The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

MATHEMATICS A

Thursday, January 24, 2008 — 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. 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 Robin spent $17 at an amusement park for admission and rides. If she paid $5 for admission, and rides cost $3 each, what is the total number of rides that she went on?

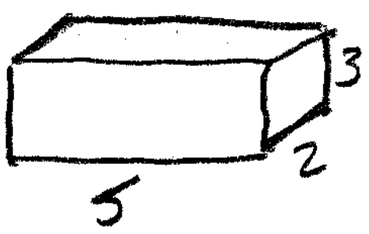
(1) 12
(2) 2
(3) 9
(4) 4

17
−5 admission price
12 left for rides

$\frac{12}{3} = 4$ rides

2 A block of wood is 5 inches long, 2 inches wide, and 3 inches high. What is the volume of this block of wood?

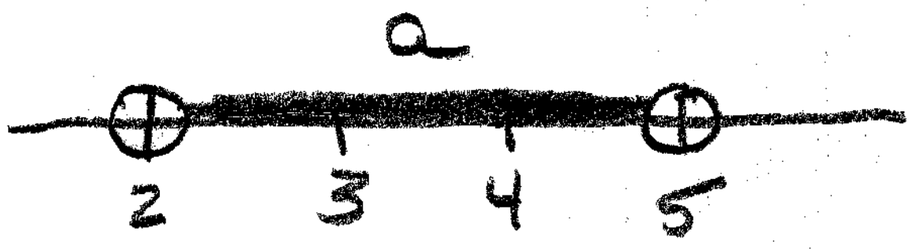
(1) 10 in^3
(2) 25 in^3
(3) 30 in^3
(4) 38 in^3



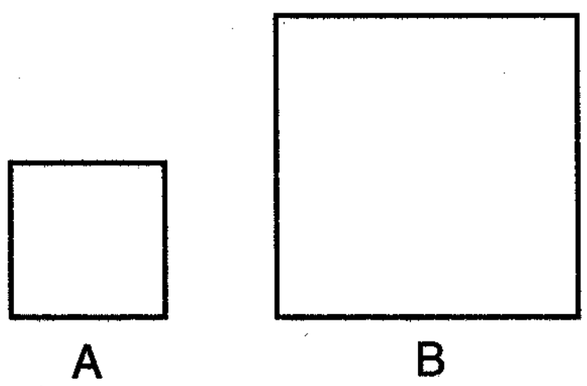
$V = l \cdot w \cdot h$
$V = 5 \cdot 2 \cdot 3$
$V = 30$

3 The statement "$a > 2$ and $a < 5$" is true when a is equal to

(1) 10
(2) 2
(3) 3
(4) 5



4 In the accompanying diagram, figure B is the image of figure A.



Which type of transformation was performed?

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

turns the image

like a mirror image

slides the image around

makes bigger or smaller, like when the eye pupils dilate

[2]

Use this space for computations.

5 A box contains 6 dimes, 8 nickels, 12 pennies, and 3 quarters. What is the probability that a coin drawn at random is *not* a dime?

(1) $\frac{6}{29}$
(2) $\frac{8}{29}$
(3) $\frac{12}{29}$
(4) $\frac{23}{29}$

Dimes 6
Nickels 8
Pennies 12
Quarters 3
29 total coins

$P(\text{event}) = \frac{\#\text{ times event happens}}{\text{total possible outcomes}}$

$P(\text{not dime}) = \frac{29-6}{29}$

$P(\text{not dime}) = \frac{23}{29}$

6 If x varies directly as y, and $x = 8$ when $y = 24$, what is the value of x when $y = 6$?

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

think proportions

Ratio $\frac{x}{y} \Rightarrow \frac{8}{24} = \frac{x}{6} \Rightarrow$ Cross Multiply $\Rightarrow 8(6) = 24x$

$48 = 24x$

$\frac{48}{24} = x \Rightarrow x = 2$

7 What is the value of p in the equation $8p + 2 = 4p - 10$?

(1) 1
(2) −1
(3) 3
(4) −3

$8p + 2 = 4p - 10$
$-2 \quad -2$
$8p = 4p - 12$
$-4p \quad -4p$
$4p = -12 \Rightarrow p = \frac{-12}{4}$
$p = -3$

