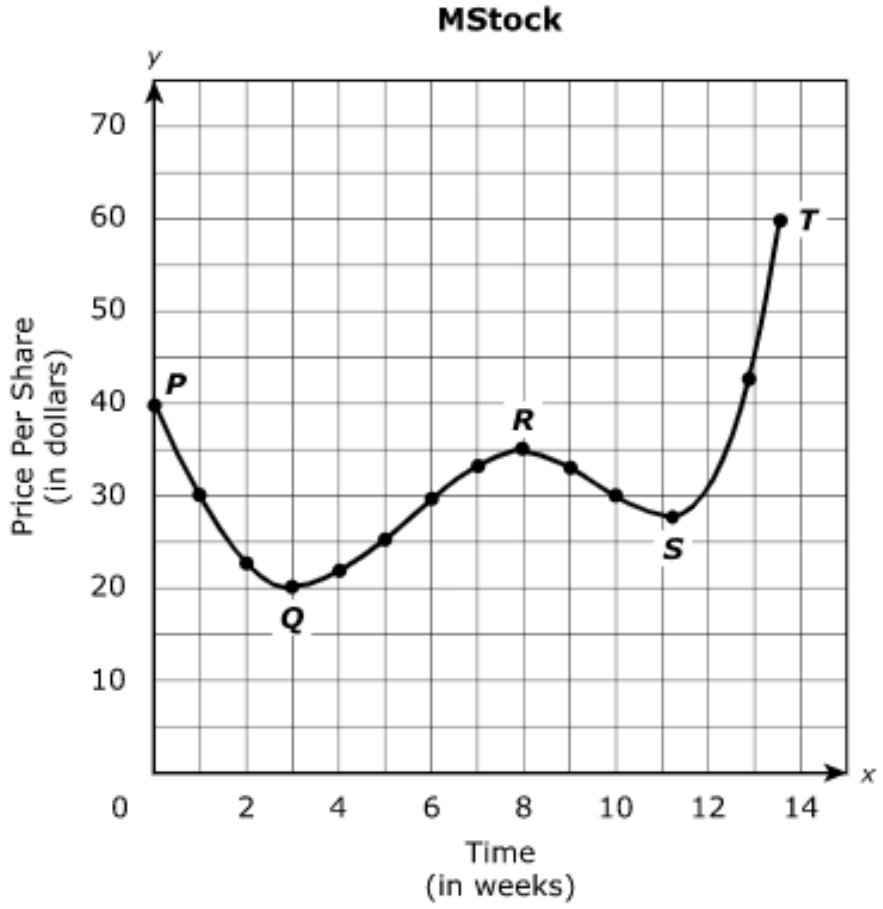
Select **all** that apply.

- A. translate 4 units up
- B. translate 4 units down
- C. translate 4 units to the left
- D. translate 4 units to the right
- E. reflect over the *x*-axis
- F. reflect over the *y*-axis
- G. reflect over the line $x = 4$
- H. reflect over the line $x = -4$

4. **2831-M42233P**

Part A

A company owns some shares of MStock. The accountant for the company models the stock's price per share, in dollars, as its value changes over several weeks. A graph of the model is shown.



Which statements are true about the value of the stock?

Select **all** that apply.

- A. The value of the stock increases between weeks 4 and 8 and decreases between weeks 8 and 11.
- B. The value of the stock decreases between weeks 0 and 2 and decreases between weeks 2 and 6.
- C. The value of the stock increases between weeks 8 and 11 and decreases between weeks 12 and 14.
- D. The value of the stock decreases between weeks 0 and 2 and increases between weeks 5 and 8.
- E. The value of the stock decreases between weeks 6 and 9 and increases between weeks 10 and 12.

