The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

MATHEMATICS A

Wednesday, June 19, 2002 — 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. 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 35 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. Record your answers in the spaces provided on the separate answer sheet. [40]

1 Jamie is 5 years older than her sister Amy. If the sum of their ages is 19, how old is Jamie?

(1) 5
(2) 7
(3) 12
(4) 14

Use this space for computations.

Let A be Amy's age.
Let A+5 be Jamie's age
Then, $A + A + 5 = 19$
$2A + 5 = 19$
$2A = 14$
$A = 7$
Jamie: $7 + 5 = 12$

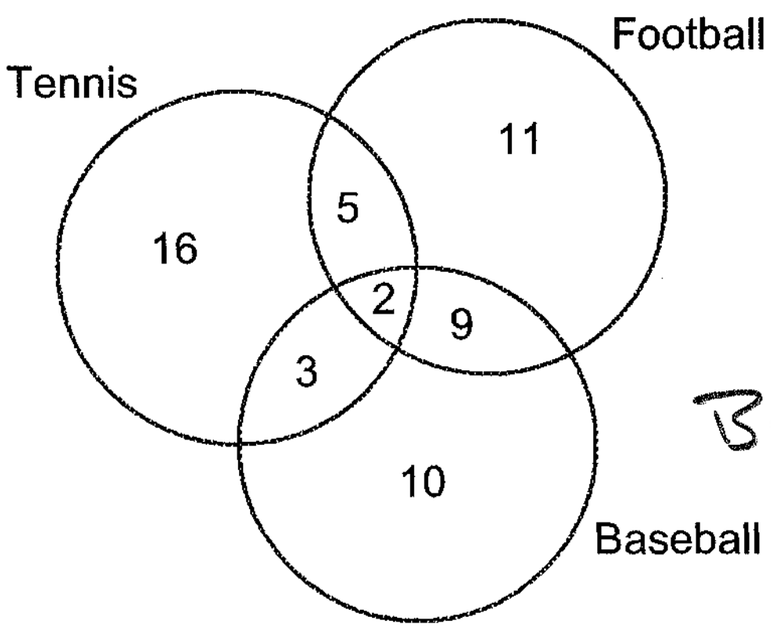
2 If the probability that it will rain on Thursday is $\frac{5}{6}$, what is the probability that it will *not* rain on Thursday?

(1) 1
(2) 0
(3) $\frac{1}{6}$
(4) $\frac{5}{6}$

The sum of all probabilities for mutually exclusive events is 1.
$1 - \frac{5}{6} = \frac{1}{6}$

3 The accompanying diagram shows the results of a survey asking which sports the members of the Key Club watch on television.

Sports Watched on Television



Tennis: $16 + 5 + 2 + 3 = 26$
Football: $11 + 9 + 2 + 5 = 27$
Baseball: $10 + 3 + 2 + 9 = 24$

Which statement or statements are true?

I The most watched sport is tennis. Not true
II The least watched sport is baseball. True
III More Key Club members watch tennis than football. Not true

(1) I, only
(2) II, only
(3) I and II, only
(4) II and III, only

Use this space for computations.

4 During each marking period, there are five tests. If Vanita needs a 65 average to pass this marking period and her first four grades are 60, 72, 55, and 80, what is the *lowest* score she can earn on the last test to have a passing average?

(1) 58
(2) 65
(3) 80
(4) 100

$\bar{X} \leq \frac{X_1 + X_2 + X_3 + X_4 + X_n}{n}$

$65 \leq \frac{60 + 72 + 55 + 80 + X_n}{5}$

$65 \leq \frac{267 + X_n}{5} \Rightarrow 325 \leq 267 + X_n$

$-267 \quad -267$

$58 \leq X_n$

5 What is the slope of the linear equation $5y - 10x = -15$?

(1) 10
(2) 2
(3) -10
(4) -15

$5y - 10x = -15$

$+10x \quad +10x$

$5y = 10x - 15$

$y = 2x - 3$ slope = 2

$y = mx + b$ → y-intercept
→ slope

D(5)

6 Which expression is a factor of $n^2 + 3n - 54$?

(1) $n + 6$
(2) $n^2 + 9$
(3) $n - 9$
(4) $n + 9$

$n^2 + 3n - 54$

Need 2 #s whose product are -54 and difference is 3

$(n + 9)(n - 3)$

$54 = (54 \cdot 1)$
$(6 \cdot 9)$ ← product is 54, difference is 3
$(27 \cdot 2)$

