

MATHEMATICS A

Thursday, June 19, 2008 — 1:15 to 4:15 p.m., only

Print Your Name:

Steve Watson

Print Your School's Name:

www.jmap.org

Print your name and the name of your school in the boxes above. Then turn to the last page of this booklet, which is the answer sheet for Part I. Fold the last page along the perforations and, slowly and carefully, tear off the answer sheet. Then fill in the heading of your answer sheet.

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. All work should be written in pen, except graphs and drawings, which should be done in pencil.

This examination has four parts, with a total of 39 questions. You must answer all questions in this examination. Write 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. Clearly indicate the necessary steps, including appropriate formula substitutions, diagrams, graphs, charts, etc.

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 minimum of a scientific calculator, a straightedge (ruler), and a compass must be available for you to use while taking this examination.

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

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

Part I

Answer all questions in this part. Each correct answer will receive 2 credits. No partial credit will be allowed. For each question, write on the separate answer sheet the numeral preceding the word or expression that best completes the statement or answers the question. [60]

Use this space for computations.

1 Segment RS is parallel to segment TU . If the slope of $\overline{RS} = \frac{5}{8}$ and the slope of $\overline{TU} = \frac{x}{24}$, the value of x is

- (1) 20
- (2) 15

- (3) 10
- (4) 5

Parallel lines have same slopes

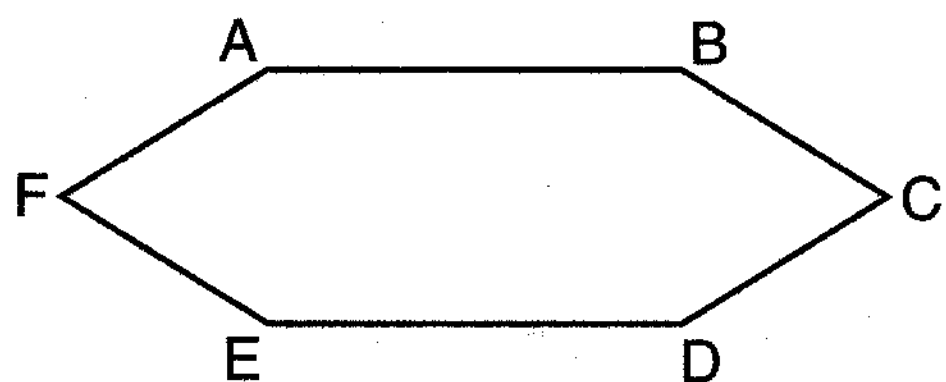
$$\frac{5}{8} = \frac{x}{24} \rightarrow 120 = 8x$$

Cross Multiply $5(24) = 8(x)$

$$\frac{120}{8} = x$$

$$15 = x$$

2 Which type of figure is shown in the accompanying diagram?



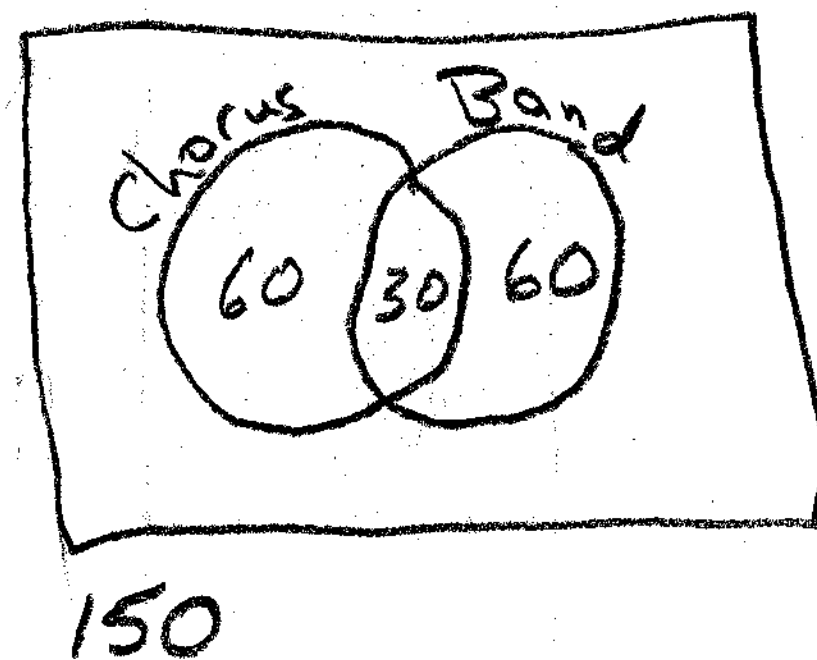
- (1) hexagon - 6 sides
- (2) octagon - 8 sides

- (3) pentagon - 5 sides
- (4) quadrilateral - 4 sides

3 At an all-county music competition, 150 students participated. If 90 students sang in the chorus and 90 played in the band, how many students *both* sang in the chorus and played in the band?

- (1) 0
- (2) 30

- (3) 60
- (4) 240



4 What is the value of w in the equation $0.04w + 0.6 = 2.4$?

- (1) 0.045
- (2) 0.45

- (3) 4.5
- (4) 45

$$\begin{array}{r} .04w + .6 = 2.4 \\ \underline{- .6 \quad - .6} \\ .04w = 1.8 \\ \underline{\cdot 04} \quad \underline{.04} \\ w = 45 \end{array}$$

check

$$.04(45) + .6 = 2.4$$

$$1.8 + .6 = 2.4$$

$$2.4 = 2.4 \checkmark$$

[2]

$$w = 45$$

10 What is the value of x in the equation $5 - 3x = -7$?

Use this space for computations.

