The University of the State of New York
REGENTS HIGH SCHOOL EXAMINATION

ALGEBRA I

Wednesday, January 25, 2023 — 1:15 to 4:15 p.m., only

Student Name _____ KEY _____

School Name _____ (K. Potter) _____

The possession or use of any communications device is strictly prohibited when taking this examination. If you have or use any communications device, no matter how briefly, your examination will be invalidated and no score will be calculated for you.

Print your name and the name of your school on the lines above.

A separate answer sheet for **Part I** has been provided to you. Follow the instructions from the proctor for completing the student information on your answer sheet.

This examination has four parts, with a total of 37 questions. You must answer all questions in this examination. Record your answers to the Part I multiple-choice questions on the separate answer sheet. Write your answers to the questions in **Parts II, III**, and **IV** directly in this booklet. All work should be written in pen, except for graphs and drawings, which should be done in pencil. Clearly indicate the necessary steps, including appropriate formula substitutions, diagrams, graphs, charts, etc. Utilize the information provided for each question to determine your answer. Note that diagrams are not necessarily drawn to scale.

The formulas that you may need to answer some questions in this examination are found at the end of the examination. This sheet is perforated so you may remove it from this booklet.

Scrap paper is not permitted for any part of this examination, but you may use the blank spaces in this booklet as scrap paper. A perforated sheet of scrap graph paper is provided at the end of this booklet for any question for which graphing may be helpful but is not required. You may remove this sheet from this booklet. Any work done on this sheet of scrap graph paper will *not* be scored.

When you have completed the examination, you must sign the statement printed at the end of the answer sheet, indicating that you had no unlawful knowledge of the questions or answers prior to the examination and that you have neither given nor received assistance in answering any of the questions during the examination. Your answer sheet cannot be accepted if you fail to sign this declaration.

Notice ...

A graphing calculator and a straightedge (ruler) must be available for you to use while taking this examination.

DO NOT OPEN THIS EXAMINATION BOOKLET UNTIL THE SIGNAL IS GIVEN.

Part I

Answer all 24 questions in this part. Each correct answer will receive 2 credits. No partial credit will be allowed. Utilize the information provided for each question to determine your answer. Note that diagrams are not necessarily drawn to scale. For each statement or question, choose the word or expression that, of those given, best completes the statement or answers the question. Record your answers on your separate answer sheet. [48]

Use this space for computations.

1 When the expression $2x(x - 4) - 3(x + 5)$ is written in simplest form, the result is

   (1) $2x^2 - 11x - 15$ ⬤

   (2) $2x^2 - 11x + 5$

   (3) $2x^2 - 3x - 19$

   (4) $2x^2 - 3x + 1$

Handwritten work:
- Distribute 1st
$(2x)(x-4)(-3)(x+5)$
$2x^2 (-8x - 3x) - 15$
- combine like terms:
$2x^2 - 11x - 15$

2 The point $(3,w)$ is on the graph of $y = 2x + 7$. What is the value of w?

   (1) -2

   (2) -4

   (3) 10

   (4) 13 ⬤

Handwritten work:
pt. $(3, w)$
(x, y)
substitute
$x = 3$

$y = 2x + 7$
$= 2(3) + 7$
$= 6 + 7$
$y = 13$
or $w = 13$

3 Students were asked to write $2x^3 + 3x + 4x^2 + 1$ in standard form. Four student responses are shown below.

   Alexa: $4x^2 + 3x + 2x^3 + 1$

   Carol: $2x^3 + 3x + 4x^2 + 1$

   ☆ Ryan: $2x^3 + 4x^2 + 3x + 1$

   Eric: $1 + 2x^3 + 3x + 4x^2$

Handwritten work:
order largest exponent to smallest
$2x^{(3)} + 4x^{(2)} + 3x^{(1)} + 1$

Which student's response is correct?

   (1) Alexa

   (2) Carol

   (3) Ryan ⬤

   (4) Eric

4 Given $f(x) = -3x^2 + 10$, what is the value of $f(-2)$?

   (1) -26

   (2) -2 ⬤

   (3) 22

   (4) 46

Handwritten work:
Substitute $x = -2$ into the given equation and solve.

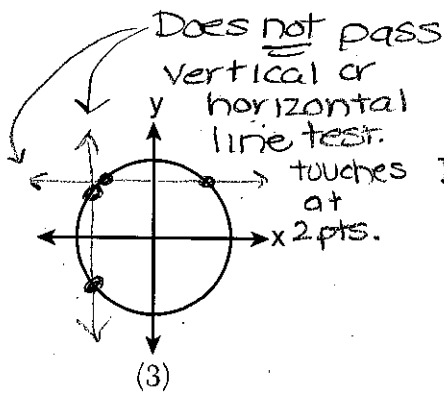$f(-2) = -3(-2)^2 + 10$
$= -3(4) + 10$
$= -12 + 10$
$= -2$

use PEMDAS when solving

☆ careful it's $(-2)^2$ not $-(2)^2$

5 Which relation is a function?

duplicate "y"

{(1,3), (2,1), (3,1), (4,7)}

(1)

Input (x)	Output (y)
−6	−2
−4	2
7	3
7	5

(2) ★ ⬤

(handwritten annotations, top right, center:)

Does not pass vertical or horizontal line test.
touches at 2 pts.

(3)

(x) Domain   (y) Range

3 → 4
6 → 5
8
11 → 7

→ duplicate "y" values

(4)

(handwritten notes:)
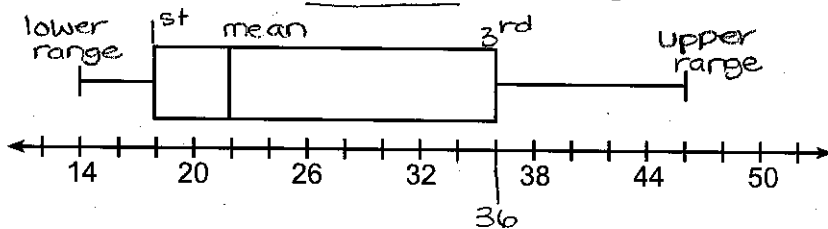
Def. of a function :
no duplicate "y" values

Also must pass the vertical and horizontal line test.
meaning if I move a straight line Left to Right or up to down I will only touch "1" point on the function.

