The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

MATHEMATICS A

Thursday, January 29, 2009 — 1:15 to 4:15 p.m., only

Print Your Name: Steve Watson

Print Your School's Name: IHS@PH

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.

MATHEMATICS A

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 Given the true statements:

"Rob plays basketball or tennis."

"Rob does not play tennis."

Which statement must also be true?

(1) Rob plays basketball.

(2) Rob does not play basketball.

(3) Rob does not play basketball, and he does not play tennis.

(4) Rob plays football.

2 Granola bars cost \$0.55 each. Which table represents this relationship?

(1)

Number of Bars	Total Cost
0	\$0.00
2	1.00
4	2.00

(2)

Number of Bars	Total Cost
0	\$0.00
2	1.10
4	2.20

(3)

Number of Bars	Total Cost
0	\$0.55
2	0.55
4	0.55

(4)

Number of Bars	Total Cost
0	\$0.55
2	1.10
4	2.20

3 A ship sailed t miles on Tuesday and w miles on Wednesday. Which expression represents the average distance per day traveled by the ship?

(1) $2(t + w)$

(2) $t + \frac{w}{2}$

(3) $\frac{t + w}{2}$

(4) $t - w$

Use this space for computations.

4 What is the value of x in the equation $2(x - 3) + 1 = 19$?

(1) 6
(2) 9
(3) 10.5
(4) 12

$2(x-3)+1=19$
$2x-6+1=19$
$2x-5=19$
$+5 \quad +5$
$2x=24$
$\frac{2x}{2}=\frac{24}{2}$
$x=12$

check
$2(12-3)+1=19$
$2(9)+1=19$
$18+1=19$
$19=19$

5 Which equation represents the line whose slope is 2 and whose y-intercept is 6?

(1) $y = 2x + 6$
(2) $y = 6x + 2$
(3) $2y + 6x = 0$
(4) $y + 2x = 6$

$y = mx + b$
slope, y-intercept
$y = 2x + 6$

6 If $0.02x + 0.7 = 0.8$, then x is equal to

(1) 0.5
(2) 2
(3) 5
(4) 50

$.02x + 0.7 = 0.8$
$-0.7 \quad -0.7$
$.02x = 0.8 - 0.7$
$.02x = 0.1$
$\frac{.02x}{.02} = \frac{0.1}{.02}$
$x = 5$

check
$0.02(5) + 0.7 = 0.8$
$0.1 + 0.7 = 0.8$
$0.8 = 0.8$ ✓

7 If the probability of a spinner landing on red in a game is $\frac{1}{5}$, what is the probability of it *not* landing on red?

(1) 20%
(2) 25%
(3) 50%
(4) 80%

The sum of the probabilities of mutually exclusive events is 1.

$P(\text{red}) = \frac{1}{5}$ $P(\text{not red}) = 1 - \frac{1}{5} = \frac{4}{5}$ or 80%

8 What is the solution for the equation $x + 1 = x + 2$?

(1) -1
(2) $\frac{1}{2}$
(3) all real numbers
(4) There is no solution.

$x + 1 = x + 2$
$-1 \quad -1$
$x = x + 1$

There is no number that makes this equation balance

9 If five times the measure of an angle is decreased by 30°, the result is the same as when two times the measure of the angle is increased by 18°. What is the measure of the angle?

(1) $-16°$
(2) $-4°$
(3) 16°
(4) 4°

$5x - 30 \quad 2x + 18$
$5x - 30 = 2x + 18$
$-2x \quad -2x$
$3x - 30 = 18$
$+30 \quad +30$
$3x = 48$
$\frac{3x}{3} = \frac{48}{3}$
$x = 16$

[3]

10 The expression $(-2a^2b^3)(4ab^5)(6a^3b^2)$ is equivalent to

(1) $8a^6b^{30}$
(2) $48a^5b^{10}$
(3) $-48a^6b^{10}$
(4) $-48a^5b^{10}$

Use this space for computations.

$(-2)(a^2)(b^3)(4)(a)(b^5)(6)(a^3)(b^2)$

$(-2)(4)(6)(a^2)(a)(a^3)(b^3)(b^5)(b^2)$

-48 $a^{(2+1+3)}$ $b^{(3+5+2)}$

$-48a^6b^{10}$

11 What is the value of n if the number 0.0000082 is written in the form 8.2×10^n?

(1) -6
(2) -5
(3) 5
(4) 6

1 2 3 4 5 6

Moving to the left is positive.
Moving to the right is negative.
The decimal moved 6 places to the right

12 The sum of $\sqrt{27}$ and $\sqrt{108}$ is

(1) $\sqrt{135}$
(2) $9\sqrt{3}$
(3) $3\sqrt{3}$
(4) $4\sqrt{27}$

$\sqrt{27} + \sqrt{108}$

$\sqrt{3}\sqrt{9} + \sqrt{3}\sqrt{36}$

$\sqrt{3}(3) + \sqrt{3}(6)$

$3\sqrt{3} + 6\sqrt{3}$

$9\sqrt{3}$

13 Which equation has the solution set {1,3}?

(1) $x^2 - 4x + 3 = 0$
(2) $x^2 - 4x - 3 = 0 \neq 1$
(3) $x^2 + 4x + 3 = 0 \neq 1$
(4) $x^2 + 4x - 3 = 0 \neq 1$