7 If 3.85×10^6 is divided by 385×10^4, the result is

(1) 1
(2) 0.01
(3) 3.85×10^2
(4) 3.85×10^{10}

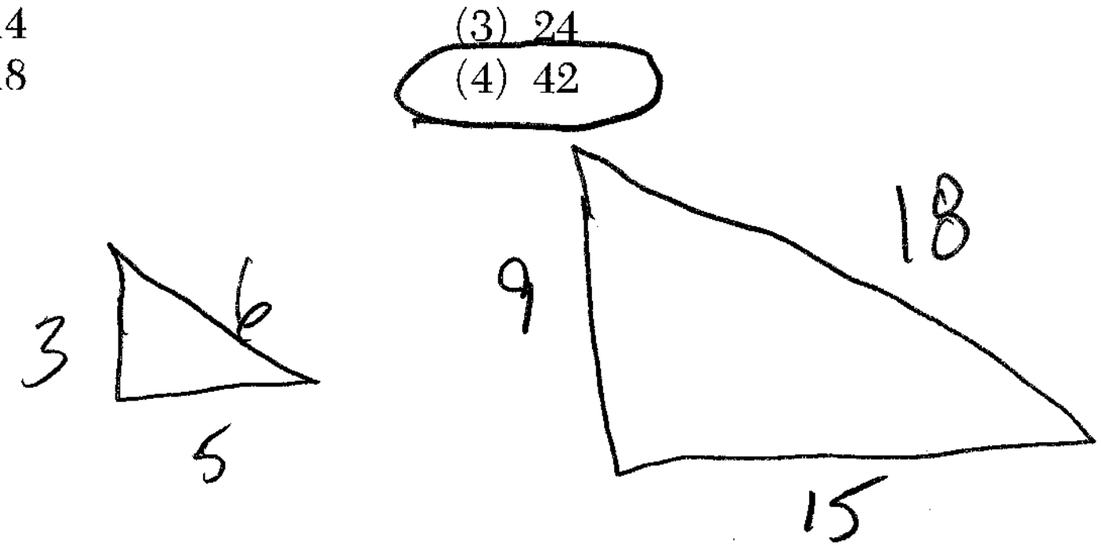
$\frac{3.85 \times 10^6}{385 \times 10^4} \Rightarrow \frac{3.85}{3.85} \times \left(\frac{10^6}{10^6}\right)$

$= 1 \times 1$

$= 1$

8 Two triangles are similar. The lengths of the sides of the smaller triangle are 3, 5, and 6, and the length of the longest side of the larger triangle is 18. What is the perimeter of the larger triangle?

(1) 14
(2) 18
(3) 24
(4) 42



The longest side

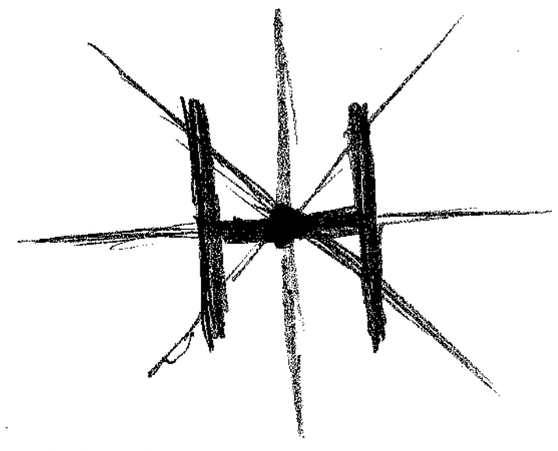
$\frac{18}{6} = 3$ of the big Δ is 3 times the little Δ.

So - all the other sides are 3 times as big.

$18 + 15 + 9 = 42$

9 Which letter has point symmetry?

(1) A
(2) B
(3) H
(4) W



Use this space for computations.

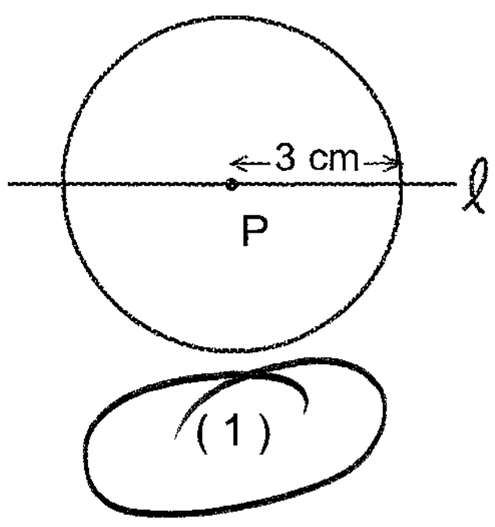
10 If two lines are parallel and the slope of one of the lines is m, what is the product of their slopes?

(1) 1
(2) $2m$
(3) m^2
(4) 0

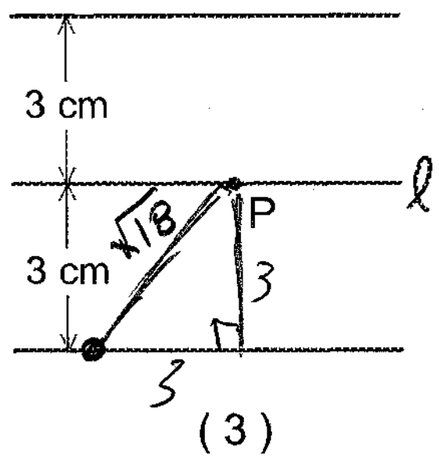
11 Which is an irrational number?

(1) 0
(2) π
(3) $-\frac{1}{3}$
(4) $\sqrt{9}$

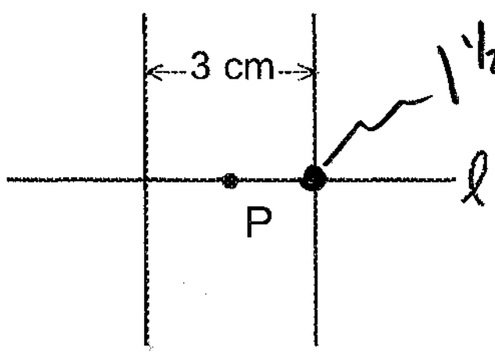
12 If point P lies on line ℓ, which diagram represents the locus of points 3 centimeters from point P?



