The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

MATHEMATICS A

Tuesday, August 17, 2004 — 8:30 to 11:30 a.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.

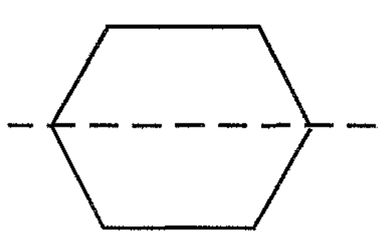
MATHEMATICS A

Part I

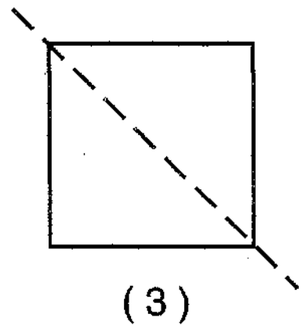
Answer all questions in this part. Each correct answer will receive 2 credits. No partial credit will be allowed. For each question, write on the separate answer sheet the numeral preceding the word or expression that best completes the statement or answers the question. [60]

1 Which diagram shows a dotted line that is *not* a line of symmetry?

Use this space for computations.



(1)



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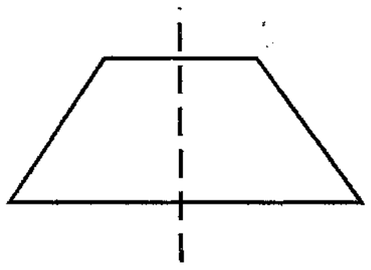

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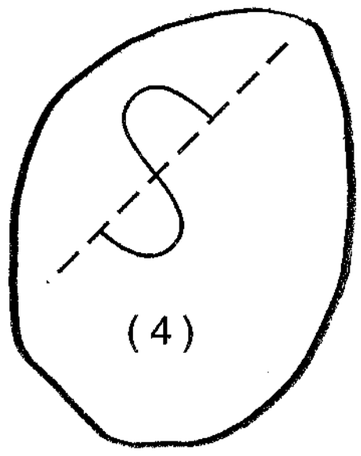


(4)

2 Rosario and Enrique are in the same mathematics class. On the first five tests, Rosario received scores of 78, 77, 64, 86, and 70. Enrique received scores of 90, 61, 79, 73, and 87. How much higher was Enrique's average than Rosario's average?

(1) 15 points
(2) 2 points
(3) 3 points
(4) 4 points

78 - 75 = 3

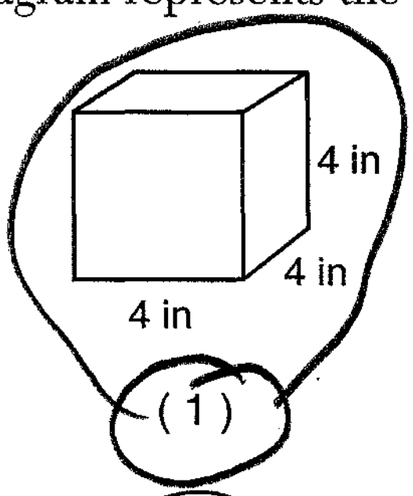
$\text{Rosario} = \frac{78+77+64+86+70}{5}$

$= \frac{375}{5} \Rightarrow 75$

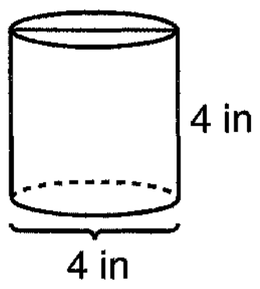
$\text{Enrique} = \frac{90+61+79+73+87}{5}$

$= \frac{390}{5} \Rightarrow 78$

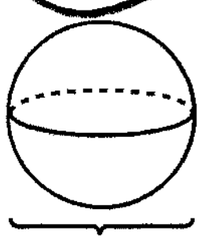
3 Which diagram represents the figure with the greatest volume?



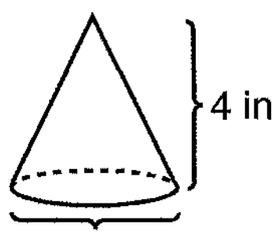
(1)



(3)



(2)



(4)

Use this space for computations.

4 The school cafeteria offers five sandwich choices, four desserts, and three beverages. How many different meals consisting of one sandwich, one dessert, and one beverage can be ordered?