8 A solution of the equation $\frac{x^2}{4} = 9$ is

(1) 12
(2) 6
(3) 3
(4) $\frac{3}{2}$

$\frac{x^2}{4} = 9$

$M(4) \quad x^2 = 4(9)$

$x^2 = 36$
$\sqrt{x^2} = \sqrt{36}$
$x = 6$

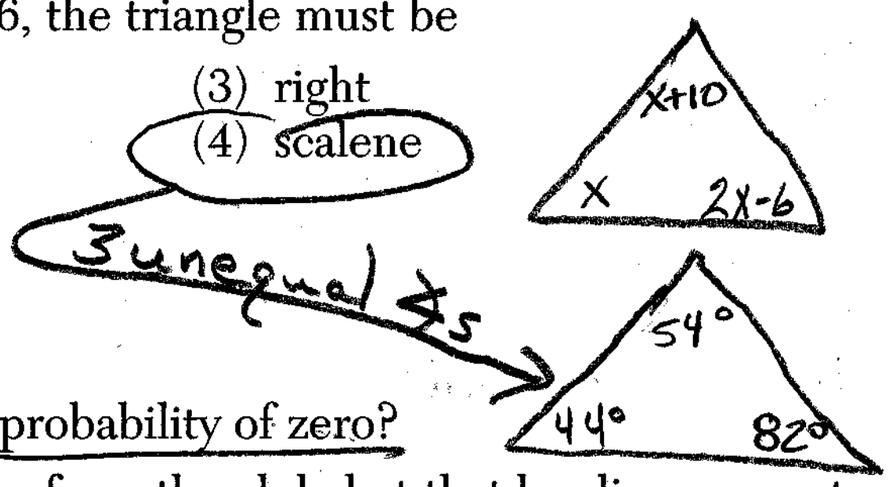
9 Which transformation produces a figure that is always the mirror image of the original figure?

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

mirrors reflect

10 If the measures, in degrees, of the three angles of a triangle are x, $x + 10$, and $2x - 6$, the triangle must be

(1) isosceles
(2) equilateral
(3) right
(4) scalene



Use this space for computations.

$x + x + 10 + 2x - 6 = 180°$
$2x + 10 + 2x - 6 = 180°$
$4x + 4 = 180°$
$-4 \quad -4$
$4x = 176$
$x = 44$

11 Which event has a probability of zero?

(1) choosing a letter from the alphabet that has line symmetry
(2) choosing a number that is greater than 6 and is even
(3) choosing a pair of parallel lines that have unequal slopes
(4) choosing a triangle that is both isosceles and right

can happen
can happen
Can not happen.
can happen

12 Which property is represented by the statement $\frac{1}{2}(6a + 4b) = 3a + 2b$?

(1) commutative
(2) distributive
(3) associative
(4) identity

13 Which equation expresses the relationship between x and y, as shown in the accompanying table?

x	0	1	2	3	4
y	2	5	8	11	14

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

x	$y = 3x + 2$	y
0	$y = 3(0) + 2$	2 ✓
1	$y = 3(1) + 2$	5 ✓
2	$y = 3(2) + 2$	8 ✓
3	$y = 3(3) + 2$	11 ✓
4	$y = 3(4) + 2$	14 ✓

Yes

x	$y = x + 3$	y
0	$y = 0 + 3$	3

No

x	$y = 2x + 3$	y
0	$y = 2(0) + 3$	3

No

14 What are the factors of $x^2 - 5x + 6$?

(1) $(x + 2)$ and $(x + 3)$
(2) $(x - 2)$ and $(x - 3)$
(3) $(x + 6)$ and $(x - 1)$
(4) $(x - 6)$ and $(x + 1)$

multiply to a positive (−)(−) or (+)(+)
sum to a negative (−)+(−)
∴ Must be 2 negatives

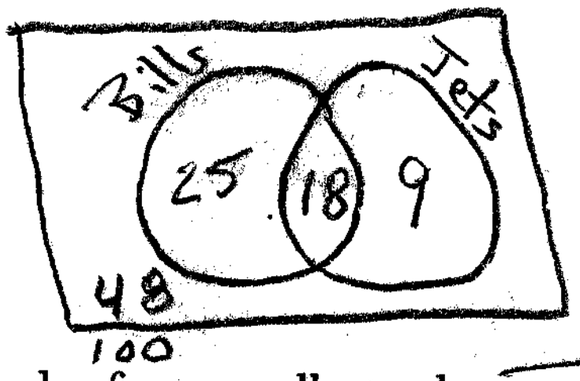
Use this space for computations.