(1) $-\frac{2}{3}$

(3) -4

(2) $\frac{2}{3}$

(4) 4

$$\begin{array}{r} 5 - 3x = -7 \\ -5 \quad -5 \\ \hline -3x = -12 \end{array}$$

check
 $5 - 3(4) = -7$
 $5 - 12 = -7$
 $-7 = -7$ ✓

$$\frac{-3x}{-3} = \frac{-12}{-3} \Rightarrow x = 4$$

11 Which expression is equivalent to $7\sqrt{90}$?

(1) $16\sqrt{10}$

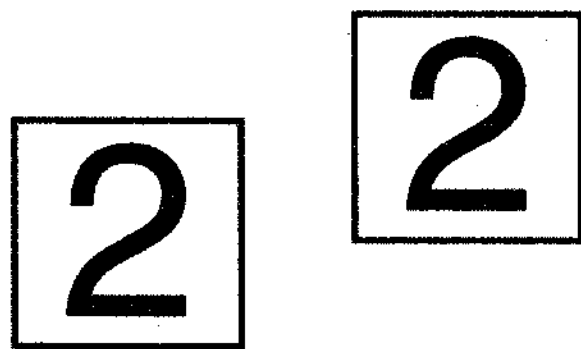
(3) $70\sqrt{9}$

(2) $21\sqrt{10}$

(4) $\sqrt{630}$

$$\begin{array}{l} 7\sqrt{90} \\ 7\sqrt{9}\sqrt{10} \\ 7 \cdot 3\sqrt{10} \\ 21\sqrt{10} \end{array}$$

12 Which transformation is illustrated by the accompanying diagram?



(1) translation → slides
 (2) reflection → like in a mirror

(3) rotation
 (4) dilation

→ goes around in circular motion
 → makes bigger or smaller

13 If $3(x + 2) - 2(x + 1) = 8$, the value of x is

(1) 1

(3) 5

(2) $\frac{1}{5}$

(4) 4

$$3(x+2) - 2(x+1) = 8$$

$$3x + 6 - 2x - 2 = 8$$

$$\begin{array}{r} x + 4 \\ -4 \\ \hline x \end{array}$$

$$= 8$$

$$= 8$$

$$-4$$

$$= 4$$

check $3(4+2) - 2(4+1) = 8$
 $3(6) - 2(5) = 8$
 $18 - 10 = 8$ ✓

14 An expression equivalent to $3!$ is

(1) $3 \cdot 3$

(3) $3 \cdot 3 \cdot 3$

(2) $3 \cdot 2 \cdot 1$

(4) -3

$$3! = 3 \times 2 \times 1$$

— p1:p

Use this space for computations.

15 The reciprocal of 5 is

- (1) 1
- (2) $\frac{1}{5}$
- (3) $-\frac{1}{5}$
- (4) -5

16 What is the converse of the statement "If x is an even integer, then $x + 1$ is an odd integer"?

- (1) x is not an even integer if and only if $(x + 1)$ is not an odd integer.
- (2) x is an even integer if and only if $(x + 1)$ is an odd integer.
- (3) If $(x + 1)$ is not an odd integer, then x is not an even integer.
- (4) If $(x + 1)$ is an odd integer, then x is an even integer.