(continues on next page)

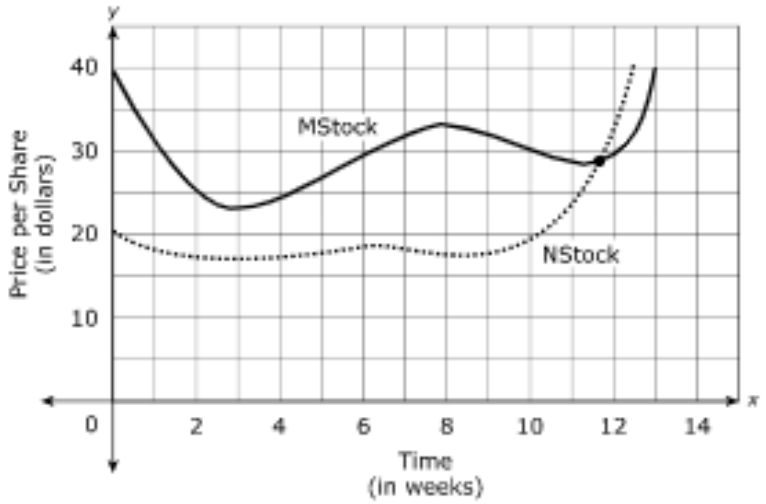
Part B

Which point shows the approximate lowest value of MStock?

- A. *P*
- B. *Q*
- C. *R*
- D. *S*

Part C

The company also owns shares in NStock. The accountant for the company models the stock's price per share for NStock. The graphs of the models for NStock and MStock are shown.

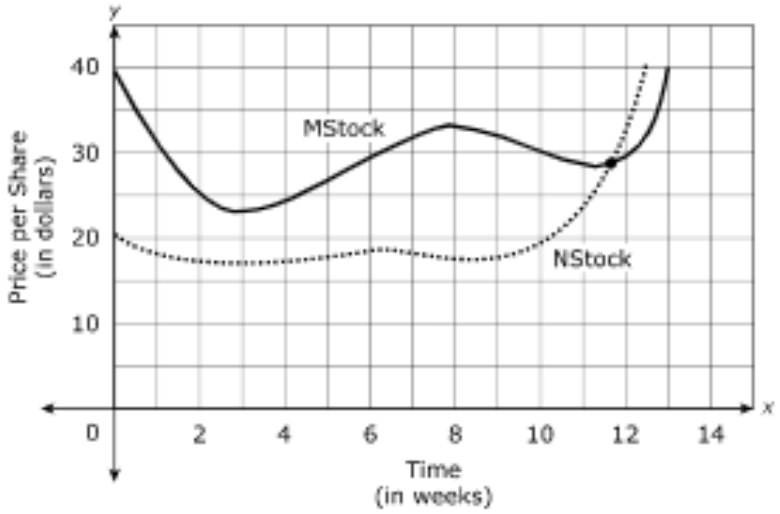


After approximately what week is the value of NStock greater than the value of MStock?

- A. week 1
- B. week 5
- C. week 7
- D. week 11

(continues on next page)

Part D



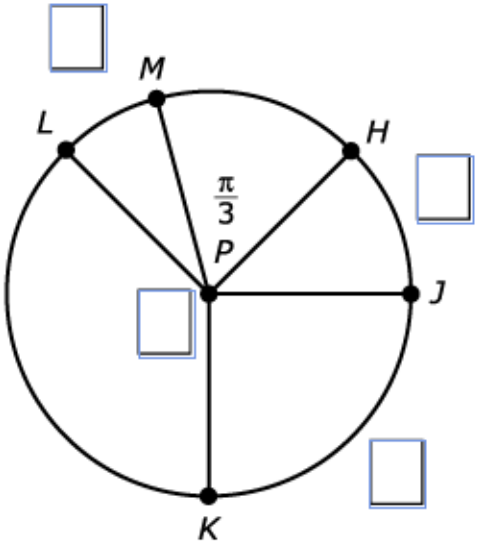
In which week did both stocks reach their lowest values?

- A. week 1
- B. week 3
- C. week 10
- D. week 12

5. **M45037**

A unit circle with center *P* is shown. In circle *P*, $\angle JPK$ is a right angle, $m\angle HPJ = \frac{1}{2}m\angle JPK$, and $m\angle LPK = m\angle HPJ + m\angle JPK$. Determine the values of $m\angle LPK$ and the lengths of $\overset{\frown}{LM}$, $\overset{\frown}{HJ}$, and $\overset{\frown}{JK}$.