(1) 1
(2) 12
(3) 3
(4) 60

Sandwich Choices × Dessert Choices × Beverage Choices
5 × 4 × 3 = 60

5 When $-9x^5$ is divided by $-3x^3$, $x \neq 0$, the quotient is

(1) $-3x^2$
(2) $3x^2$
(3) $-27x^{15}$
(4) $27x^8$

$\frac{-9x^5}{-3x^3}$

$-9 \; x^{(5-3)}$

-3

$3 \; x^2$

6 What is the value of n in the equation $0.6(n + 10) = 3.6$?

(1) -0.4
(2) 5
(3) -4
(4) 4

$\frac{0.6(n+10)}{0.6} = \frac{3.6}{0.6}$

$n + 10 = 6$

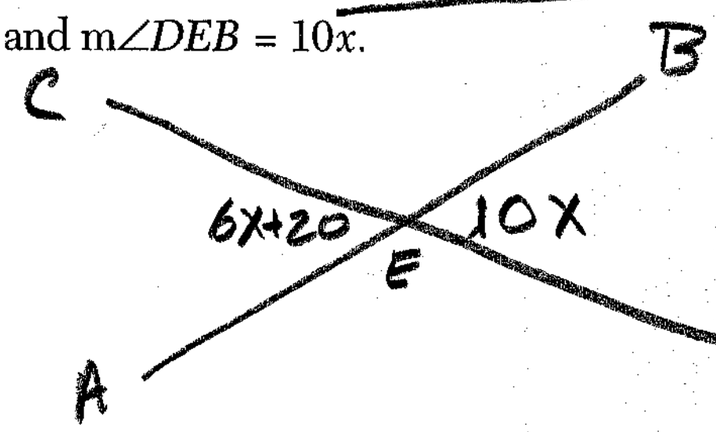
$-10 \quad -10$

$n = -4$

D(0.6)

7 $\overleftrightarrow{AB}$ and $\overleftrightarrow{CD}$ intersect at point E, $m\angle AEC = 6x + 20$, and $m\angle DEB = 10x$. What is the value of x?

(1) $4\frac{3}{8}$
(2) 5
(3) 10
(4) $21\frac{1}{4}$



$6x + 20 = 10x$

$-6x \quad -6x$

$20 = 4x$

$5 = x$

8 If $x = -4$ and $y = 3$, what is the value of $x - 3y^2$?

(1) -13
(2) -23
(3) -31
(4) -85

$x - 3y^2$

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

$(-4) - 3(3)^2$

$-4 - 3(9)$

$-4 - 27$

-31

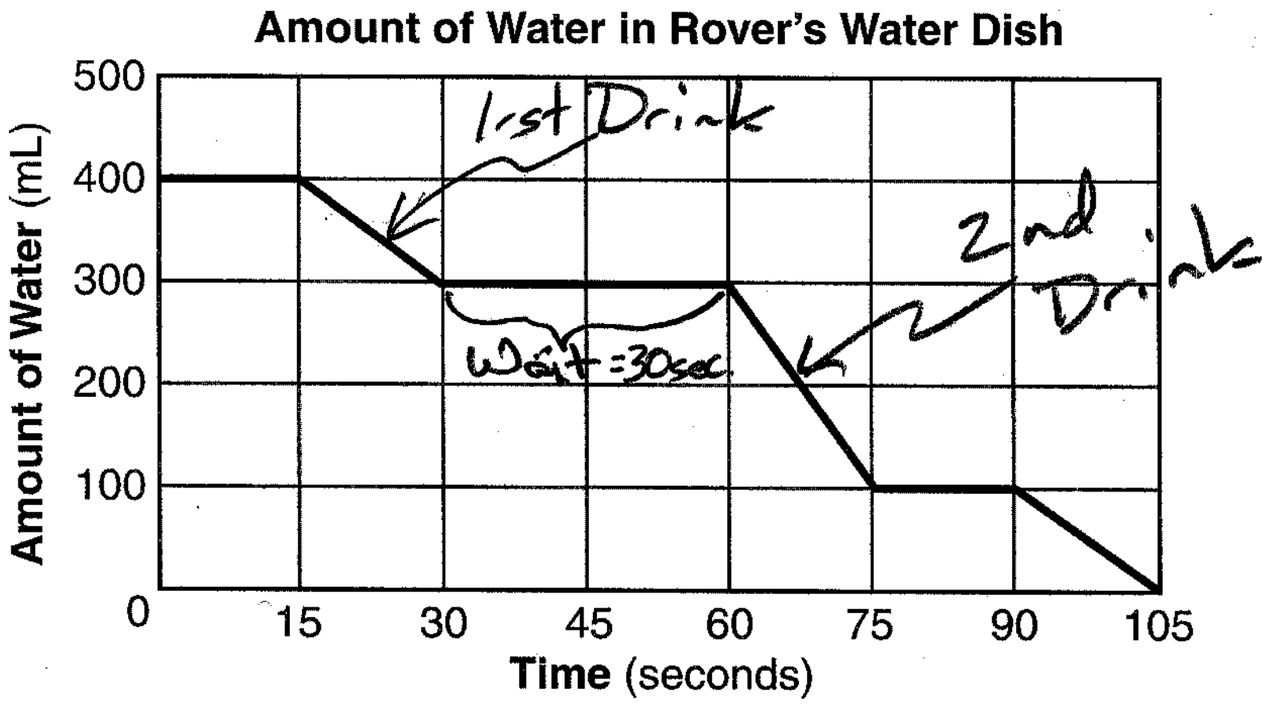
9 What are the coordinates of P', the image of $P(-4,0)$ under the translation $(x - 3, y + 6)$?

(1) (–7,6)
(2) (7,–6)
(3) (1,6)
(4) (2,–3)

$(-4, 0)$
$(x-3, y+6)$
$(-4-3, 0+6)$
$(-7, 6)$

Use this space for computations.

