The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

MATHEMATICS A

Wednesday, June 16, 2004 — 1:15 to 4:15 p.m., only

Print Your Name: _Imaginary Student_

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. 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 your use while taking this examination.

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]

1 The test scores for 10 students in Ms. Sampson's homeroom were 61, 67, 81, 83, 87, 88, 89, 90, 98, and 100. Which frequency table is accurate for this set of data?

Use this space for computations.

Interval	Frequency
61–70	2
71–80	2
81–90	7
91–100	10

(1)

Interval	Frequency
61–70	2
71–80	0
81–90	8
91–100	10

(3)

Interval	Frequency
61–70	2
71–80	2
81–90	8
91–100	10

(2)

Interval	Frequency
61–70	2
71–80	0
81–90	6
91–100	2

(4)

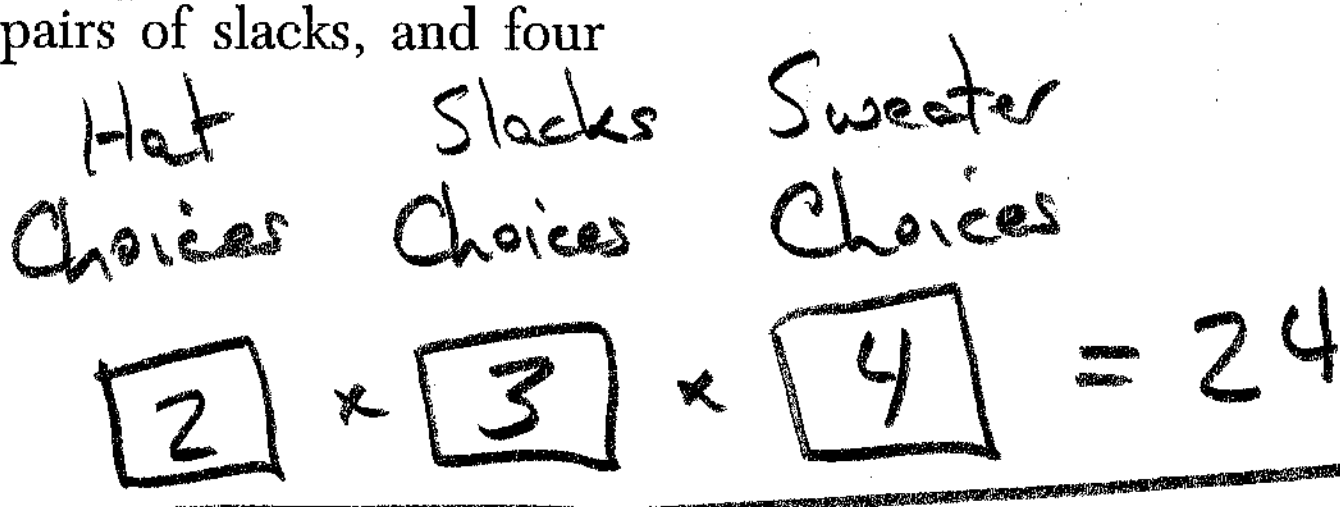*(handwritten: 2 ⇒ 61-70 | 61 67; ∅ ⇒ 71-80; 6 ⇒ 81-90 | 81, 83, 87, 88, 89, 90; 2 ⇒ 91-100 ⇒ 98, 100)*

2 What is the image of (x,y) after a translation of 3 units right and 7 units down?

(1) $(x + 3, y - 7)$ (3) $(x - 3, y - 7)$
(2) $(x + 3, y + 7)$ (4) $(x - 3, y + 7)$
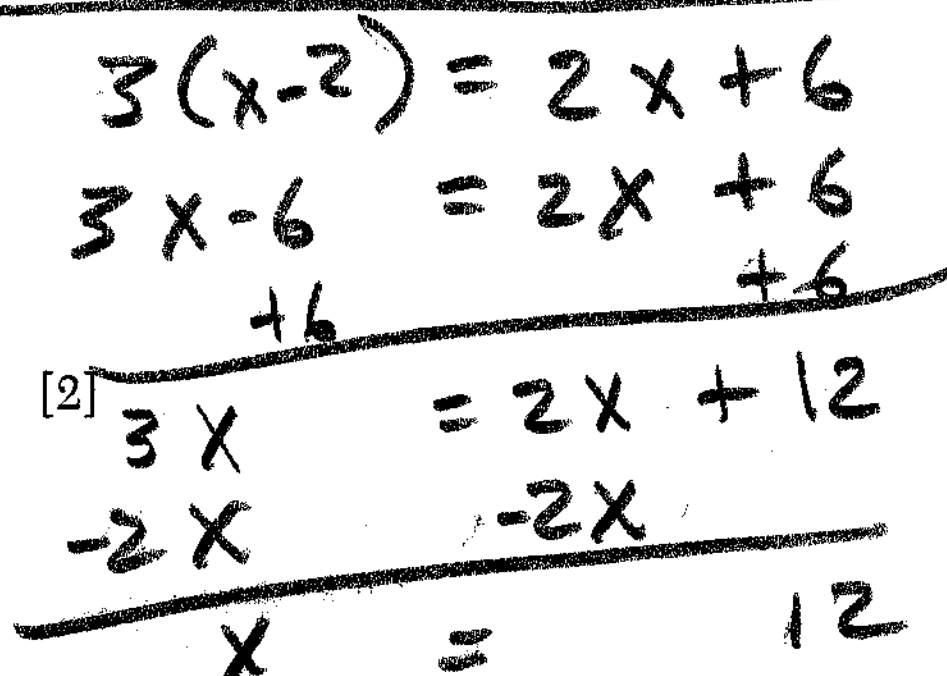
(handwritten: (x, y) → $(x+3, y-7)$)
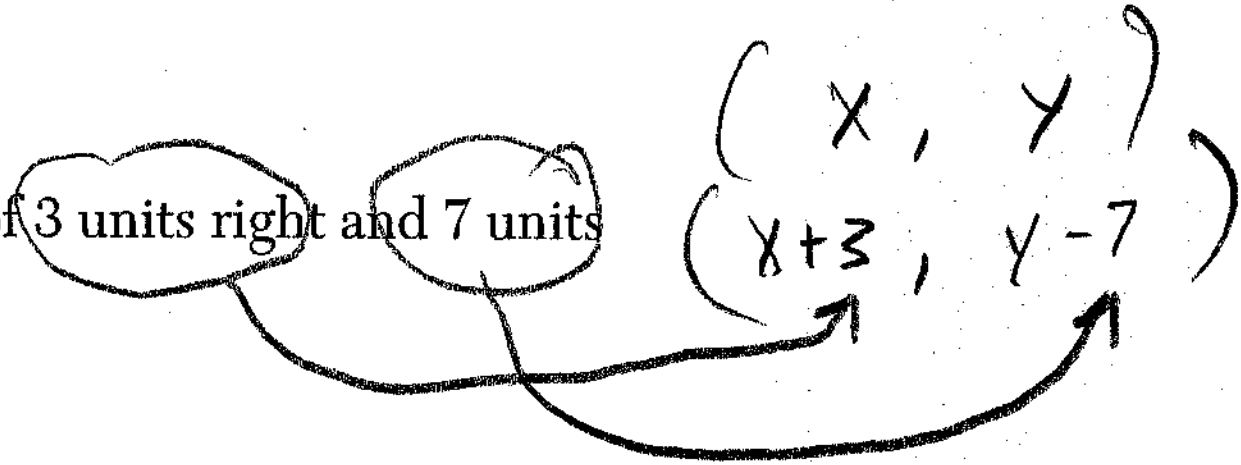
3 How many different outfits consisting of a hat, a pair of slacks, and a sweater can be made from two hats, three pairs of slacks, and four sweaters?