Given: If 1, then 2

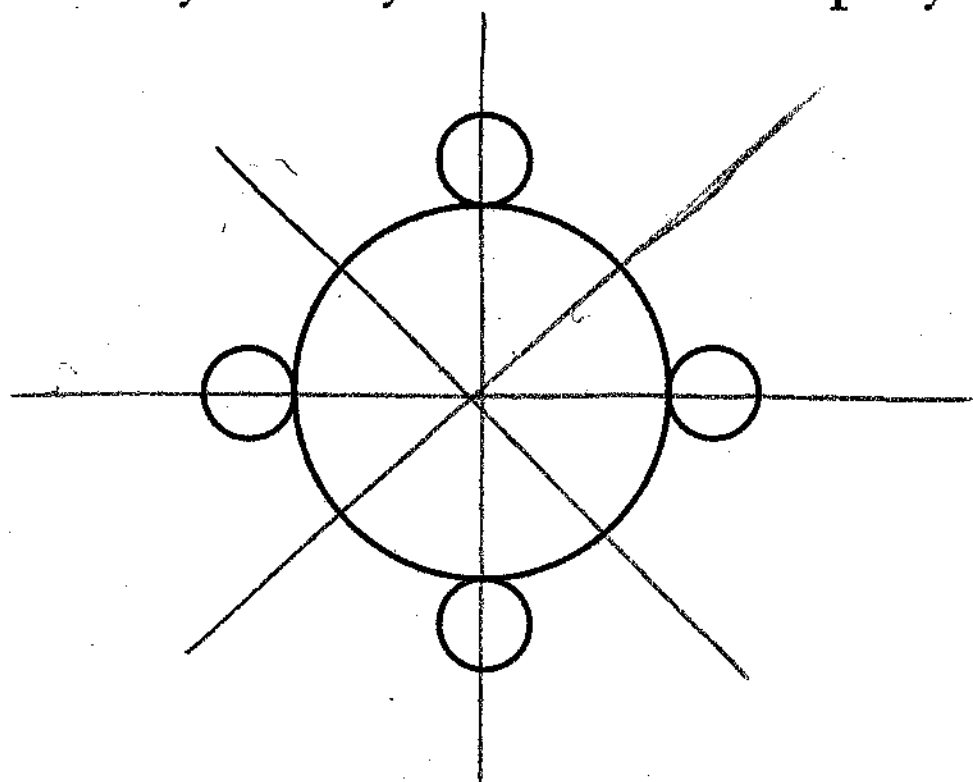
Inverse: If not 1, then not 2

Converse: If 2, then 1

Contrapositive: If not 2, then not 1

If $(x + 1)$ is an odd integer then x is an even integer

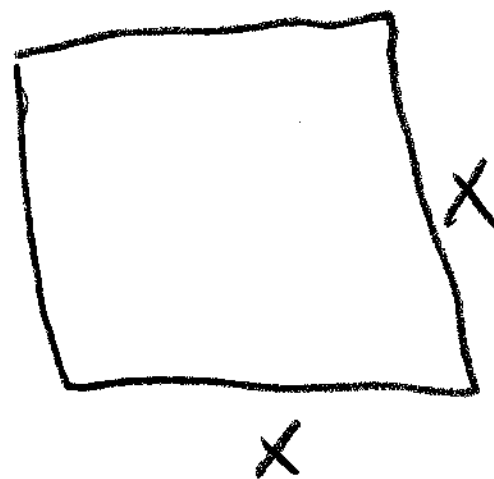
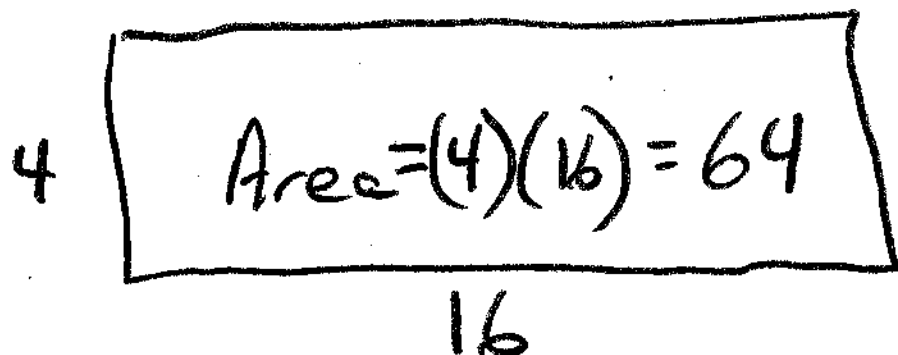
17 How many lines of symmetry does the accompanying figure have?



- (1) an infinite number
- (2) 2
- (3) 8
- (4) 4

18 The dimensions of a rectangle are 4 and 16. What is the smallest integral value that could be the side of a square that has an area larger than that of the rectangle?

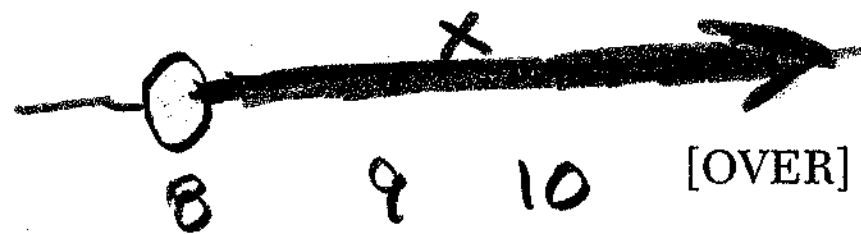
- (1) 8
- (2) 9
- (3) 64
- (4) 81



$$x^2 > 64$$

$$\sqrt{x^2} > \sqrt{64}$$

$$x > 8$$



smallest integer > 8

19 Angle A and angle B are complementary angles. If $m\angle A = x$, which expression represents the number of degrees in angle B?

- (1) $x - 180$
 (2) $180 - x$

- (3) $x - 90$
 (4) $90 - x$

add up to 90°

$$m\angle A + m\angle B = 90^\circ$$

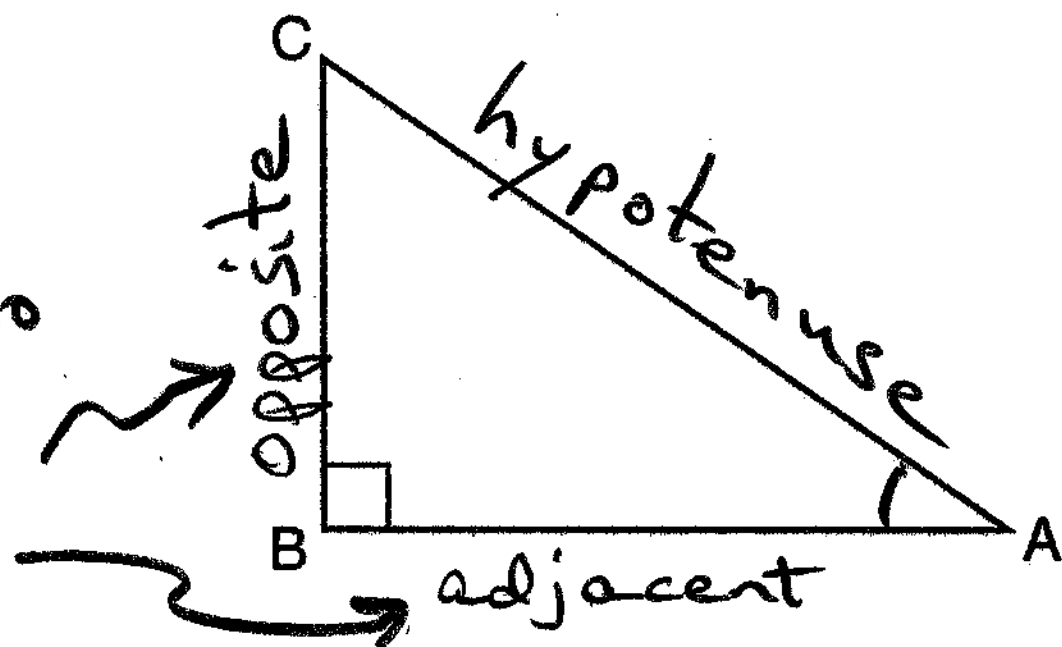
$$x + m\angle B = 90^\circ$$

$$\begin{array}{r} x + m\angle B = 90^\circ \\ -x \\ \hline m\angle B = 90^\circ - x \end{array}$$

Use this space for computations.

20 Cassandra is calculating the measure of angle A in right triangle ABC, as shown in the accompanying diagram. She knows the lengths of \overline{AB} and \overline{BC} .

We know these two values



SOH - CAH - TOA

$$\sin = \frac{\text{opposite}}{\text{hypotenuse}}$$

$$\cos = \frac{\text{adjacent}}{\text{hypotenuse}}$$

$$\tan = \frac{\text{opposite}}{\text{adjacent}}$$

If she finds the measure of angle A by solving only one equation, which concept will be used in her calculations?

- (1) Pythagorean theorem (3) $\cos A$
 (2) $\sin A$ (4) $\tan A$

Pythagorean Theorem gives length of AC, which is not what we want.

21 The probability that Jinelle's bus is on time is $\frac{2}{3}$, and the probability that Mr. Corney is driving the bus is $\frac{4}{5}$. What is the probability that on any given day Jinelle's bus is on time and Mr. Corney is the driver?