$x^2 - 5x + 6$
$(x - \_\_)(x - \_\_)$
$(x - 3)(x - 2)$ These are the #s

Factors of 6
1 and 6
2 and 3
Sum to 5
2 and 3

15 A school newspaper took a survey of 100 students. The results of the survey showed that 43 students are fans of the Buffalo Bills, 27 students are fans of the New York Jets, and 48 students do not like either team. How many of the students surveyed are fans of *both* the Buffalo Bills and the New York Jets?

(1) 16
(2) 18
(3) 52
(4) 70



100 − 48 = 52 total fans
43 + 27 = 70
70 − 52 = 18 duplicates

16 In which group are the numbers arranged in order from smallest value to largest value?

(1) $\pi, 3.14, \sqrt{9.86}, \frac{22}{7}$
(2) $\sqrt{9.86}, \frac{22}{7}, 3.14, \pi$
(3) $\frac{22}{7}, 3.14, \pi, \sqrt{9.86}$
(4) $3.14, \sqrt{9.86}, \pi, \frac{22}{7}$

$\pi = 3.14159$
$3.14 = 3.14 \Rightarrow$ Smallest
$\frac{22}{7} = 3.142857 \Rightarrow$ Biggest
$\sqrt{9.86} = 3.140063$

17 The expression $\frac{4x^2y^3}{2xy^4}$ is equivalent to

(1) $\frac{2x}{y}$
(2) $\frac{2y}{x}$
(3) $2xy$
(4) $-2xy$

4	x^2	y^3
2	x	y^4
2	$x^{(2-1)}$	$y^{(3-4)}$
2	x^1	y^{-1}

$2x^1y^{-1}$

$\frac{2x}{1} \cdot \frac{1}{y} = \frac{2x}{y}$

Use this space for computations.

18 On a map, 1 inch represents 3 miles. How many miles long is a road that is $2\frac{1}{2}$ inches long on the map?

(1) $\frac{1}{2}$
(2) $5\frac{1}{2}$
(3) $6\frac{1}{2}$
(4) $7\frac{1}{2}$

$\frac{\text{inches}}{\text{miles}} \Rightarrow \frac{1}{3} = \frac{2\frac{1}{2}}{x}$

Cross multiply $1x = 3(2\frac{1}{2})$

$x = 7\frac{1}{2}$

19 What is the product of $2r^2 - 5$ and $3r$?

(1) $6r^3 - 15r$
(2) $6r^3 - 5$
(3) $6r^2 - 15r$
(4) $6r^2 - 15$

$3r(2r^2 - 5)$

$6r^3 - 15r$

20 If x represents a given number, the expression "5 less than twice the given number" is written as

(1) $5 < 2x$
(2) $5 < 2 + x$
(3) $2x - 5$
(4) $5 - 2x$

5 less -5 | twice the given number $2X$

21 The additive inverse of $\frac{1}{a}$ is

(1) $-\frac{1}{a}$
(2) $-a$
(3) 0
(4) a

A number and its additive inverse sum to the addition identity element, which is 0.

$\frac{1}{a} + (-\frac{1}{a}) = 0$

22 For which value of x is the expression $\frac{6 - x}{x + 2}$ undefined?

(1) -2
(2) 2
(3) 0
(4) 6

An expression is undefined if the demoninator is zero. Dividing by zero is undefined.

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

sum to 90°

Use this space for computations.

23 Two angles are complementary. The measure of one angle is 15° more than twice the other. What is the measure of the *smaller* angle?

(1) 25°
(2) 35°
(3) 55°
(4) 65°

15° more than twice the other
+15° 2x

Big x Small x
$(2x+15)+(x)=90$
$3x+15=90$
$-15 \quad -15$
$3x=75$
$x=25$

24 The larger of two consecutive integers is represented by $x + 4$. Which expression represents the *smaller* integer?

(1) $x + 2$
(2) $x + 3$
(3) $x + 5$
(4) $x + 6$

If x remains constant,
x+3 is one less than
x+4.