(1) 9   (3) 24
(2) 12   (4) 29

(handwritten: Hat Choices × Slacks Choices × Sweater Choices = 2 × 3 × 4 = 24)

4 If $3(x - 2) = 2x + 6$, the value of x is

(1) 0   (3) 12
(2) 5   (4) 20

(handwritten:
$3(x-2) = 2x + 6$
$3x - 6 = 2x + 6$
$+6 \qquad +6$
$3x = 2x + 12$
$-2x \qquad -2x$
$x = 12$
)

[2]

5 Which statement is logically equivalent to "If a triangle is an isosceles triangle, then it has two congruent sides"?

(1) If a triangle does not have two congruent sides, then it is an isosceles triangle.

(2) If a triangle does not have two congruent sides, then it is not an isosceles triangle.

(3) If a triangle is not an isosceles triangle, then it has two congruent sides.

(4) If a triangle is an isosceles triangle, then it does not have two congruent sides.

Given: If 1, then 2
Inverse: If not 1, then not 2
Converse: If 2, then 1
Contrapositive: If not 2, then not 1

The contrapositive is logically equivalent to the given.
If not it has 2 congruent sides, then not it is an isosceles △

6 Parking charges at Superior Parking Garage are $5.00 for the first hour and $1.50 for each additional 30 minutes. If Margo has $12.50, what is the maximum amount of time she will be able to park her car at the garage?

(1) $2\frac{1}{2}$ hours (3) 6 hours

(2) $3\frac{1}{2}$ hours (4) $6\frac{1}{2}$ hours

$1 + 2\frac{1}{2} = 3\frac{1}{2}$ hours

12.50
-5.00 1st hour
7.50

← This will buy 5 half hours or 2½ hours

7 If the temperature in Buffalo is 23° Fahrenheit, what is the temperature in degrees Celsius? [Use the formula $C = \frac{5}{9}(F - 32)$.]

(1) −5 (3) −45

(2) 5 (4) 45

$C = \frac{5}{9}(F - 32) \rightarrow C = \frac{5}{9}\left(\frac{-9}{1}\right)$
$C = \frac{5}{9}(23 - 32)$
$C = \frac{5}{9}(-9)$ $C = \frac{-45}{9}$
$C = -5$

8 Tara buys two items that cost d dollars each. She gives the cashier $20. Which expression represents the change she should receive?

(1) $20 - 2d$ (3) $20 + 2d$

(2) $20 - d$ (4) $2d - 20$

$2d$

$20 - 2d$

9 At the beginning of her mathematics class, Mrs. Reno gives a warm-up problem. She says, "I am thinking of a number such that 6 less than the product of 7 and this number is 85." Which number is she thinking of?
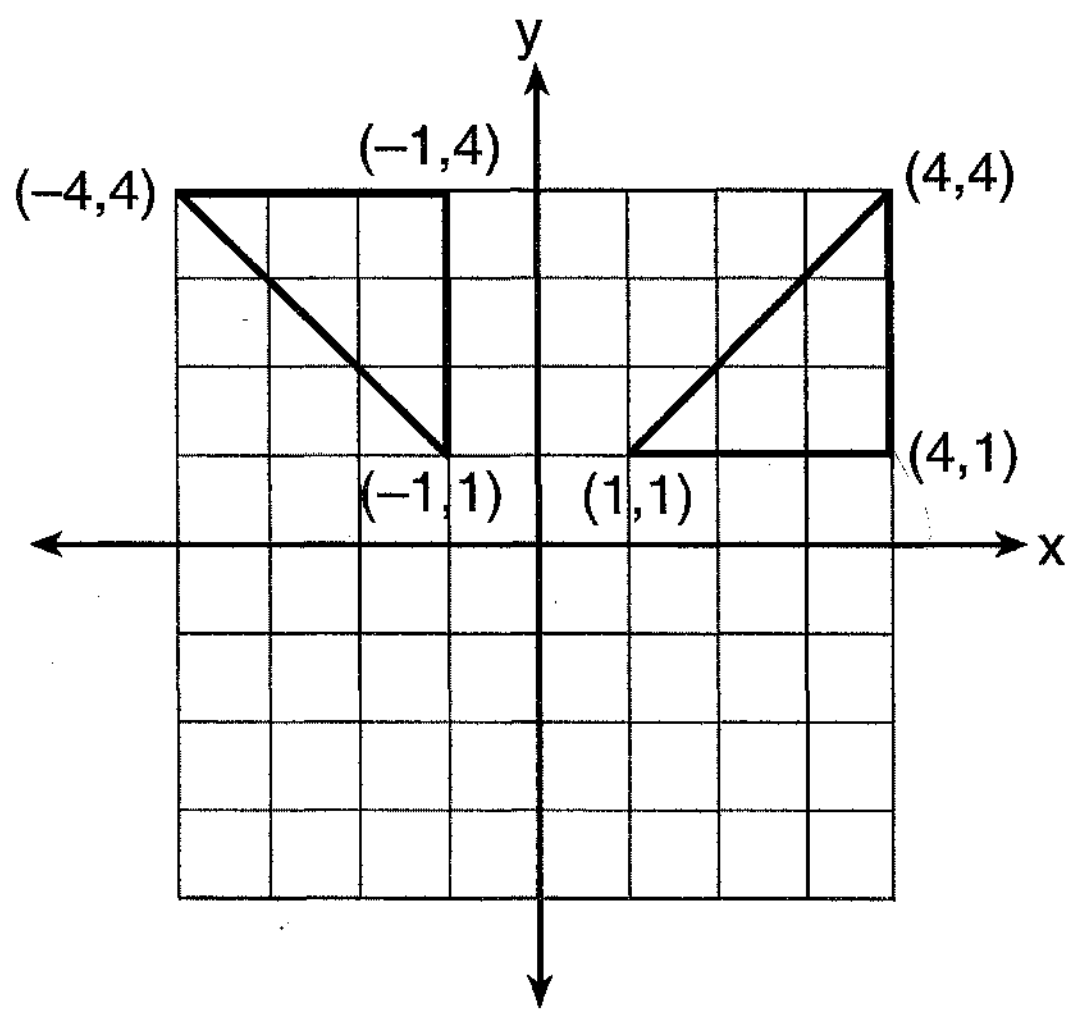
(1) $11\frac{2}{7}$ (3) 84