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

$(1)^2 - 4(1) + 3 = 0$

$1 - 4 + 3 = 0$ ✓

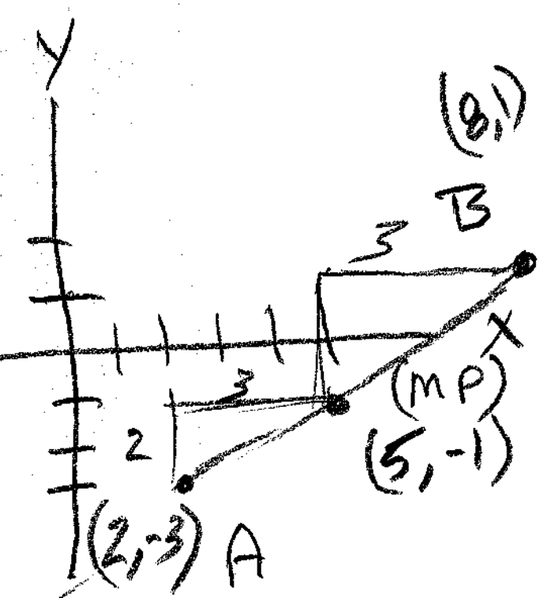
$x^2 - 4x + 3 = 0$

$(3)^2 - 4(3) + 3 = 0$

$9 - 12 + 3 = 0$ ✓

14 The midpoint of $\overline{AB}$ has coordinates of (5,–1). If the coordinates of A are (2,–3), what are the coordinates of B?

(1) (8,1)
(2) (8,–5)
(3) (7,0)
(4) (3.5,–2)



$MP = \left(\frac{x_1+x_2}{2}, \frac{y_1+y_2}{2}\right)$ $(5,-1) = \left(\frac{2+x_2}{2}, \frac{-3+y_2}{2}\right)$

$5 = \frac{2+x_2}{2}$ $\quad -1 = \frac{-3+y_2}{2}$

$10 = 2 + x_2$ $\quad -2 = -3 + y_2$

$10 - 2 = x_2$ $\quad -2 + 3 = y_2$

$8 = x_2$ $\quad 1 = y_2$

15 If $x = 2$ and $y = -3$, what is the value of $2x^2 - 3xy - 2y^2$?

(1) -20
(2) -2
(3) 8
(4) 16

$2x^2 - 3xy - 2y^2$

$2(\,)^2 - 3(\,)(\,) - 2(\,)^2$

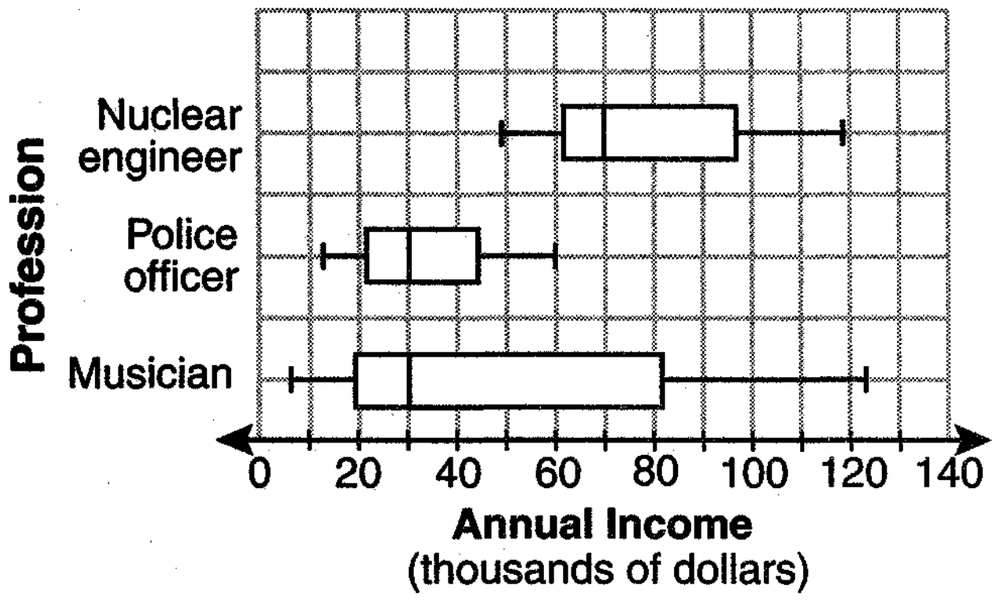
$2(2)^2 - 3(2)(-3) - 2(-3)^2$

$2(4) - 3(-6) - 2(9)$

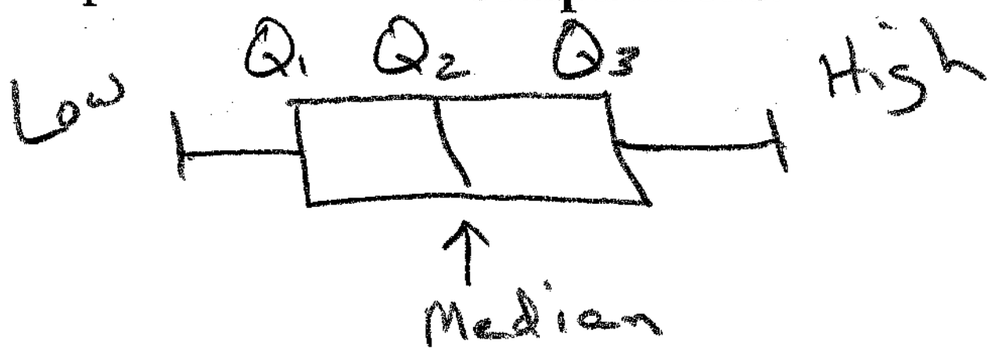
$8 + 18 - 18$

8

16 The accompanying box-and-whisker plots can be used to compare the annual incomes of three professions.



Use this space for computations.



Based on the box-and-whisker plots, which statement is true?

(1) The median income for nuclear engineers is greater than the income of all musicians.
(2) The median income for police officers and musicians is the same.
(3) All nuclear engineers earn more than all police officers.
(4) A musician will eventually earn more than a police officer.

