

NC Math 1

North Carolina

End-of-Course

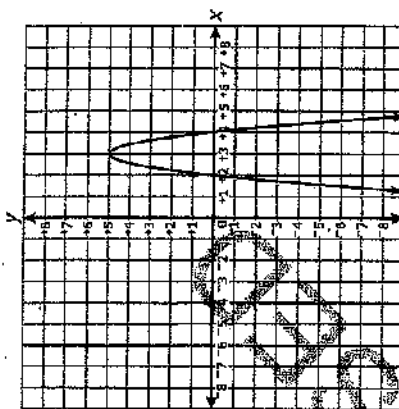
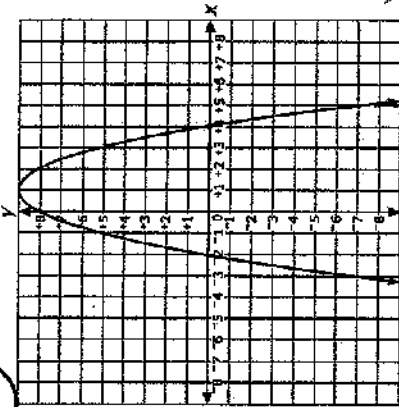
Assessment



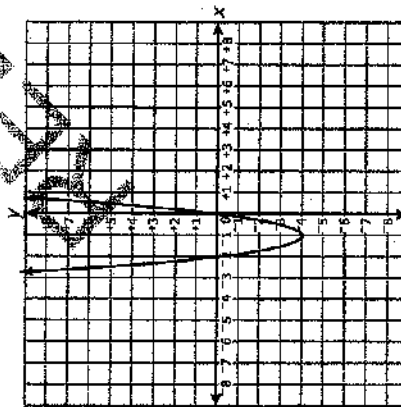
RELEASED ITEMS

1 Which choice is the graph of $y = (4 - x)(x + 2)$?

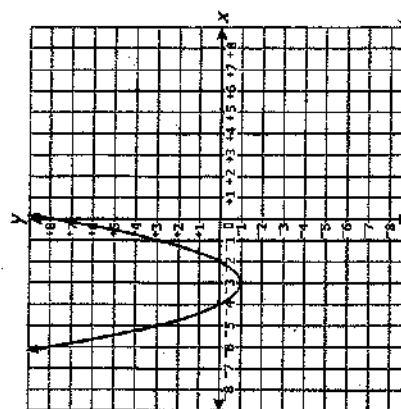
A. $x = 4$ B. $x = -2$



C



D





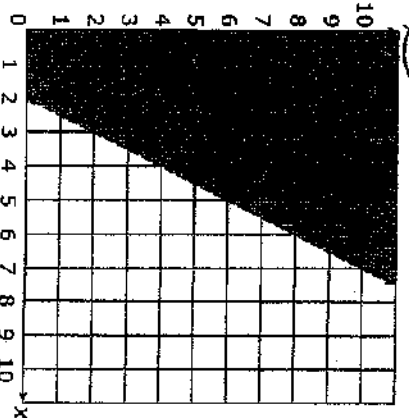
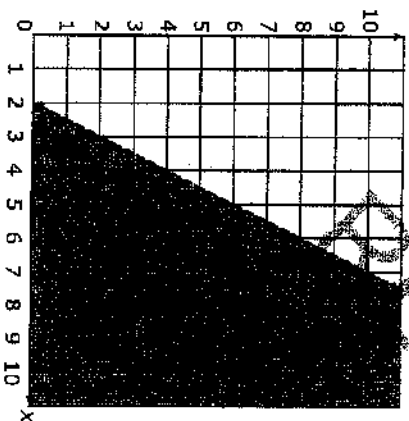
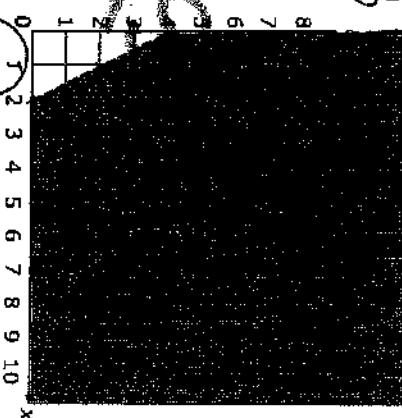
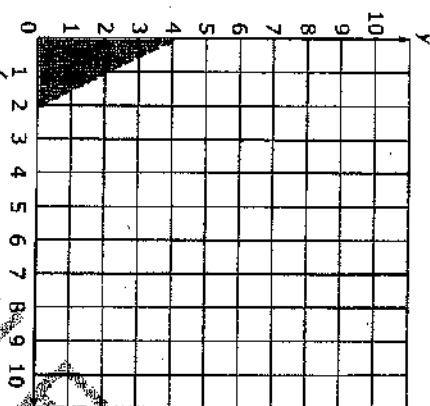
- 2 In which graph does the shaded region represent the solution set for the inequality shown below?