(2) 13 (4) 637

-6
$7x$
$= 85$

$7x - 6 = 85$
$\quad +6 \quad +6$
$7x = 91$
$x = 13$

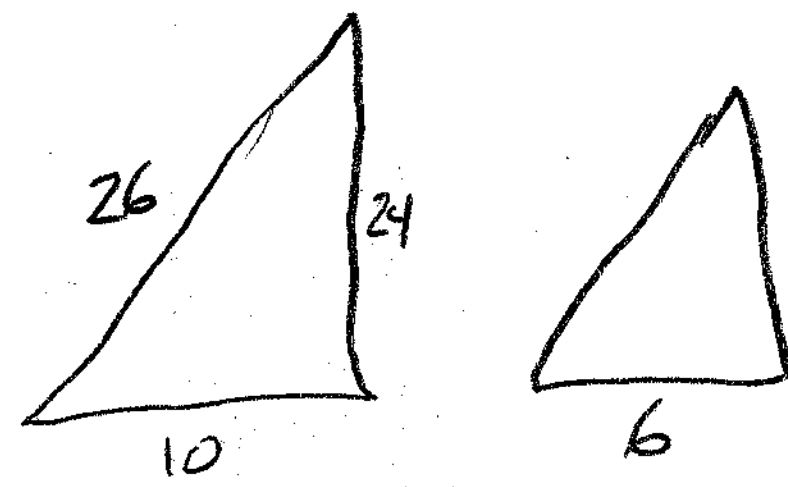**10** Which type of transformation is illustrated in the accompanying diagram?

(−4,4) (−1,4) (4,4)

(−1,1) (1,1) (4,1)

(1) dilation   (3) translation
(2) reflection   (4) rotation

11 Delroy's sailboat has two sails that are similar triangles. The larger sail has sides of 10 feet, 24 feet, and 26 feet. If the shortest side of the smaller sail measures 6 feet, what is the perimeter of the *smaller* sail?

(1) 15 ft   (3) 60 ft
(2) 36 ft   (4) 100 ft

26 24

10 6

$$\frac{10}{6} = \frac{10 + 24 + 26}{x}$$

$$\frac{10}{6} = \frac{60}{x}$$

$$360 = 10x$$

$$36 = x$$

12 What is the least common denominator of $\frac{1}{2}$, $\frac{2}{7x}$, and $\frac{5}{x}$?

(1) 9x   (3) 14x
(2) 2x   (4) $14x^2$

$(2)(7)(x)(x)$

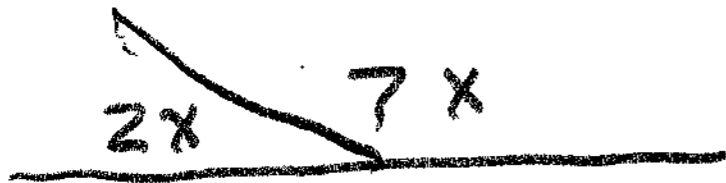**13** Which property of real numbers is illustrated by the equation
$-\sqrt{3} + \sqrt{3} = 0$?

(1) additive identity
(2) commutative property of addition
(3) associative property of addition
(4) additive inverse

14 The ratio of two supplementary angles is 2:7. What is the measure of the *smaller* angle?

(1) 10°

(2) 14°

(3) 20°

(4) 40°

sum to 180°

$2x + 7x = 180°$
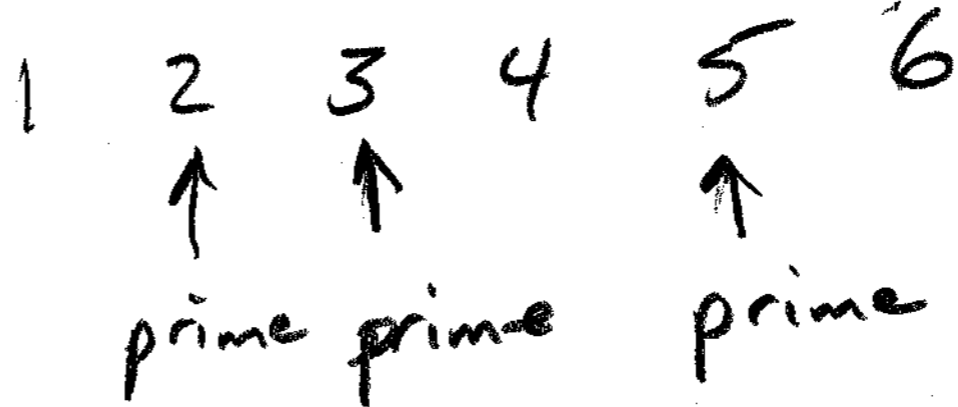
$9x = 180$

$x = 20°$

$2(20) = 40°$

15 Mary chooses an integer at random from 1 to 6. What is the probability that the integer she chooses is a prime number?

(1) $\frac{5}{6}$

(2) $\frac{3}{6}$

(3) $\frac{2}{6}$

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

1 2 3 4 5 6

prime prime prime

16 The statement "x is *not* the square of an integer and x is a multiple of 3" is true when x is equal to

(1) 9 *square of 3*

(2) 18

(3) 32 *not multiple of 3*

(4) 36 *square of 6*

17 Which phrase does *not* describe a triangle?

(1) acute scalene

(2) isosceles right

(3) equilateral equiangular

(4) obtuse right

obtuse is $> 90°$

right is $90°$

An obtuse right △ would have more than 180°, which is not possible.

18 The number of people on the school board is represented by x. Two subcommittees with an equal number of members are formed, one with $\frac{2}{3}x - 5$ members and the other with $\frac{x}{4}$ members. How many people are on the school board?