1) 70,000 > 80,000 No
2) 30,000 = 30,000 Yes
3) 50,000 > 60,000 No
4) Maybe - Maybe Not

17 For which value of m is the expression $\frac{15m^2n}{3-m}$ undefined?

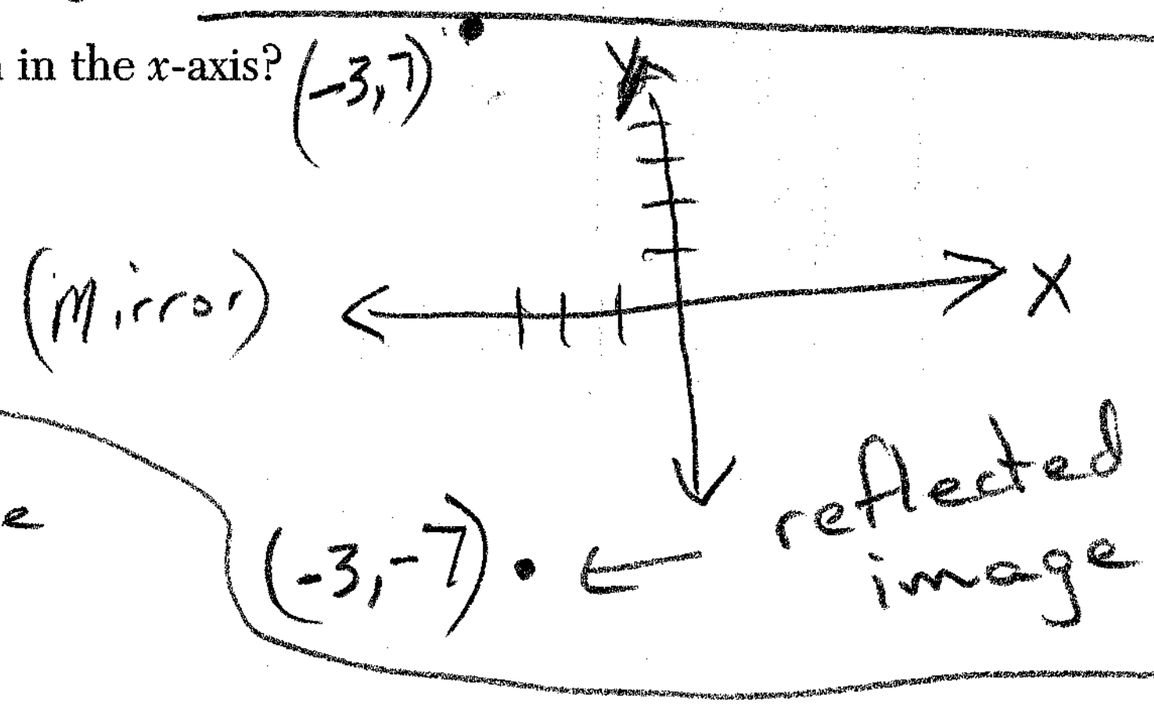
(1) 1
(2) 0
(3) 3
(4) –3

A fractional expression is undefined when the denominator equals zero.

$3 - m = 0 \Rightarrow 3 = m$

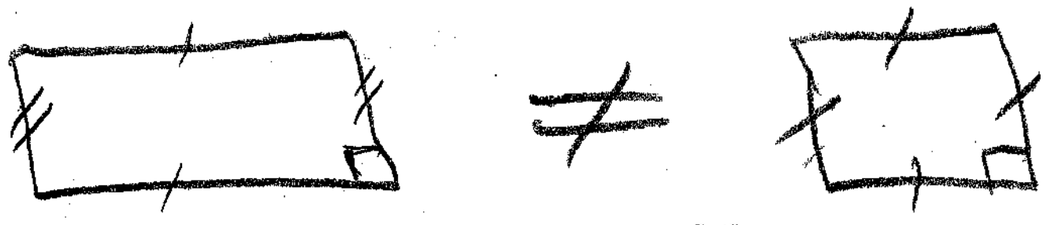
18 What is the image of point (–3,7) after a reflection in the x-axis?

(1) (3,7)
(2) (–3,–7)
(3) (3,–7)
(4) (7,–3)



19 Which statement is *false*?

(1) All parallelograms are quadrilaterals. True
(2) All rectangles are parallelograms. True
(3) All squares are rhombuses. True
(4) All rectangles are squares. Not true



circle with radius = 2

Use this space for computations.

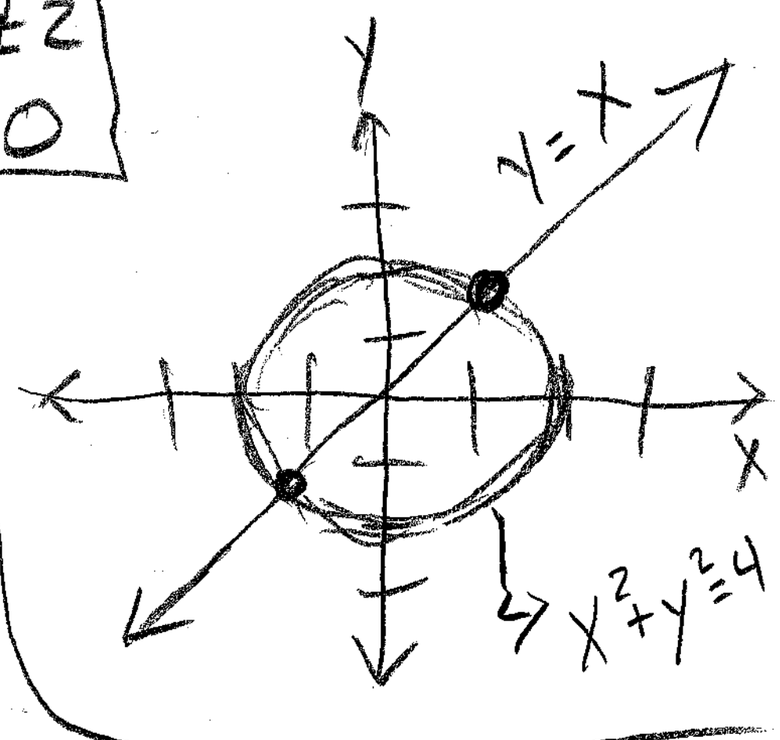
20 The graphs of the equations $x^2 + y^2 = 4$ and $y = x$ are drawn on the same set of axes. What is the total number of points of intersection?

