EOC Review- Unit 3: Linear & Exponential 2017

Schoolnet Problems to Practice:

Standard	What is it?	Practice Problems
N-RN.2	Rewrite expressions involving radicals and rational exponents using the properties of exponents	Below
A-CED.1	Create equations and inequalities in one variable and use them to solve problems (Linear & Expo)	Below
A-CED.2	Write linear & Exponential equations from word problems	Below
F-LE.1	Identify situations that can be modeled with linear and exponential functions, and justify the most appropriate model for a situation based on the rate of change over equal intervals. (Which is better fit)	Below
F-LE.3	Compare the end behavior of **linear, exponential, and quadratic** functions using graphs and tables to show that a quantity increasing exponentially eventually exceeds a quantity increasing linearly or quadratically.	Below
F-LE.5	Interpret the parameters in a linear or exponential function in terms of a context.	Below
A-REI.11	intersect are the solutions of the equation *f(x) = g(x);* (Linear & Expo)	Below
F-IF.6	Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph.	Below
F-BF.1	Write a function that describes a relationship between two quantities. a. Build linear and exponential functions, including arithmetic and geometric sequences, given a graph, table, a description of a relationship, or two ordered pairs. b. Build a function that models a relationship between two quantities by combining linear, exponential, or quadratic functions with addition and subtraction or two linear functions with multiplication.	Below
F-BF.2	Translate between explicit and recursive forms of arithmetic and geometric sequences and use both to model situations.	Below

N-RN.2 Practice:

1. **Which of the following mathematical sentences is true?**

   A. $\sqrt{4x} = 4\left(x^{\frac{1}{2}}\right)$

   B. $9^{\frac{1}{2}} = 4.5$

   C. $\sqrt[3]{27} = 3$

   D. $y^{-\frac{1}{2}} = \sqrt{y}$

4. **If $x > 0$ for what value of n does $(\sqrt[3]{x})^n = x$?**

   A. -3

   B. $-\frac{1}{3}$

   C. $\frac{1}{3}$

   D. 3

5. **Simplify** $\frac{\sqrt{81x^6}}{9x^2}$.

   A. x

   B. x^3

   C. $3x$

   D. $3x^3$

6. **Which expression is equivalent to** $\sqrt{\frac{x^3}{x^6}}$?

   A. $\frac{1}{x}$

   B. $\frac{\sqrt{x}}{x}$

   C. $\frac{\sqrt{x}}{x^2}$

   D. $\frac{\sqrt{x}}{x^5}$

8. Which expression is equivalent to $(5x)^{\frac{1}{2}}\sqrt{25x}$?

   A. $5\sqrt{x}$

   B. $5\sqrt{5x}$

   C. $5x\sqrt{5}$

   D. $25x\sqrt{5}$

11. Which expression is equivalent to $\sqrt[4]{x}$?

   A. $x^{\frac{1}{4}}$

   B. x^4

   C. $x^{-\frac{1}{4}}$

   D. x^{-4}

12. **Simplify** $(2n) \times (3n) \times (3n) \times (3n)$.

   A. $11n$

   B. $11n^4$

   C. $54n$

   D. $54n^4$

14. Which expression is equivalent to $\left(4x^3y^2\right)^5$?

   A. $5\left(4x^3y^2\right)$

   B. $5\left(4x^{3\cdot5}y^{2\cdot5}\right)$

   C. $\left(4^5x^{3\cdot5}y^{2\cdot5}\right)$

   D. $\left(4^5x^{3+5}y^{2+5}\right)$

16. Which expression is equivalent to $\left(\sqrt[3]{25x^2y}\right)\left(\sqrt[3]{25xy^2}\right)$?

A. $xy(50)^{\frac{1}{3}}$

B. $5xy(5)^{\frac{1}{3}}$

C. $(50x^3y^3)^{\frac{1}{3}}$

D. $(625xy)^{\frac{1}{3}}$

19. $\sqrt{64x^{16}} =$

A. $8x^4$

B. $8x^8$

C. $32x^4$

D. $32x^8$

23. **Which expression is equivalent to** $\left(-7r^2t^4\right)(5rt)$?

A. $-35rt^3$

B. $-35r^2t^4$

C. $-35r^3t^3$

D. $-35r^3t^5$

25. Which expression is equivalent to $(4x^3)^{\frac{1}{2}} \bullet (9x)^{\frac{1}{2}}$?

A. $6x^2$

B. $\sqrt{13x^4}$

C. $\sqrt{36x^4}$

D. $36x^{\frac{3}{4}}$

29. **Which expression is equivalent to** $\sqrt{96}$?

A. $4\sqrt{6}$

B. $4\sqrt{24}$

C. $6\sqrt{16}$

D. $16\sqrt{6}$

31. **What is** $\sqrt[3]{27a^9b^{12}c^6}$?

A. $3a^3b^4c^2$

B. $3a^6b^9c^3$

C. $9a^3b^4c^2$

D. $9a^6b^9c^3$

A-CED.1 Practice:

3. **Two airplanes leave the same airport traveling in opposite directions in a straight line. The Quik-Jet airplane is traveling due north at an average speed of 300 miles per hour. The Sky Master airplane is traveling due south at an average speed of 600 miles per hour. If both airplanes depart at the same time, how many minutes would the airplanes take to be 400 miles apart?**

   A. $2\frac{1}{4}$

   B. $26\frac{2}{3}$

   C. 45

   D. 50

4. Sam deposited $200 into a savings account that pays 4% interest compounded monthly. ***Approximately*** how long will it take for the deposit to be worth $220?