(1) $\frac{2}{15}$

(3) $\frac{10}{12}$

(2) $\frac{8}{15}$

(4) $\frac{6}{8}$

Probability of Multiple Events = $P(A) \cdot P(B)$

$$P(A) = \frac{2}{3}$$

$$P(B) = \frac{4}{5}$$

$$P(A+B) = \left(\frac{2}{3}\right)\left(\frac{4}{5}\right)$$

$$P(A+B) = \frac{8}{15}$$

Use this space for computations.

22 What is the midpoint of the line segment that joins points (4,-2) and (-2,5)?

(1) $(1, \frac{3}{2})$

(3) $(1, \frac{7}{2})$

(2) $(\frac{3}{2}, 3)$

(4) $(2, \frac{3}{2})$

$(4, -2)$
 (x_1, y_1)

$(-2, 5)$
 (x_2, y_2)

$$\text{midpoint} = \left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right)$$

$$\text{midpoint} = \left(\frac{4 + (-2)}{2}, \frac{-2 + 5}{2} \right)$$

$$\text{midpoint} = \left(\frac{2}{2}, \frac{3}{2} \right)$$

$$\text{midpoint} = \left(1, \frac{3}{2} \right)$$

23 A conditional statement is always logically equivalent to its

- (1) contrapositive
(2) converse

- (3) conjunction
(4) inverse

24 If $x + y = -10$ and $x - y = 2$, what is the value of x ?

- (1) -6
(2) 6

- (3) -4
(4) 4

$$\begin{array}{r} x + y = -10 \\ -y \quad -y \\ \hline x = -10 - y \end{array}$$

$$\begin{array}{r} x - y = 2 \\ +y \quad +y \\ \hline x = 2 + y \end{array}$$

check $x + y = -10$ $x - y = 2$
 $-4 + -6 = -10$ $-4 - (-6) = 2$
 $-10 = -10 \checkmark$ $-4 + 6 = 2$
 $2 = 2 \checkmark$

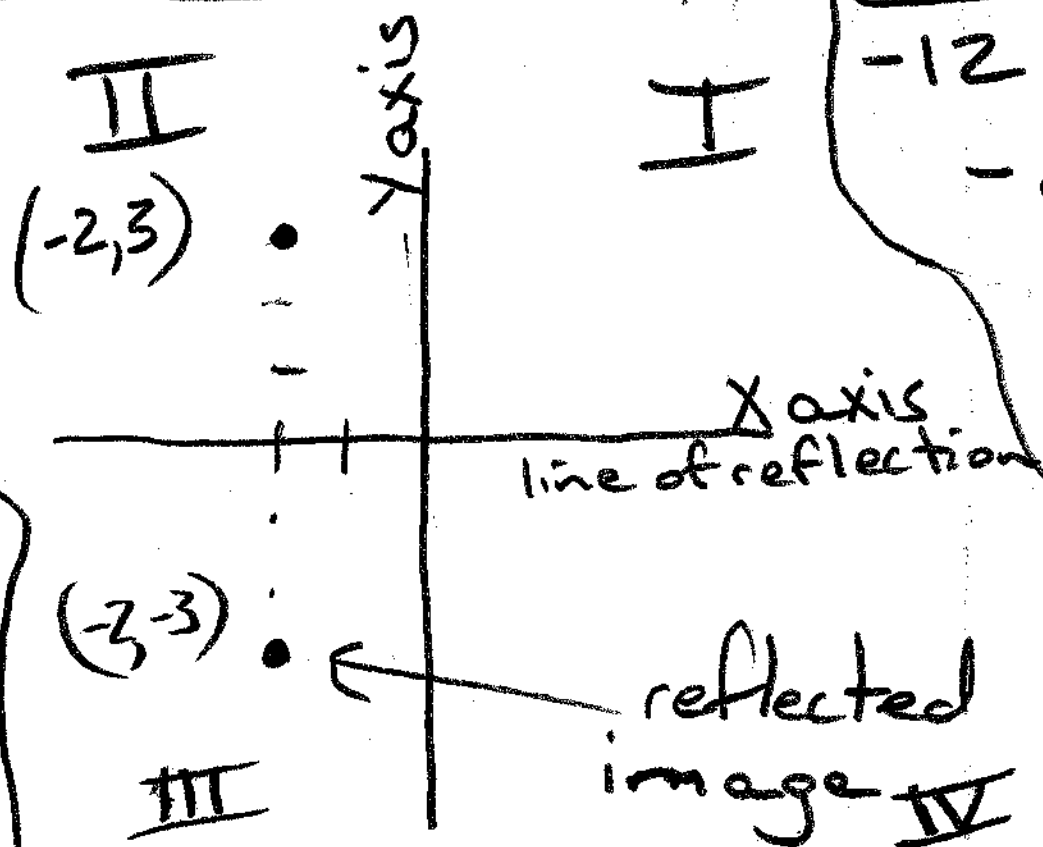
$$\begin{array}{r} -10 - y = 2 + y \\ +y \quad +y \\ \hline -10 = 2 + 2y \\ -2 \quad -2 \\ \hline -12 = 2y \end{array}$$

25 Point (-2,3) is reflected in the x-axis. In which quadrant does its image lie?

- (1) I
(2) II

- (3) III
(4) IV

The quadrants are named counterclockwise with Roman numerals.



$$\begin{array}{r} -12 = 2y \\ -6 = y \\ \hline x + y = -10 \\ x + (-6) = -10 \\ +6 \quad +6 \\ \hline x = -4 \end{array}$$

26 The expression $(3c)^{-2}$ is equivalent to

- (1) $-6c^2$
(2) $\frac{1}{3c^2}$

- (3) $\frac{1}{9c^2}$
(4) $\frac{3}{c^2}$

$$(3c)^{-2} = \frac{1}{(3c)^2} = \frac{1}{(3c)(3c)} = \frac{1}{9c^2}$$

Use this space for computations.