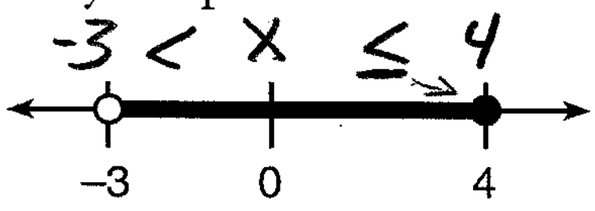
10 The accompanying graph shows the amount of water left in Rover's water dish over a period of time.



How long did Rover wait from the end of his first drink to the start of his second drink of water?

(1) 10 sec
(2) 30 sec
(3) 60 sec
(4) 75 sec

11 Which inequality is represented in the accompanying graph?



(1) $-3 \leq x < 4$
(2) $-3 \leq x \leq 4$
(3) $-3 < x \leq 4$
(4) $-3 < x \leq 4$

closed dot means add equal sign to inequality sign.

12 The ratio of Tariq's telephone bill to Pria's telephone bill was 7:5. Tariq's bill was \$14 more than Pria's bill. What was Tariq's bill?

(1) \$21
(2) \$28
(3) \$35
(4) \$49

$\frac{\text{Tariq}}{\text{Pria}} \Rightarrow \frac{7x}{5x}$

$7x = 5x + 14$
$-5x \quad -5x$
$2x = 14$
$x = 7$

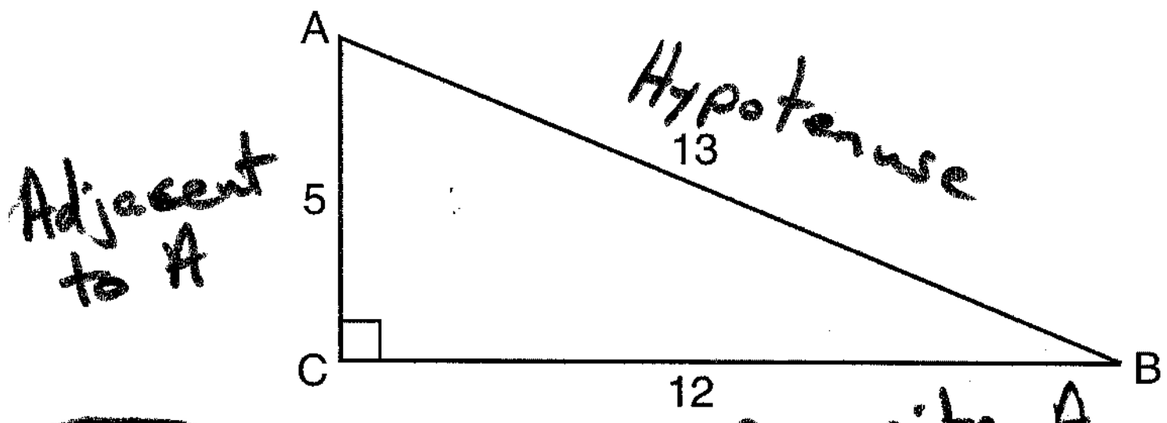
Tariq's Bill = $7 \times 7 = 49$

Use this space for computations.

13 Which equation illustrates the distributive property of multiplication over addition?

(1) $6(3a + 4b) = 18a + 4b$
(2) $6(3a + 4b) = 18a + 24b$
(3) $6(3a + 4b) = (3a + 4b)6$
(4) $6(3a + 4b) = 6(4b + 3a)$

14 Which ratio represents cos A in the accompanying diagram of $\triangle ABC$?



(1) $\frac{5}{13}$
(2) $\frac{12}{13}$
(3) $\frac{12}{5}$
(4) $\frac{13}{5}$

15 A rocket car on the Bonneville Salt Flats is traveling at a rate of 640 miles per hour. How much time would it take for the car to travel 384 miles at this rate?

(1) 36 minutes
(2) 245 minutes
(3) 256 minutes
(4) 1.7 hours

16 What is the inverse of the statement "If I do not buy a ticket, then I do not go to the concert"?

(1) If I buy a ticket, then I do not go to the concert.
(2) If I buy a ticket, then I go to the concert.
(3) If I go to the concert, then I buy a ticket.
(4) If I do not go to the concert, then I do not buy a ticket.

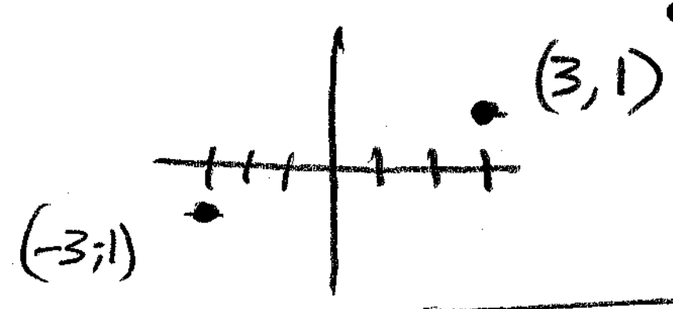
17 If the value of dependent variable y increases as the value of independent variable x increases, the graph of this relationship could be a

(1) horizontal line
(2) vertical line
(3) line with a negative slope
(4) line with a positive slope