   A. 2 months

   B. 3 months

   C. 28 months

   D. 29 months

5. An electrician charges $42 per hour. He estimates that he will need $628 in materials for a project and the total cost of the project will be $1,384. How many hours does the electrician expect the job to take?

   A. 18 hours

   B. 33 hours

   C. 42 hours

   D. 48 hours

6. **Two printing presses running at the same time need 6 hours to print a weekly magazine. Working alone, the faster press does the job in 8 hours. How many hours are needed for the slower press to do the same job?**

   A. 10

   B. 14

   C. 24

   D. 48

8. **A rectangular room is 9 feet longer than it is wide. The area of the room is 360 square feet. How many feet long is the room?**

   A. 18

   B. 24

   C. 40

   D. 60

9. **An economist predicts that the number of employees with a certain company will increase by 50% each year. There are 600 employees now. According to the economist's prediction, how many employees will be with the company exactly 3 years from now?**

A. 900
B. 1350
C. 1500
D. 2025

13. **The population of a certain species grows exponentially with time. If the population increases by 40% every 1.5 years, how often does the population increase by 96%?**

A. every 2.1 years
B. every 2.25 years
C. every 3 years
D. every 3.6 years

14. The perimeter of a rectangle is 28 inches. The length is 6 less than 3 times the width. What is the length of the rectangle?

A. 5 inches
B. 8 inches
C. 9 inches
D. 12 inches

15. **A chemist has 10 liters of an acid solution that is 60% acid. How many liters of water must the chemist add to make a solution that is 20% acid?**

A. 4
B. 5
C. 10
D. 20

17. **Tom can fill an ice cream order in 5 minutes. Nancy can fill the same order in 8 minutes. How long, in minutes, would it take Tom and Nancy to fill the ice cream order if they worked together?**

A. $\frac{13}{40}$
B. $3\frac{1}{13}$
C. $6\frac{2}{13}$
D. $6\frac{1}{2}$

25. Mike's coin collection has a total of 75 coins. Kevin's coin collection has three less than two times Mike's collection. Which equation models the number of coins in Kevin's collection, x?

A. $\frac{x}{2} - 3 = 75$

B. $\frac{x+3}{2} = 75$

C. $\frac{x}{2} + 3 = 75$

D. $\frac{x-3}{2} = 75$

29. **A train traveling at 70 kilometers per hour left Jacksonville at 2:25 p.m. At 4:25 p.m., another train left Jacksonville on a parallel track traveling at 110 kilometers per hour. At these rates, when will the second train overtake the first?**

A. 5:45 p.m.

B. 5:55 p.m.

C. 7:45 p.m.

D. 7:55 p.m.

38. **A machine shop has a fixed set-up cost of $2000 to produce new bolts. The cost of materials and labor to produce each individual bolt is $8.50. Which of the following functions models the average cost per bolt for the company to produce *x* bolts, where** $x > 1$?

A. $C(x) = 2000 + 8.50x$

B. $C(x) = (2000 + 8.50)x$

C. $C(x) = \frac{2000 + 8.50}{x}$

D. $C(x) = \frac{2000 + 8.50x}{x}$

43. The sum of three consecutive odd integers is 105. What is the value of the smallest integer?

A. 31

B. 33

C. 35

D. 37

A-CED.2 Practice:

3. The period (T) of a mass attached to a spring is equivalent to the product of 2π and the square root of the ratio of the mass (m) to the spring constant (k). Which equation represents this relationship?

A. $T = 2\pi\sqrt{\frac{k}{m}}$

B. $T = 2\pi\sqrt{\frac{m}{k}}$

C. $T = 2\pi\left(\frac{k}{m}\right)^2$

D. $T = 2\pi\left(\frac{m}{k}\right)^2$

4. Mikel has $20 to spend at the aquarium.

- The aquarium charges a $10 admission fee.
- The aquarium also has special exhibits that cost $4.00 each to view.

Which equation can be used to determine the amount of money, y, that Mikel has left if he views $x$exhibits?

A. $y = 4 - 10x$

B. $y = 10x - 4$

C. $y = 10 - 4x$

D. $y = 4x - 10$

5. **It costs $4.50 per person for 2 people and $3.00 per person for 3 people to go on a horse carriage ride. Using c to represent the cost per person and n to represent the number of people, which equation models this relationship?**

A. $cn = 9.00$

B. $9.00n = c$

C. $c + n = 7.50$

D. $2n + 3n = 7.50$

67. **Which of the following equations could represent the relationship between *x* and *y* in the table below?**

x	1	2	3	4	5
y	2	5	10	17	26

A. $y = 2x$

B. $y = 2x + 1$

C. $y = \sqrt{x - 1}$

D. $y = x^2 + 1$

76. **A riverboat ride costs $8 per person, and there is a 25% discount for children, students, and senior citizens. If there are (*p*) people who do not qualify for a discount and (*s*) people who do qualify, which equation can be used to calculate the revenue (*R*)?**

A. $R = 8p - 6s$

B. $R = 8p + (0.75)(8)(s)$

C. $R = 8p + 0.75s$

D. $R = 8p + (0.25)(8)(s)$

78. The population of a town is growing by 2% every 3 years. There were 1,000 people living in the town in 1990. Which equation models the population of the town, p, t years after 1990?