(1) 20

(2) 12

(3) 8

(4) 4

$\frac{2}{3}x - 5 = \frac{x}{4}$

$M_3 \quad 2x - 15 = \frac{3x}{4}$

$M_4 \quad 8x - 60 = 3x$

$\underline{-3x \qquad\qquad -3}$

$5x - 60 = 0$

$\underline{\quad +60 \quad +60}$

$5x = 60$

$x = 12$

19 The angle of elevation from a point 25 feet from the base of a tree on level ground to the top of the tree is 30°. Which equation can be used to find the height of the tree?
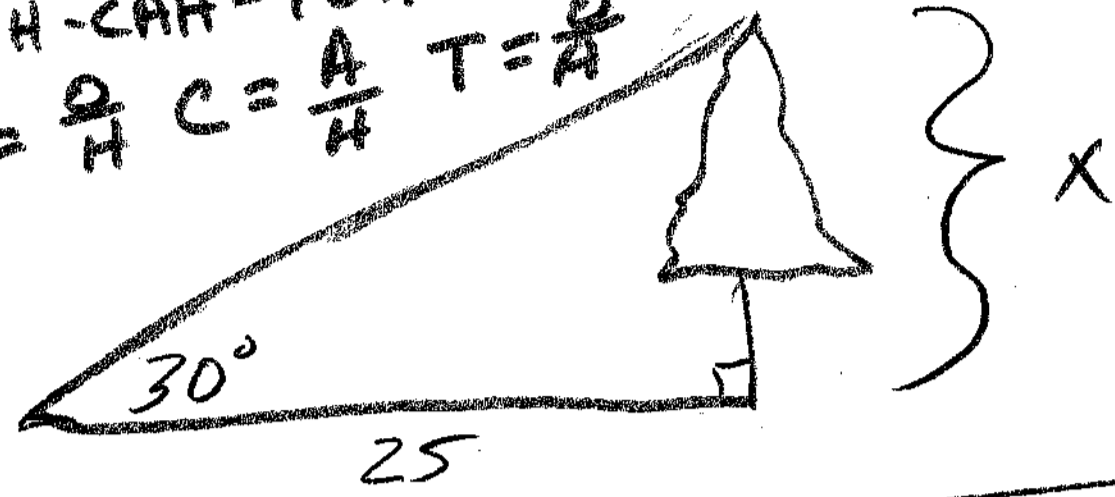
(1) $\tan 30° = \dfrac{x}{25}$

(2) $\cos 30° = \dfrac{x}{25}$

(3) $\sin 30° = \dfrac{x}{25}$

(4) $30^2 + 25^2 = x^2$

SOH-CAH-TOA

$S = \dfrac{O}{H}$ $C = \dfrac{A}{H}$ $T = \dfrac{O}{A}$

$T = \dfrac{O}{A}$ $\tan 30° = \dfrac{x}{25}$

30°   25   x

20 Rashawn bought a CD that cost $18.99 and paid $20.51, including sales tax. What was the rate of the sales tax?

(1) 5%

(2) 2%

(3) 3%

(4) 8%

Tax
Cost

$\dfrac{20.51 - 18.99}{18.99} = \dfrac{1.52}{18.99} = 8\%$

21 If $3x$ is one factor of $3x^2 - 9x$, what is the other factor?
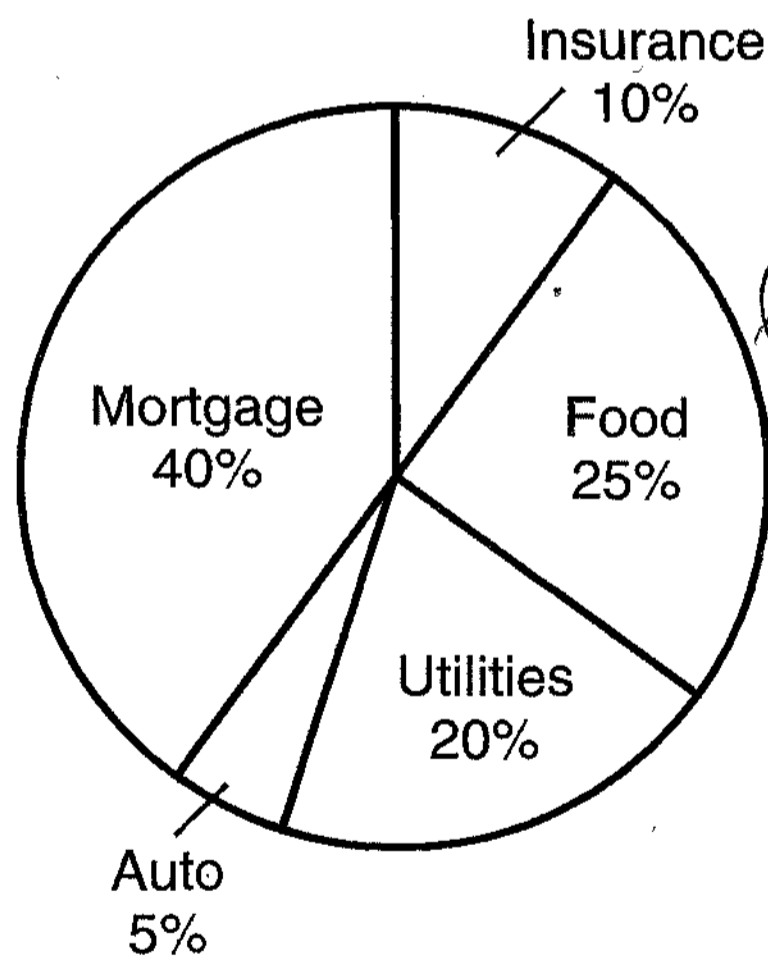
(1) $3x$

(2) $x^2 - 6x$

(3) $x - 3$

(4) $x + 3$

$3x^2 - 9x$

$3x(x - 3)$

22 The accompanying circle graph shows how the Marino family spends its income each month.

Insurance 10%

Mortgage 40%

Food 25%

Utilities 20%

Auto 5%

$\dfrac{Part}{Whole}$ $\dfrac{25\%}{100\%} = \dfrac{x°}{360°}$

$25(360) = 100x$

$9000 = 100x$

$90 = x$

What is the measure, in degrees, of the central angle that represents the percentage of income spent on food?

(1) 25

(2) 50

(3) 90

(4) 360

23 Melissa is walking around the outside of a building that is in the shape of a regular polygon. She determines that the measure of one exterior angle of the building is 60°. How many sides does the building have?

(1) 6

(2) 9

(3) 3

(4) 12

equal sides equal ∡s

The sum of exterior ∡s is always 360°.

$$\frac{360°}{60°} = 6 \text{ equal } ∡s$$

24 Which expression is an example of the associative property?

(1) $(x + y) + z = x + (y + z)$

(2) $x + y + z = z + y + x$ *Commutative*

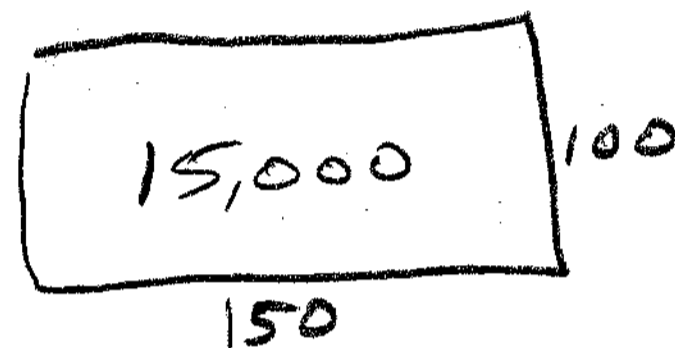(3) $x(y + z) = xy + xz$ *Distributive*

(4) $x \cdot 1 = x$ *Identity*

25 A farmer has a rectangular field that measures 100 feet by 150 feet. He plans to increase the area of the field by 20%. He will do this by increasing the length and width by the same amount, x. Which equation represents the area of the new field?