(1) 1
(2) 2
(3) 3
(4) 0

$y = x$

$m = 1 \quad b = 0$

x	$x^2 + y^2 = 4$	y
0	$y^2 = 4$	± 2
± 2	$x^2 = 4$	0



21 Expressed as a single fraction, $\frac{3}{4x} - \frac{2}{5x}$ is equal to

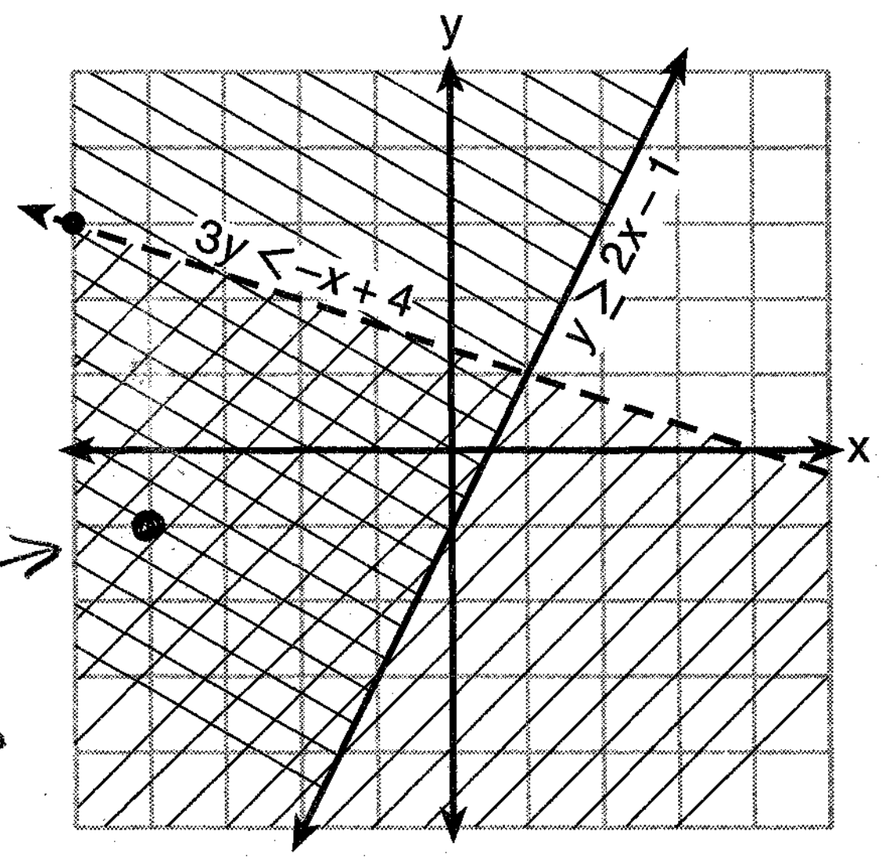
(1) $-\frac{1}{x}$
(2) $\frac{1}{9x}$
(3) $\frac{1}{20x}$
(4) $\frac{7}{20x}$

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

$\frac{15x - 8x}{20x^2}$

$\frac{7x}{20x^2} \Rightarrow \frac{7x}{20(x)(x)} = \frac{7}{20x}$

22 Which point is a solution for the system of inequalities shown on the accompanying graph?



(−4, −1) solves both inequalities

(1) (−4,−1)
(2) (2,3)
(3) (1,1)
(4) (−2,2)

Use this space for computations.

23 Which statement is an example of a biconditional statement?

(1) If Craig has money, he buys a car.
(2) Craig buys a car if and only if he has money.
(3) Craig has money or he buys a car.
(4) Craig has money and he buys a car.

Must have 2 "ifs"

24 Which property of real numbers is illustrated by the equation $52 + (27 + 36) = (52 + 27) + 36$?

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

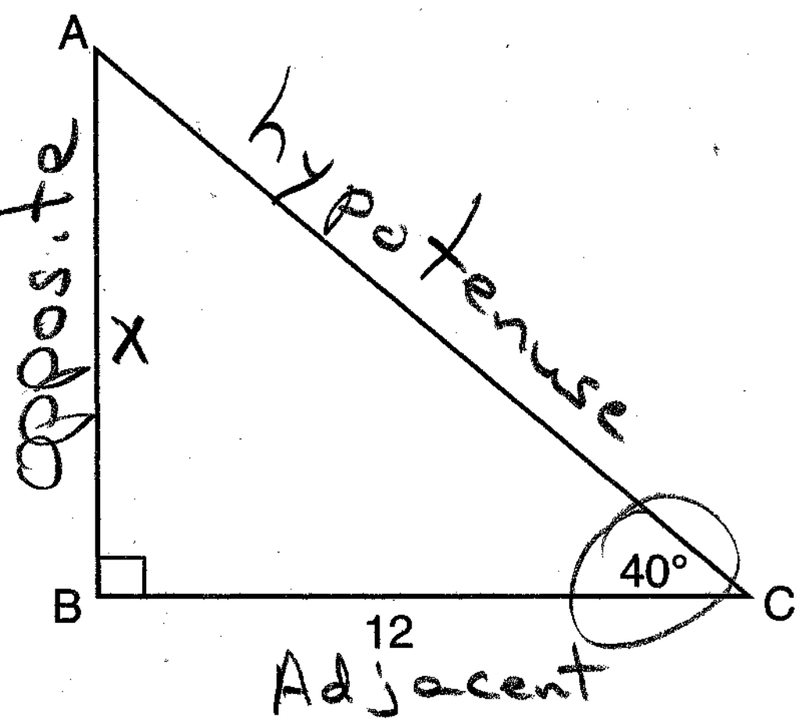
25 How many different two-letter arrangements can be formed using the letters in the word "BROWN"?