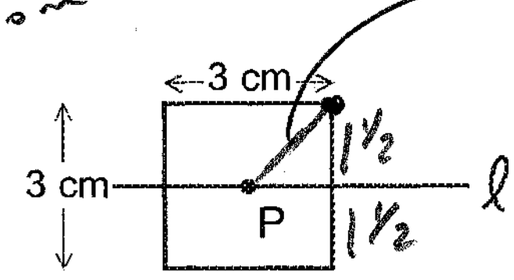
(1)



(3)



(2)



(4)

13 What is the measure, in degrees, of each exterior angle of a regular hexagon?

(1) 45
(2) 60
(3) 120
(4) 135

Use this space for computations.

= 6 sides

$\frac{360^\circ}{6} = 60^\circ$

14 What is the solution of the equation $3y - 5y + 10 = 36$?

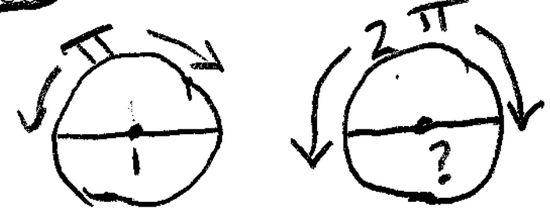
(1) –13
(2) 2
(3) 4.5
(4) 13

$3y - 5y + 10 = 36$
$-2y + 10 = 36$
$-10 \quad -10$
$-2y = 26$
$\frac{-2y}{-2} = \frac{26}{-2}$
$y = -13$

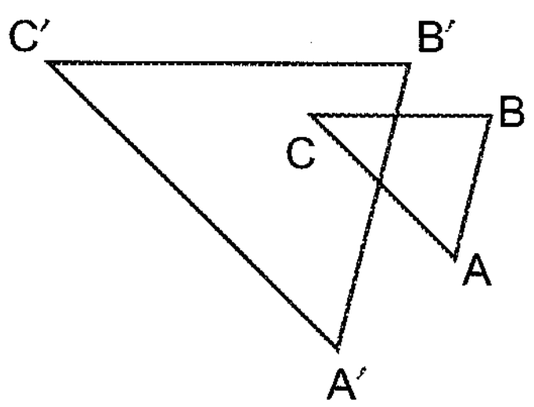
15 If the circumference of a circle is doubled, the diameter of the circle

(1) remains the same
(2) increases by 2
(3) is multiplied by 4
(4) is doubled

$C = \pi d$



16 In the accompanying diagram, $\triangle ABC$ is similar to but not congruent to $\triangle A'B'C'$.



Gets Smaller

Which transformation is represented by $\triangle A'B'C'$?

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

$2\pi = 2\pi d$
$2(3.14159) = 3.14159(d)$
$2 = d$

17 The expression $15 - 3[2 + 6(-3)]$ simplifies to

(1) –45
(2) –33
(3) 63
(4) 192

$15 - 3[2 + 6(-3)]$
$15 - 3[2 + (-18)]$
$15 - 3[-16]$
$15 + 48$
63

18 The expression $\sqrt{90} \cdot \sqrt{40} - \sqrt{8} \cdot \sqrt{18}$ simplifies to

(1) 22.9
(2) 48
(3) 864
(4) 3,456

Use this space for computations.

$\sqrt{90} \cdot \sqrt{40} - \sqrt{8} \cdot \sqrt{18}$

$\sqrt{9}\sqrt{10} \cdot \sqrt{4}\sqrt{10} - \sqrt{2}\sqrt{4} \cdot \sqrt{2}\sqrt{9}$

$3\sqrt{10} \cdot 2\sqrt{10} - \sqrt{2}(2) \cdot \sqrt{2}(3)$

$6\sqrt{10}\sqrt{10} - 6\sqrt{2}\sqrt{2}$

$6(10) - 6(2)$

$60 - 12$

48

19 If $x = 2a - b^2$, then a equals

(1) $\frac{x-b^2}{2}$
(2) $\frac{x+b^2}{2}$
(3) $\frac{b^2-x}{2}$
(4) $x + b^2$

Isolate a

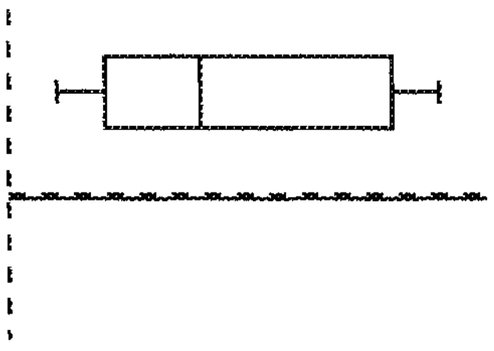
$x = 2a - b^2$

$+b^2 \quad +b^2$

$x + b^2 = 2a$

$\frac{x+b^2}{2} = \frac{2a}{2}$

20 The accompanying diagram is an example of which type of graph?



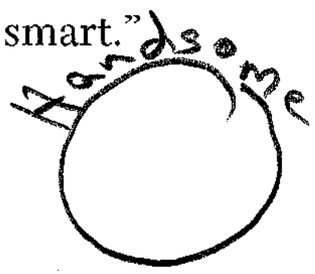
(1) bar graph
(2) stem-and-leaf plot
(3) histogram
(4) box-and-whisker plot

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]

21 Given the true statement "John is not handsome" and the false statement "John is handsome or smart." Determine the truth value for the statement "John is smart."