(1) $(100 + 2x)(150 + x) = 18,000$

(2) $2(100 + x) + 2(150 + x) = 15,000$

(3) $(100 + x)(150 + x) = 18,000$

(4) $(100 + x)(150 + x) = 15,000$

15,000 | *100* | *150*

The new field will have area of 18,000 ft^2

$$(100 + x)(150 + x) = 18,000$$

26 In a game, each player receives 5 cards from a deck of 52 different cards. How many different groupings of cards are possible in this game?

(1) $_{52}P_5$ *Order matters w/ P*

(2) $_{52}C_5$ *Order does not matter with C*
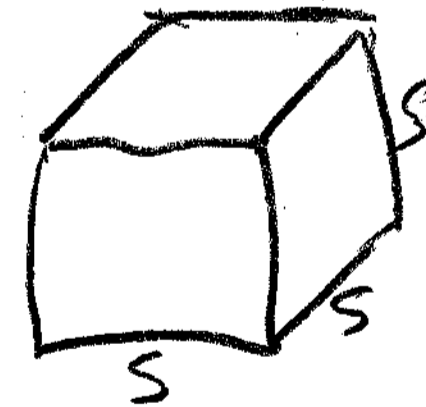
(3) $\dfrac{52!}{5!}$

(4) $5!$

27 A box in the shape of a cube has a volume of 64 cubic inches. What is the length of a side of the box?

(1) $21.\overline{3}$ in

(2) 16 in

(3) 8 in

(4) 4 in

$$S^3 = 64$$

$$S = \sqrt[3]{64}$$

$$S = 4$$

Check $4 \cdot 4 \cdot 4 = 64$ ✓

28 The line $3x - 2y = 12$ has

(1) a slope of $\frac{3}{2}$ and a y-intercept of -6

(2) a slope of $-\frac{3}{2}$ and a y-intercept of 6

(3) a slope of 3 and a y-intercept of -2

(4) a slope of -3 and a y-intercept of -6

$3x - 2y = 12$

$-3x \qquad -3x$

$-2y = -3x + 12$

$\div(-2) \qquad y = \frac{3}{2}x - 6$

↳ slope ↳ y-intercept

29 If the mass of a proton is 1.67×10^{-24} gram, what is the mass of 1,000 protons?

(1) 1.67×10^{-27} g

(2) 1.67×10^{-23} g

(3) 1.67×10^{-22} g

(4) 1.67×10^{-21} g

$1.67 \times 10^{-24} \times 10^3 = 1.67 \times 10^{(-24+3)} = 1.67 \times 10^{-21}$

30 If $(x - 4)$ is a factor of $x^2 - x - w = 0$, then the value of w is

(1) 12

(2) −12

(3) 3

(4) −3

$x^2 - x - w = 0$

$(x + \underline{\ \ })(x - 4) = 0$

middle term

↓

$-4x + \underline{\ }x = -x$

↑

must be 3

$(x+3)(x-4) = 0$

$x^2 - 4x + 3x - 12 = 0$

$x^2 - x - 12 = 0$

$w = 12$

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 In the accompanying diagram of $\triangle BCD$, m$\angle C = 70$, m$\angle CDE = 130$, and side $\overline{BD}$ is extended to A and to E. Find m$\angle CBA$.

C
70°

120 / 60   50 \ 130°
A   B   D   E
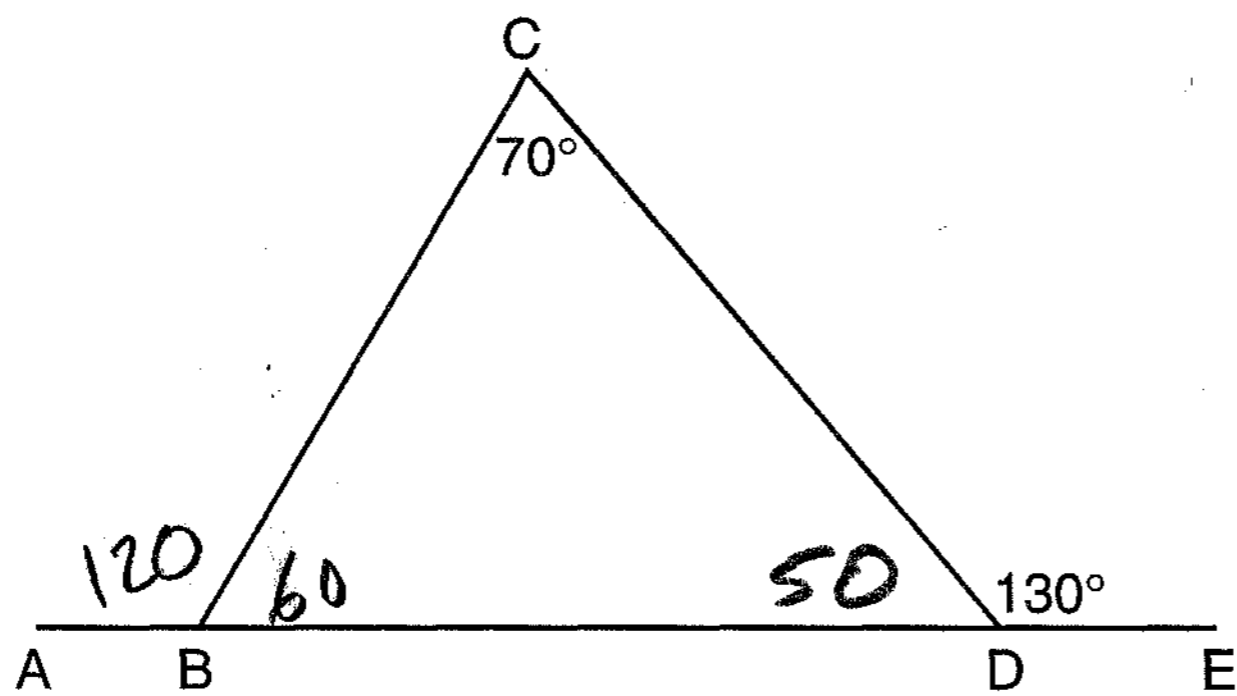
$\angle CDE + \angle CDB = 180$

$130 + \angle CDB = 180$

$\angle CDB = 50$

$\angle CBD = 180 - (70 + 50)$

$= 180 - 120$

$= 60°$

$\angle CBA = 180 - 60$

$= 120°$

$m\angle CBA = 120°$

32 Brett was given the problem: "Evaluate $2x^2 + 5$ when $x = 3$." Brett wrote that the answer was 41. Was Brett correct? Explain your answer.