18 What is the image of point (–3,–1) under a reflection in the origin?

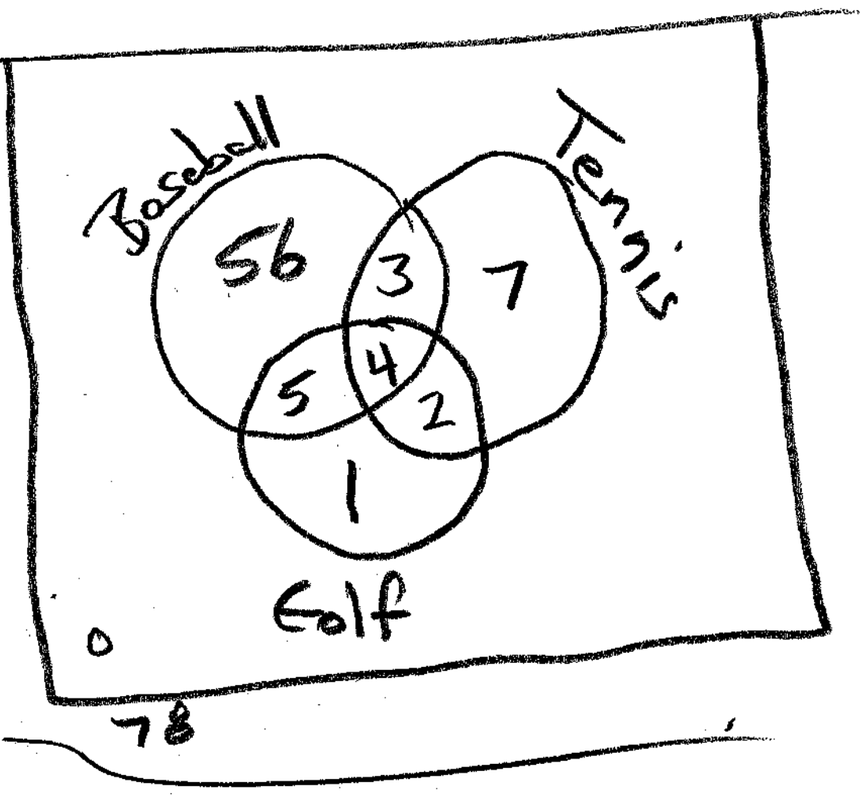
(1) (3,1)
(2) (–3,1)
(3) (1,3)
(4) (–1,–3)

Use this space for computations.



19 Seventy-eight students participate in one or more of three sports: baseball, tennis, and golf. Four students participate in all three sports; five play both baseball and golf, only; two play both tennis and golf, only; and three play both baseball and tennis, only. If seven students play only tennis and one plays only golf, what is the total number of students who play only baseball?

(1) 12
(2) 44
(3) 56
(4) 60



78 − (5+4+3+2+1+7)
78 − 22 ⟹ 56

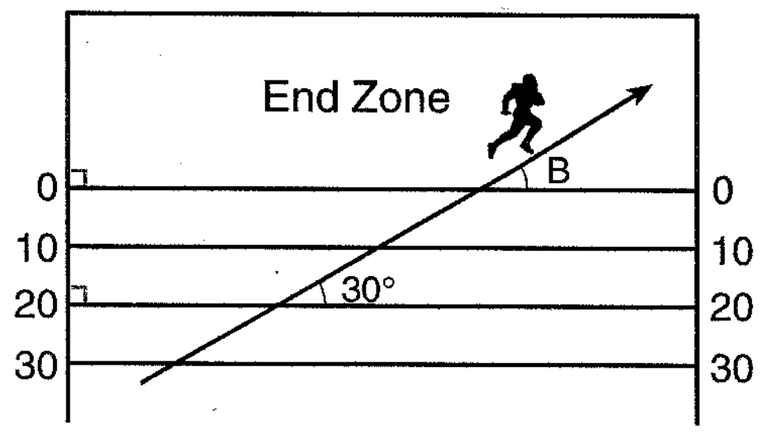
20 Which linear equation represents the data in the accompanying table?

c	d
0	20.00
1	21.50
2	23.00
3	24.50

+1 < > +1.50
+1 < > +1.50
+1 < > +1.50

(1) $d = 1.50c$
(2) $d = 1.50c + 20.00$
(3) $d = 20.00c + 1.50$
(4) $d = 21.50c$

21 The accompanying diagram shows a football player crossing the 20-yard line at an angle of 30° and continuing along the same path.



∠B = 30°
Corresponding angles have equal measures

What is the measure of angle B, where the player crosses into the end zone?

(1) 30°
(2) 60°
(3) 150°
(4) 180°

22 For which value of x is the expression $\frac{x-7}{x+2}$ undefined?

(1) -2
(2) 2
(3) 7
(4) 0

Use this space for computations.

the expression is undefined when the numerator equals zero.