Drag and drop each radian measure into the diagram.



$\frac{\pi}{6}$ $\frac{\pi}{4}$ $\frac{\pi}{3}$ $\frac{\pi}{2}$ $\frac{2\pi}{3}$ $\frac{3\pi}{4}$ $\frac{5\pi}{6}$

6. **VH218358**

Gina rolled two number cubes, each numbered from 1 to 6, and calculated the sum of the two numbers landing face up. She repeated the process 100 times, and only once did she record a sum of 2. She suspected that the cubes might not be fair.

Gina reasoned that if the cubes were fair, the probability of rolling the sum of 2 is $\frac{1}{36}$. For 100 rolls, $100\left(\frac{1}{36}\right) \approx 2.8$. She thought she should have seen the sum about two or three times in 100 rolls.

Under the assumption that the cubes are fair, she conducted a simulation to determine what is a plausible number of times to observe the sum in 100 rolls. The results of 50 trials of the simulation are shown in the table.

Results of Simulation

Observations of the Sum	Frequency out of 50
no times	4
one time	5
two times	10
three times	14
four times	10
five times	4
six times	2
seven times	1

Based on the results of the simulation, is there statistical evidence that Gina's number cubes are not fair?

A. Yes. The greatest frequency in the simulation is 14, indicating that the sum should have been observed three times. The number cubes are not fair.

B. Yes. Observing the sum only one time out of 100 is equal to the probability of 0.01. Such a small probability indicates that the number cubes are not fair.

C. No. Observing the sum once or never occurred in 18% of the trials, indicating that the observation is plausible. There is no evidence that the number cubes are not fair.

D. No. The sum was observed from a minimum of no times to a maximum of seven times in the simulation. Observing the sum one time falls within the interval of one to seven. The number cubes are fair.

7. **3056-M44176**

Part A

Three friends go to a store to rent games and movies. Calvin rents 3 movies and 2 video games and spends a total of $25. Samantha rents 2 movies and 1 video game and spends a total of $14.75.

If the rental fee for each game is the same and the rental fee for each movie is the same, determine how much their friend, Keith, will spend at the rental store to rent 1 movie and 2 video games. Explain your answer.

Enter your answer and your explanation in the space provided.

- Math symbols
- Relations
- Geometry
- Groups
- Trigonometry
- Statistics
- Greek

Part B

A fourth friend, Beth, rents her movies and video games from a different store. At this store, the rental fee for a movie is the same as the rental fee for a video game.

The total cost of renting 2 movies and 3 video games is the same at both stores. Determine the rental fee that Beth's store charges for each movie or video game. Explain your answer.

Enter your answer and your explanation in the space provided.

- Math symbols
- Relations
- Geometry
- Groups
- Trigonometry
- Statistics
- Greek

8. **M48753**

The table contains data about the fuel capacity, in gallons, and the weight, in pounds, for small motorcycles.

Fuel Capacity (gallons)	Weight (pounds)
0.5	84
1.0	131
1.1	139
1.3	145
1.7	176
2.0	212
2.1	227
2.2	219
2.5	253
2.6	263

- Give an equation for a linear regression model for these data to predict the weight from the fuel capacity. Identify the variables in your equation.
- Justify how well your linear equation fits the model by discussing a scatter plot of the data and the correlation coefficient in assessing the fit of your linear model.
- Use your model to predict the total weight of a small motorcycle that has a fuel capacity of 6 gallons, and discuss the usefulness of this prediction.

Enter your answers and your explanations in the space provided.

- Math symbols
- Relations
- Geometry
- Groups
- Trigonometry
- Statistics
- Greek

9. **M47815**

The functions $h(d),\ g(y),\ \text{and}\ f(m)$ each represent the balance of a savings account that is opened with an initial balance of a dollars, with no additional deposits or withdrawals.

- $f(m) = a(1.0008^m)$ where *m* is the number of months since the account was opened
- $g(y) = a(1.01^y)$ where *y* is the number of years since the account was opened
- $h(d) = a(1.00005^d)$ where *d* is the number of days since the account was opened

If the time period is the same for all three accounts, order the functions from greatest to least growth rate.