25 If $\frac{5}{n} - \frac{1}{2} = \frac{3}{6n}$, what is the value of n?

(1) –2
(2) 2
(3) 9
(4) $\frac{2}{7}$

$\frac{5}{n} - \frac{1}{2} = \frac{3}{6n}$

$\frac{5(2) - 1(n)}{2(n)} = \frac{3}{6n}$

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

cross multiply
$6n(10-n) = 3(2n)$
$\frac{6n(10-n)}{6n} = \frac{6n}{6n}$
$10-n=1$
$-1 \quad -1$
$9-n=0$
$9=n$

26 The expression $\sqrt{28} - \sqrt{7}$ is equivalent to

(1) $\sqrt{7}$
(2) 2
(3) $3\sqrt{7}$
(4) 4

$\sqrt{28} - \sqrt{7}$
$\sqrt{4}\sqrt{7} - \sqrt{7} \Rightarrow 2\sqrt{7} - \sqrt{7} = \sqrt{7}$

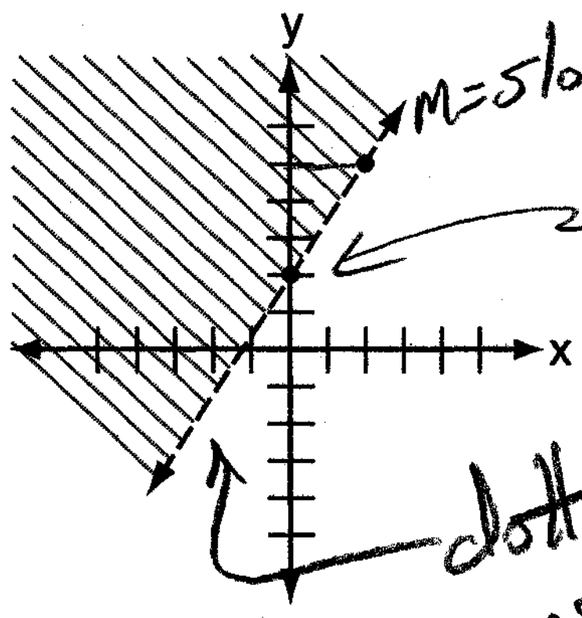
27 Which set of numbers could be the lengths of the sides of a right triangle?

(1) {10,24,26}
(2) {12,16,30}
(3) {3,4,6}
(4) {4,7,8}

Pythagorean Theorem
$a^2 + b^2 = c^2$
$(10)^2 + (24)^2 = (26)^2$
$100 + 576 = 676$
$676 = 676$

Use this space for computations.

28 Which inequality is shown in the accompanying diagram?



M=slope ⇒ $\frac{rise}{run} = \frac{3}{2}$

y-intercept is 2

dotted line means not equal

$y = mx + b$

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

$b = 2$

$y = \frac{3}{2}x + 2$

$y > \frac{3}{2}x + 2$

(1) $y > \frac{3}{2}x + 2$

(2) $y < \frac{3}{2}x + 2$

(3) $y \geq \frac{3}{2}x + 2$

(4) $y \leq \frac{3}{2}x + 2$

29 What is the total number of different seven-letter arrangements that can be formed using the letters in the word "MILLION"?

(1) 30

(2) 210

(3) 1,260

(4) 2,520

$\frac{7 \cdot 6 \cdot 5 \cdot 4 \cdot 3 \cdot 2 \cdot 1}{2 \cdot 1 \cdot 2 \cdot 1} = \frac{5040}{4} = 1260$

Correction for duplicate Is

Correction for Duplicate Is.