$x+2=0$
$-2 \quad -2$
$x = -2$

23 The expression $(3x^2 + 2xy + 7) - (6x^2 - 4xy + 3)$ is equivalent to

(1) $-3x^2 - 2xy + 4$
(2) $3x^2 - 2xy + 4$
(3) $-3x^2 + 6xy + 4$
(4) $3x^2 - 6xy - 4$

$3x^2 + 2xy + 7$
$-6x^2 - 4xy + 3$

to subtract, change signs add

$-6x^2 + 4xy - 3$
$-3x^2 + 6xy + 4$

24 The number 1.56×10^{-2} is equivalent to

(1) 156
(2) 0.156
(3) 0.0156
(4) 0.00156

$1.56 \times 10^{-2} = \frac{1.56}{1} \times \frac{1}{10^2}$

$\frac{1.56}{1} \times \frac{1}{100}$

$\frac{1.56}{100} \Rightarrow .0156$

25 Which set can *not* represent the lengths of the sides of a triangle?

(1) {4,5,6}
(2) {5,5,11}
(3) {7,7,12}
(4) {8,8,8}

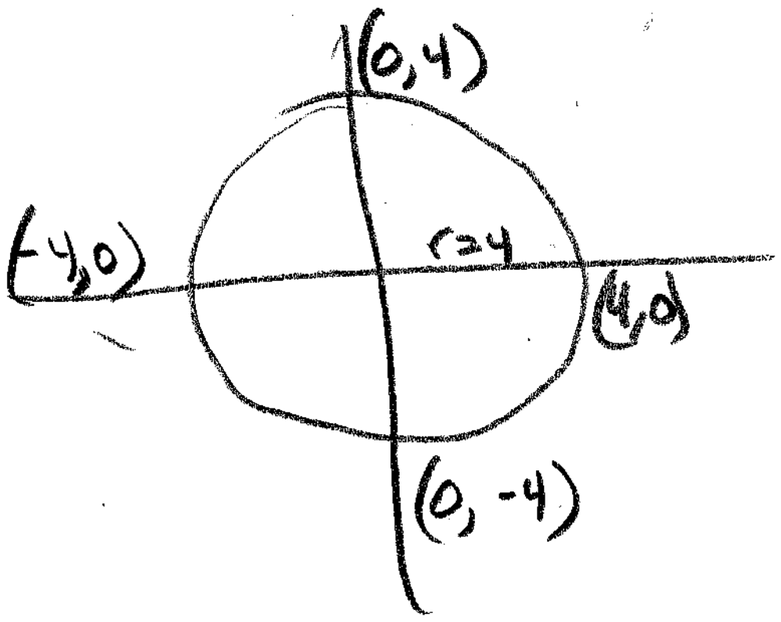
$5+5 \neq 11$

The sum of any 2 sides must be greater than the third side.

26 Which equation represents the locus of points 4 units from the origin?

(1) $x = 4$
(2) $x^2 + y^2 = 4$
(3) $x + y = 16$
(4) $x^2 + y^2 = 16$

$x^2 + y^2 = r^2$



This is a circle with radius = 4

27 What is the contrapositive of the statement "If I study, then I pass the test"?

(1) I pass the test if I study.
(2) If I do not study, then I do not pass the test.
(3) If I do not pass the test, then I do not study.
(4) If I pass the test, then I study.

Use this space for computations.

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 not 2 I pass the test, then not 1 I study

28 What is the sum, in degrees, of the measures of the interior angles of a stop sign, which is in the shape of an octagon?

(1) 360
(2) 1,080
(3) 1,440
(4) 1,880

(8-2) 180
(6) 180 ⇒ 1080

△ Interior ∠s sum to 180°
□ " " " " 360°
Every side adds 180°
(n-2) 180° = sum of interior ∠s of a polygon

29 What point is the intersection of the graphs of the lines $2x - y = 3$ and $x + y = 3$?

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

2x - y = 3
2x - 3 = y
y = 2x - 3

x + y = 3
y = -x + 3

2x - 3 = -x + 3
+x +x
3x - 3 = 3
+3 +3
3x = 6
x = 2

30 Selena and Tracey play on a softball team. Selena has 8 hits out of 20 times at bat, and Tracey has 6 hits out of 16 times at bat. Based on their past performance, what is the probability that both girls will get a hit next time at bat?

(1) 1
(2) $\frac{14}{36}$
(3) $\frac{31}{40}$
(4) $\frac{48}{320}$

$P_{(A+B)} = (P_A)(P_B)$

$P_{(\text{Selena Hits})} = \frac{8}{20}$ $P_{(\text{Tracey Hits})} = \frac{6}{16}$

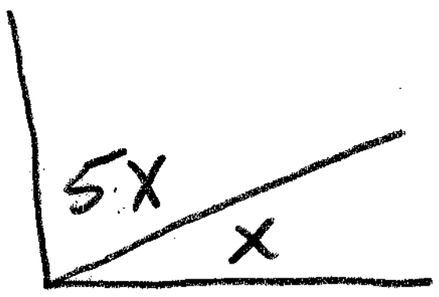
$P_{(\text{Both Hit})} = \left(\frac{8}{20}\right)\left(\frac{6}{16}\right) = \frac{48}{320}$

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]

sum to 90°

31 Two angles are complementary. One angle has a measure that is five times the measure of the other angle. What is the measure, in degrees, of the larger angle?