Drag and drop the functions into the correct order.

f(m)	g(y)	h(d)

10. **VF902881**

When graphed in the *xy*-coordinate plane, which equations will intersect the graph of $y = 2^x$ in the interval $0 < x < 1$?

Select **all** that apply.

- ☐ A. $y = \frac{1}{x}$
- ☐ B. $y = 2 - |x|$
- ☐ C. $y = 4x$
- ☐ D. $y = x - 1$
- ☐ E. $y = 3x^2$

11. **M40562**

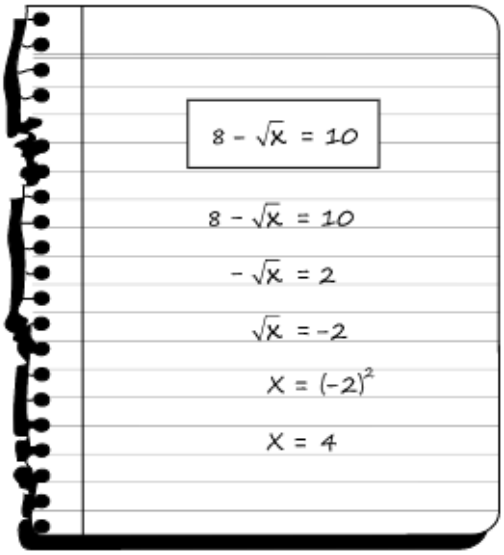
Select **all** the values that are solutions to the equation $x^2 - 14x + 50 = 0$.

Select **all** that apply.

- [ ] A. -7
- [ ] B. 7
- [ ] C. $7 + i$
- [ ] D. $7 - i$
- [ ] E. $7 + 2i$
- [ ] F. $7 - 2i$

12. **VF564797**

Mark solved the equation in the box, using the steps shown.



Is the solution $x = 4$ correct? State yes or no, and justify your answer.

Enter your answer and your justification in the space provided.

- Math symbols
- Relations
- Geometry
- Groups
- Trigonometry
- Statistics
- Greek

13. **VF650994**

In the equation shown, p is a constant. If the equation has no real solutions, which could be the value of p?

$2x^2 + px + 4 = 0$

Select **all** that apply.

- A. -10
- B. -5
- C. 0
- D. 5
- E. 10

14. **VH031799**

Which expressions are equivalent to the given expression for **all** positive values of *x*, *y*, and *z*?

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

Select **all** that apply.

- [ ] A. $x^6y^2z^{\frac{1}{2}}$
- [ ] B. $x^6y^{-2}z^{\frac{1}{2}}$
- [ ] C. $x^{-8}y^{15}z^5$
- [ ] D. $\frac{x^6z^{\frac{1}{2}}}{y^2}$
- [ ] E. $x^6y^{-2}\sqrt{z}$
- [ ] F. $\frac{y^{15}z^5}{x^8}$
- [ ] G. $\frac{x^6\sqrt{z^5}}{y^2}$

15. **VH024132**

The size of the population of a certain city was 25,000 in 2010 and decreased 4% each year afterward.

Part A

The size of the population, *y*, can be modeled by an exponential function of the form $y = a(b^x)$, where *x* represents the number of years since 2010 and *a* and *b* are constants. What is the value of *b*?

Enter your answer in the box.

Part B

Suppose the equation representing the size of the population is graphed in the *xy*-coordinate plane. Which statement is true?

A. The size of the population in 2010 is indicated by the *x*-intercept.

B. The size of the population in 2010 is indicated by the *y*-intercept.

C. The rate of change per year is indicated by the *x*-intercept.

D. The rate of change per year is indicated by the *y*-intercept.

16. **VF905308**

Wesley deposits $2,000 in an account that earns 4.5% annual interest compounded continuously. If no other deposits or withdrawals are made, the amount, *A*, in dollars, in the account after *t* years can be modeled by the function $A(t) = 2{,}000e^{0.045t}$.

Part A

What is the average rate of change, in dollars per year, of the amount in the account over the first two years? Give your answer to the nearest whole number.

Enter your answer in the box.