$$2x^2 + 5$$
$$2(3)^2 + 5$$
$$2(9) + 5$$
$$18 + 5$$
$$23$$

Brett was wrong. He should have written that the answer is 23

33 Kyoko's mathematics teacher gave her the accompanying cards and asked her to arrange the cards in order from least to greatest. In what order should Kyoko arrange the cards?

| π | $\sqrt{8}$ | $3.\overline{1}$ | $2\sqrt{3}$ | $2\frac{4}{5}$ |

Strategy: Convert to Decimals

| 3.14159 | 2.8284 | 3.1111 | 3.4641 | 2.80 |

next greatest   next least   middle   greatest   least

Answer

least | $2\frac{4}{5}$ | $\sqrt{8}$ | $3.\overline{1}$ | π | $2\sqrt{3}$ | greatest

34 The coordinates of the midpoint of $\overline{AB}$ are (2,4), and the coordinates of point B are (3,7). What are the coordinates of point A? [The use of the accompanying grid is optional.]

$$mp = \left(\frac{X_1 + X_2}{2}, \frac{Y_1 + Y_2}{2}\right)$$

$$mp = (2, 4)$$
$$b = (3, 7)$$

$$X_{mp} = \frac{X_1 + X_2}{2}$$

$$2 = \frac{3 + X_2}{2}$$

$$Y_{mp} = \frac{Y_1 + Y_2}{2}$$

$$4 = \frac{7 + Y_2}{2}$$

$$8 = 7 + Y_2$$

$$1 = Y_2$$

Algebraic Solution
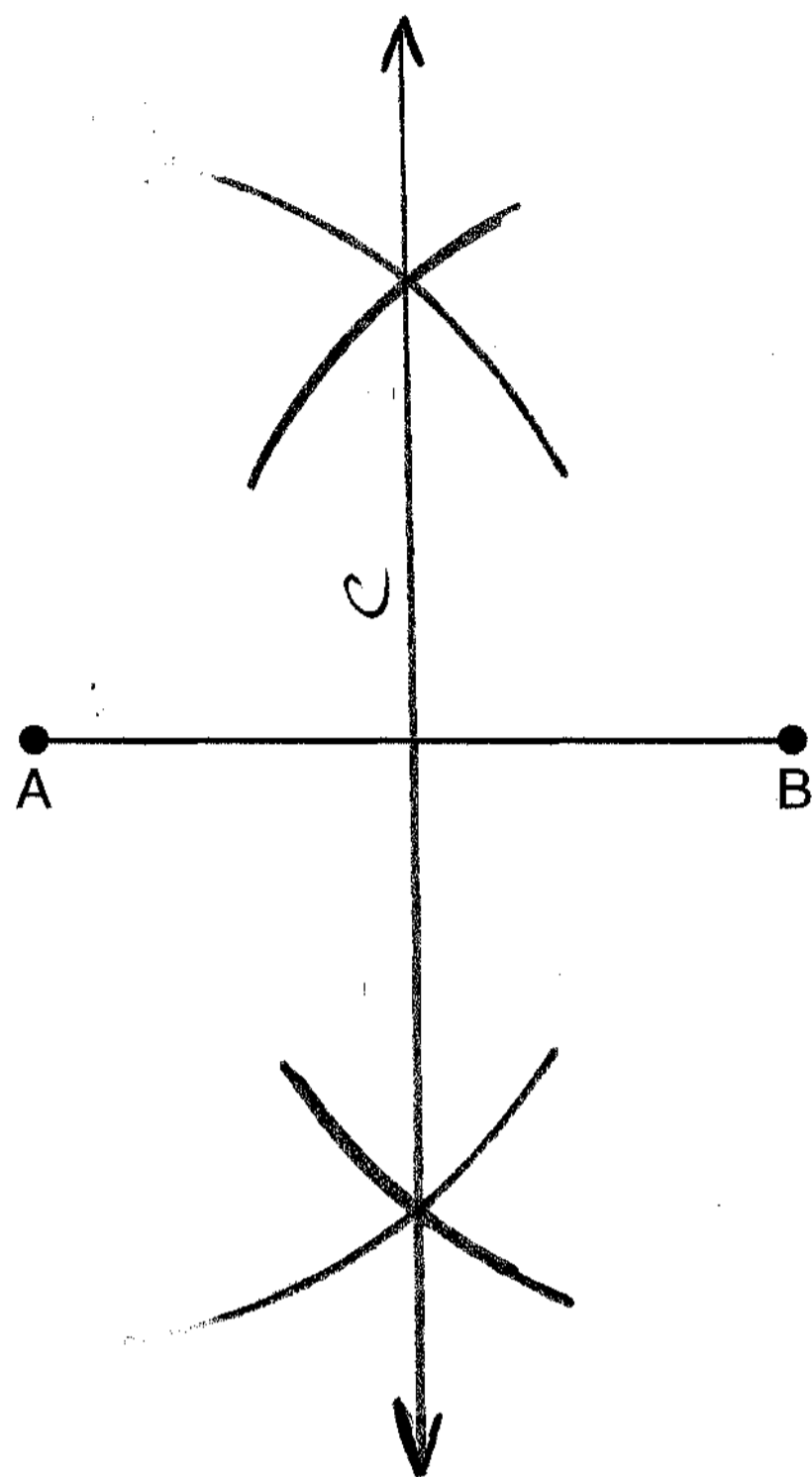
The coordinates of point A are (1, 1)