$5x + x = 90°$

$6x = 90°$

$x = 15°$

The larger ∠ is $5(15°)$, or $\boxed{75°}$

32 Given: $\frac{\sqrt{99}}{11}$, $\sqrt{164}$, $\sqrt{196}$

Identify the expression that is a rational number and explain why it is rational.

$\frac{\sqrt{99}}{11} \Rightarrow \frac{\sqrt{99}}{11} \Rightarrow \frac{\sqrt{9}\sqrt{11}}{11} \Rightarrow \frac{3\sqrt{11}}{11}$ ← √prime

$\sqrt{164} = \sqrt{2}\sqrt{82}$

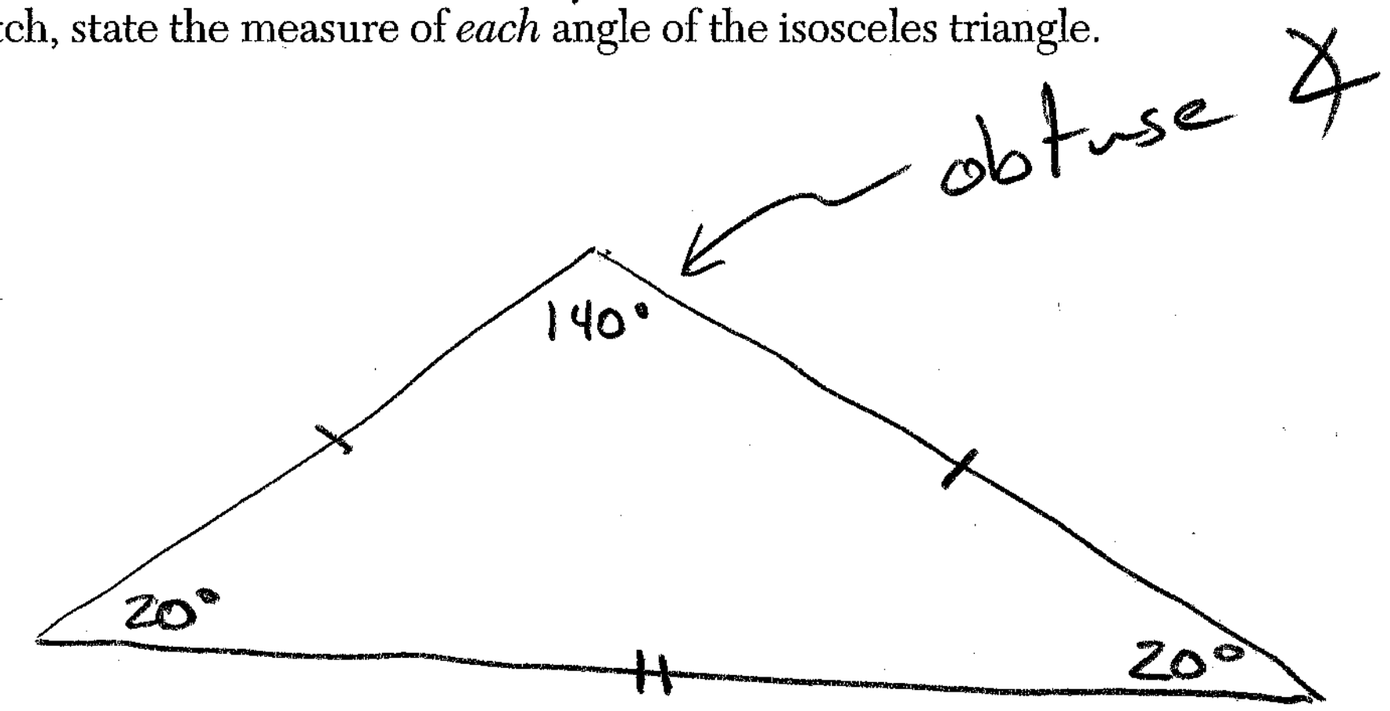
$= \sqrt{2}\sqrt{2}\sqrt{41}$

$= 2\sqrt{41}$ ← √prime

Square roots of primes are always irrational.

$\sqrt{196} \Rightarrow 14 \Rightarrow \frac{14}{1}$ $\sqrt{196}$ is rational because it can be expressed as the ratio of 2 integers

33 Dylan says that all isosceles triangles are acute triangles. Mary Lou wants to prove that Dylan is *not* correct. Sketch an isosceles triangle that Mary Lou could use to show that Dylan's statement is not true. In your sketch, state the measure of *each* angle of the isosceles triangle.