$

(continues on next page)

Part B

The solution to the equation $4{,}000 = 2{,}000e^{0.045t}$ gives the number of years it will take for the amount in the account to reach \$4,000. What is the solution to the equation expressed as a logarithm?

A. $0.045\ln(2)$

B. $\frac{\ln 2}{0.045}$

C. $\ln\left(\frac{2}{0.045}\right)$

D. $\ln\left(\frac{0.045}{2}\right)$

Part C

Which interval contains the numbers of years when the amount in the account will first reach \$5,000?

A. $16 < t < 20$

B. $20 < t < 24$

C. $24 < t < 28$

D. $28 < t < 32$

Part D

If Wesley wants to have \$5,000 in the account after 15 years, how much should he deposit initially, assuming the same interest rate? Give your answer to the nearest whole number of dollars.

Enter your answer in the box.

\$ [ ]

17. **M43524**

Given that $f(x) = 3x$ and $g(x) = x + 1$, complete the expressions for $h(x)$ if $h(x) = 2f(x^2) - 3g(6)$.

Drag and drop the expressions into each box.

3	6	7	9	18	21	$3x$	$6x$	$9x$	$12x$
$18x$	$(x + 1)$	$3x^2$	$6x^2$	$9x^2$	$18x^2$	$6x^3$	$9x^3$	$18x^3$	

$h(x) = 2$ (☐) $- 3$ (☐)

$=$ ☐ $-$ ☐

18. **M41740**

A function $f(x)$ is defined as $f(x) = x^2 + x - 6$.

Determine:

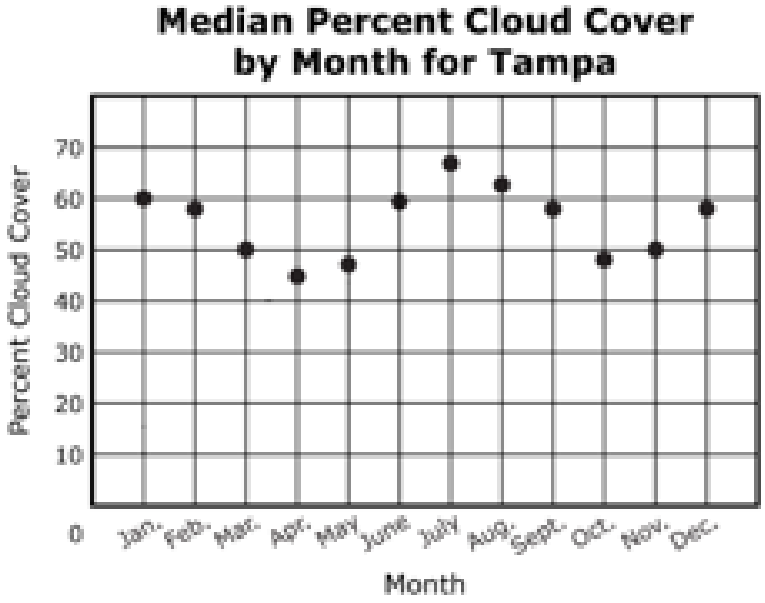
- the *x*-intercepts
- the *y*-intercept
- the coordinates of any maximum or minimum, and
- intervals of increase and decrease.

Enter your answers in the space provided. Enter **only** your answers.

- Math symbols
- Relations
- Geometry
- Groups
- Trigonometry
- Statistics
- Greek

19. **VH234112**

The graph shows the median percent cloud cover per month for 12 months for the city of Tampa, Florida.



Because the cloud cover tends to be cyclical in nature, a sine function was used to model the relationship between median percent cloud cover and month. With the number 1 representing the month of January, the model $c = 55 + 9 \sin(0.98m + 0.74)$ predicts the median percent cloud cover for month number m.

(continues on next page)

Part A

Which constant in the model gives the **best** representation of the average of the median percent cloud cover for the year?

- A. 0.74
- B. 0.98
- C. 9
- D. 55

Part B

The median percent cloud cover for the month of September was 58%. How does the model predict the amount of cloud cover for September?

Select from the drop-down menus to correctly complete the sentence.