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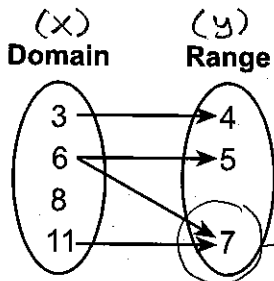
6 What is the value of the third quartile in the box plot shown below?

lower range   1st   mean   3rd   upper range

14   20   26   32   38   44   50

36

(1) 18   ⬤ 36
(2) 22   (4) 46

---

7 What is the solution to $2 + 3(2a + 1) = 3(a + 2)$?

(1) $\frac{1}{7}$ (3) $-\frac{3}{7}$

⬤ $\frac{1}{3}$ (4) $-\frac{1}{3}$

(handwritten notes:)

- Distribute 1st, then combine like terms.
- Solve for "a"

$2 + 3(2a + 1) = 3(a + 2)$
$2 + 6a + 3 = 3a + 6$
combine
$5 + 6a = 3a + 6$
$\quad -3a \quad -3a$
$\overline{\quad 5 + 3a = 6}$
$-5 \qquad -5$

Get letters on one side of = and #'s on the other

$3a = 1$
$\overline{3} \quad \overline{3}$

Do opposite operation to get variable "a" alone.

$a = \frac{1}{3}$

8 One Saturday afternoon, three friends decided to keep track of the number of text messages they received each hour from 8 a.m. to noon. The results are shown below.

Emily said that the number of messages she received increased by 8 each hour.   ex: 8, 16, 24, 32, 40, ...

Jessica said that the number of messages she received doubled every hour.   ex. 2, 4, 8, 16, 32

Chris said that he received 3 messages the first hour, 10 the second hour, none the third hour, and 15 the last hour.

Which of the friends' responses best classifies the number of messages they received each hour as a linear function?

(1) Emily, only   *(circled)*

(2) Jessica, only

(3) Emily and Chris

(4) Jessica and Chris

Handwritten notes:
Emily +8 /hr

Jessica ∧2 /hr
★ exponential

Chris: 3+10+0+15

To be a linear function there must be a constant change per hour.

9 Which expression is equivalent to $(x + 4)^2(x + 4)^3$?

(1) $(x + 4)^6$

(2) $(x + 4)^5$ *(circled)*

(3) $(x^2 + 16)^6$

(4) $(x^2 + 16)^5$

Handwritten notes:
★ same base (x+4) so just add the exponents. Do not solve.

10 Caitlin graphs the function $f(x) = ax^2$, where a is a positive integer. If Caitlin multiplies a by -2, when compared to $f(x)$, the new graph will become

(1) narrower and open downward

(2) narrower and open upward

(3) wider and open downward   *(circled)*

(4) wider and open upward

Handwritten notes:
Just "y", F(x)=ax²
can be written
as: y=ax²

then: y = -2ax²
is twice as wide, open down.

★ The simplest quadratic graph is
y = ax²
the vertex is at the origin (0,0)
• If "a" is positive (a > 0) it opens up. ↑
• If "a" is negative (a < 0) it opens down. ↓

11 Sunny purchases a new car for $29,873. The car depreciates 20% annually.

take value away

Which expression can be used to determine the value of the car after t years?

(1) $29,873(.20)^t$ only gives us dep. amount

(2) $29,873(20)^t$ not in decimal form

(3) $29,873(1 - .20)^t$ *(circled)*

(4) $29,873(1 + .20)^t$ this would add value to the car, not take it away

Handwritten notes:
starting price - yearly dep. amt.

$20\% = \frac{20}{100} = .20$ in decimal form

12 If $f(x) = x^2 + 2x + 1$ and $g(x) = 7x - 5$, for which values of x is $f(x) = g(x)$?

(1) -1 and 6

(2) -6 and -1

(3) -3 and -2

(4) 2 and 3 *(circled)*

Handwritten notes:
set F(x)=g(x) solve for "x"

$x^2 + 2x + 1 = 7x - 5$
$-7x + 5 \quad -7x + 5$
$x^2 - 5x + 6 = 0$
$(x-2)(x-3) = 0$
$x-2=0 \mid x-3=0$
$x=2 \mid x=3$

• combine all terms set = 0.
• find the roots.

13 Skyler mows lawns in the summer. The function $f(x)$ is used to model the amount of money earned, where x is the number of lawns completely mowed. A reasonable domain for this function would be

(1) real numbers   (3) irrational numbers

(2) rational numbers   (4) natural numbers

X = domain

f(x) = y = range

Natural #'s { 1,2,3,4,...}

14 Which expression is equivalent to $2x^2 + 8x - 10$?

(1) $2(x - 1)(x + 5)$ (3) $2(x - 1)(x - 5)$

(2) $2(x + 1)(x - 5)$ (4) $2(x + 1)(x + 5)$

• Factor out 2 first, then un FOIL.
$2x^2 + 8x - 10$
$2(x^2 + 4x - 5)$
$2(x + 5)(x - 1)$

factors of 5 : 1, 5
since -5, one factor has to be + and one -
we need + 4 in the middle term so:
+5 and -1.

15 Ian throws a ball up in the air and lets it fall to the ground. The height of the ball, $h(t)$, is modeled by the equation $h(t) = -16t^2 + 6t + 3$, with $h(t)$ measured in feet, and time, t, measured in seconds. The number 3 in $h(t)$ represents

(1) the maximum height of the ball

(2) the height from which the ball is thrown

(3) the number of seconds it takes for the ball to reach the ground

(4) the number of seconds it takes for the ball to reach its maximum height

The constant 3 means the ball started at an initial height of 3ft, not from the ground o ft.

16 Thirty-two teams are participating in a basketball tournament. Only the winning teams in each round advance to the next round, as shown in the table below.

Number of Rounds Completed, x	0	1	2	3	4	5
Number of Teams Remaining, f(x)	32	16	8	4	2	1

÷2 ÷2 ÷2 ÷2 ÷2

Which function type best models the relationship between the number of rounds completed and the number of teams remaining?