(1) 10
(2) 12
(3) 20
(4) 25

5 letters → Choose 2
Order Matters

$5P_2 \Rightarrow 5 \times 4 = 20$

26 In the accompanying diagram of right triangle ABC, $BC = 12$ and $m\angle C = 40$.



Which single function could be used to find AB?

(1) tan 50
(2) sin 50
(3) cos 40
(4) sin 40

SOH-CAH-TOA

Have adjacent
Need opposite

Opp and adj ⇒ use TOA

$\tan = \frac{opp}{adj}$

$\tan 40° = \frac{x}{12}$ (Not an answer choice)

Using angle A

$\tan 50° = \frac{12}{x}$

$\frac{5}{n} = +3 + \frac{7}{2n}$

27 When 5 is divided by a number, the result is 3 more than 7 divided by twice the number. What is the number?

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

Check $\frac{5}{\frac{1}{2}} = 3 + \frac{7}{2(\frac{1}{2})}$

$10 = 3 + 7 \Rightarrow 10 = 10$ ✓

$\frac{5}{n} = 3 + \frac{7}{2n}$

$5 = 3n + \frac{7}{2}$ m(n)

$5 - \frac{7}{2} = 3n$

$5 - 3\frac{1}{2} = 3n$

$1\frac{1}{2} = 3n$

$\frac{3}{2} = 3n$

$\frac{\frac{3}{2}}{\frac{3}{1}} = n$

$\frac{3}{6} = n$

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

Use this space for computations.

28 Under which operation is the set of odd integers closed?

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

Any odd # times any odd # will result in an odd #.

29 A basketball squad has ten players. Which expression represents the number of five-player teams that can be made if John, the team captain, must be on every team?

(1) ${}_{10}C_5$
(2) ${}_9C_4$
(3) ${}_9P_4$
(4) ${}_{10}P_5$

The choices are between 9 players and there are 4 positions.

1 ${}_9C_4$

30 Which statement is logically equivalent to "If I am in a mathematics class, then I am having fun"?

(1) If I am not in a mathematics class, then I am not having fun. → Inverse
(2) If I am having fun, then I am in a mathematics class. → Converse
(3) If I am not having fun, then I am not in a mathematics class. → Contrapositive
(4) If I am in a mathematics class, then I am not having fun.

1 2 2?

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

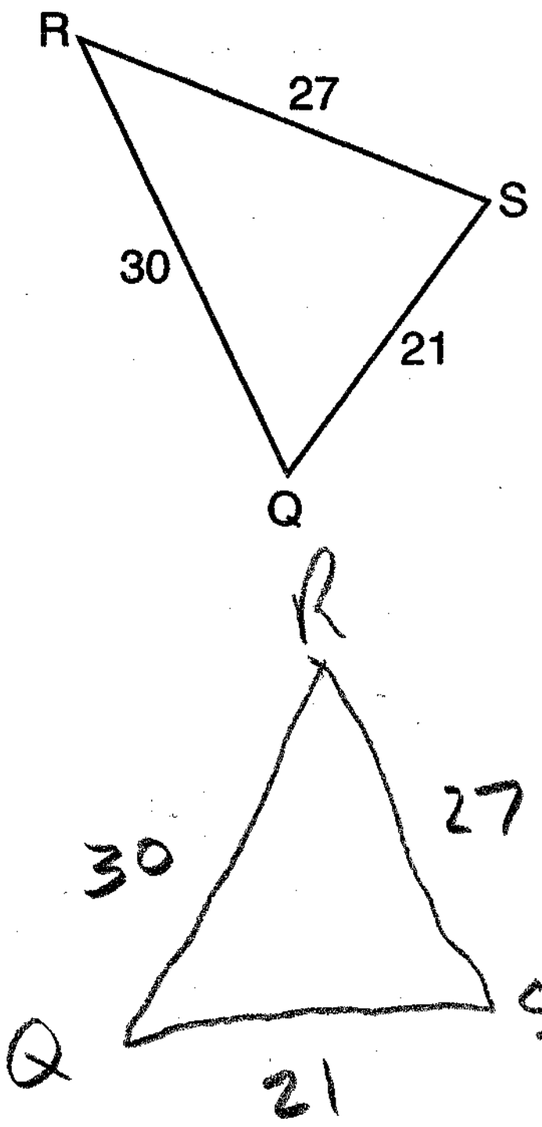
The contrapositive has the same truth value as the given statement

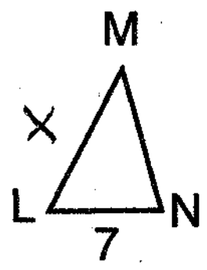
∴ If not (I am having fun), then not (I am in math class)