$$4 = 3 + X_2$$
$$1 = X_2$$
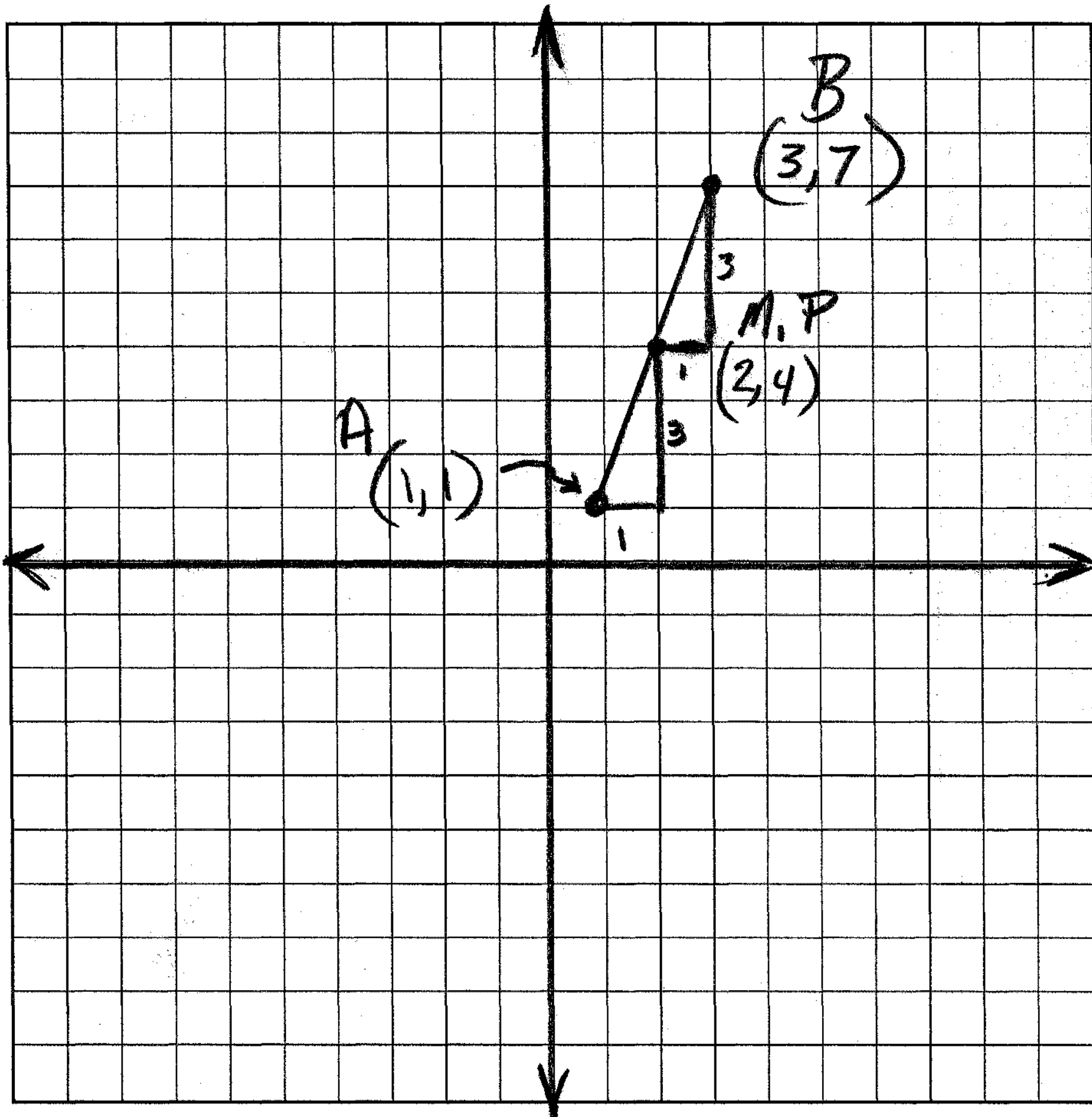
Graphing Solution

35 Using only a compass and a straightedge, construct the perpendicular bisector of $\overline{AB}$ and label it c. [Leave all construction marks.]

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 The senior class at South High School consists of 250 students. Of these students, 130 have brown hair, 160 have brown eyes, and 90 have both brown hair and brown eyes. How many members of the senior class have *neither* brown hair *nor* brown eyes?

Solution 1

	Brown Hair	Not Brown Hair	Total
Brown Eyes	90	70	160
Not Brown Eyes	40	50	90
Total	130	120	250

Solution 2

Br. Hair: 40, overlap 90, Br. Eyes: 70, 50, 250

50 members of the senior class have neither brown hair nor brown eyes.

37 Express both the perimeter and the area of the rectangle shown in the accompanying diagram as polynomials in simplest form.

$x - 4$

$x + 6$
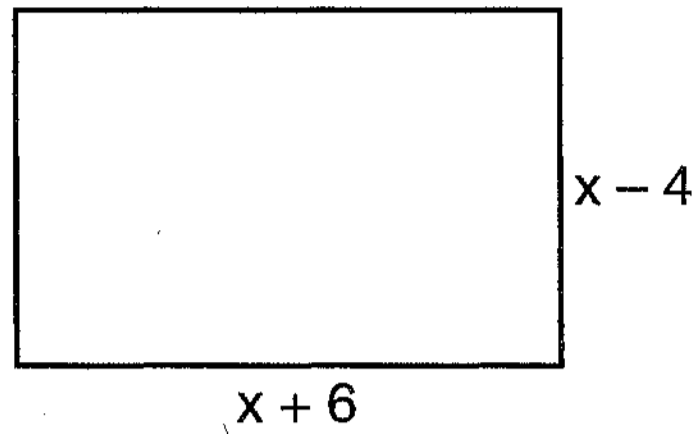
Perimeter $= 2(x+6) + 2(x-4)$

$2x + 12 + 2x - 8$

$4x + 4$

$$P = 4(x+1)$$

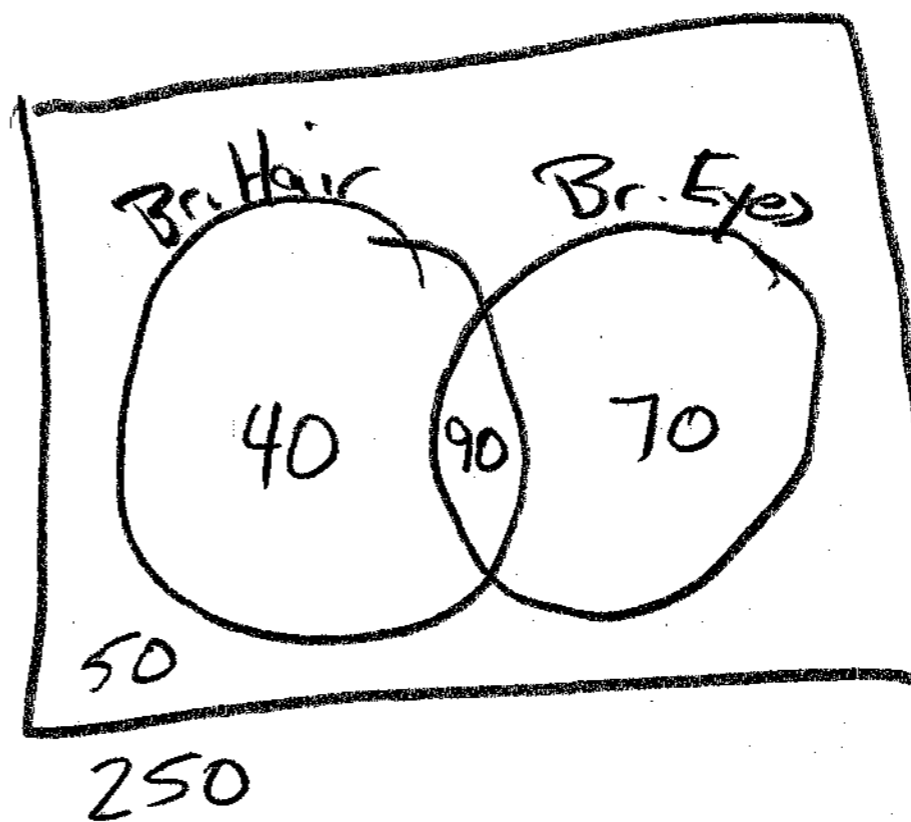Area $= (x+6)(x-4)$

$x^2 - 4x + 6x - 24$

$$A = x^2 + 2x - 24$$

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 On the first six tests in her social studies course, Jerelyn's scores were 92, 78, 86, 92, 95, and 91. Determine the median and the mode of her scores. If Jerelyn took a seventh test and raised the mean of her scores *exactly* 1 point, what was her score on the seventh test?