27 Which property is illustrated by the equation $6 + (4 + x) = 6 + (x + 4)$?

- (1) associative property of addition
- (2) associative property of multiplication
- (3) distributive property
- (4) commutative property of addition

28 Under which operation is the set $\{-1, 0, 1\}$ closed?

- (1) multiplication
- (2) division
- (3) addition
- (4) subtraction

You can use each element in a set more than once under an operation.
 $\therefore (-1) + (-1) = (-2)$ open under addition
 $(-1) - (1) = -2$ open under subtraction
 $(-1) \div (0) = \text{undefined}$ open under division

29 The accompanying table represents the number of cell phone minutes used for one week by 23 users.

Number of Minutes	Number of Users
71-80	10
61-70	7
51-60	2
41-50	3
31-40	1

1 2 3 4 5 6 7 8 9 10
 1 2 3 4 5 6 7
 1 2
 1 2 3
 1
 The middle # will be in the 61-70 interval.

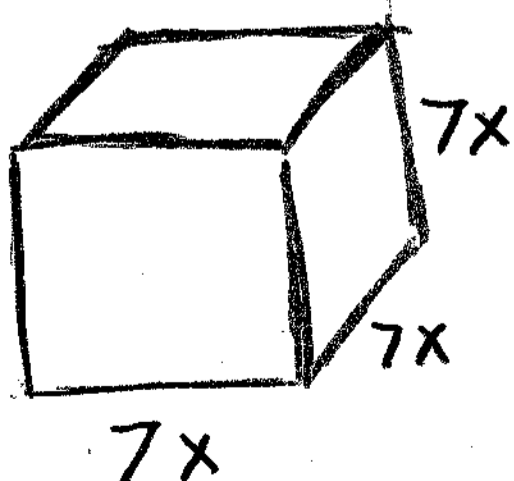
Which interval contains the median?

- (1) 41-50
- (2) 51-60
- (3) 61-70
- (4) 71-80

The median is the middle number in an ordered array.

30 If the length of a side of a cube is $7x$, which expression represents the cube's volume?

- (1) $7x^3$
- (2) $49x^3$
- (3) $343x$
- (4) $343x^3$



$$V = lwh$$

$$V = (7x)(7x)(7x)$$

$$V = (7)(7)(7)(x)(x)(x)$$

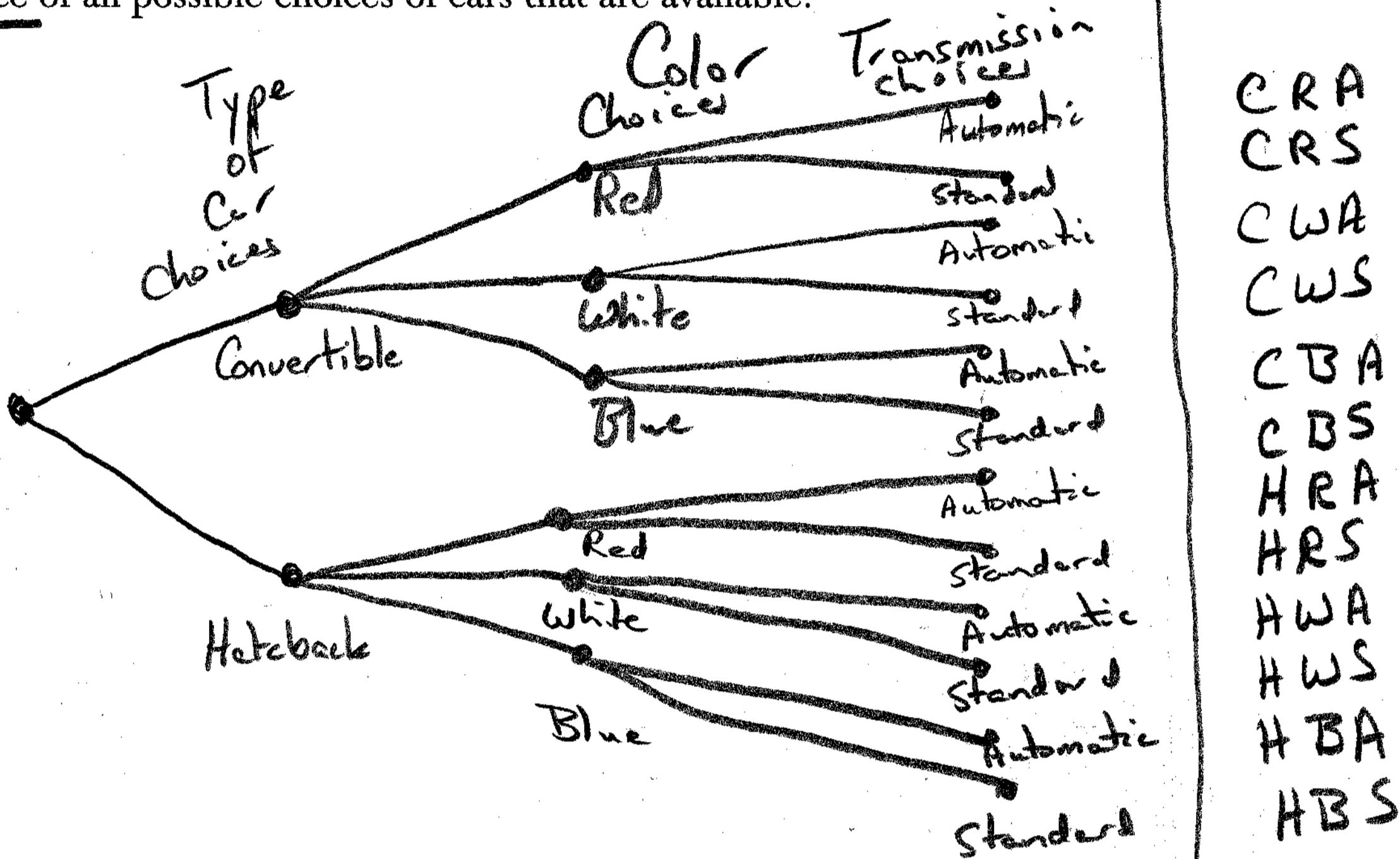
$$V = 343x^3$$

or $V = (7x)^3$

Part II

Answer all questions in this part. Each correct answer will receive 2 credits. Clearly indicate the necessary steps, including appropriate formula substitutions, diagrams, graphs, charts, etc. For all questions in this part, a correct numerical answer with no work shown will receive only 1 credit. [10]

31 Samuel is buying a new car. He wants either a convertible or a hatchback. Both types of cars are available in red, white, or blue and with automatic or standard transmission. Draw a tree diagram or list a sample space of all possible choices of cars that are available.