True

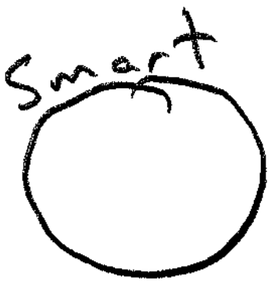


John

John is not handsome

False

or



John is handsome or smart

?

Therefore: John is smart is false

22 Ninety percent of the ninth grade students at Richbartville High School take algebra. If 180 ninth grade students take algebra, how many ninth grade students do *not* take algebra?

90% x total students = 180

$.9T = 180$

$\frac{.9T}{.9} = \frac{180}{.9}$

$T = 200$

10% do not take algebra

$200(.10) = 20$

20 students do not take algebra

23 If the instructions for cooking a turkey state "Roast turkey at 325° for 20 minutes per pound," how many *hours* will it take to roast a 20-pound turkey at 325°?

20 lbs times 20 minutes

$20 \times 20 = 400$ minutes

$\frac{400 \text{ minutes}}{60 \text{ minutes/hour}} = 6\frac{2}{3}$ hours

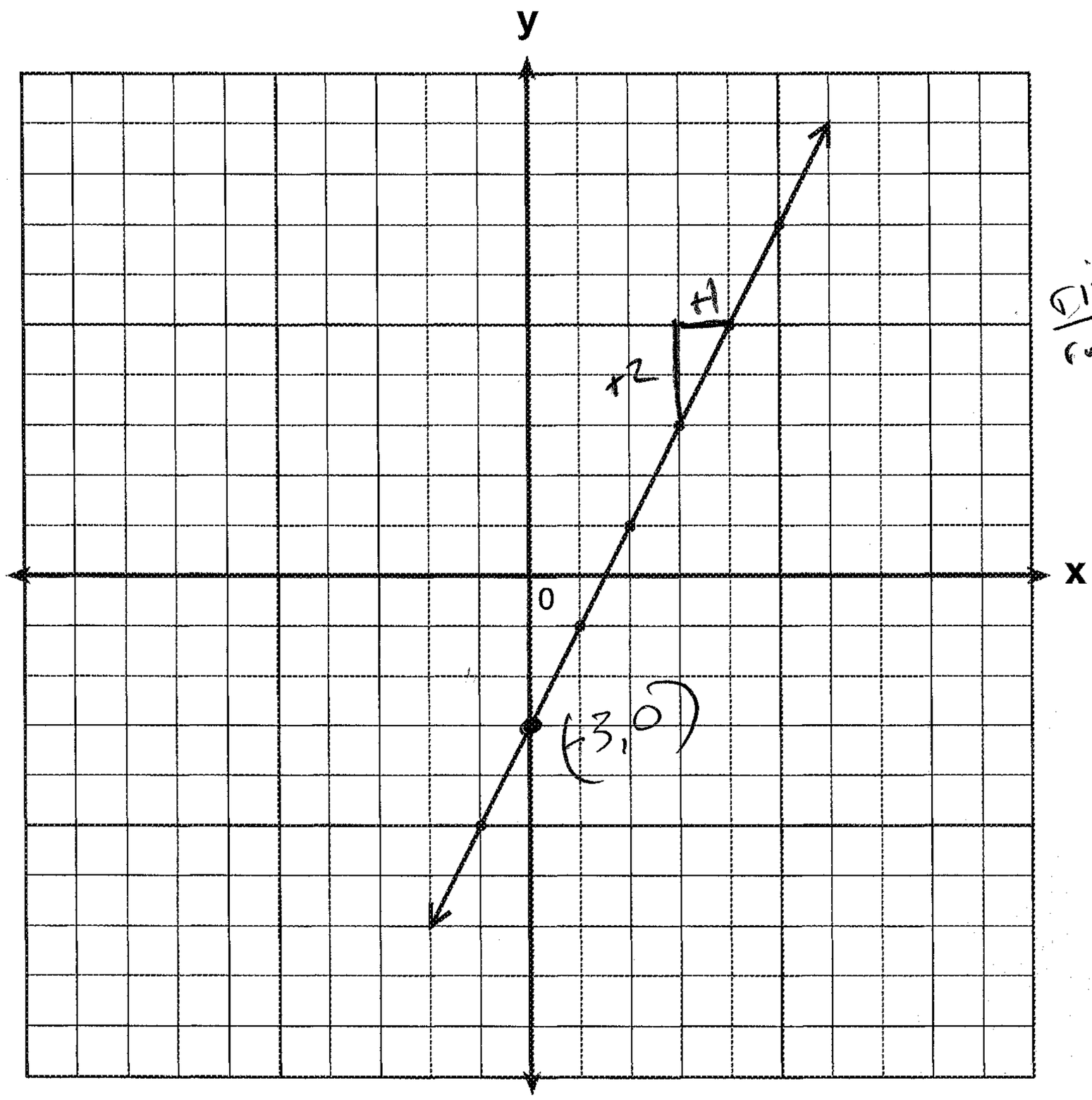
24 An addition table for a subset of real numbers is shown below. Which number is the identity element? Explain your answer.