A. $p = 1,000\left(0.98\right)^{\frac{t}{3}}$

B. $p = 1,000\left(1.02\right)^{\frac{t}{3}}$

C. $p = 0.98\left(1,000\right)^{\frac{t}{3}}$

D. $p = 1.02\left(1,000\right)^{\frac{t}{3}}$

80. In 6 years, Susan's age, y, will be half as much as her sister's age, x, will be in two years. Which equation models Susan's age in terms of her sister's age?

A. $y = \frac{1}{2}x - 5$

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

C. $y = \frac{1}{2}x + 1$

D. $y = \frac{1}{2}x + 4$

88. John has a full tank of gas in his car.

- His car has a 15-gallon tank.
- His car gets 30 miles per gallon.

Which equation shows the relationship between how many miles, m, John drives and the number of gallons of gas, g, remaining in the car's tank?

A. $g = 15 - 30m$

B. $m = 30g - 15$

C. $g = 15 - \frac{m}{30}$

D. $m = \frac{30}{g} - 15$

91. Thomas rented a van for \$65 a day, plus \$0.35 for each mile he drove over 3,000 miles. Thomas rented the van for 8 days and drove it m miles. Which equation models the total cost, C, that Thomas paid to rent the van if $m \geq 3{,}000$?

A. $C = 520 + 0.35(m - 3{,}000)$

B. $C = 520 + 0.35(m + 3{,}000)$

C. $C = 65 + 35(m - 3{,}000)$

D. $C = 65 + 0.35m$

94. Steve and Marcia bought soda, chips, and gum.

- They bought twice as many chips as pieces of gum.
- They bought 3 fewer sodas than chips.
- Let P represent the total items purchased, s represent soda, c represent chips, and g represent gum.

Which set of equations could be used to model the amounts of items purchased?

A. $g = 2c$
$s = c - 3$
$P = s + c + g$

B. $c = 2g$
$s = c - 3$
$P = s + c + g$

C. $g = 2c$
$s = c + 3$
$P = s + c + g$

D. $c = 2g$
$s = c + 3$
$P = s + c + g$

95. Shelly invested \$1,000 at a rate of 5% interest per year. Which equation models the value of the investment, V, after t years?

A. $V = 1{,}000 + 5t$

B. $V = 1{,}000 + 1.05t$

C. $V = 1{,}000(0.05)^t$

D. $V = 1{,}000(1.05)^t$

96. A cell phone plan costs \$49 per month for 200 minutes. For each minute over 200, the customer is charged an additional \$0.10 per minute. Which equation could be used to calculate the monthly bill, y, if a person talked x minutes over 200 in a month?

A. $y = 0.1x + 49$

B. $y = 0.1x + 249$

C. $y = 0.1(200 - x) + 49$

D. $y = 0.1(x - 200) + 49$

F-LE.1 Practice:

1. A car is purchased for $30,000. The value of the car depreciates annually so that it is $24,000 after 1 year, $19,200 after 2 years, and $15,360 after 3 years. Why can this situation be modeled using an exponential function?

   A. The value of the car depreciates annually by 20%.

   B. The value of the car depreciates annually by 80%.

   C. The value of the car depreciates annually by $6,000.

   D. The value of the car depreciates annually by $4,800.

3. **A function is shown in the table.**

x	1	2	3	4	5	6
$f(x)$	15	27	39	51	63	75

Which sentence justifies the claim that the function is a linear function?

A. All the outputs are odd numbers.
B. All the outputs are positive numbers.
C. The function grows by equal factors over equal intervals.
D. The function grows by equal differences over equal intervals.

5. **Which values should be added to the table below in the order shown to prove that $h(x)$ is a linear function?**

x	0	1	2	3	4	5
$h(x)$	–4		10		24	

A. 2, 16, 30
B. 2, 18, 32
C. 3, 17, 31
D. 4, 16, 32

7. Which table of values could represent an exponential function?

A.

x	y
1	2
2	4
3	8
4	16

B.

x	y
2	4
4	8
6	12
8	16

C.

x	y
3	15
4	12
5	9
6	6

D.

x	y
4	11
5	14
6	17
7	20

15. **Values for the function $g(x)$ are shown in the table.**

x	0	1	2	3	4	5
$g(x)$	1	$\frac{1}{2}$	$\frac{1}{4}$	$\frac{1}{8}$	$\frac{1}{16}$	$\frac{1}{32}$

Which statement proves that $g(x)$ is an exponential function?

A. All values of $g(x)$ are fractions.
B. All values of $g(x)$ are positive numbers.
C. The function $g(x)$ decreases by equal factors over equal intervals.
D. The function $g(x)$ grows by equal differences over equal intervals.

20. **The table shows a linear relationship between *x* and *y*.**

x	*y*
–8	–4
–4	–1
0	2
4	5

As the value of *x* increases by 3, what is the increase in the value of *y*?