Part II

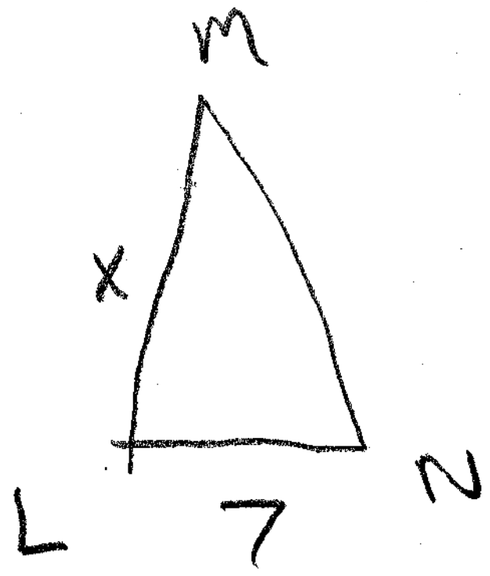
Answer all questions in this part. Each correct answer will receive 2 credits. Clearly indicate the necessary steps, including appropriate formula substitutions, diagrams, graphs, charts, etc. For all questions in this part, a correct numerical answer with no work shown will receive only 1 credit. [10]

31 In the accompanying diagram, ΔQRS is similar to ΔLMN, $RQ = 30$, $QS = 21$, $SR = 27$, and $LN = 7$. What is the length of $\overline{ML}$?





Q corresponds to L
R corresponds to M
S corresponds to N



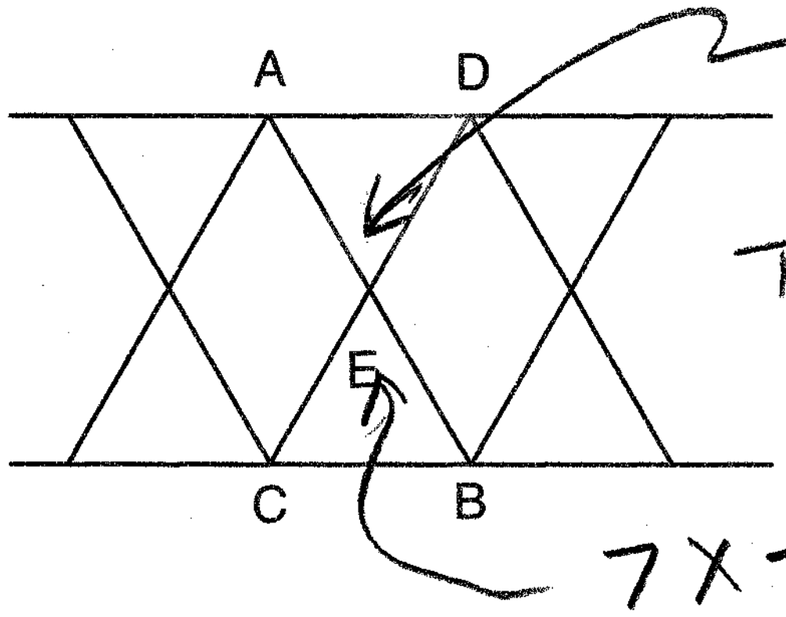
$\frac{30}{21} = \frac{x}{7}$ ⇐ Set up a proportion

$21x = 210$

$x = 10$

The length of ML is 10

32 The support beams on a bridge intersect in the pattern shown in the accompanying diagram. If $\overline{AB}$ and $\overline{CD}$ intersect at point E, $m\angle AED = 3x + 30$, and $m\angle CEB = 7x - 10$, find the value of x.



3X+30

These angles are equal because they are vertical angles.

7X-10

$7X - 10 = 3X + 30$

$-3X \quad -3X$

$4X - 10 = 30$

$+10 \quad +10$

$4X = 40$

$X = 10$

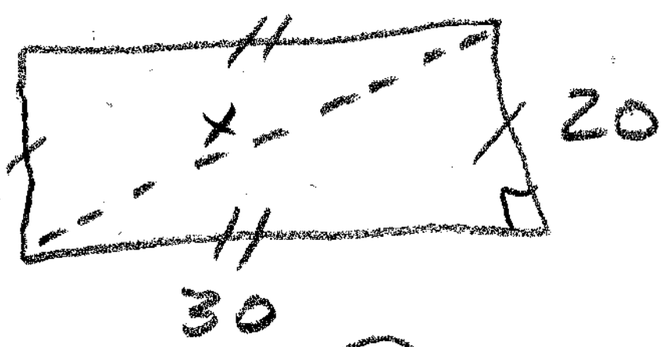
Check

$7(10) - 10 = 3(10) + 30$

$70 - 10 = 30 + 30$

$60 = 60$ ✓

33 The "Little People" day care center has a rectangular, fenced play area behind their building. The play area is 30 meters long and 20 meters wide. Find, to the *nearest meter*, the length of a pathway that runs along the diagonal of the play area.



Find X

Use Pythagorean Theorem

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

$30^2 + 20^2 = c^2$

$900 + 400 = c^2$

$1300 = c^2$

$\sqrt{1300} = \sqrt{c^2}$

$36.05551275 = c$

The pathway is 36 meters long

34 Subtract $2x^2 - 5x + 8$ from $6x^2 + 3x - 2$ and express the answer as a trinomial.

$6x^2 + 3x - 2$

Minus $2x^2 - 5x + 8$

$4x^2 + 8x - 10$

To subtract, change the signs and add

$6x^2 - (+4x^2)$

$6x^2 - 4x^2 = 2x^2$

$3x - (+5x)$

$3x + 5x = 8x$

$-2 - (+8)$

$-2 - 8 = -10$

35 Express in simplest form: $\dfrac{8x}{x^2 - 16} \div \dfrac{2x}{x + 4}$

$\dfrac{8x}{x^2-16} \div \dfrac{2x}{x+4}$

$4\dfrac{8x}{(x+4)(x-4)} \times \dfrac{x+4}{2x_1}$

$\dfrac{4}{x-4}$

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 Juan received scores of 82, 76, 93, and 80 on his first four chemistry tests of the year. His goal is to have an 86 average in chemistry for his first five tests. What score must he earn on the next test to achieve an average of exactly 86?