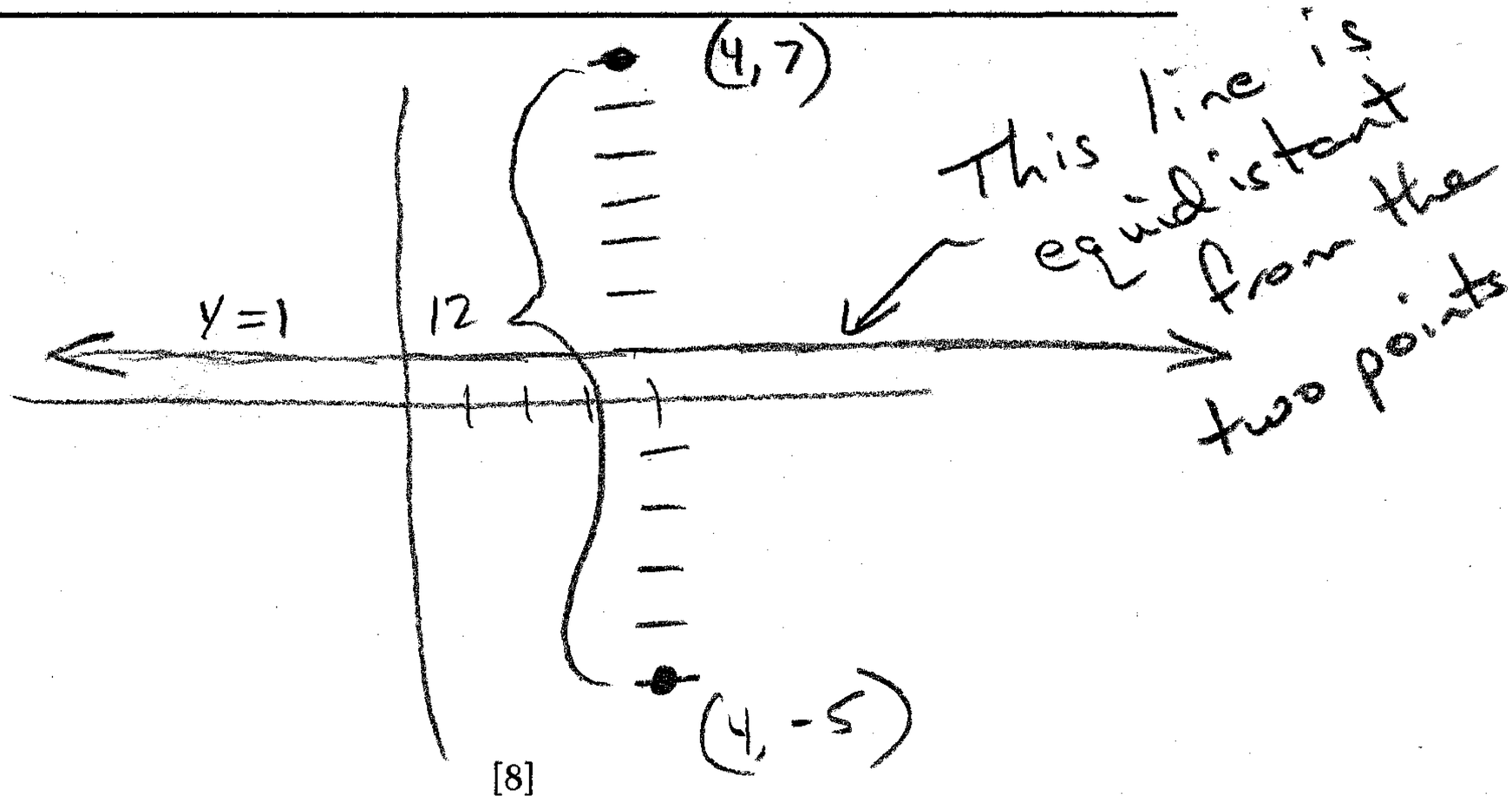
30 The locus of points equidistant from the points (4,–5) and (4,7) is the line whose equation is

(1) $y = 1$

(2) $y = 2$

(3) $x = 1$

(4) $x = 4$



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 The circumference of a circle measures 22π units. Find the number of square units in the area of the circle. Express your answer in terms of π.

$C_0 = \pi d$

$22\pi = \pi d$

$\frac{22\pi}{\pi} = d$

$22 = d$

$A_0 = \pi r^2 \quad r = \frac{1}{2}d \quad r = 11$

$A_0 = \pi(11)^2$

$A_0 = 121\pi \text{ units}^2$

32 As captain of his football team, Jamal gets to call heads or tails for the toss of a fair coin at the beginning of each game. At the last three games, the coin has landed with heads up. What is the probability that the coin will land with heads up at the next game? Explain your answer.

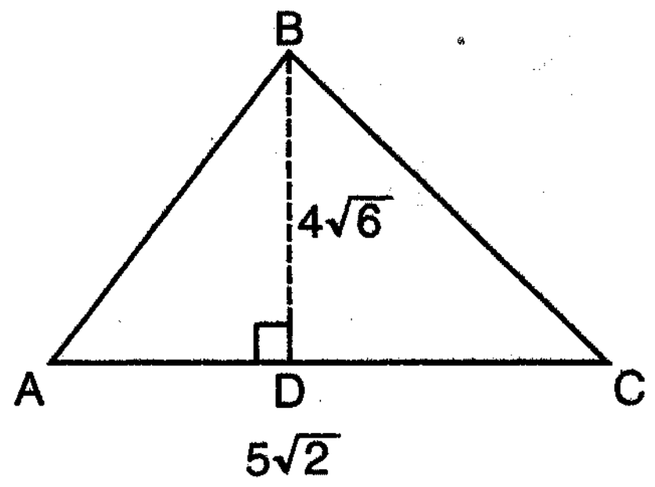
The probability is $\boxed{\frac{1}{2}}$

A coin has no memory!