A. 2.50
B. 2.25
C. 1.75
D. 1.50

25. George is planning to take a long trip in his car. The table below shows the total distance George estimates he will cover after each hour.

Time (in hours)	Distance Covered (in miles)
1	60
2	120
3	180
4	240
5	300

Which statement is **correct**?

A. The distance is increasing by a constant percentage each hour, so the data can be modeled by a linear function.

B. The distance is increasing by a constant percentage each hour, so the data can be modeled by an exponential function.

C. The distance is increasing at a constant rate each hour, so the data can be modeled by a linear function.

D. The distance is increasing at a constant rate each hour, so the data can be modeled by an exponential function.

26. Which scenario is ***best*** modeled by a linear function?

A. the height of a rocket x seconds after it is launched from a 20-foot tall platform

B. the amount of a radioactive element that decreases by half every x 10-year periods

C. the total population of a town that has changed by 2% every x years

D. the total price paid for x shirts that are on sale for half off

32. Jasmine currently has sixteen songs downloaded in her music player. She is going to add two new songs a month to her player. Which type of function would ***best*** model Jasmine's total number of songs in her player after each month?

A. cubic function

B. exponential function

C. linear function

D. quadratic function

34. **Which situation can be represented with a linear graph where the volume of water in a tub is a function of time?**

A. A faucet pumps water into a tub at a rate of 2 gallons per minute.
B. A tub loses one-fifth of the remaining water each minute as it is drained.
C. A tub is filled at a rate of 2 gallons per minute and then drained at a rate of 3 gallons per minute.
D. A faucet pumps water into a tub at a rate of 3 gallons per minute as 5% of its volume is drained per minute.

51. **Which distance can be modeled as a linear function of time?**

A. the distance traveled by a car moving at 40 miles per hour
B. the distance traveled by a train decelerating by 2 miles per hour per minute
C. the distance traveled by a car as it comes to a stop over a length of 100 meters
D. the distance traveled by a train as it increases speed from 30 to 35 miles per hour

58. Which scenario would ***best*** be modeled by an exponential growth function?

A. the salary of a worker who makes $8 every hour

B. the population of a town that is doubling every decade

C. the population of a virus that is reducing in number by half every hour

D. the amount of commision a worker makes who earns 8% commission on his total sales

F-LE.3 Practice:

1. Melissa and Steve bought new cars.

   - The value of Melissa's car can be calculated using the function $f(x) = 16{,}000(0.9)^x$, where x is the number of years after the car was purchased.
   - The value of Steve's car can be calculated using the function $f(x) = 18{,}000 - 1{,}500x$, where x is the number of years after the car was purchased.

   After 7 years from the purchase of their cars, which statement below is true?

   A. Melissa's car is worth about \$150 more than Steve's car.

   B. Steve's car is worth about \$150 more than Melissa's car.

   C. Melissa's car is worth about \$1,500 more than Steve's car.

   D. Steve's car is worth about \$1,500 more than Melissa's car.

3. At what values of x will $f(x) = 3^x - 1$ exceed $g(x) = x^2 - 2x + 8$?

   A. $x > 8$

   B. $x \geq 8$

   C. $x > 2$

   D. $x \geq 2$

5. Two functions are shown below.

$$f(x) = 15 + (1.1)^x$$
$$g(x) = 115 + 1.1x$$

   For what integer value of x does the value of $f(x)$ first exceed the value of $g(x)$?

   A. 54

   B. 60

   C. 181

   D. 187

6. What is the smallest positive integer such that the value of $f(x) = {}^{-}x^2 + 5x$ exceeds the value of $g(x) = {}^{-}10x + 10$?

A. 0

B. 1

C. 4

D. 10

12. Two functions are shown in the table below.

x	$f(x)$	$g(x)$
0	100	5
1	102	10
2	104	20
3	106	40

Which statement is true about the two functions when $x = 5$?

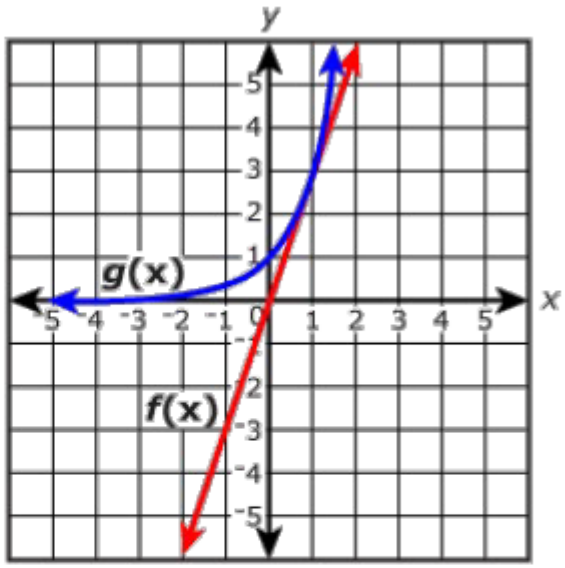
A. The value of $f(x)$ exceeds the value of $g(x)$ by 20.