$$\text{average} = \frac{\text{sum}}{\text{count}}$$

$$\overline{X} = \frac{X_1 + X_2 + X_3 + X_4 + X_5}{5}$$

$$86 = \frac{82 + 76 + 93 + 80 + X_5}{5}$$

$$86 = \frac{331 + X}{5}$$

$$430 = 331 + X$$

$$430 - 331 = X$$

$$99 = X$$

Juan needs a score of 99 on his next test

Check $86 = \frac{82 + 76 + 93 + 80 + 99}{5}$

$86 = \frac{430}{5}$

$86 = 86$ ✓

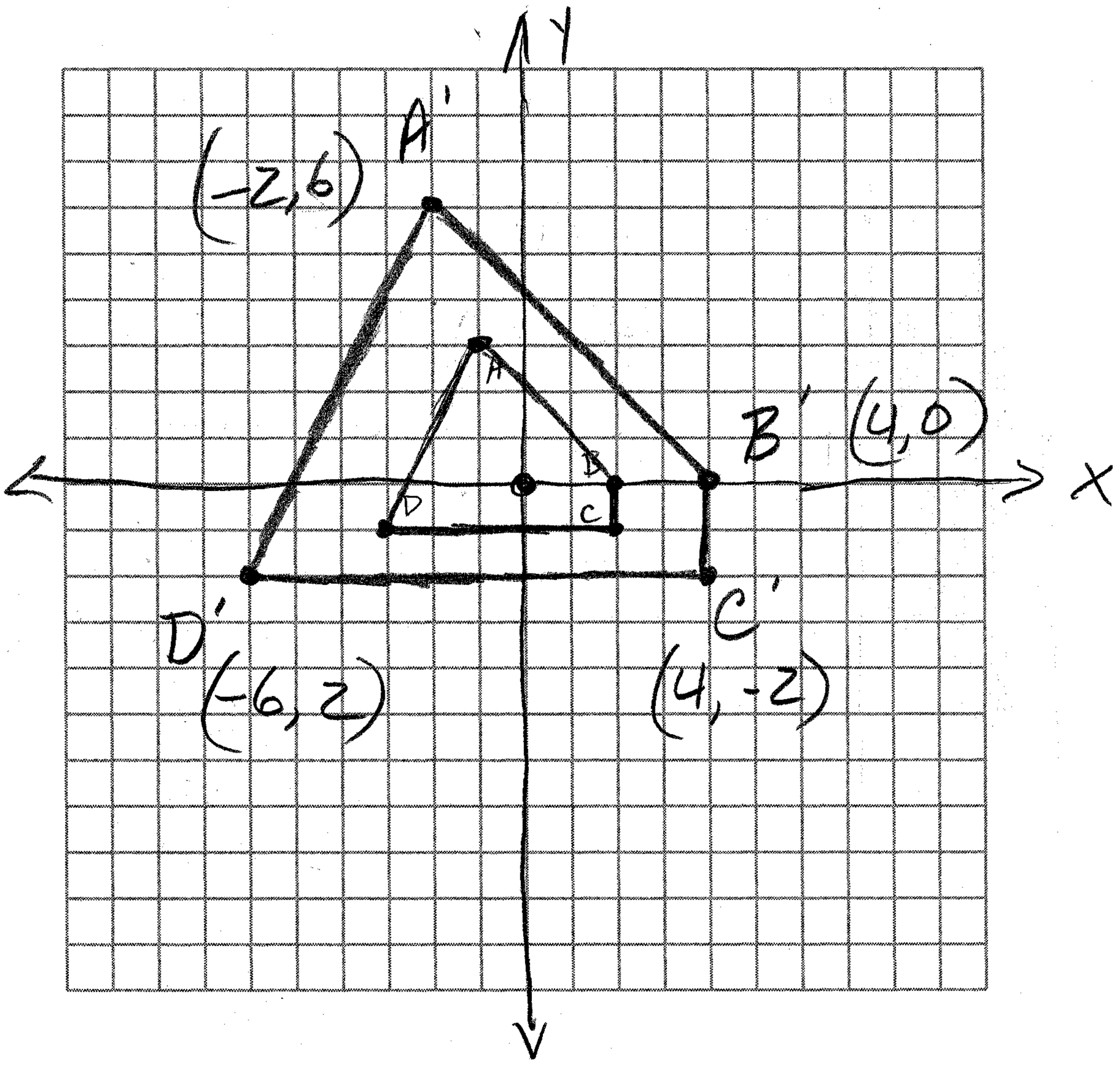
37 On the accompanying grid, graph and label quadrilateral $ABCD$, whose coordinates are $A(-1,3)$, $B(2,0)$, $C(2,-1)$, and $D(-3,-1)$. Graph, label, and state the coordinates of $A'B'C'D'$, the image of $ABCD$ under a dilation of 2, where the center of dilation is the origin.

A (-1, 3) → times 2 → A' (-2, 6)

B (2, 0) → times 2 → B' (4, 0)

C (2, -1) → times 2 → C' (4, -2)

D (-3, -1) → times 2 → D' (-6, -2)



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]

P D

38 Mr. Braun has $75.00 to spend on pizzas and soda pop for a picnic. Pizzas cost $9.00 each and the drinks cost $0.75 each. Five times as many drinks as pizzas are needed. What is the maximum number of pizzas that Mr. Braun can buy?