$$2x - y < 4$$

$$-y < -2x + 4$$

$$-y < -2x + \frac{4}{-1}$$

$$y > 2x - 4$$



- 3 Which expression is equivalent to $(x + 2)(3x - 3)$?

- A $3x^2 - 6$
 B $3x^2 + 3x - 6$
 C $3x^2 + 6x - 6$
 D $3x^2 + 9x - 6$

$$\begin{array}{r} 3x^2 + 6x - 6 \\ 3x^2 + 6x - 6 \\ \hline 0 \end{array}$$

RELEASED



Questions 9 and 10 are gridded response items that require you to write your answers in the boxes provided on your answer sheet. Write only one number or symbol in each box and fill in the circle in each column that matches what you have printed. Fill in only one circle in each column.

- 9 The total cost, in dollars, of membership in a fitness center is given by the function $c(m) = 20m + 40$, where m is the number of months a person is a member. In dollars, how much is the cost of a membership for 1 year?

$$\begin{array}{r} 20 \\ \times 12 \\ \hline 240 \\ + 40 \\ \hline 280 \end{array}$$

(12 months)

- 10 Water is being pumped into a 10-foot-tall cylindrical tank at a constant rate.

- The depth of the water is increasing linearly.
- At 1:30 p.m., the water depth was 2.4 feet.
- It is now 4:00 p.m., and the depth of the water is 3.9 feet.

What will the depth (in feet) of the water be at 5:00 p.m.?

5:30 p.m.	1:30	2.4	3.9	4.5
5:00 p.m.	4:00	3.9	4.2	4.5 feet
4:30	4:00	4.2		
4:00	4:00	4.5 feet		

$1.5/5 = .30$ per hour

- 11 Sally works at a store.

- x represents Sally's monthly paycheck, and y represents her monthly savings.
- Sally will save at least \$20 more than half of her paycheck each month.
- She can save at most \$80 more than two-thirds of her paycheck each month.
- Her paycheck each month is at least \$1,200, but no more than \$1,850.

Which system of inequalities represents these constraints?

- A $x \leq \frac{1}{2}y + 20$
 $x \geq \frac{2}{3}y + 80$
 $y \leq 1,200$
 $y \geq 1,850$
- B $y \geq \frac{1}{2}x + 20$
 $y \leq \frac{2}{3}x + 80$
 $x \geq 1,200$
 $x \leq 1,850$
- C $y \leq \frac{1}{2}x + 20$
 $y \geq \frac{2}{3}x + 80$
 $x \leq 1,200$
 $x \geq 1,850$
- D $x \geq \frac{1}{2}y + 20$
 $x \leq \frac{2}{3}y + 80$
 $y \geq 1,200$
 $y \leq 1,850$





Calculator Icons

- 12 A company uses the formula $T = 581s + 150p$ to determine the total cost to purchase s computers and p printers. Which formula can be used to determine the number of printers purchased, given the total cost, T , and the number of computers purchased?

A $p = \frac{T}{150} - 581s$

B $p = T - \frac{581s}{150}$

C $p = \frac{T - 581s}{150}$

D $p = T - 581s - 150$

$$\begin{array}{r} T = 581s + 150p \\ T - 581s = 150p \\ \hline 150 \quad 150 \\ p = \frac{T - 581s}{150} \end{array}$$

Calculator Icons



Questions 13 through 15 are gridded response items that require you to write your answers in the boxes provided on your answer sheet. Write only one number or symbol in each box and fill in the circle in each column that matches what you have printed. Fill in only one circle in each column.