+	0	1	2	3
0	0	1	2	3
1	1	2	3	4
2	2	3	4	0
3	3	4	0	1

The identity element for an operation does not change the other elements

0 is the identity element for addition

25 Write the equation for the line shown in the accompanying graph.
Explain your answer.



$\frac{\text{rise}}{\text{run}} = \frac{2}{1} = m$

Equation of a line → $y = mx + b$ ↳ y-intercept
↳ slope

slope = 2
y-intercept = -3

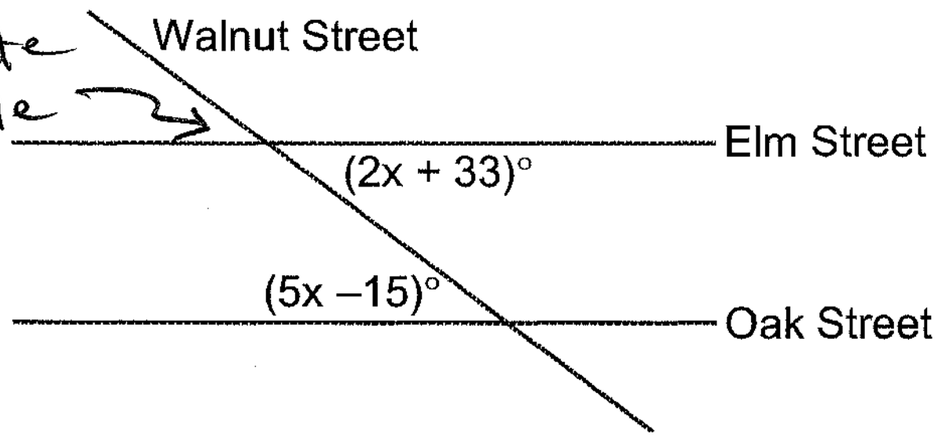
$y = 2x + (-3)$

$y = 2x - 3$

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. [15]

26 Two parallel roads, Elm Street and Oak Street, are crossed by a third, Walnut Street, as shown in the accompanying diagram. Find the number of degrees in the acute angle formed by the intersection of Walnut Street and Elm Street.



acute angle

alternate interior ∠s are equal in measure

$2x+33 = 5x-15$

$-2x \quad -2x$

$33 = 3x-15$

$+15 \quad +15$

$48 = 3x$

$\frac{48}{3} = \frac{3x}{3}$

$16 = x$

$2x+33$

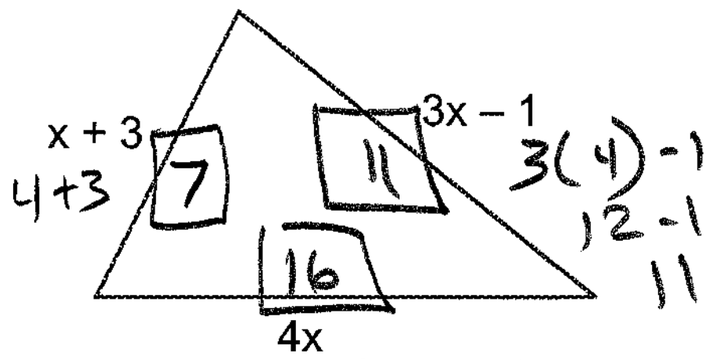
$2(16)+33$

$32+33$

$65°$

The acute angle(s) at Walnut and Elm measures 65°

27 The plot of land illustrated in the accompanying diagram has a perimeter of 34 yards. Find the length, in yards, of *each* side of the figure. Could these measures actually represent the measures of the sides of a triangle? Explain your answer.



$4+3$

$3(4)-1$

$12-1$

11

$4(4)$

16

$P = 34$

$(x+3)+(3x-1)+(4x)=34$

$8x+2=34$

$-2 \quad -2$

$8x = 32$

$x = 4$

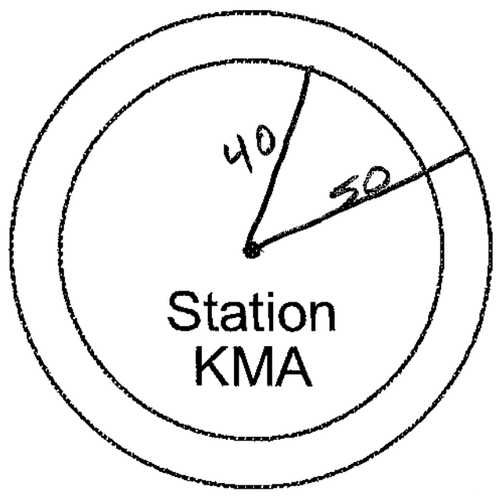
$7+11 \stackrel{?}{>} 16$ Yes

$11+16 \stackrel{?}{>} 7$ Yes

$16+7 \stackrel{?}{>} 11$ Yes

Yes: The 3 lengths (7, 11, & 16) could be the sides of a Δ because every pair of adjacent sides is greater than the 3rd side

28 As shown in the accompanying diagram, radio station KMA is increasing its radio listening radius from 40 miles to 50 miles. How many additional square miles of listening area, to the *nearest tenth*, will the radio station gain?