$P(\text{event}) = \frac{\#\text{ of times the event happens}}{\text{total \# of possible outcomes}}$

$P(\text{head}) = \frac{1}{2}$

33 In the accompanying diagram of ΔABC, altitude $BD = 4\sqrt{6}$ and $AC = 5\sqrt{2}$. Find the area of the triangle to the *nearest tenth of a square unit.*



(Not drawn to scale)

$$A_\Delta = \frac{1}{2} b h$$

$$A_\Delta = \frac{1}{2}(5\sqrt{2})(4\sqrt{6})$$

$$A_\Delta = \frac{1}{2}(5)(4)(\sqrt{2})(\sqrt{6})$$

$$A_\Delta = \frac{1}{2}(20)(\sqrt{12})$$

$$A_\Delta = 10\sqrt{12}$$

$$A_\Delta = 34.64\cancel{1016}15$$

$$A_\Delta = 34.6 \text{ units}^2$$

34 Write an equation of a line that is perpendicular to the line $y = \frac{2}{3}x + 5$ and that passes through the point (0,4).

$m = \frac{2}{3}$ $\perp m = \frac{-3}{2}$

Step 1 - Set it up.
- Write $y = mx + b$ 3 times to make the table below. Fill in known values

	$y = mx + b$	$y = mx + b$
$y = 4$ $\perp m = \frac{-3}{2}$ $x = 0$ $b = ?$	Solve for the unknown here	Write the equation here

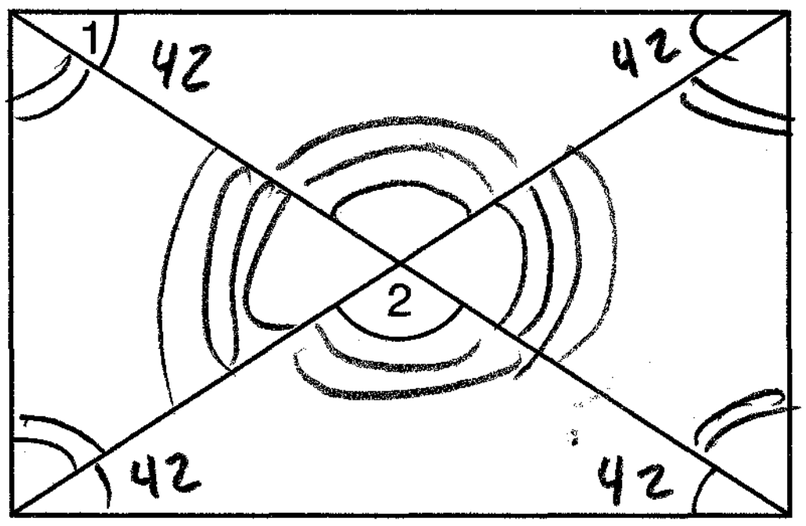
Step 2. Solve it

	$y = mx + b$	$y = mx + b$
$y = 4$ $\perp m = \frac{-3}{2}$ $x = 0$ $b = ?$	$4 = \frac{-3}{2}(0) + b$ $4 = b$	$y = \frac{-3}{2}x + 4$

Note

You could also note that (0,4) is the y-intercept, so $b = 4$.

35 As shown in the accompanying diagram, a rectangular gate has two diagonal supports. If m∠1 = 42, what is m∠2?



$180 - (42 + 42) = m\angle 2$

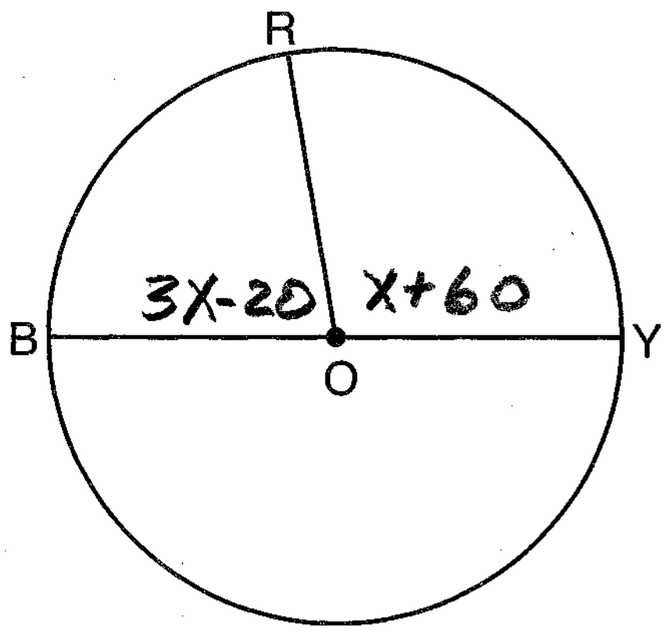
$180 - (84) = m\angle 2$

$\boxed{96^\circ} = m\angle 2$

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 In the accompanying diagram, $\overline{BY}$ is a diameter of circle O, the measure of central angle ROY is $(x + 60)°$, and the measure of central angle ROB is $(3x - 20)°$. Find the number of degrees in the measure of central angle ROY.