B. The value of $g(x)$ exceeds the value of $f(x)$ by 20.

C. The value of $f(x)$ exceeds the value of $g(x)$ by 50.

D. The value of $g(x)$ exceeds the value of $f(x)$ by 50.

13. The functions $f(x) = 3x$ and $g(x) = 3^x$ intersect at the point $(1, 3)$.



Which statement is true?

A. $f(x)$ and $g(x)$ increase at the same rate beginning at their intersection.

B. $f(x)$ increases at a slower rate beginning at their intersection.

C. $f(x)$ increases at a faster rate beginning at their intersection.

D. $f(x)$ increases at a slower rate until the functions intersect.

15. For what positive integer value of x will the value of $g(x) = 3^x$ first exceed the value of $f(x) = 2x + 25$?

A. 3

B. 4

C. 25

D. 26

16. Two functions are shown in the table below.

x	$f(x)$	$g(x)$
$^{-}3$	1	8
$^{-}2$	4	4
$^{-}1$	7	2
0	10	1

Which statement is true about the two functions when $x = {}^{-}6$?

A. The value of $f(x)$ exceeds the value of $g(x)$ by 56.

B. The value of $g(x)$ exceeds the value of $f(x)$ by 56.

C. The value of $f(x)$ exceeds the value of $g(x)$ by 72.

D. The value of $g(x)$ exceeds the value of $f(x)$ by 72.

17. Which statement is true about the functions $f(x) = 2x^2 + x + 2$ and $g(x) = 2^x + 2$, when $x = 0$?

A. The value of $f(x)$ and the value of $g(x)$ are the same.

B. The value of $f(x)$ exceeds the value of $g(x)$ by 1.

C. The value of $g(x)$ exceeds the value of $f(x)$ by 1.

D. The value of $g(x)$ exceeds the value of $f(x)$ by 2.

F-LE.5 Practice

1. The function $V(t) = 22{,}000 - 3{,}400t$ models the value of the Mr. Smith's boat t years after he purchased it in 2009. What does the 22,000 represent?

A. the current value of the boat

B. the value of the boat when Mr. Smith purchased it

C. the amount the value of the boat increases each year Mr. Smith owns it

D. the amount the value of the boat decreases each year Mr. Smith owns it

11. Suppose that the equation $y = 2.26x + 14.3$ can be used to represent the percent of U. S. population enrolled in an insurance health maintenance organization (HMO) x years since 1992. What does the coefficient of x represent?

A. The percent of the U. S. population that joins an HMO each year.

B. The percent of the U. S. population that drops an HMO each year.

C. The percent of the U. S. population that has no insurance coverage.

D. The percent of the U. S. population that uses an HMO for insurance coverage.

12. **The number of maps remaining at an information booth can be modeled by the function $f(x) = 274 - 32x$, where x is the number of hours that have elapsed since the booth opened. Which statement is true?**

A. Every hour, 274 maps are given away.

B. Every hour, 242 maps are given away.

C. There were 32 maps at the booth before it opened.

D. There were 274 maps at the booth before it opened.

19. The math club is selling silk-screened T-shirts as a fundraiser. The T-shirt company charges a one-time set-up fee of $125.00 for the artwork and $0.50 to screen each T-shirt. Undecorated shirts cost $5.00 each. Which equation models the cost (C) of x number of silk-screened T-shirts?

A. $C = 125 + 0.5x$

B. $C = 125 - 5x$

C. $C = 125 + 5.5x$

D. $C = 125x + 5.5$

23. Each year, a basketball league organizes a tournament. The number of teams, T, left after n rounds can be modeled by the equation $T = 8(0.5)^n$.

Which function can be used to find the number of teams left after n rounds if eight additional teams participate in the tournament and the proportion of teams eliminated after each round remains the same?

A. $f(n) = 16(0.5)^n$

B. $f(n) = 16(0.5)^{n+8}$

C. $f(n) = 8(0.5)^n + 8$

D. $f(n) = 8(0.5)^{8n}$

28. To calculate the charge for a load of bricks, including delivery, the Pine Ridge Brick Company uses the function $c = 0.42b + 25$, where c is the charge and b is the number of bricks. What is the meaning of the coefficient of b?

A. the delivery charge per load

B. the total delivery charge

C. the total cost of the bricks

D. the cost per brick

31. The equation, $y = 3{,}900x + 80{,}000$ models the change in average house prices, y, in a city x years since 2008. The slope of the line represents which value?

A. the average price of a house in 2008

B. the total change in average price of a house since 2008

C. the increase in average price of a house between two consecutive years

D. the decrease in average price of a house between two consecutive years

36. The function $f(x) = 37x + 20$ models the total cost for Rachel to be a member at a gym for x months. What can be interpreted from the y-intercept of the function?

A. Rachel must pay $37 per month to use the gym.

B. Rachel must pay $20 per month to use the gym.

C. Rachel must pay a $37 membership fee to join the gym.

D. Rachel must pay a $20 membership fee to join the gym.

41. **The number of bottles of water in a pantry after a delivery can be modeled by the function $f(x) = 24x + 35$, where x is the number of cases of bottled water delivered. Which statement is true?**

A. Each case of water contains 24 bottles.

B. Each case of water contains 35 bottles.

C. There were 24 bottles of water in the pantry before the delivery.

D. There were 59 bottles of water in the pantry before the delivery.

51. The function $f(t) = 500(0.8)^t$ models the the size of a population of rats in an area t years after 2005. What does 0.8 represent in this function?