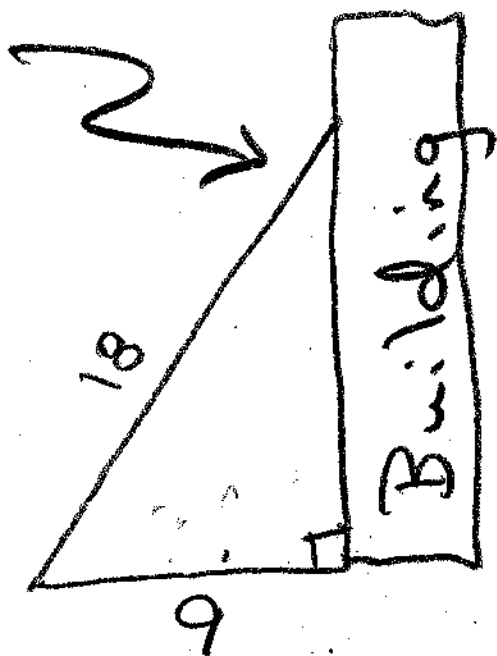


Tree Diagram

- or - Sample Space

- 32 An 18-foot ladder leans against the wall of a building. The base of the ladder is 9 feet from the building on level ground. How many feet up the wall, to the nearest tenth of a foot, is the top of the ladder?

Ladder



Pythagorean Theorem

$$a^2 + b^2 = c^2$$

$$9^2 + b^2 = 18^2$$

$$81 + b^2 = 324$$

$$-81 \quad -81$$

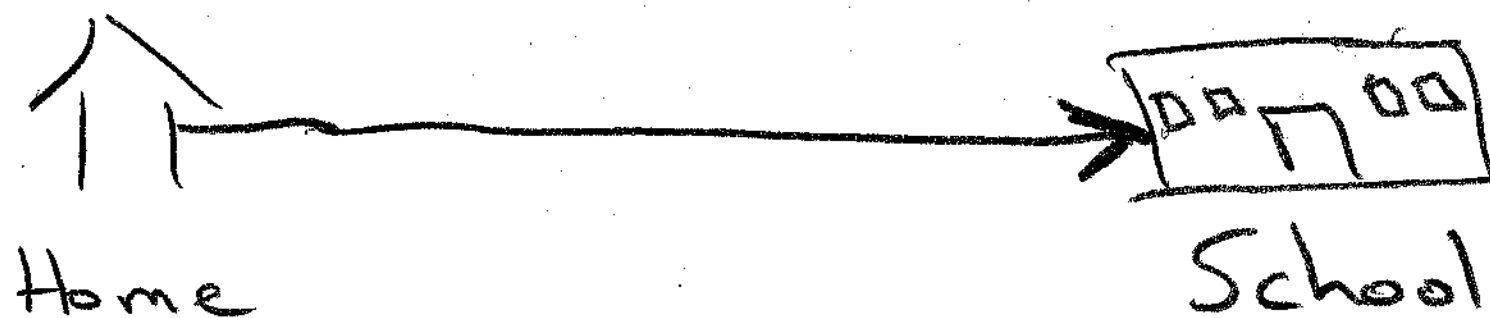
$$b^2 = 243$$

$$\sqrt{b^2} = \sqrt{243}$$

$$b = 15.58845727$$

$$b = \boxed{15.6 \text{ feet}}$$

- 33 Kimberly rides her bicycle from her home to school at an average rate of 12 miles per hour. If it takes her 20 minutes to get to school, how many miles is her home from her school?



$$12 \text{ miles per hour} = \frac{12 \text{ miles}}{1 \text{ hour}} = \frac{12 \text{ miles}}{60 \text{ minutes}} = \frac{1 \text{ mile}}{5 \text{ minutes}}$$