$3X-20 + X+60 = 180°$

$4X-20+60=180$

$4X+40=180$

$-40 \quad -40$

$4X = 140$

$X = 35$

$X+60 = m\angle ROY$

$35+60 = m\angle ROY$

$95° = m\angle ROY$

Check

$3X-20 + X+60 = 180$

$3(35)-20+35+60=180$

$105-20+35+60=180$

$85+95=180$

$180=180$ ✓

37 In the spaces provided below, write the converse, the inverse, and the contrapositive of the statement "If I run, then I am tired."

Converse: If I am tired, then I run.

Reverse Order

Inverse: If I do not run, then I am not tired.

Add not

Contrapositive: If I am not tired, then I did not run.

Reverse and add not

Given: If 1, then 2

Inverse: If not 1, then not 2

Converse: If 2, then 1

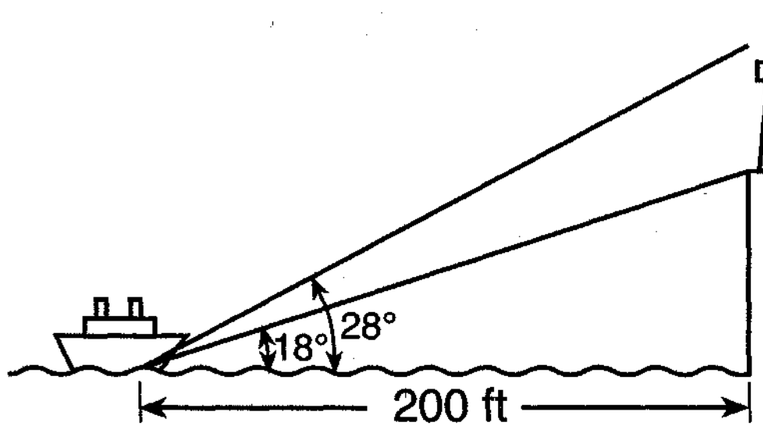
Contrapositive: If not 2, then not 1

If (1) I run, then (2) I am tired

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 A lighthouse is built on the edge of a cliff near the ocean, as shown in the accompanying diagram. From a boat located 200 feet from the base of the cliff, the angle of elevation to the top of the cliff is 18°, and the angle of elevation to the top of the lighthouse is 28°. What is the height, x, to the *nearest tenth of a foot*?