- 13 What is the value of the positive zero of the function, f , defined by $f(x) = x^2 - 121$? ** difference of squares*
- $(x+11)(x-11)$
 $x = -11$ $x = 11$

- 14 What is the value of x in the system of equations shown below?

$$\begin{array}{l} 5x + 4y = 1 \\ y = -x \end{array}$$

SUBSTITUTION

$$\begin{array}{l} 5x + 4(-x) = 1 \\ 5x + 4 - 4x = 1 \\ x = -3 \end{array}$$

- 15 What is the value of the smaller zero of the function $f(x) = 2x^2 - 8x - 24$?
- solution roots x int.*
- $$\begin{array}{l} 2(x^2 - 4x - 12) \\ 2(x - 6)(x + 2) \\ x = 6 \quad x = -2 \end{array}$$

This is the end of the calculator inactive released items.





- 50 The table below shows the hours, x , spent working on a new road and the distance, y , of finished road.

Time (hours)	Distance (miles)
50	1.5
200	6
350	10.5
400	12
650	19.5

What is the slope of the line that fits these data?

- A $\frac{3}{400}$
 B $\frac{3}{100}$
 C $\frac{3}{25}$
 D 3

stet 44
 $a = .03$
 $\downarrow$
 $\frac{3}{100}$

This is the end of the NC Math 1 released items.



- 16 A statistician collected the following data to explore the relationship between two variables, x and y .

x	y
2.3	11.0
4.2	16.5
5.1	19.2
6.4	23.1
8.2	24.3
8.5	29.5

$y = 2.63x + 5.38$

The statistician performed a linear regression and also plotted the residuals.

- Based on the residual plot, the statistician decided to exclude one data point.
- The statistician then performed linear regression on the set of remaining data points.
- The result was that the new linear model fit the remaining data more closely than the original model fit the original data.

Which data point did the statistician exclude?

- A (2.3, 11.0)
 B (4.2, 16.5)
 C (6.4, 23.1)
 D (8.2, 24.3)

residual value
 observed - predicted

observed
 predicted
 residual value
 -4.93
 $.067$
 $.398$
 $.871$
 -2.46
 1.751





- 17 A set of nine data points is shown below.

6, 11, 12, 10, 9, 7, 5, 3, 9

Which statement is true if a tenth data point of 45 is added to the data set?

- A The mean and median will both increase.
 B The mean will increase and the median will decrease.
 C ☒ The mean will increase and the median will remain the same.
 D The mean and median will both decrease.

original $\bar{x} = 8.2$ med = 9
 new $\bar{x} = 11.9$ med = 9



Questions 18 and 19 are gridded response items that require you to write your answers in the boxes provided on your answer sheet. Write only one number or symbol in each box and fill in the circle in each column that matches what you have printed. Fill in only one circle in each column.

- 18 What is the distance, in units, between the y-intercept of $f(x) = x^2 + 7x - 18$ and the y-intercept of the linear function that passes through the points shown in the table below?

x	$g(x)$
-5	2
10	11
25	20
60	41

$g = .6x + 5$

distance = 23

- 19 What is the value of x in the equation shown below?

$$2(x + 8) - 4x = 10x + 4$$

$$2x + 16 - 4x = 10x + 4$$

$$-2x + 16 = 10x + 4$$

$$\begin{array}{r} -10x \\ -2x + 16 = 10x + 4 \\ \hline -12x = -12 \end{array}$$

$$x = 1$$



20 This is a paper/pencil copy of an online technology enhanced item.

Three systems of equations are shown in the table below.

Place (click and drag) the choice that describes the number of solutions of each system into the appropriate column in the table below.

$2x + 2y = 16$	$2(2x + 2y = 8)$	$2x + 3y = 12$
$4x + 3y = 27$	$4x + 4y = 16$	$6x + 3y = 18$

all solutions
 $4x + 4y = 16$
no solution
 $0 = -6$



21 Which equation represents the line that is perpendicular to the graph of $4x + 3y = 9$ and passes through $(-2, 3)$?

- A $3x - 4y = 18$
- B $3x + 4y = 18$
- C $3x - 4y = -6$
- D $3x + 4y = 6$

$4x + 3y = 9$
 $3y = -\frac{4x}{3} + 3$
 $y = -\frac{4}{3}x + 9$
 $y = mx + b$
 $3 = -\frac{4}{3}(-2) + b$
 $3 = -1.5 + b$
 $b = 4.5$
 $m = -\frac{4}{3}$
 $lm = \frac{3}{4}$
 $4(y = \frac{3}{4}x + \frac{9}{2})$
 $4y = 3x + 18$
 $3x - 4y = -18$



22 A club began with 3 members. Each month, each member brought one new member. Which function can be used to determine the number of members x months after the club began?