(1) absolute value   (3) linear

(2) exponential   (4) quadratic

$32 \cdot \left(\frac{1}{2}\right)^n$ where
n = # of rounds

17 In a geometric sequence, the first term is 4 and the common ratio is -3. The fifth term of this sequence is

(1) 324   (3) -108

(2) 108   (4) -324

4, ___, ___, ___, ___
a = 1st term #
r = common ratio (-3)
n = term
$a_n = ar^{n-1}$
$a_5 = 4(-3)^{5-1}$
$a_5 = 4(-3)^4$
$= 4(81)$
$= 324$

★ remember
$(-3)^4 = (-3)(-3)(-3)(-3)$
9 · 9
81

18 The amount of energy, Q, in joules, needed to raise the temperature of m grams of a substance is given by the formula $Q = mC(T_f - T_i)$, where C is the specific heat capacity of the substance. If its initial temperature is T_i, an equation to find its final temperature, T_f, is

(1) $T_f = \dfrac{Q}{mC} - T_i$ (3) $T_f = \dfrac{T_i + Q}{mC}$

● (2) $T_f = \dfrac{Q}{mC} + T_i$ (4) $T_f = \dfrac{Q - mC}{T_i}$

19 When using the method of completing the square, which equation is equivalent to $x^2 - 12x - 10 = 0$?

(1) $(x + 6)^2 = -26$ (3) $(x - 6)^2 = -26$

(2) $(x + 6)^2 = 46$ ● (4) $(x - 6)^2 = 46$

✳ look at middle term(-12x) → ½ of -12 = -6 ; (-6)×(-6) = 36
bring (-10) to right of = and add 36 to both sides of = .

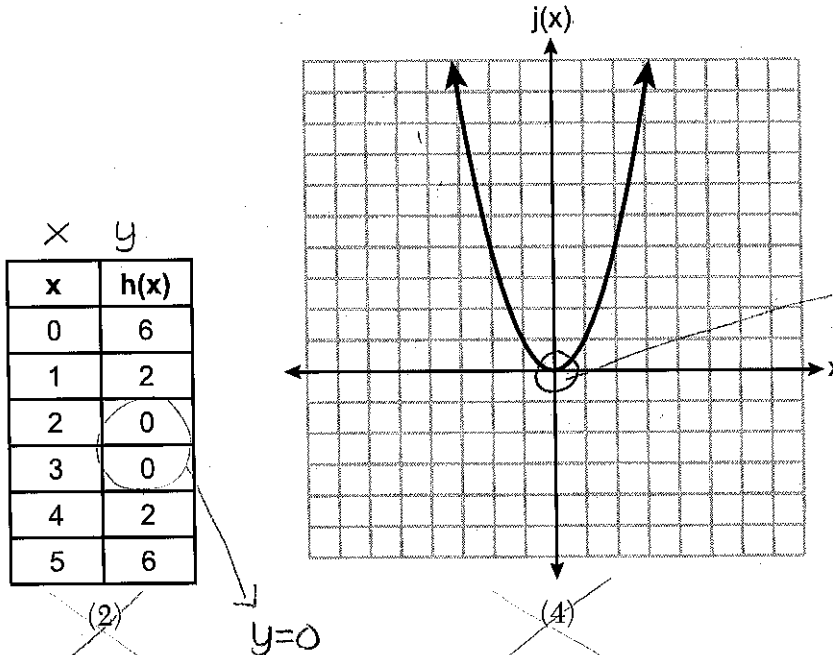**20** Which quadratic function has the *smallest* minimum value?

$f(x) = 6x^2 + 5x - 2$ $g(x) = 6(x - 2)^2 - 2$
         ●(1)   (3)

x	y
x	**h(x)**
0	6
1	2
2	0
3	0
4	2
5	6

(2)   y=0   (4)

Handwritten side notes:

solve for T_f

$Q = mC(T_f - T_i)$

$\dfrac{Q}{mc} = \dfrac{mC(T_f - T_i)}{mc}$

$\dfrac{Q}{mc} = T_f - T_i$

$+ T_i \qquad + T_i$

$\dfrac{Q}{mc} + T_i = T_f$

✳ DO the opposite operation. mC is ✕ so ÷ to get rid of it on right side. T_i is − so need to ✚ it to get rid of it on right and bring to left.

Smallest "y" or f(x), g(x), h(x) value.

Choices Down to #1 or #3
• try diff. values for x
  ex: x = -1
  $f(x) = 6(-1)^2 + 5(-1) - 2$
       $= 6 - 5 - 2$
  ✕ $= 6 - 7$
       $= -1$

  $g(x) = 6(-1-2)^2 - 2$
        $= 6(-3)^2 - 2$
        $= 6(9) - 2$
        $= 54 - 2$
        $= 52$

21 Which representation yields the <u>same outcome</u> as the sequence defined recursively below?

$$a_1 = 3$$
$$a_n = -4 + a_{n-1}$$

(1) 3, 7, 11, 15, 19,...   (3) $a_n = 4n - 1$

● 3, −1, −5, −9, −13,...   (4) $a_n = 4 - n$

Handwritten computations:
$a_n = -4 + a_{n-1}$
$a_2 = -4 + a_{2-1}$
$= -4 + a_1$
$= -4 + 3$
$= -1$

$a_3 = -4 + a_{3-1}$
$= -4 + a_2$
$= -4 + -1$
$= -5$

22 If the zeros of the function $g(x)$ are {−3,0,4}, which function could represent $g(x)$?

(1) $g(x) = (x + 3)(x - 4)$ ● $g(x) = x(x + 3)(x - 4)$

(2) $g(x) = (x - 3)(x + 4)$ (4) $g(x) = x(x - 3)(x + 4)$

Handwritten computations:
zero's of the function is the same as the roots.
$x = 0, \ x = -3, \ x = 4$
$x(x+3)(x-4)$
$x=0 \mid x+3=0 \mid x-4=0$
$\quad\quad x=-3 \mid \quad x=4$

23 Morgan read that a snail moves about <u>72 feet per day</u>. He performs the calculation $\dfrac{72 \, \text{feet}}{1 \, \text{day}} \cdot \dfrac{1 \, \text{day}}{24 \, \text{hours}} \cdot \dfrac{1 \, \text{hour}}{60 \, \text{minutes}} \cdot \dfrac{12 \, \text{inches}}{1 \, \text{foot}}$ to convert this rate to different units. What are the units for the converted rate?