SOH-CAH-TOA

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

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

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

Set calculator to Degrees

opposite

adjacent

Remember

$\tan 18° = \frac{\text{cliff height}}{200}$

$200(\tan 18) = \text{cliff height}$

$64.98393925 = \text{cliff height}$

$\tan 28° = \frac{\text{cliff height plus lighthouse height}}{200}$

$200(\tan 28) = \text{cliff height plus lighthouse height}$

$106.3418863 = \text{cliff height plus lighthouse height}$

$106.3418863 - 64.98393925 = \text{lighthouse height}$

$41.35794708 = \text{lighthouse height}$

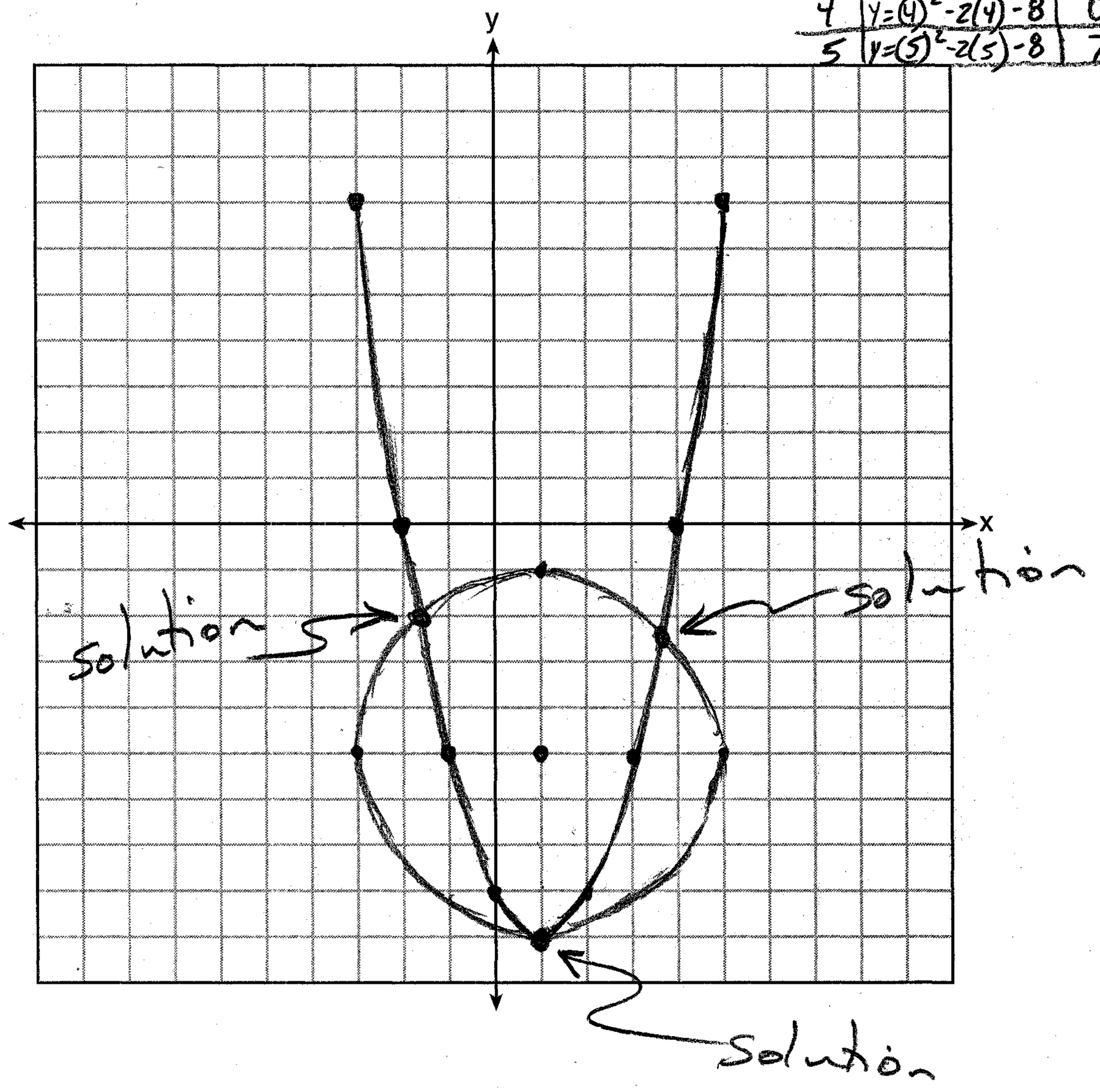
41.4 feet answer

39 On the accompanying set of axes, graph the parabola whose equation is $y = x^2 - 2x - 8$ over the interval $-3 \leq x \leq 5$ and graph the circle whose center is at (1,–5) and whose radius is 4.

Using your graphs, determine how many points of intersection the two graphs have.

There are [3] points of intersection

x	$y = x^2 - 2x - 8$	y
-3	$y = (-3)^2 - 2(-3) - 8$	7
-2	$y = (-2)^2 - 2(-2) - 8$	0
-1	$y = (-1)^2 - 2(-1) - 8$	-5
0	$y = (0)^2 - 2(0) - 8$	-8
1	$y = (1)^2 - 2(1) - 8$	-9
2	$y = (2)^2 - 2(2) - 8$	-8
3	$y = (3)^2 - 2(3) - 8$	-5
4	$y = (4)^2 - 2(4) - 8$	0
5	$y = (5)^2 - 2(5) - 8$	7



Tear Here

The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

MATHEMATICS A

Thursday, January 24, 2008 — 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 1	17 1	25 3
2 3	10 4	18 4	26 1
3 3	11 3	19 1	27 1
4 1	12 2	20 3	28 1
5 4	13 3	21 1	29 3
6 2	14 2	22 1	30 1
7 4	15 2	23 1	
8 2	16 4	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.

Signature

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)

Tear Here

MATHEMATICS A