$$78, \; 86, \; 91, \; \boxed{92, \; 92} \; 95 \qquad \text{Mode}$$

$$\text{Median} = \frac{91 + 92}{2} = 91.5$$

$$\boxed{\begin{array}{l} \text{Median} = 91.5 \\ \text{Mode} = 92 \end{array}}$$

$$\text{Mean} = \frac{78 + 86 + 91 + 92 + 92 + 95}{6}$$

$$\text{Mean} = \frac{534}{6} \implies 89$$

To raise the mean by exactly 1 point, the new mean would be 90.

$$90 = \frac{534 + \text{seventh test}}{7}$$

$$630 = 534 + \text{seventh test}$$
$$\underline{-534 \quad -534}$$
$$96 = \text{seventh test}$$

M(9)

$\boxed{\text{Jerelyn needs a } 96 \text{ on test \#7}}$

39 Solve the following system of equations algebraically or graphically:

$$x^2 + y^2 = 25$$
$$3y - 4x = 0$$

→ circle w/ center at origin and r=5

→ line

[The use of the accompanying grid is optional.]

$3y - 4x = 0$
$\quad +4x \quad +4x$
$3y \quad = 4x$
$\frac{3y}{3}$
$y = \frac{4}{3}x$
└ slope

x-intercept = 0

Solutions are at (3, 4) and (-3, -4)

x	$x^2 + y^2 = 25$	y
0	$0^2 + y^2 = 25$	
0	$y^2 = 25$	±5
	$x^2 + 0^2 = 25$	0
±5	$x^2 = 25$	0
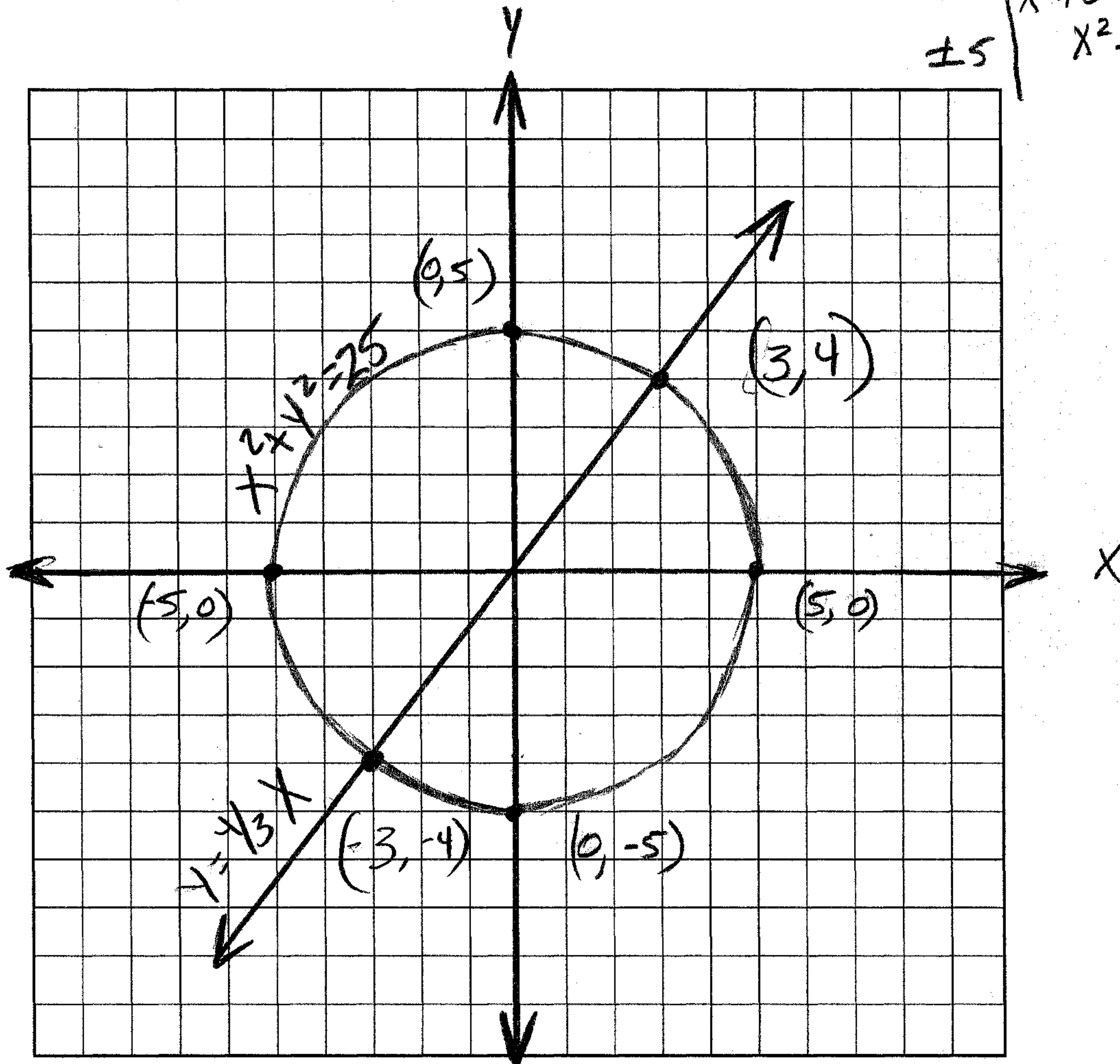
$x^2 + y^2 = 25$

$y = \frac{4}{3}x$

(0,5)
(3,4)
(-5,0)
(5,0)
(-3,-4)
(0,-5)

The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

MATHEMATICS A

Wednesday, June 16, 2004 — 1:15 to 4:15 p.m., only

ANSWER SHEET

Student ..*Imaginary Student*..........   Sex: ☐ Male   ☐ Female   Grade ....

Teacher ....*Mr. Steve*...........   School ..*IHS @ PH*...........

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

Part I

Answer all 30 questions in this part.

1 ....4....	9 ....2....	17 ....4....	25 ....3....
2 ....1....	10 ....4....	18 ....2....	26 ....2....
3 ....3....	11 ....2....	19 ....1....	27 ....4....
4 ....3....	12 ....3....	20 ....4....	28 ....1....
5 ....2....	13 ....4....	21 ....3....	29 ....4....
6 ....6....	14 ....4....	22 ....3....	30 ....1....
7 ....1....	15 ....2....	23 ....1....	
8 ....1....	16 ....2....	24 ....1....	

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.

_____
Signature

Math. A – June '04   [19]