$A_0 = \pi r^2$

Original area $= \pi (40)^2$

New area $= \pi (50)^2$

$\pi (50)^2 - \pi (40)^2 =$ Gain in Area

$2500\pi - 1600\pi =$ Gain in Area

$900\pi =$ Gain in Area

$2827.4 = $ Gain in Area

2827.4 miles^2 = Gain in Area

29 Solve for x: $x^2 + 3x - 28 = 0$

Factors of 28

1 28
2 14
4 7

difference is 3

$x^2 + 3x - 28 = 0$

$(x + 7)(x - 4) = 0$

$x + 7 = 0 \qquad x - 4 = 0$

$x = -7 \qquad x = 4$

Answer

Check

$7^2 + 3(-7) - 28 = 0$

$49 - 21 - 28 = 0$

$49 - 49 = 0$ ✓

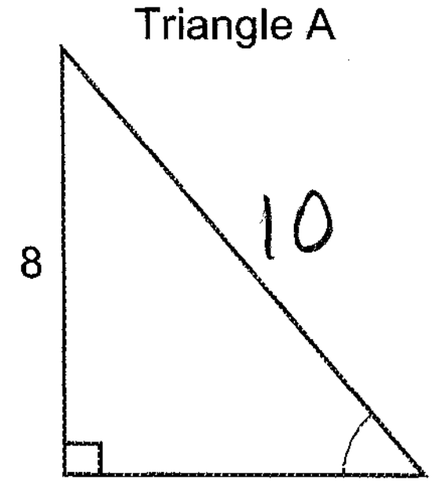
$4^2 + 3(4) - 28 = 0$

$16 + 12 - 28 = 0$

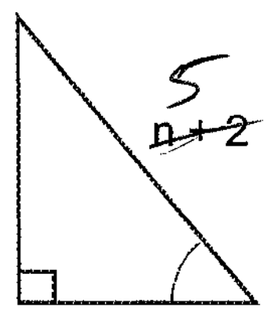
$28 - 28 = 0$ ✓

30 In the accompanying diagram, triangle A is similar to triangle B. Find the value of n.

Triangle A



Triangle B



$8^2 + 6^2 = c^2$

$64 + 36 = c^2$

$100 = c^2$

$10 = c$

$\frac{\text{hypotenuse}}{\text{base}} = \frac{\text{hypotenuse}}{\text{base}}$

$\frac{10}{6} = \frac{n+2}{3}$

$10(3) = 6(n+2)$

$30 = 6n + 12$

$-12 \quad -12$

$18 = 6n$

$\frac{18}{6} = \frac{6n}{6}$

$3 = n$

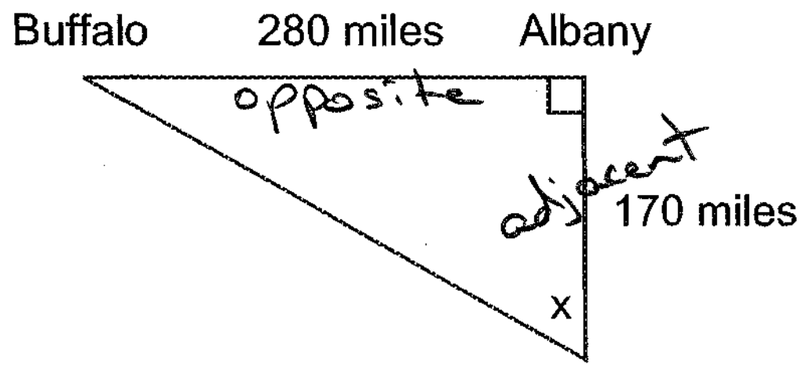
Answer

[12]

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. [20]

31 As seen in the accompanying diagram, a person can travel from New York City to Buffalo by going north 170 miles to Albany and then west 280 miles to Buffalo.



SOH-CAH-TOA

$\sin = \frac{opp}{hyp.}$

$\cos = \frac{adj}{hyp}$

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

a If an engineer wants to design a highway to connect New York City directly to Buffalo, at what angle, x, would she need to build the highway? Find the angle to the *nearest degree*.

$\tan X = \frac{280}{170} = 1.647058824$

Set calculator to degrees

$\arctan 1.647058824 = 58.73626831°$

answer → 59°

b To the *nearest mile*, how many miles would be saved by traveling directly from New York City to Buffalo rather than by traveling first to Albany and then to Buffalo?

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

$(280)^2 + (170)^2 = c^2$

$78{,}400 + 28{,}900 = c^2$

$107{,}300 = c^2$

$\sqrt{107{,}300} = c$

$327.5667871 = c$

a+b = distance along legs of right Δ

280+170 = 450

(450 − 327.5667871)

122.4332129

This is distance along hypotenuse

Answer

they would save 122 miles

32 At Ron's Rental, a person can rent a big-screen television for $10 a month plus a one-time "wear-and-tear" fee of $100. At Josie's Rental, the charge is $20 a month and an additional charge of $20 for delivery with no "wear-and-tear" fee.

a If c equals the cost, write one equation representing the cost of the rental for m months at Ron's Rental and one equation representing the cost of the rental for m months at Josie's Rental.