Miles
Minutes

$$\frac{1}{5} = \frac{x}{20}$$

Cross
Multiply

$$5x = 20$$

$$x = 4$$

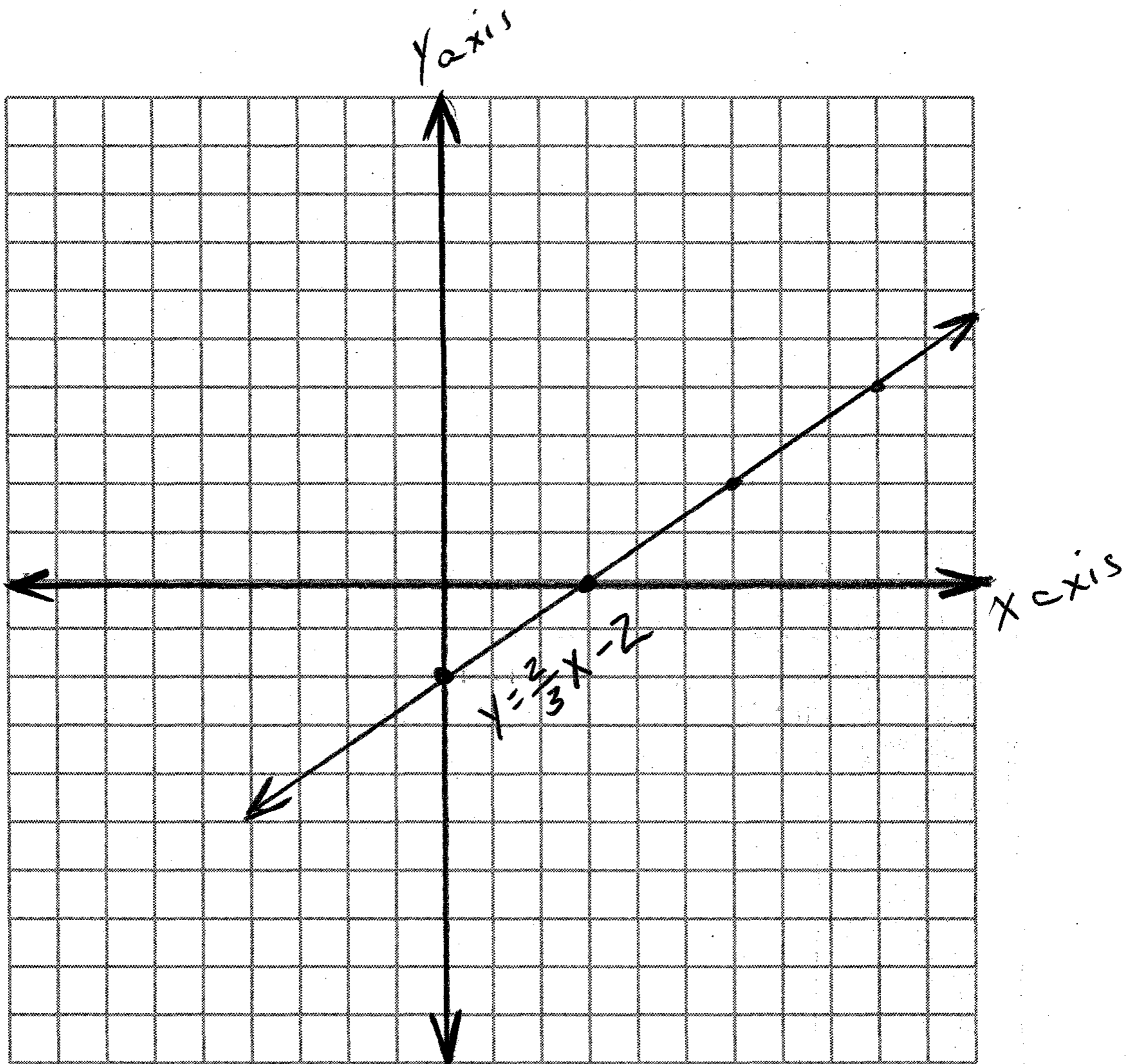
kimberly's home is

$\boxed{4 \text{ miles}}$ from school.

34 On the accompanying grid, draw the graph of the line whose slope is $\frac{2}{3}$ and whose y -intercept is -2 .

\uparrow
 $(0, -2)$

$$\text{slope} = \frac{2}{3} = \frac{\text{rise}}{\text{run}}$$



$$y = mx + b$$
$$y = \frac{2}{3}x - 2$$

35 Write the following numbers in order from smallest value to largest value:

$$\sqrt{3}, 1\frac{2}{3}, \frac{3}{2}, 1.75, 1$$

Smallest

$$\boxed{1}$$

$$\boxed{\frac{3}{2}}$$

$$\boxed{1\frac{2}{3}}$$

$$\boxed{\sqrt{3}}$$

$$\boxed{1.75}$$

Largest

Justify your answer.

Step 1

Convert to decimals.

$$\sqrt{3} \Rightarrow 1.732\dots \text{ Next to largest}$$

$$1\frac{2}{3} \Rightarrow 1.\overline{666}$$

$$\frac{3}{2} \Rightarrow 1.500 \text{ Next to Smallest}$$

$$1.75 \Rightarrow 1.750 \text{ Largest}$$

$$1 \Rightarrow 1.000 \text{ Smallest}$$

Step 2 Arrange from small to large

Part III

Answer all questions in this part. Each correct answer will receive 3 credits. Clearly indicate the necessary steps, including appropriate formula substitutions, diagrams, graphs, charts, etc. For all questions in this part, a correct numerical answer with no work shown will receive only 1 credit. [6]

36 Max is ^{Pay} paid a salary of \$225 a week plus ^{225 + 2.5% x T} 2.5% commission on his total sales.

$$2.5\% = .025$$

Write an equation for P , Max's pay for one week, in terms of T , his weekly total sales.

$$P = 225 + .025T$$

Use this equation to determine his total pay for a week in which his total sales are \$4,650.

$$P = 225 + .025(4,650)$$

$$P = 225 + 116.25$$

$$P = 341.25$$

$$\boxed{\$341.25}$$

37 Express in simplest form: $\frac{x^2 - 5x - 24}{x^2 - 8x}$

$$\frac{x^2 - 5x - 24}{x^2 - 8x}$$

$$\frac{(x+3)(\cancel{x-8})}{x(\cancel{x-8})}$$

$$\boxed{\frac{x+3}{x}} \text{ Answer}$$

$$x^2 - 5x - 24$$

$$(x + _)(x - _)$$

$$(x+3)(x-8)$$

Factors
of 24

$$24+1$$

$$12+2$$

$$8+3$$

$$6+4$$

Difference
of 5

Part IV

Answer all questions in this part. Each correct answer will receive 4 credits. Clearly indicate the necessary steps, including appropriate formula substitutions, diagrams, graphs, charts, etc. For all questions in this part, a correct numerical answer with no work shown will receive only 1 credit. [8]

38 In the accompanying diagram, isosceles $\triangle ABC \cong$ isosceles $\triangle DEF$, $m\angle C = 5x$, and $m\angle D = 2x + 18$. Find $m\angle B$ and $m\angle BAG$.