(1) hours/inch   (3) inches/hour

(2) minutes/inch   ● inches/minute

Handwritten computations:
✱ look at just the units
cancel out any duplicate top + bottom
$\dfrac{ft}{day} \cdot \dfrac{day}{hr} \cdot \dfrac{hr}{min} \cdot \dfrac{inch}{ft} = \dfrac{inch}{min}$ remains

24 During summer vacation, Ben decides to sell hot dogs and pretzels on a food cart in Manhattan. It costs Ben <u>$0.50 for each hot dog</u> and <u>$0.40 for each pretzel</u>. He has <u>only $100 to spend</u> each day on hot dogs and pretzels. He wants to sell <u>at least 200 items</u> each day. If h is the number of hot dogs and p is the number of pretzels, which inequality would be part of a system of inequalities used to determine the total number of hot dogs and pretzels Ben can sell?

(1) $h + p \le 200$ (3) $0.50h + 0.40p \ge 200$

● $h + p \ge 200$ (4) $0.50h + 0.40p \le 200$

Handwritten computations:
✱
atleast 200, so
= 200 or more.

$0.50h$ = cost per hotdog
$0.40p$ = cost per pretzel

total of hotdogs and pretzels means we add them

because we are not looking for a total cost, but total number of items sold, we will just use the h for hotdogs sold, p for pretzels sold.
Then: $h + p \ge 200$

Part II

Answer all 8 questions in this part. Each correct answer will receive 2 credits. Clearly indicate the necessary steps, including appropriate formula substitutions, diagrams, graphs, charts, etc. Utilize the information provided for each question to determine your answer. Note that diagrams are not necessarily drawn to scale. For all questions in this part, a correct numerical answer with no work shown will receive only 1 credit. All answers should be written in pen, except for graphs and drawings, which should be done in pencil. [16]

25 Graph the function $g(x) = \sqrt{x+3}$ on the set of axes below.
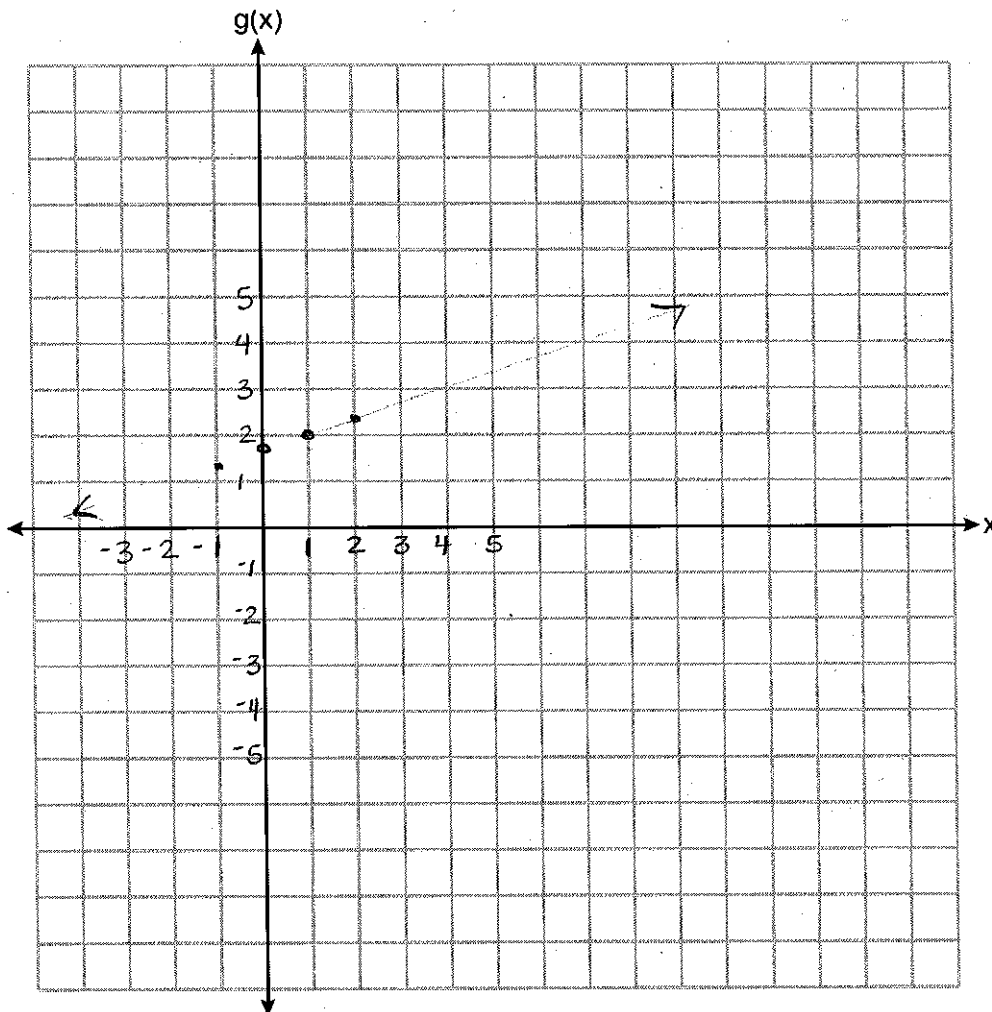
• Draw a table

X	y (g(x))	
0	$\sqrt{0+3} = \sqrt{3}$	$= 1.7$
1	$\sqrt{1+3} = \sqrt{4} = 2$	
2	$\sqrt{2+3} = \sqrt{5} = 2.2$	
-1	$\sqrt{-1+3} = \sqrt{2} = 1.4$	

coordinates:
(0, 1.7)
(1, 2)
(2, 2.2)
(-1, 1.4)

26 The sixth-grade classes at West Road Elementary School were asked to vote on the location of their class trip. The results are shown in the table below.