A. a decay rate of 80% each year

B. a growth rate of 80% each year

C. a decay rate of 20% each year

D. a growth rate of 20% each year

A-REI.11 Practice:

4. The functions $f(x)$ and $g(x)$ are defined below.

$$f(x) = \frac{3}{4}(2)^x$$
$$g(x) = 18x - 60$$

What is the difference in the x values for the two points where $f(x) = g(x)$?

A. 48

B. 36

C. 4

D. 2

7. When does the value of $f(x) = \left(\frac{1}{2}\right)^x$ equal the value of $g(x) = 2x + 8$?

A. $x = -2$

B. $x = -1$

C. $x = 2$

D. $x = 4$

8. Given:

$$f(x) = 3^x$$
$$g(x) = -2x + 13$$

For which x-value does $f(x) = g(x)$?

A. $\frac{5}{13}$

B. 0

C. 2

D. 9

10. A company is selling two new products. Weekly sales of product one can be modeled by the function $f(x) = 100(1.108)^x$ after x weeks. Weekly sales of product two can be modeled by the function $g(x) = 10x + 200$ after x weeks. After ***approximately*** how many weeks will the weekly sales of the two products be the same?

A. 9 weeks

B. 11 weeks

C. 15 weeks

D. 19 weeks

11. If $y = 6x + 8$ and $y = -4x - 2$, what is the value of $x + y$ when the two equations are equal?

A. -2

B. -1

C. 1

D. 2

12. Carl bought a car for $5,000. The value of the car is decreasing by 9% each year. Janet bought a car for $3,000. The value of her car is decreasing by 3% per year. How long does it take for the value of the cars to be ***approximately*** the same?

A. 8 years

B. 9 years

C. 11 years

D. 13 years

29. The table below shows values for two functions, $f(x)$ and $g(x)$.

x	$f(x)$	$g(x)$
-3	-5	16
-2	-2	8
-1	1	4
0	4	2
1	7	1
2	10	0.5
3	13	0.25

For what value of x does $f(x)$ ***approximately*** equal $g(x)$?

A. 2.7

B. 0.6

C. -0.2

D. -0.4

31. Which ordered pair represents a solution to $f(x) = g(x)$?

$$f(x) = x^2 - 19$$
$$g(x) = -2x + 5$$

A. $(-6, 7)$

B. $(-4, 3)$

C. $(4, -3)$

D. $(6, -7)$

44. Since January 2010, a grape farmer has been growing red and green grapes. The number of red grape vines can be modeled by the function $f(x) = 1{,}000(1.03)^x$, where x is the number of years since January 2010. The number of green grape vines can be modeled by the function $g(x) = 20x + 1{,}125$, where x is the number of years since January 2010. In what year will the number of each type of grape vine be ***approximately*** equal?

A. 2013

B. 2015

C. 2017

D. 2019

49. Two functions are shown in the table below.

x	$f(x)$	$g(x)$
5	14	0
10	19	$^-5$
15	24	$^-10$
20	29	$^-15$

For what value of x does $f(x) = g(x)$?

A. $^-19$

B. $^-2$

C. 7

D. 28

F-IF.6 Practice:

2. The table below records the median salary at United Construction over a period of 4 years.

Year	Salary
2009	$35,000
2010	$36,000
2011	$38,000
2012	$40,000
2013	$43,000

What is the average annual increase in the median salary from 2009 to 2013?

A. $2,000

B. $8,000

C. $38,000

D. $38,400

1. Sam and Jason run the two-mile race for the school track team. The table below shows their times for the first 4 races.

Race	Sam	Jason
1	17.6 minutes	18.5 minutes
2	16.5 minutes	17.3 minutes
3	16.3 minutes	16.2 minutes
4	15.2 minutes	15.8 minutes

What is the difference between Jason's average rate of change and Sam's average rate of change from race 1 to race 4?

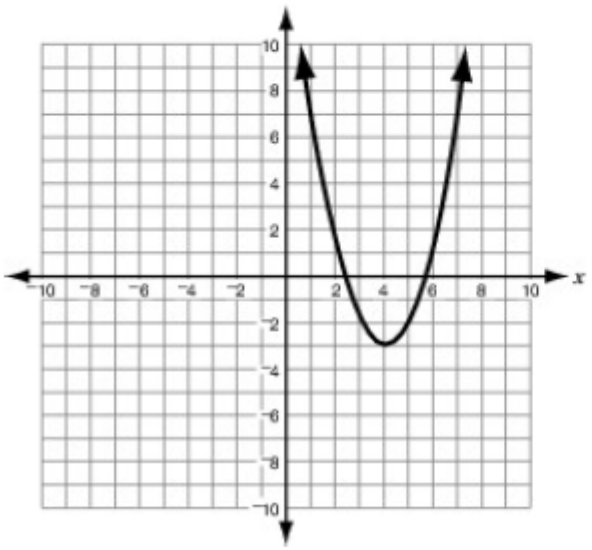
A. 0.9 minutes

B. 0.6 minutes

C. 0.4 minutes

D. 0.1 minutes

5. What is the average rate of change of the function below over the interval of $x = 5$ to $x = 7$?



A. $\frac{1}{4}$

B. $\frac{1}{2}$

C. 2

D. 4

6. **Which value represents the rate of change of** $f(x) = x^3 + x + 1$ **from** $x = 1$ **to** $x = 3$ **?**

A. 8
B. 14
C. 20
D. 28

9. The table below shows the number of minutes Leo played basketball and the total number of calories he burned.

Time (minutes)	**Total Calories Burned**
15	100
25	116
40	250
50	350
70	500

What is the ***approximate***average rate of change in the total calories Leo burned between 40 and 70 minutes?