This is an obtuse isosceles Δ

34 Factor completely: $3ax^2 - 27a$

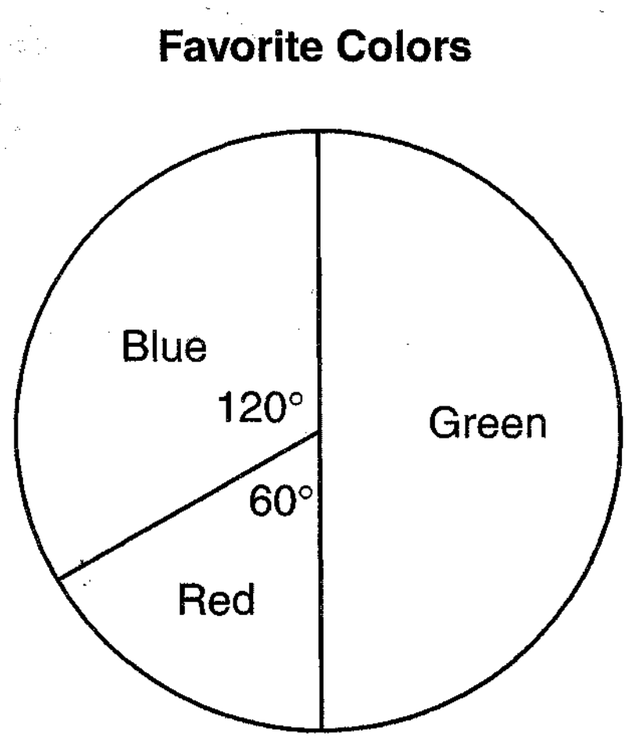
$3ax^2 - 27a$

$3(ax^2 - 9a)$

$3a(x^2 - 9)$

$3a(x+3)(x-3)$

35 The accompanying circle graph shows the favorite colors of the 300 students in the ninth grade. How many students chose red as their favorite color?



$\frac{\text{Students}}{\text{Degrees}}$

$\frac{300}{360} = \frac{x}{60}$

$18000 = 360x$

$50 = x$

50 students chose red

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 Walter is a waiter at the Towne Diner. He earns a daily wage of \$50, plus tips that are equal to 15% of the total cost of the dinners he serves. What was the total cost of the dinners he served if he earned \$170 on Tuesday?

170^{00} Total

-50^{00} Daily Wage

120^{00} Tip Income

Tip Income = Cost of dinners (15%)

$120 = C(.15)$

D(.15) $\frac{120}{.15} = C$

\$800 = Cost of Dinners

Check: Wages + Tips = Total

$50 + 800(.15) = 170$

$50 + 120 = 170$

$170 = 170$ ✓

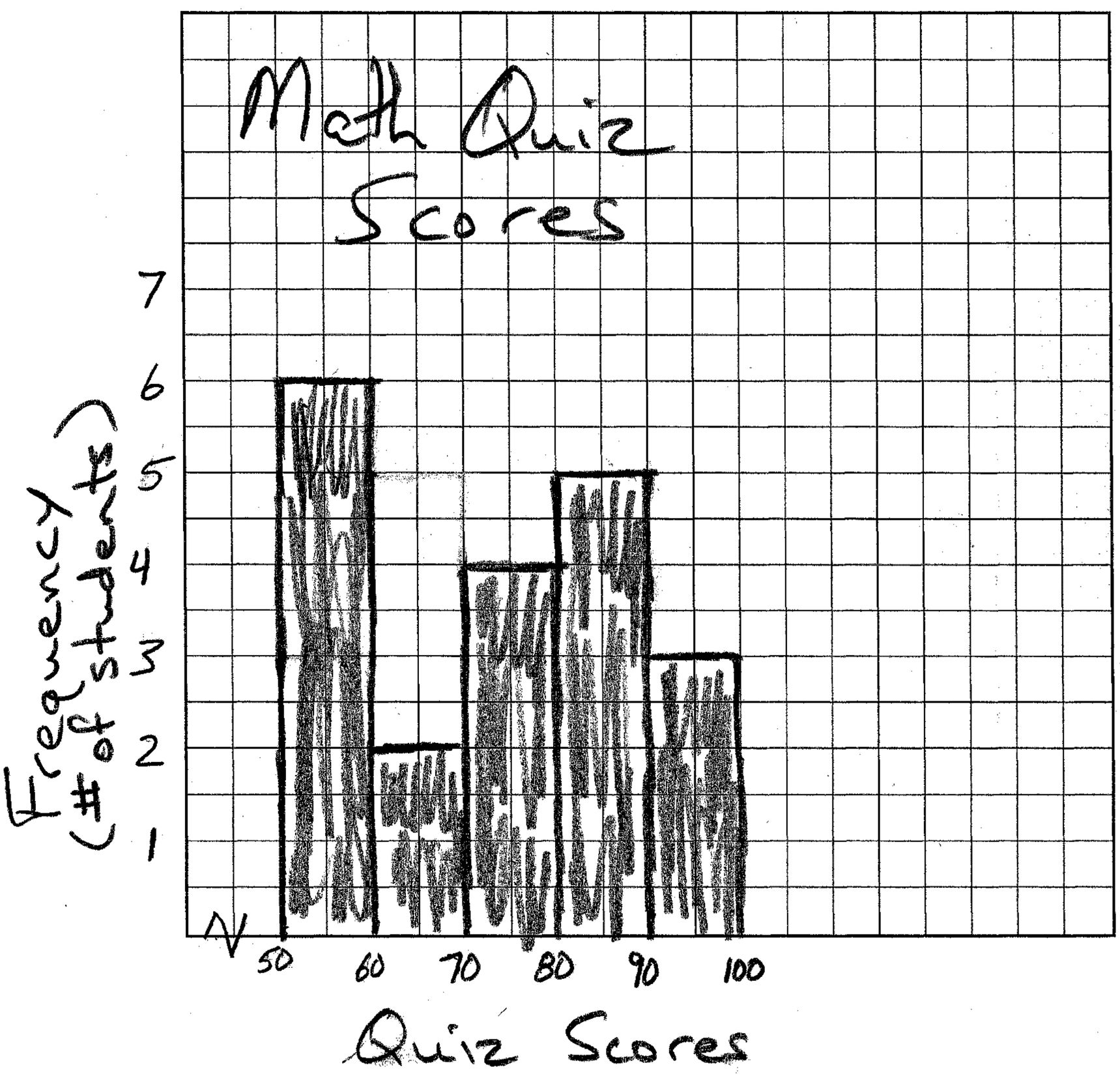
37 The following set of data represents the scores on a mathematics quiz:

58, 79, 81, 99, 68, 92, 76, 84, 58, 57,
81, 91, 77, 50, 65, 57, 51, 72, 84, 89

Complete the frequency table below and, on the accompanying grid, draw and label a frequency histogram of these scores.

Mathematics Quiz Scores

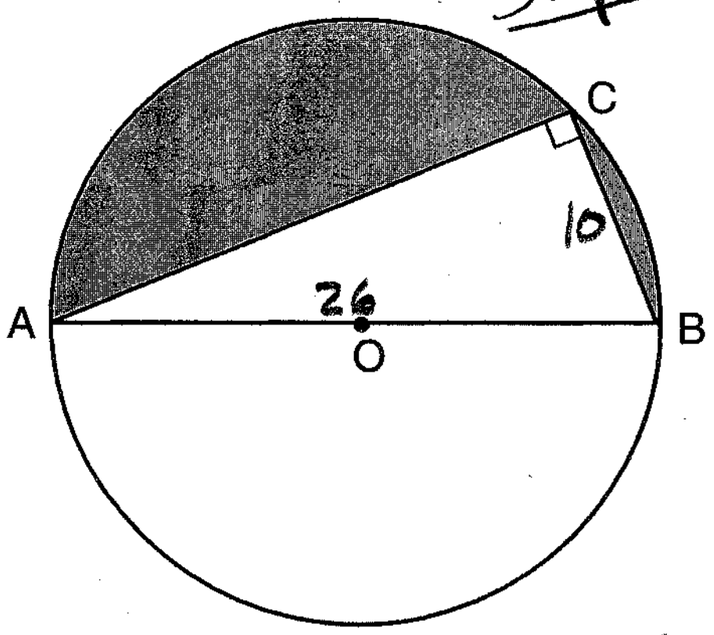
Interval	Tally	Frequency
50–59	𝍸 I	6
60–69	II	2
70–79	IIII	4
80–89	𝍸	5
90–99	III	3



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, right triangle ABC is inscribed in circle O, diameter $AB = 26$, and $CB = 10$. Find, to the *nearest square unit*, the area of the shaded region.



Step 1

$A_O = \pi r^2$

$r = \frac{d}{2} \Rightarrow \frac{26}{2} = 13$

$A_O = \pi (13)^2$

$A_O = 169\pi$

Area of $\frac{1}{2}$ circle $= \frac{169\pi}{2}$

Step 2

$A_\Delta = \frac{1}{2} bh$

$b = 10 \quad h = ?$

Solve for h using Pythagorean Theorem

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

$(10)^2 + b^2 = (26)^2$

$100 + b^2 = 676$

$-100 \qquad -100$

$b^2 = 576 \Rightarrow \sqrt{b^2} = \sqrt{576} \Rightarrow b = 24$

height of Δ

$A_\Delta = \frac{1}{2} 10 (24)$

$= 5 (24)$

$= 120$

Step 3

Shaded area $= \frac{169\pi}{2} - 120$

$= 145.4645792$

145 sq. units

39 Solve for all values of x that satisfy the equation $\frac{x}{x+3} = \frac{5}{x+7}$.

$$\frac{x}{x+3} = \frac{5}{x+7}$$

Cross Multiply

$$x(x+7) = 5(x+3)$$

$$x^2 + 7x = 5x + 15$$

$$-5x \quad -5x$$

$$x^2 + 2x = 15$$

$$-15 \quad -15$$

$$x^2 + 2x - 15 = 0$$

$$(x + \_\_)(x - \_\_) = 0$$

factors of 15: 1 15; 3 5

$$(x+5)(x-3) = 0$$

$$x+5=0 \quad x-3=0$$

$$x = -5 \text{ and } x = 3$$

Check

$$\frac{-5}{-5+3} = \frac{5}{-5+7}$$

$$\frac{-5}{-2} = \frac{5}{2}$$

$$\frac{5}{2} = \frac{5}{2} \checkmark$$

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

$$\frac{3}{6} = \frac{5}{10}$$

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

Tear Here

The University of the State of New York

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MATHEMATICS A

Tuesday, August 17, 2004 — 8:30 to 11:30 a.m., only

ANSWER SHEET

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

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

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.

RSW

Signature

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