	Playland	Splashdown	Fun Central
Boys	38	53	25
Girls	39	46	37

Determine, to the *nearest percent*, the percentage of girls who voted for Splashdown.

$$\frac{\text{Girls who voted for Splashdown}}{\text{total girls}} \times 100 = \frac{46}{122} \times 100$$

$$= 0.38 \times 100$$

$$= \boxed{38\%}$$

total girls = 39 + 46 + 37 = 122

27 Solve the inequality $-\frac{2}{3}x + 6 > -12$ algebraically for x.

$$\quad\quad -6 \quad -6$$

• opposite operation to get variable "x" alone on one side of =.

$$-\frac{2}{3}x > -18$$

• -6 first, bring over to right side.

$$\left(-\frac{3}{2}\right) \cdot -\frac{2}{3}x > -18 \cdot \left(-\frac{3}{2}\right)$$

• multiply by reciprocal of $-\frac{2}{3}$ to get rid of $-\frac{2}{3}$

$$x < \frac{54}{2}$$

$$\boxed{x < 27}$$

• when you multiply or divide by a negative you switch the direction of the inequality sign.

28 Determine the common difference of the arithmetic sequence in which $a_1 = 3$ and $a_4 = 15$.

$$a_1 \, , \, a_2 \, , \, a_3 \, , \, a_4$$

$$3 \, , \, \underline{\quad} \, , \, \underline{\quad} \, , \, 15$$
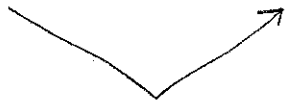
difference between 15 and 3 = 12

there are 3 places (terms) between
a_1 and a_4 which were given to us.

Then we take the $12 \div 3 = 4$

4 ; is the common added to each term.

$$3 \, , \, \underline{7} \, , \, \underline{11} \, , \, 15$$
$$\quad\;\; 3+4 \quad 7+4 \quad 11+4$$

29 Given: $A = \sqrt{363}$ and $B = \sqrt{27}$

Explain why $A + B$ is irrational.

$$\sqrt{363} = \sqrt{3 \cdot 121}$$
$$= \sqrt{3 \cdot (11 \cdot 11)} \quad \text{groups of}$$
$$\qquad \qquad \qquad \text{2 get}$$
$$= 11\sqrt{3} \qquad \text{pulled outside}$$
$$\qquad \qquad \qquad \sqrt{}$$

$$\sqrt{27} = \sqrt{3 \cdot 9}$$
$$= \sqrt{3 \cdot 3 \cdot 3}$$
$$= 3\sqrt{3}$$

then $A + B =$

$$11\sqrt{3} + 3\sqrt{3} = 14\sqrt{3} \quad \leftarrow \text{still an irrational \#.}$$

· Use your calculators to find $\sqrt{363} = 19.0525588833$
and $\sqrt{27} = 5.1961524227\ldots$

the decimals don't end but our calculators only show the 1st 12 digits.

★ <u>or</u> factor the radicals

Explain why $A \cdot B$ is rational.

$$A \cdot B$$
$$11\sqrt{3} \cdot 3\sqrt{3}$$
$$= 11 \cdot 3 \cdot (\sqrt{3} \cdot \sqrt{3})$$
$$= 33 \cdot 3$$
$$= 99$$

★ $\sqrt{3} \cdot \sqrt{3} = \sqrt{3 \cdot 3}$
$$= 3$$

99 is a whole #, Natural # and rational #

30 Use the quadratic formula to solve $x^2 - 4x + 1 = 0$ for x.

Round the solutions to the *nearest hundredth*.

The quadratic formula is given on the math reference sheet.

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

where a = coeff of x^2 term → or 1 in this case
b = coeff of x term → or -4 in this case
c = constant term → or 1 in this case

$$x = \frac{-(-4) \pm \sqrt{(-4)^2 - 4(1)(1)}}{2(1)}$$

$$x = \frac{4 \pm \sqrt{16 - 4}}{2}$$

$$x = \frac{4 \pm \sqrt{12}}{2}$$

so; $x = \frac{4 + \sqrt{12}}{2}$ or $x = \frac{4 - \sqrt{12}}{2}$

$x = \frac{4 + \sqrt{2 \cdot 2 \cdot 3}}{2}$ $x = \frac{4 - \sqrt{2 \cdot 2 \cdot 3}}{2}$

$x = \frac{4 + 2\sqrt{3}}{2}$ $x = \frac{4 - 2\sqrt{3}}{2}$ ✱ its
                                                                            $2 \cdot \sqrt{3}$
                                                                            so the 2's
$x = 4 + \sqrt{3}$ $x = 4 - \sqrt{3}$ in numerator
                                                        and denom.
                                                        cancel.

✱✱ since they want
the answer to
the nearest 100th
use calc. to find
$\sqrt{3} = 1.73$

$x = 4 + 1.73$ $x = 4 - 1.73$

$\boxed{x = 5.73}$ $\boxed{x = 2.27}$

31 Factor completely:

$$4x^3 - 49x$$

• factor the common x out first.

• find factors of 49 and 4

$$4x^3 - 49x$$

$$x(4x^2 - 49)$$

$$x(2x - 7)(2x + 7)$$

one (-) me(t) so they cancel each other out since no middle term.

4	49
1,4	1,49
(2,2)	(7,7)

32 The function g is defined as

$$g(x) = \begin{cases} |x + 3|, & x < -2 \\ x^2 + 1, & -2 \leq x \leq 2 \end{cases}$$