- A $f(x) = 2x + 3$
- B $f(x) = 3x + 1$
- C $f(x) = 1.5(2)^x$
- D $f(x) = 3(2)^x$

0 3
1 6
2 12
3 24

RELEASED





Questions 23 through 25 are gridded response items that require you to write your answers in the boxes provided on your answer sheet. Write only one number or symbol in each box and fill in the circle in each column that matches what you have printed. Fill in only one circle in each column.

23 Every ten years, the Census counts how many people are living in every town in the United States.

- The 2010 Census showed that 1,000 people were living in Appleville, and 4,000 people were living in Bridgetown.
- The population of Appleville is predicted to double every ten years.
- The population of Bridgetown is predicted to increase by 1,000 every ten years.

If the predictions come true, what will be the first census year that will show Appleville with a larger population than Bridgetown?

	2010	2020	2030	2040	2050	2060	2070	2080	2090	2100	2110	2120	2130	2140	2150	2160	2170	2180	2190	2200
A																				
B																				

24 Two stores have movies to rent.

- The first store charges a \$12.50-per-month membership fee plus \$1.50 per movie rented.
- The second store has no membership fee but charges \$3.50 per movie rented.

When A cheaper than B

What is the minimum number of movies a person would need to rent in a month for the first store to be a better deal?

$$A = 12.50 + 1.50m$$

$$B = 3.50m$$

7 movies



25 Karen has two dogs. The larger dog weighs 1.4 pounds more than the smaller dog. The combined weight of the two dogs is 12.6 pounds. What is the weight, in pounds, of the smaller dog?

$$L = 1.4 + S$$

$$L + S = 12.6$$

$$(1.4 + S) + S = 12.6$$

$$2S = 11.2$$

$$S = 5.6$$

RELEASED ITEMS

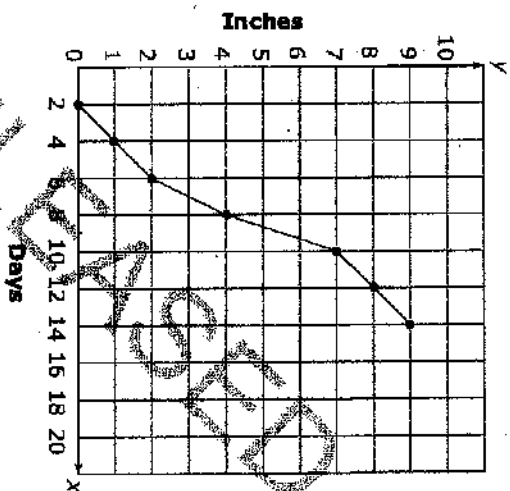


26 Which choice could be modeled by a linear function?

- A the amount of money, Y , in an account after x years earning 4% interest compounded annually
- ☒ B the monthly cost, Y , to use a cell phone for x minutes at a rate of 4 cents per minute
- C the height, Y , of a ball after bouncing x times, if each bounce reaches $\frac{2}{3}$ the previous height
- D the amount, Y , of radioactive material remaining after x years when decay occurs at a rate of 30% each year

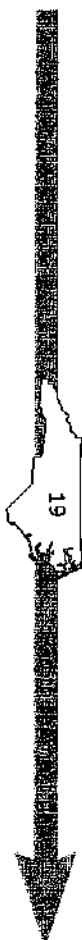
27 Oscar planted a tomato seed in his garden. Each day he recorded the height of the tomato plant.

Growth of Tomato Plant



During which interval did the tomato plant grow the fastest?

- A Day 4 to Day 6
- B Day 6 to Day 8
- ☒ C Day 8 to Day 10
- D Day 10 to Day 12





Questions 28 and 29 are gridded response items that require you to write your answers in the boxes provided on your answer sheet. Write only one number or symbol in each box and fill in the circle in each column that matches what you have printed. Fill in only one circle in each column.