A. 7.71

B. 8.21

C. 8.33

D. 8.75

12. Using the table of selected values of $f(x)$ below, calculate the average rate of change of $f(x)$ over the interval $[3, 5]$.

x	0	1	2	3	4	5
$f(x)$	7	9	12	16	14	12

A. -4

B. -2

C. 14

D. 21

15. What is the average rate of change for the function $f(x) = 4(0.5)^x$ over the interval $-1 \le x \le 2$?

A. 9

B. $\frac{1}{9}$

C. $-\frac{3}{7}$

D. $-\frac{7}{3}$

27. Which expression is equivalent to the average rate of change of the function $f(x)$ over the interval [4, 9]?

A. $\frac{f(4)-f(9)}{4-9}$

B. $\frac{4-9}{f(4)-f(9)}$

C. $\frac{4+9}{f(4)+f(9)}$

D. $\frac{f(4)+f(9)}{4+9}$

31. The population growth for a species of birds, in thousands, can be represented by the function $p(t) = 20(1.24)^t$, where t is the number of years since 2002. What is the approximate average rate of change of the population between the years of 2004 and 2007?

A. 9.3 thousand birds/year

B. 14.3 thousand birds/year

C. 27.9 thousand birds/year

D. 42.9 thousand birds/year

F-BF.1 Practice:

3. The first term of a sequence is 13. Each term in the sequence is 12 more than the previous term. Which explicit equation can be used to determine the *n*th term in the sequence?

   A. $a_n = n + 12$

   B. $a_n = 12n + 1$

   C. $a_n = 12n + 13$

   D. $a_n = 13n$

4. Which of the following expressions represents the sequence $1, 3, 5, 7, \ldots$ written explicitly for $n = 1, 2, 3, \ldots$?

   A. $n + 1$

   B. $n + 2$

   C. $2n - 1$

   D. $2n + 1$

5. The number of cows a farmer has can be modeled by an arithmetic sequence. The 2nd, 5th and 7th terms in that sequence are 30, 39, and 45, respectively. How many cows did the farmer begin with?

   A. 21

   B. 24

   C. 27

   D. 30

6. A sequence is shown below.

$$-1.5, -1.25, -1, -0.75, \ldots$$

Which explicit expression can be used to determine the value of the *n*th number in the sequence?

A. $a_n = 0.25n - 1.75$

B. $a_n = n + 0.25$

C. $a_n = n - 2.5$

D. $a_n = -1.5n$

8. A sequence is shown below.

$$-20, -17, -14, -11, -8, \ldots$$

Which explicit equation could be used to determine the value of the *n*th term in the sequence?

A. $a_n = n + 3$

B. $a_n = 3n - 23$

C. $a_n = n - 23$

D. $a_n = -3n + 23$

10. A 20-gram sample of uranium is decaying at a constant rate. After 5 days there are 19.6 grams of the uranium remaining. After 10 days there are 19.2 grams remaining. ***About*** how much of the sample remains after 30 days?

A. 2.4 grams

B. 5.9 grams

C. 16.8 grams

D. 17.7 grams

11. An athlete is training to run a marathon. She plans to run 2 miles the first week. She increases the distance by 8% each week. Which function models how far she will run in the *n*th week?

A. $t(n) = 1.08(2)^n$

B. $t(n) = 2(1.08)^n$

C. $t(n) = 1.08(2)^{(n-1)}$

D. $t(n) = 2(1.08)^{(n-1)}$

16. A theater has 22 seats in the first row, 25 seats in the second row, 28 seats in the third row, and so on. How many seats are in the fifteenth row?

A. 64 seats

B. 67 seats

C. 350 seats

D. 375 seats

18. Which context ***best*** matches the recursive equation NEXT = NOW + 5?

A. the population of sea bass in 5 year's time

B. the speed of a bike traveling at 5 miles per hour

C. the number of students at a basketball game, increasing by 5 students every minute

D. the time it takes a person to run a marathon, decreasing by 5 minutes each marathon

20. Mr. Alvarez invested an initial amount of $3,000 in an account that earns 1.1% interest compounded annually. Which recursive function describes the value of the account, A_n?

A. $A_1 = 1.1$
$A_n = 3{,}000 + A_{n-1}$

B. $A_1 = 1.1$
$A_n = 3{,}000 \cdot A_{n-1}$

C. $A_1 = 3{,}000$
$A_n = 1.011 + A_{n-1}$

D. $A_1 = 3{,}000$
$A_n = 1.011 \cdot A_{n-1}$

23. What is the 4th term in the sequence modeled by the recursive formula NEXT = 2 • NOW + 5 if the first term is equal to 5?