On the set of axes below, graph $g(x)$.
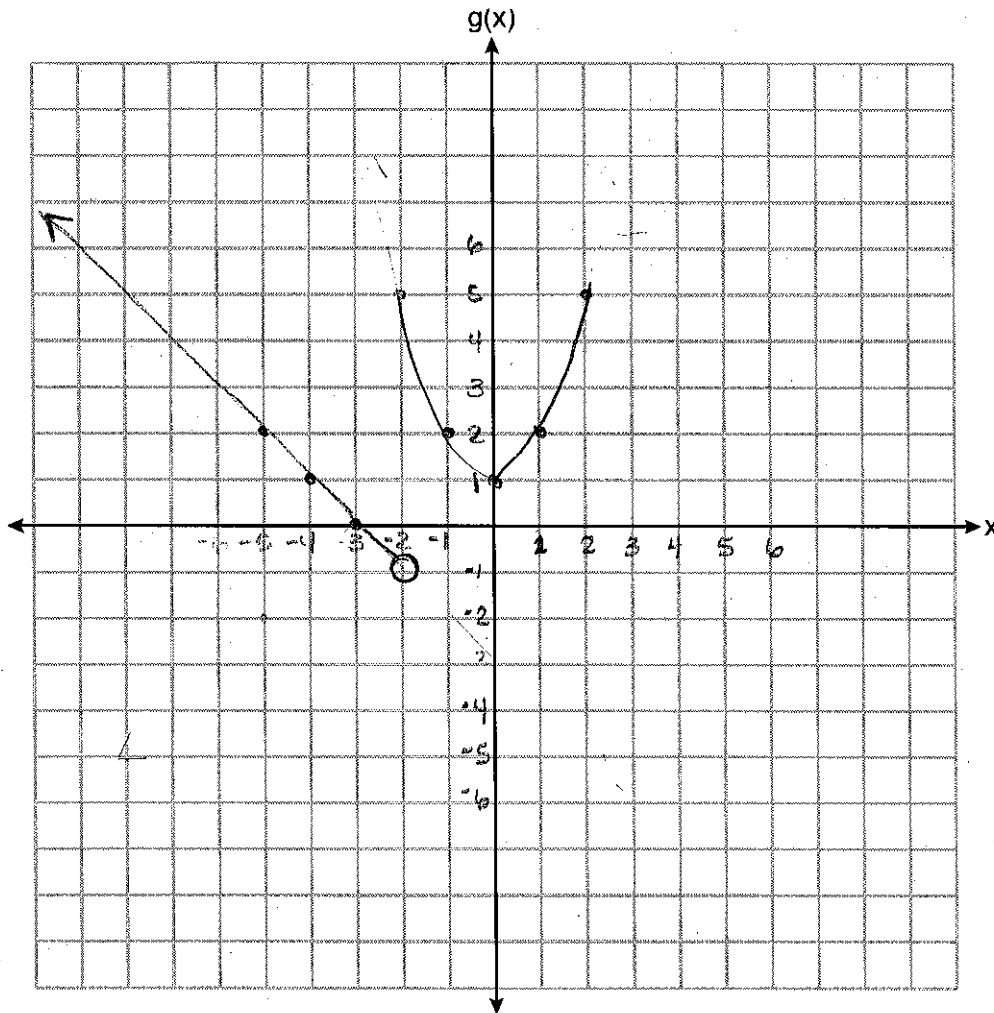
$g(x) = x + 3 \; ; \; x < -2$

x	$y = |x+3|$	pts
-3	$|-3+3|=|0|=0$	$(-3, 0)$
-4	$|-4+3|=|-1|=1$	$(-4, 1)$
-5	$|-5+3|=|-2|=2$	$(-5, 2)$

★ absolute value || is ALWAYS positive

$g(x) = x^2 + 1 \; ; \; -2 \leq x \leq 2$

x	$y = x^2 + 1$	pts
-2	$(-2)^2 + 1 = 4 + 1 = 5$	$(-2, 5)$
-1	$(-1)^2 + 1 = 1 + 1 = 2$	$(-1, 2)$
0	$(0)^2 + 1 = 0 + 1 = 1$	$(0, 1)$
1	$(1)^2 + 1 = 1 + 1 = 2$	$(1, 2)$
2	$(2)^2 + 1 = 4 + 1 = 5$	$(2, 5)$

Part III

Answer all 4 questions in this part. Each correct answer will receive 4 credits. Clearly indicate the necessary steps, including appropriate formula substitutions, diagrams, graphs, charts, etc. Utilize the information provided for each question to determine your answer. Note that diagrams are not necessarily drawn to scale. For all questions in this part, a correct numerical answer with no work shown will receive only 1 credit. All answers should be written in pen, except for graphs and drawings, which should be done in pencil. [16]

33 Anessa is studying the changes in population in a town. The graph below shows the population over 50 years.
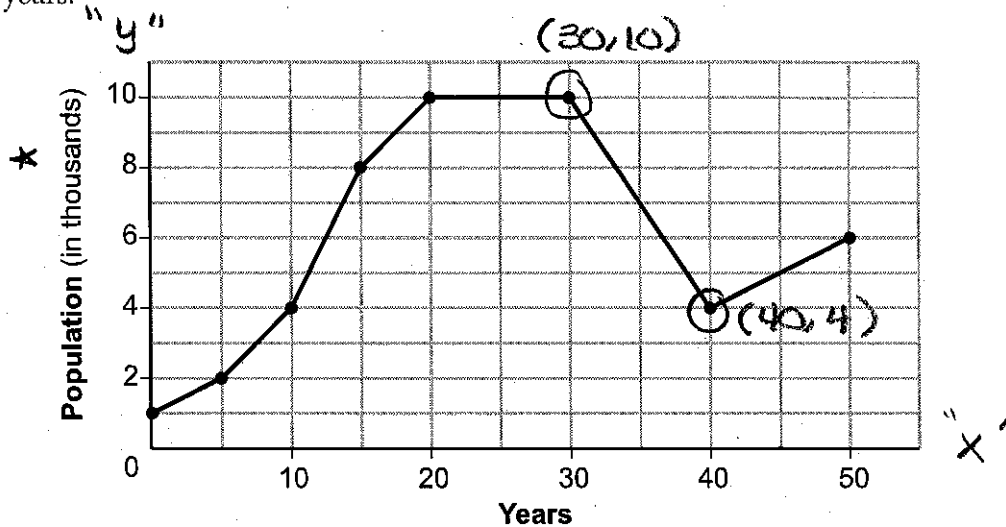
State the entire interval during which the population remained constant.

between years 20 to 30

State the maximum population of the town over the 50-year period.

Max pop = 10,000

Determine the average rate of change from year 30 to year 40.

Use population as "y" axis, years as "x" axis to get coordinate pairs: (30,10) and (40,4)

Explain what your average rate of change means from year 30 to year 40 in the context of the problem.

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{40-30}{4-10} = \frac{10}{-6} = -\frac{5}{3}$$

this means for every 3 years the population decreased by 5 thousand people.

34 The table below shows the number of math classes missed during a school year for nine students, and their final exam scores.

Number of Classes Missed (x)	2	10	3	22	15	2	20	18	9
Final Exam Score (y)	99	72	90	35	60	80	40	43	75

Write the linear regression equation for this data set. Round all values to the *nearest hundredth*.