- 28 The function $a(n) = 3n - 7$ represents the value of the n th term in a sequence. What is the sum of the 1st and 5th terms of the sequence?

$$3(1) - 7 \quad 3(5) - 7$$

$$-4 \quad + \quad 8 = \boxed{4}$$

- 29 The width of a rectangle is $\frac{3}{4}$ its length. The perimeter of the rectangle is 420 ft. What is the length, in feet, of the rectangle?

$$\frac{3}{4}L \quad 3.5L = 420$$

$$\boxed{L = 120}$$



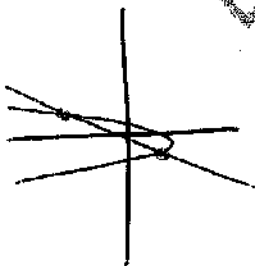
- 30 This is a paper/pencil copy of an online technology enhanced item. Two functions are shown below.

$$f(x) = 3x^2 + 14x - 5$$

$$g(x) = 11x + 13$$

Select (click) the points at which the graphs of the two functions intersect.

- ☒ (-5, 6) ☒ (-3, -20) ☒ (2, 35) ☒ (6, 29)





- 31 The table below shows the U.S. average life expectancy at birth, in years, in various decades.

Years since 1930	Life Expectancy at Birth
10	62.9
20	68.2
30	69.7
40	70.8
50	73.2
60	75.4
70	77.0
80	78.7

$$y = 0.21x + 62.70$$

- What is the meaning of the slope of the linear best-fit equation for the data?
- A The predicted average life expectancy at birth in 1930 was about 62.7 years.
 - B The predicted average life expectancy at birth in 1930 was about 57.6 years.
 - C The average life expectancy at birth increases by about 6.7 each year.
 - D The average life expectancy at birth increases by about 0.2 each year.

- 32 The choices below are data sets. In the choices, w is a constant. Each choice has the same mean. Which choice has the greatest standard deviation?

- A $w - 2, w - 1, w, w + 1, w + 2$
- B $w - 2, w - 2, w, w + 2, w + 2$
- C $w - 3, w - 1, w, w + 1, w + 3$
- D $w - 3, w, w, w, w + 3$

$$1.56$$

let $w = 0$ or pick any other #.

- 33 Abby scored 87, 93, 96, and 89 on her first four history quizzes. What score does Abby need to get on her fifth quiz to have an average of exactly 91 on her history quizzes?

- A 90
- B 94
- C 98
- D 100

$$\frac{87 + 93 + 96 + 89 + x}{5} = 91$$

$$\frac{365 + x}{5} = 91$$

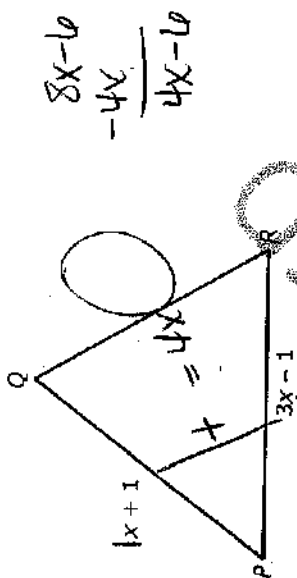
$$365 + x = 455$$

$$x = 90$$





- 34 The perimeter of the triangle below is $8x - 6$.



Which expression represents the length of $\overline{QR}$?

- A $4x - 4$
 B $4x - 6$
 C $6x - 4$
 D $6x - 8$

- 35 What are the solutions to the equation $4x^2 - 52x + 169 = 121$?

- A $\{1, -12\}$
 B $\{-1, 12\}$
 C $\{-1, -12\}$
 D $\{1, 12\}$

$$4x^2 - 52x + 169 = 121$$

$$4x^2 - 52x + 48 = 0$$

$$4(x^2 - 13x + 12) = 0$$

$$4(x - 1)(x - 12) = 0$$

$$x = 1 \quad x = 12$$

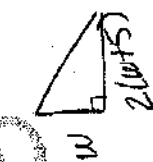


- 36 David has a rectangle and a right triangle.

- The length of the rectangle is 5 more than its width, w .
- The length of the shorter leg of the triangle is equal to the rectangle's width.
- The length of the longer leg of the triangle is twice the length of the rectangle.

Which function, $f(w)$, represents the combined area of the rectangle and the triangle?