A. 15

B. 35

C. 60

D. 75

25. Four friends attempted to write the explicit expression for the *n*th term of the sequence 2, 5, 10, 17, ….

Name	Function
Austin	$(n + 1)^2 + 1$
Kaylee	$3n - 1$
Noah	$n^2 + 1$
Zoey	$7n - 11$

If *n* represents the set of counting numbers, who wrote the **correct** expression?

A. Austin

B. Kaylee

C. Noah

D. Zoey

28. John purchased a TV on sale for $1,500 using his store credit card. The annual interest rate is 12% and is compounded monthly. The monthly payments are $375. Which recursive equation expresses the remaining amount to be paid off as a function of the number of months, n, where a_{n-1} is the balance from the previous month?

A. $a_n = 1.01a_{n-1} - 375$

B. $a_n = 1.12a_{n-1} + 375$

C. $a_n = 1.12a_{n-1} - 375n$

D. $a_n = 1.01a_{n-1} + 375n$

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

1, 4, 7, 10

Which formula can be used to determine the nth term in the sequence?

A. $a_n = 3n - 2$

B. $a_n = 3n + 1$

C. $a_n = n - 3$

D. $a_n = n + 3$

F-BF.2 Practice:

1. The 12th term of an arithmetic sequence is 87 and the 20th term is 135. Which number represents the value of the common difference, d, of the sequence?

A. 4

B. 6

C. 8

D. 48

2. A sequence is shown below:

2, 6, 18, 54, . . .

Which recursive formula models the sequence?

A. NEXT = NOW + 4

B. NEXT = 3 • NOW

C. $\text{NEXT} = \frac{2}{3} \bullet 3^{\text{NOW}}$

D. $\text{NEXT} = 2 \bullet 3^{\text{NOW}}$

3. A sequence is defined by the formula $a_1 = 4$ and $a_n = a_{n-1} + 6$ for n greater than 1. Which of the following describes a_8?

A. $a_8 = 4 + 7(6)$

B. $a_8 = 6 + 7(4)$

C. $a_8 = 6 + 8(4)$

D. $a_8 = 4 + 8(6)$

7. A sequence is shown below:

0.5, 0.05, 0.005, . . .

Which recursive formula models the sequence?

A. $\text{NEXT} = 0.5 \bullet \left(\frac{1}{10}\right)^{\text{NOW}}$

B. $\text{NEXT} = 5 \bullet \left(\frac{1}{10}\right)^{\text{NOW}}$

C. $\text{NEXT} = \frac{\text{NOW}}{10}$

D. $\text{NEXT} = \frac{10}{\text{NOW}}$

8. The first four triangular numbers are 1, 3, 6, and 10. Which expression can be used to find *n*th triangular number?

A. $n+1$

B. $\frac{n^2+3n}{2}$

C. $\frac{n(n+1)}{2}$

D. $\frac{n \bullet n+1}{2}$

9. The sequence $a_1, a_2, a_3, \ldots$ is defined explicitly as $a_n = -3n - 2$.

What is the recursive form of this sequence?

A. $a_1 = -5, a_n = -3a_{n-1}$

B. $a_1 = -5, a_n = 3a_{n-1}$

C. $a_1 = -5, a_n = a_{n-1} - 3$

D. $a_1 = -5, a_n = a_{n-1} + 3$

10. Determine the first three terms of the sequence and whether the given formula is explicit or recursive.

$$a_n = \frac{1}{2}(n)(n-1), n = 1, 2, 3, \ldots$$

A. Explicit: 0, 1, 3

B. Explicit: 1, 3, 6

C. Recursive: 0, 1, 3

D. Recursive: 1, 3, 6

12. The explicit formula for a function is $f(n) = {}^{-}3n + 8$. What is the starting value for the recursive form of the function?

A. 8

B. 5

C. $^{-}3$

D. $^{-}11$

16. The sequence below shows the number of raffle tickets that Samantha sold each day during a month.

3, 7, 11, 15, . . .

Which explicit formula models the number of tickets Samantha sold on day x?

A. $t(x) = x + 4$

B. $t(x) = 3x + 4$

C. $t(x) = 4x - 1$

D. $t(x) = 4x + 3$

19. Look at the recursive function below.

$$a_1 = 900$$
$$a_n = a_{n-1} - 60$$

Which explicit formula represents this function?

A. $a_n = 840n$

B. $a_n = 900n - 60$

C. $a_n = 900 - 60n$

D. $a_n = 960 - 60n$

23. A certain recursive equation is defined by the formula NEXT = NOW + 4, starting at 7. What is the explicit form of this equation?

A. $f(n) = n + 4$

B. $f(n) = n + 7$

C. $f(n) = 4n + 3$

D. $f(n) = 4n + 7$

24. A geometric sequence is shown below.

24, 12, 6, ...

Which is the explicit formula for this sequence?

A. $a_n = 24 - \frac{1}{2}(n - 1)$

B. $a_n = 24 - \frac{1}{2}n$

C. $a_n = 24\left(\frac{1}{2}\right)^n$

D. $a_n = 24\left(\frac{1}{2}\right)^{n-1}$