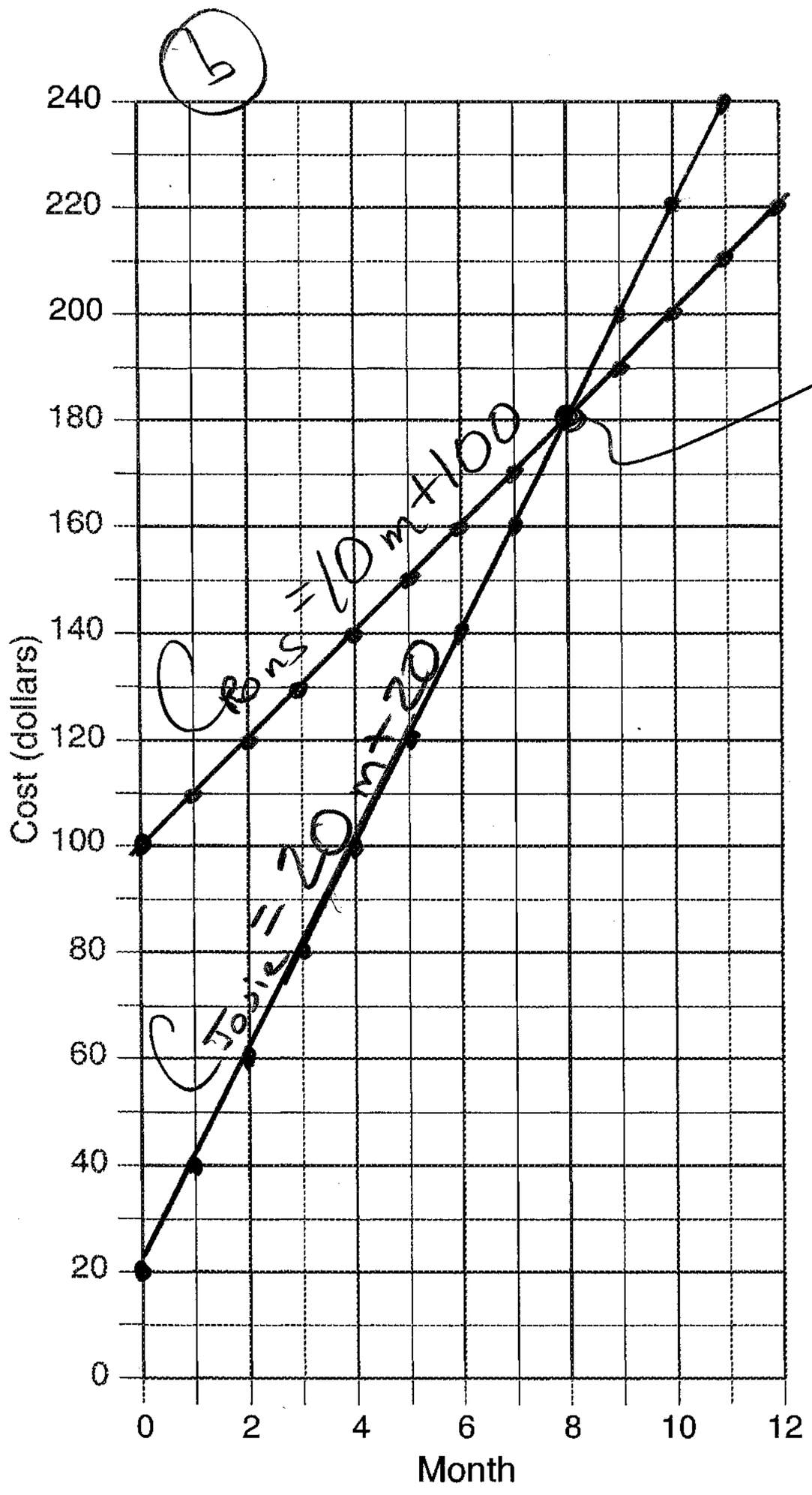
b On the accompanying grid, graph and label *each* equation.

c From your graph, determine in which month Josie's cost will equal Ron's cost.

a

$C_r = 10m + 100$

$C_j = 20m + 20$



b

c They cost the same at 8 months

33 Mr. Perez owns a sneaker store. He bought 350 pairs of basketball sneakers and 150 pairs of soccer sneakers from the manufacturers for $62,500. He sold all the sneakers and made a 25% profit. If he sold the soccer sneakers for $130 per pair, how much did he charge for one pair of basketball sneakers?

350 B sneakers + 150 S sneakers = 62,500

350B + 150S = 62,500

Profit = (62,500)(.25) = 15,625 ← 25%

62,500 + 15,625 = 78,125 total sales
(cost) + (profit)

1 soccer sneaker sales price → (130)(150) = 19,500 total sales of soccer sneakers

78,125 − 19,500 = 58,625 total sales of b-ball sneakers

$\frac{58,625}{350}$ = $167.50 is price of one pair of basketball sneakers

34 Alexi's wallet contains four $1 bills, three $5 bills, and one $10 bill. If Alexi randomly removes two bills without replacement, determine whether the probability that the bills will total $15 is greater than the probability that the bills will total $2.