- A $f(w) = 2w^2 + 10w$
 B $f(w) = 3w^2 + 15w$
 C $f(w) = w^2 + 10w + 25$
 D $f(w) = w^2 + 15w + 50$



$$w(w+5) + \frac{1}{2}(2w+10)w$$

$$w^2 + 5w + w(w+5)$$

$$w^2 + 5w + w^2 + 5w$$

$$2w^2 + 10w$$



- 37 The table below shows the number of hours 7 students studied for a math test and the grade each student earned on the test.

Student	Hours Studied (x)	Test Grade (y)
Mary	2.00	84
Jonathan	1.75	86
Susan	2.00	88
Terry	3.00	94
Patrick	3.50	95
Amanda	3.50	93
Darius	2.25	89

predicted best used

How does Amanda's test score compare to the score predicted using the linear best-fit model of data for a student who studied 3.50 hours?

- ☒ A Amanda scored about 5 points lower than the score predicted for a student who studied 3.50 hours.
- ☒ B Amanda scored about 5 points higher than the score predicted for a student who studied 3.50 hours.
- ☒ C Amanda scored about 2 points lower than the score predicted for a student who studied 3.50 hours.
- ☐ D Amanda scored about 2 points higher than the score predicted for a student who studied 3.50 hours.

26



- 38 This is a paper/pencil copy of an online technology enhanced item.

Place (click and drag) one option from each of the lists below into its corresponding box to create an equation of the line that passes through the point (1, -10) and is perpendicular to $y = -\frac{1}{3}x + 5$.

$$1m = 3$$

$$y = mx + b$$

$$-10 = 3(1) + b$$

$$-10 = 3 + b$$

$$b = -13$$

$$y = 3x - 13$$

1 2 3



- 39 Two functions are shown below.

$$f(x) = 3x + 7$$

$$g(x) = 2x + 12$$

$$(5, 22)$$

What is the value of x where the graphs of f(x) and g(x) intersect?

- A -22
- B -5
- ☒ C 5
- D 22

27



40

Marcus measured the height, in inches, Y , of plants over the course of 3 weeks. The correlation coefficient between the number of days, x , and the height of the plants is 0.85. Which could be concluded based on the correlation coefficient of the data?

- ☒ A There is a strong relationship showing that as the number of days increases, the height of the plants increases.
- ☐ B There is a strong relationship showing that as the number of days increases, the height of the plants decreases.
- ☐ C There is a weak relationship showing that as the number of days increases, the height of the plants increases.
- ☐ D There is a weak relationship showing that as the number of days increases, the height of the plants decreases.

REFUSED

28



Question 41 is a gridded response item that requires you to write your answer in the boxes provided on your answer sheet. Write only one number or symbol in each box and fill in the circle in each column that matches what you have printed. Fill in only one circle in each column.

- 41 A function is shown below.

$$g(x) = 19.60 + 1.74x$$

What is the value of $g(30)$?

$$19.60 + 1.74(30)$$

$$g(30) = 71.8$$

REFUSED

29





42 The table below shows the weights of 8 different bears at a zoo.

Type of Bear	Weight (pounds)
Asiatic Black Bear	225
Black Bear	300
Brown Bear	550
Panda Bear	200
Polar Bear	1,000
Sloth Bear	300
Spectacled Bear	280
Sun Bear	100

original
 $\bar{x} = 290$
 $\bar{x} = 309.38$
 new
 $\bar{x} = 280$
 $\bar{x} = 279.3$

- If the weight of the polar bear is removed, which statement is true?
- (A) The mean decreases more than the median because the polar bear is a high outlier.
- B The mean decreases less than the median because the polar bear is a high outlier.
- C The mean decreases more than the median because the high value balances the low value.
- D The mean decreases less than the median because the high value balances the low value.



43 The vertices of a rectangle are located at (1, 2), (5, 0), (2, -6), and (-2, -4). What is the area of the rectangle?

- A 20 square units
- (B) 30 square units
- C 35 square units
- D 45 square units

on graph paper

44 This is a paper/pencil copy of an online technology-enhanced item. Select (click) each situation that can be modeled with a linear function.

- ✓ A taxi charges an initial fee of \$2.00, and \$1.50 for each additional mile.
- ✓ The population of a town decreases by 1500 people per year.
- ✓ An airplane flying at an altitude of 33,000 feet descends at a rate of 20 feet per minute.
- ✓ A pizza restaurant charges \$5.50 per pizza, and \$0.50 for each additional topping.
- ✓ A cell doubles in size every 20 minutes.