$m\angle C = m\angle D$
 $5x = 2x + 18$
 $\begin{array}{r} -2x \quad -2x \\ \hline 3x = 18 \end{array}$
 $\frac{3x}{3} = \frac{18}{3}$
 $x = 6$

$m\angle B = 180 - 2(30)$
 $= 180 - 60$
 $m\angle B = 120^\circ$ Answer

$m\angle BAG = 180 - 30$
 $m\angle BAG = 150^\circ$

Check
 $5x = 2(x) + 18$
 $5(6) = 2(6) + 18$
 $30 = 12 + 18$
 $30 = 30 \checkmark$

39 Solve the following system of equations algebraically or graphically for x and y :

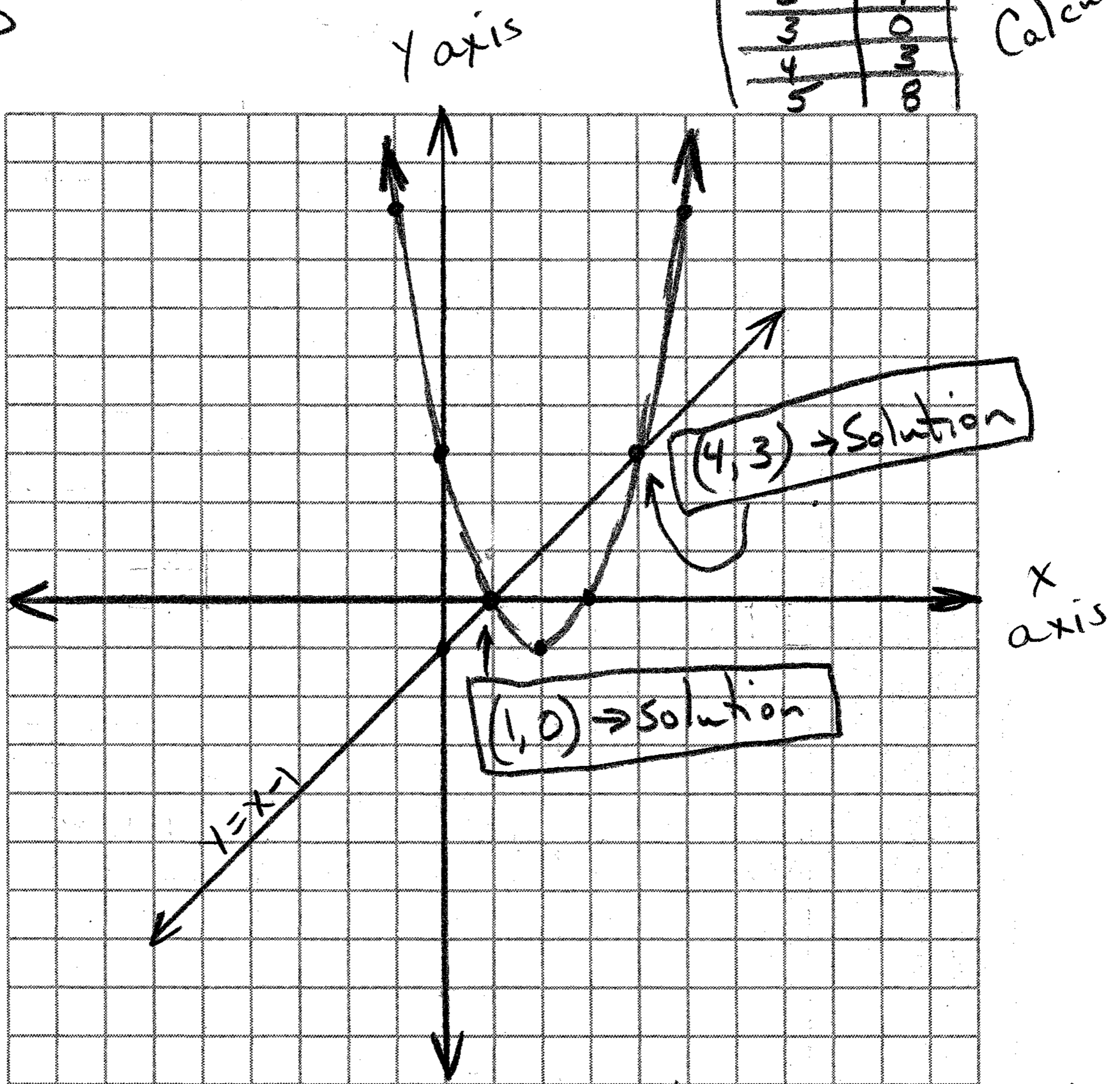
$$y = x^2 - 4x + 3$$

$$y = x - 1$$

x	y
-1	8
0	3
1	0
2	-1
3	0
4	3
5	8

Table is from Graphing Calculator

Graphing Solution



Algebraic Solution

$$y = x^2 - 4x + 3$$

$$y = x - 1$$

$$x^2 - 4x + 3 = x - 1$$

$$\begin{array}{r} x^2 - 4x + 3 \\ -x \\ \hline x^2 - 5x + 3 = -1 \\ +1 \quad +1 \\ \hline x^2 - 5x + 4 = 0 \end{array}$$

Factors of 4
 4 and 1
 2 and 2
 These sum to 5

$$x = 4$$

$$y = x - 1$$

$$y = (4) - 1$$

$$y = 3$$

$$\boxed{(4, 3)}$$

$$x = 1$$

$$y = x - 1$$

$$y = (1) - 1$$

$$y = 0$$

$$\boxed{(1, 0)}$$

Two Solutions

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

$$x-4=0 \quad x-1=0$$

$$x=4 \quad x=1$$

The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

MATHEMATICS A

Thursday, June 19, 2008 — 1:15 to 4:15 p.m., only

ANSWER SHEET

Student Steve Watson Sex: Male Female Grade
Teacher School IHS@PH

Your answers to Part I should be recorded on this answer sheet.

Part I

Answer all 30 questions in this part.

Table with 30 rows and 4 columns of question numbers and handwritten answers (e.g., 1: 2, 2: 1, 3: 2, 4: 4, 5: 4, 6: 1, 7: 3, 8: 3, 9: 4, 10: 4, 11: 2, 12: 1, 13: 4, 14: 2, 15: 2, 16: 4, 17: 4, 18: 2, 19: 4, 20: 4, 21: 2, 22: 1, 23: 1, 24: 3, 25: 3, 26: 3, 27: 4, 28: 1, 29: 3, 30: 4).

Your answers for Parts II, III, and IV should be written in the test booklet.

The declaration below should be signed when you have completed the examination.

I do hereby affirm, at the close of this examination, that I had no unlawful knowledge of the questions or answers prior to the examination and that I have neither given nor received assistance in answering any of the questions during the examination.

Handwritten signature 'RW'

Signature

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Tear Here