Using our TI-84
Stat > Edit
Enter x values in L1
Enter y values in L2
stat > Calc ∨ 8
LinReg (a+bx) L1, L2 > Enter

$y = a + bx$
$a = 27.5475 = 27.55$
$b = 1.871 = 1.87$

State the correlation coefficient for your linear regression. Round your answer to the *nearest hundredth*.

State what the correlation coefficient indicates about the linear fit of the data.

�—★ Skip unless you have time and want to go back to work on it.

If you can atleast put down the formula and then the values it would be worth 1 to 2 pts out of 3.

35 A fence was installed around the edge of a rectangular garden. The length, l, of the fence was 5 feet less than 3 times its width, w. The amount of fencing used was 90 feet.

Write a system of equations or write an equation using one variable that models this situation.

W = width of garden
$L = 3w - 5$

$p = 90$ ft.

$p = 2L + 2w$ × formula
$90 = 2(3w-5) + 2(w)$ ← substitute

Determine algebraically the dimensions, in feet, of the garden.

solve: $90 = 2(3w-5) + 2(w)$ · distribute first

$90 = 6w - 10 + 2w$ · combine like terms

$90 = 8w - 10$ · bring #'s to left side and
$+10 \qquad +10$ w terms on right side

$\dfrac{100}{8} = \dfrac{8w}{8}$ · Divide by 8 to get "w" alone

$12.5 = w$

then:
$\boxed{w = 12.5 \text{ ft}}$
$L = 3(12.5) - 5$
$\quad = 37.5 - 5$
$\boxed{L = 32.5 \text{ ft}}$

36 Given:
$$3y - 9 \leq 12$$
$$y < -2x - 4$$

Graph the system of inequalities on the set of axes below.

$y \leq 7$
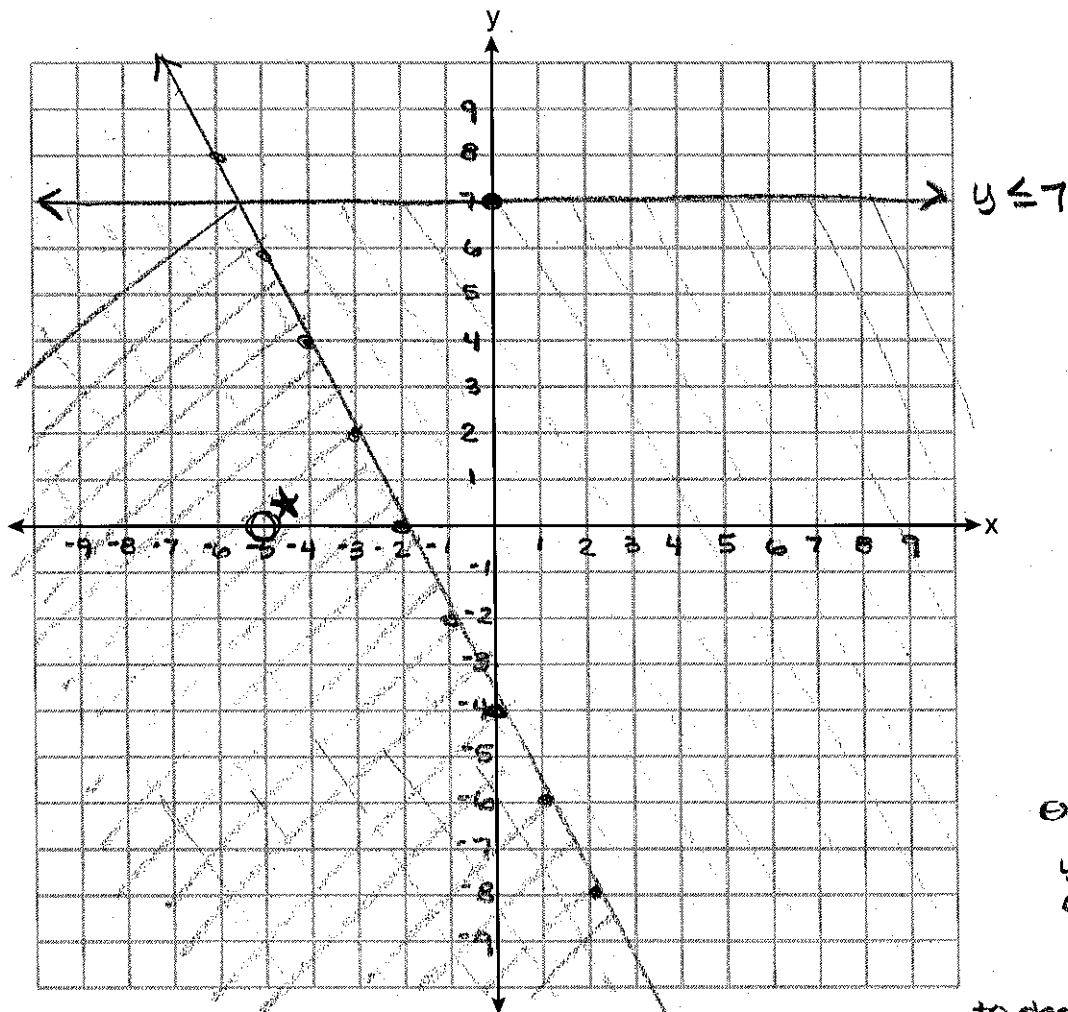
$y < -2x - 4$ — to decide which side of line to shade, try pt (0,0). If its true shade it.

EX: try pt. (0,0)
$y < -2x - 4$
$0 < -2(0) - 4$
$0 < -4$
F

State the coordinates of a point that satisfies both inequalities. Justify your answer.

$3y - 9 \leq 12$ → get in $y = mx + b$ form
$ +9 +9$
$\dfrac{3y}{3} \leq \dfrac{21}{3}$
$y \leq 7$

$y < -2x - 4$ → already in $y = mx + b$
form: $m = \dfrac{-2}{1}$
$b = -4$

• To find the pt. that justifies both, choose a point in the shaded section where they cross over each other.
EX: ★ pt. (0, -5)
$x = 0, y = -5$
Subst. in both inequal. to verify it works.