- 45 What is the distance between the y-intercept of the function $f(x) = 2x^2 - 6x + 3$ and the y-intercept of the linear function g represented by the table below?

x	g(x)
-5	15
-2	3
2	-13
5	-25

$g = -4x - 5$

- A 2 units
B 3 units
C 8 units
D 9 units



- 46 The table below displays the walking heart rate and running heart rate of eight girls in beats per minute (bpm).

Walking Heart Rate	Running Heart Rate
66	128
72	136
74	134
78	138
80	142
84	146
86	148
88	152

Using the linear best-fit model for the data, what is the predicted running heart rate of a girl whose walking heart rate is 100 bpm?

- A 161 bpm
B 163 bpm
C 165 bpm
D 167 bpm

WAF $y = 1.04x + 58.84$
 $y = 1.04(100) + 58.84$





47 This is a paper/pencil copy of an online technology enhanced item. Place (click and drag) the data sets below into the appropriate rows in the table.

Symmetric about the Mean	
Skewed Left	
Skewed Right	

skewed right
skewed left
symmetric

most of data

115



48 A rectangle has a perimeter of 64.

- Let x equal the width of the rectangle.
- Let y equal the area of the rectangle.

Which equation can be used to find the area of the rectangle?

- A $y = x^2 - 64x$
- B $y = x^2 + 64x$
- C $y = x^2 - 32x$
- D $y = x^2 + 32x$

$x(32-x)$
 $-x^2 + 32x$

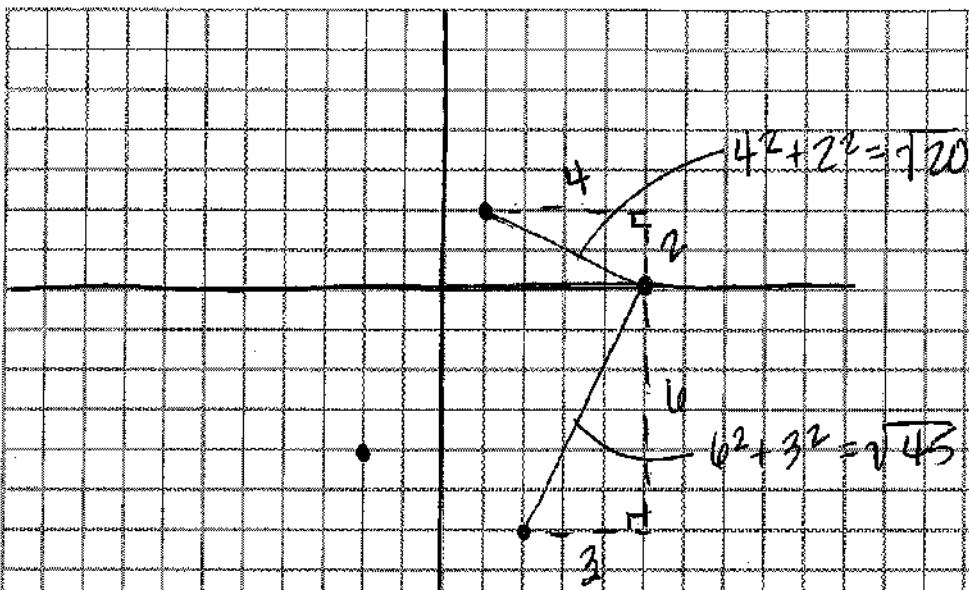
$64-2x$
 $32-x$
 x

49 What is the midpoint of the longest side of the triangle with vertices (1, 4), (3, 4), and (3, 6)?

- A (1, 1)
- B (2, 4)
- C (2, 5)
- D (3, 5)

on scratch paper





$A = \text{LW}$
 $\sqrt{20} \cdot \sqrt{45} = 30$



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

$$y > 2x - 4$$



5, 30 min
4:30
5

2.4
3.9
4.2

4.5

1.5
1.5 = 0.3
20 min

$$-\frac{b}{2a} = \frac{-(-1)}{2(-2)} = \frac{1}{-4}$$

$$-x^2 + 2x + 8$$



x^2	8
$2x$	x^2
x	4

$$x = x$$

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

$$2 = x$$

$$0 = 2 + x$$

$$0 = x - 4$$