$P(15)$ or

$P_{(10+5)} = P_{(10)} \cdot P_{(5)}$

$\frac{1}{8} \cdot \frac{3}{7} = \frac{3}{56}$

$P_{(5+10)} = P_{(5)} \cdot P_{(10)}$

$\frac{3}{8} \cdot \frac{1}{7} = \frac{3}{56}$

$\frac{6}{56}$

Ways to get 15

5 + 10

or

10 + 5

$P(2) \Rightarrow P_{(1+1)} = P_{(1)} \cdot P_{(1)}$

$\left(\frac{4}{8}\right)\left(\frac{3}{7}\right) = \frac{12}{56}$

Ways to get 2

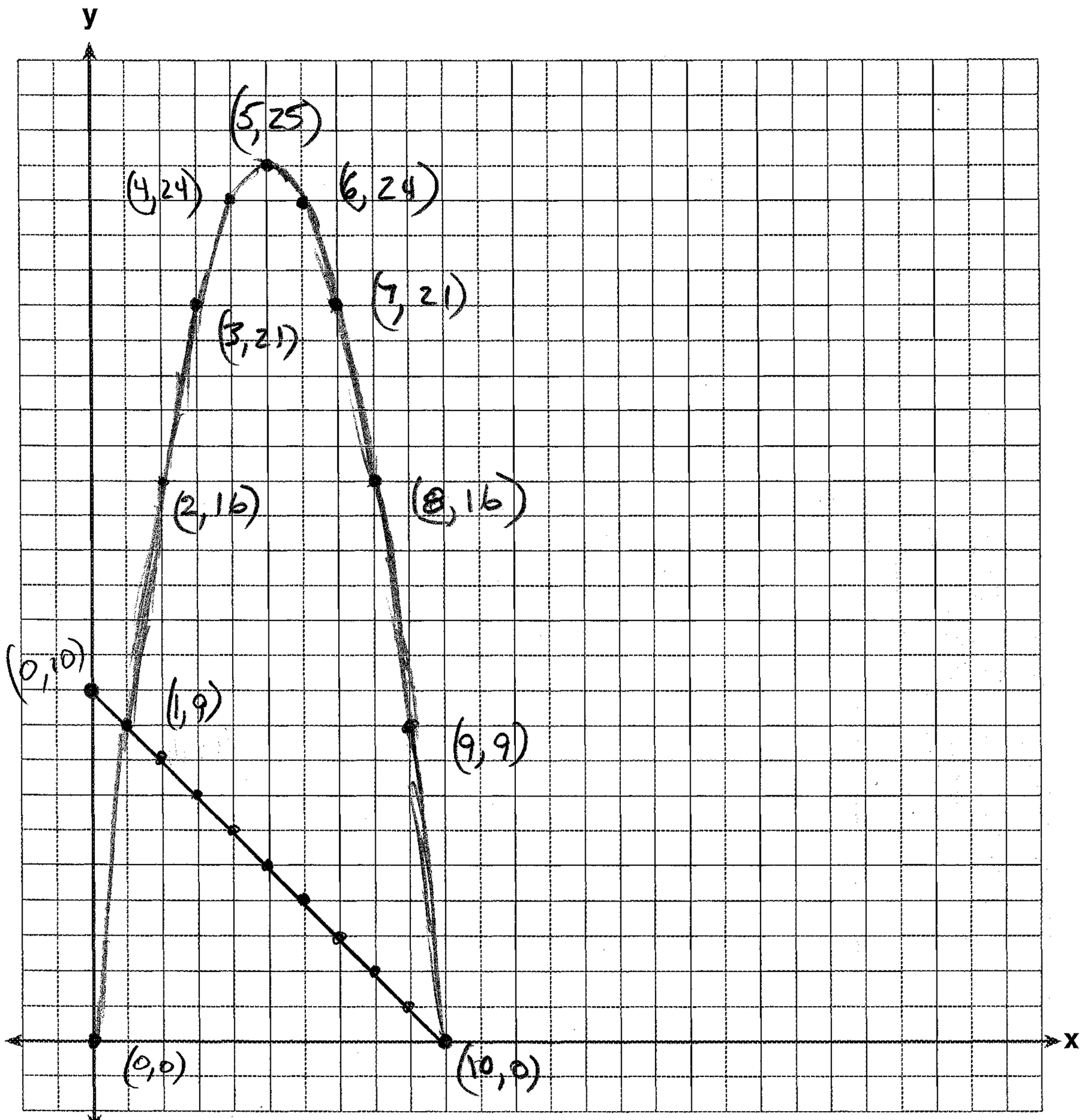
1 + 1

$\frac{12}{56} > \frac{6}{56}$

$P_{(2)} > P_{(15)}$

Answer → No: The probability of getting 2 is greater than the probability of getting 15

35 A rocket is launched from the ground and follows a parabolic path represented by the equation $y = -x^2 + 10x$. At the same time, a flare is launched from a height of 10 feet and follows a straight path represented by the equation $y = -x + 10$. Using the accompanying set of axes, graph the equations that represent the paths of the rocket and the flare, and find the coordinates of the point or points where the paths intersect.



The paths intersect at (1,9) and (10,0)

Answer

Tear Here

The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

MATHEMATICS A

Wednesday, June 19, 2002 — 1:15 to 4:15 p.m., only

ANSWER SHEET

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 20 questions in this part.

1 3	6 4	11 2	16 4
2 3	7 1	12 1	17 3
3 2	8 4	13 2	18 2
4 1	9 3	14 1	19 2
5 2	10 3	15 4	20 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.

_____

Signature

Tear Here