→ $D = 5P$

Let P = # of pizzas

Let D = # of drinks

Inequality

Eq. #1 $9P + .75D \leq 75$

Eq #2 $D = 5P$

Use Substitution Method

$$9P + .75(5P) \leq 75$$

$$9P + \frac{3}{4}\left(\frac{5P}{1}\right) \leq 75$$

$$\frac{9P}{1} + \frac{15P}{4} \leq 75$$

$$\frac{36P + 15P}{4} \leq 75$$

$$\frac{51P}{4} \leq 75$$

$$51P \leq 300$$

$$P \leq 5.882352941$$

Mr. Braun can buy a maximum of 5 pizzas

39 The daily high temperatures for the month of February in New York City were: ~~34°~~, ~~37°~~, ~~31°~~, ~~36°~~, ~~30°~~, ~~32°~~, ~~32°~~, ~~34°~~, ~~30°~~, ~~37°~~, ~~31°~~, ~~30°~~, ~~30°~~, ~~31°~~, ~~36°~~, ~~34°~~, ~~36°~~, ~~32°~~, ~~32°~~, ~~30°~~, ~~37°~~, ~~31°~~, ~~36°~~, ~~32°~~, ~~31°~~, ~~36°~~, ~~31°~~, and ~~35°~~.

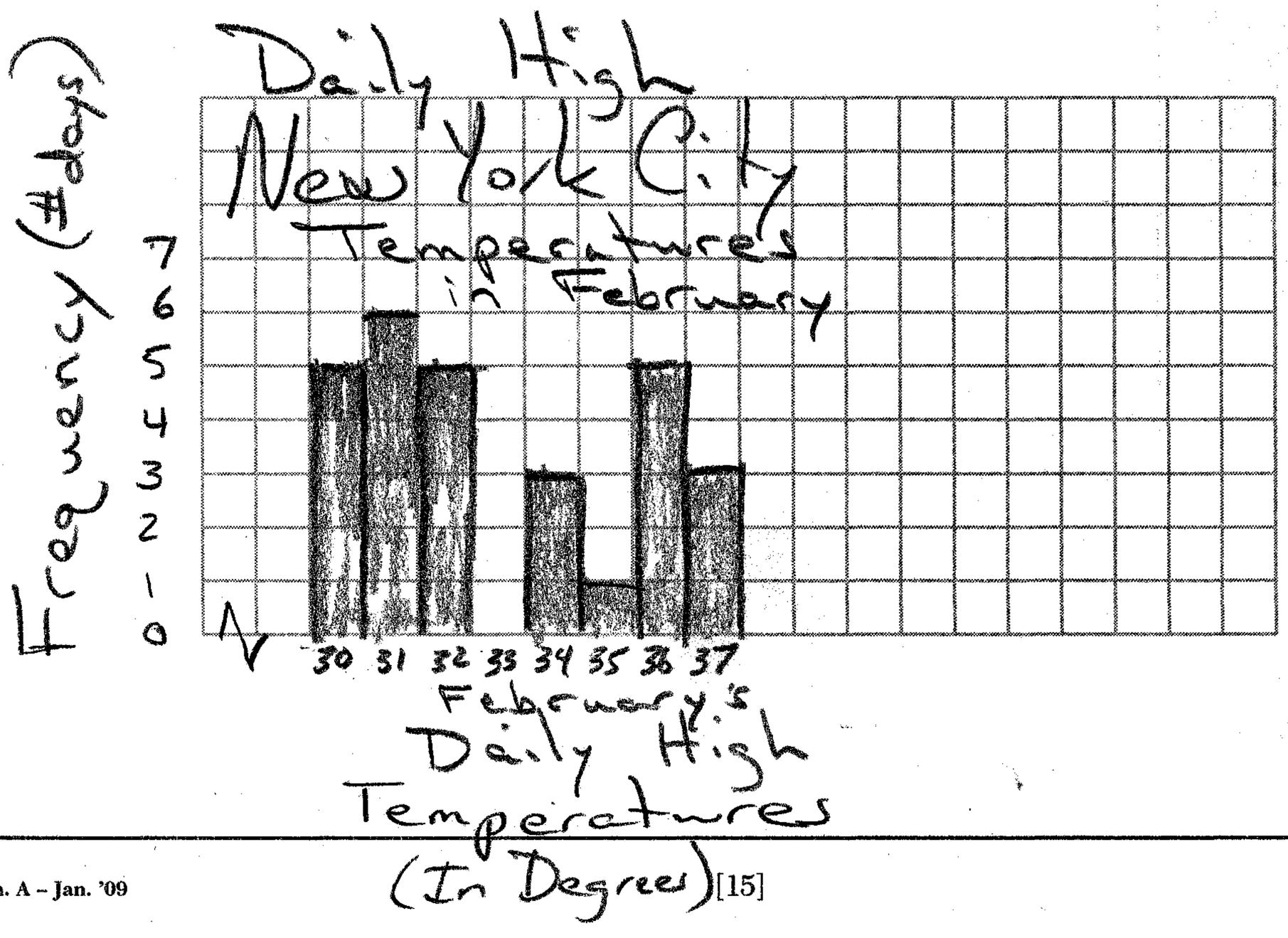
→ 28 #s

Complete the table below.

Use the table to construct a frequency histogram for these temperatures on the accompanying grid.

Temperature, in Degrees	Tally	Frequency
30	𝍸	5
31	𝍸 I	6
32	𝍸	5
33		0
34	III	3
35	I	1
36	𝍸	5
37	III	3

28 total



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The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

MATHEMATICS A

Thursday, January 29, 2009 — 1:15 to 4:15 p.m., only

ANSWER SHEET

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

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

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.

R S Watson

Signature

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MATHEMATICS A			
Question	**Maximum Credit**	**Credits Earned**	**Rater's/Scorer's Initials**
Part I 1–30	**60**		
Part II 31	**2**		
32	**2**		
33	**2**		
34	**2**		
35	**2**		
Part III 36	**3**		
37	**3**		
Part IV 38	**4**		
39	**4**		
Maximum Total	**84**		

Total Raw Score

Checked by

Scaled Score
(from conversion chart)

Rater's/Scorer's Name (minimum of three)

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MATHEMATICS A