$y \leq 7$	$y < -2x - 4$
$-5 \leq 7$	$-5 < -2(0) - 4$
True	$-5 < -4$
	True

[OVER]

Part IV

Answer the question in this part. A correct answer will receive 6 credits. Clearly indicate the necessary steps, including appropriate formula substitutions, diagrams, graphs, charts, etc. Utilize the information provided to determine your answer. Note that diagrams are not necessarily drawn to scale. A correct numerical answer with no work shown will receive only 1 credit. All answers should be written in pen, except for graphs and drawings, which should be done in pencil. [6]

37 Aidan and his sister Ella are having a race. Aidan runs at a rate of 10 feet per second. Ella runs at a rate of 6 feet per second. Since Ella is younger, Aidan is letting her begin 30 feet ahead of the starting line.

Let y represent the distance from the starting line and x represent the time elapsed, in seconds.

Write an equation to model the distance Aidan traveled.

$$A = 10ft/sec. \rightarrow y = 10x$$
$$Ella = 6ft/sec. + 30 \rightarrow y = 6x + 30$$

$$Aidan: \quad y = 10x$$

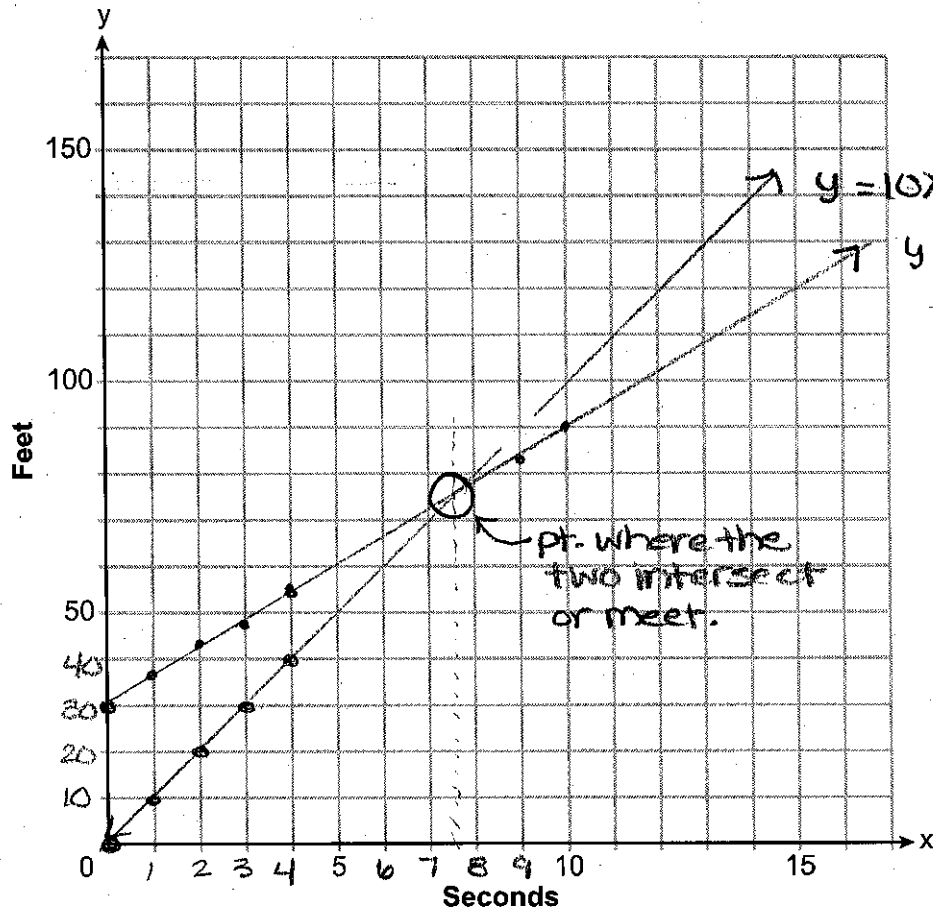Write an equation to model the distance Ella traveled.

$$Ella: \quad y = 6x + 30$$

Question 37 continued

On the set of axes below, graph your equations.

Exactly how many seconds does it take Aidan to catch up to Ella? Justify your answer.

- when will Aidan = Ella

$$10x = 6x + 30$$
$$\underline{-6x \quad -6x}$$
$$\frac{4x}{4} = \frac{30}{4}$$
$$x = 7.5$$

solve for x
get letters on one side
#'s on the other.

to get 4·x alone, do the opposite operation; divide by 4

7.5 sec.

High School Math Reference Sheet

1 inch = 2.54 centimeters
1 meter = 39.37 inches
1 mile = 5280 feet
1 mile = 1760 yards
1 mile = 1.609 kilometers

1 kilometer = 0.62 mile
1 pound = 16 ounces
1 pound = 0.454 kilogram
1 kilogram = 2.2 pounds
1 ton = 2000 pounds

1 cup = 8 fluid ounces
1 pint = 2 cups
1 quart = 2 pints
1 gallon = 4 quarts
1 gallon = 3.785 liters
1 liter = 0.264 gallon
1 liter = 1000 cubic centimeters

Triangle	$A = \frac{1}{2}bh$	Pythagorean Theorem	$a^2 + b^2 = c^2$
Parallelogram	$A = bh$	Quadratic Formula	$x = \dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a}$
Circle	$A = \pi r^2$	Arithmetic Sequence	$a_n = a_1 + (n - 1)d$
Circle	$C = \pi d \text{ or } C = 2\pi r$	Geometric Sequence	$a_n = a_1 r^{n-1}$
General Prisms	$V = Bh$	Geometric Series	$S_n = \dfrac{a_1 - a_1 r^n}{1 - r} \text{ where } r \neq 1$
Cylinder	$V = \pi r^2 h$	Radians	$1 \text{ radian} = \dfrac{180}{\pi} \text{ degrees}$
Sphere	$V = \frac{4}{3}\pi r^3$	Degrees	$1 \text{ degree} = \dfrac{\pi}{180} \text{ radians}$
Cone	$V = \frac{1}{3}\pi r^2 h$	Exponential Growth/Decay	$A = A_0 e^{k(t - t_0)} + B_0$
Pyramid	$V = \frac{1}{3}Bh$		

Scrap Graph Paper — this sheet will *not* be scored.