The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

MATHEMATICS A

Thursday, June 14, 2007 — 1:15 to 4:15 p.m., only

Print Your Name: Imaginary Student

Print Your School's Name: Imaginary High School

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

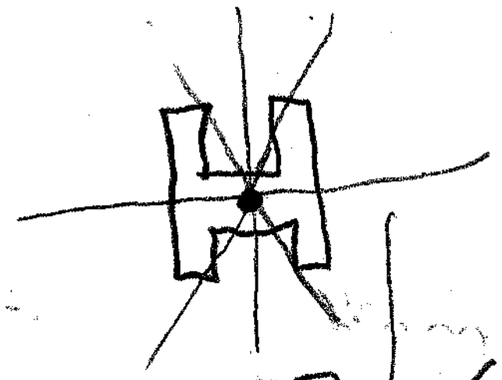
Part I

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 Which letter has both point and line symmetry?

(1) **Z**
(2) **T**
(3) **C**
(4) **H**



2 What is the value of x in the equation $6(x - 2) = 36 - 10x$?

(1) -6
(2) 1.5
(3) 3
(4) 6

Check $6(3-2) = 36 - 10(3)$
$6(1) = 36 - 30$
$6 = 6$ ✓

DR
$6(x-2) = 36-10x$
Add(10x) $6x - 12 = 36 - 10x$
$+10x \quad +10x$
$16x - 12 = 36$
Add(12) $+12 \quad +12$
$16x = 48$
D(16) $\frac{16x}{16} = \frac{48}{16}$
$x = 3$ Answer

3 In his first three years coaching baseball at High Ridge High School, Coach Batty's team won 7 games the first year, 16 games the second year, and 4 games the third year. How many games does the team need to win in the fourth year so that the coach's average will be 10 wins per year?

(1) 13
(2) 10
(3) 3
(4) 9

$\text{Avg} = \frac{\text{Sum}}{\text{count}}$

$10 = \frac{7+16+4+x}{4}$

$10 = \frac{27+x}{4}$

$40 = 27 + x$
$-27 \quad -27$
$13 = x$

4 What is the value of w in the equation $\frac{1}{2}w + 7 = 2w - 2$?

(1) 6
(2) 2
(3) $3\frac{1}{3}$
(4) 3.6

Check $\frac{1}{2}(6) + 7 = 2(6) - 2$
$3 + 7 = 12 - 2$
$10 = 10$ ✓

$\frac{1}{2}w + 7 = 2w - 2$
M(2) $w + 14 = 4w - 4$
S(w) $-w \quad -w$
$14 = 3w - 4$
A(4) $+4 \quad +4$
$18 = 3w$
D(3) $6 = w$ Answer

5 A six-sided number cube has faces with the numbers 1 through 6 marked on it. What is the probability that a number less than 3 will occur on one toss of the number cube?

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

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

$P(<3) = \frac{2}{6}$ ← either 1 or 2
← six possible outcomes.

1 and 2 are < 3

[2]

Use this space for computations.

6 The expression $\sqrt{54-b}$ is equivalent to a positive integer when b is equal to

(1) -10
(2) 54
(3) 16
(4) 4

(1) $\sqrt{54-(-10)} = \sqrt{64} = 8$ (3) $\sqrt{54-16} = \sqrt{38} = 6.16\ldots$
(2) $\sqrt{54-54} = \sqrt{0} = 0$ (4) $\sqrt{54-4} = \sqrt{50} = 7.07\ldots$

8 is the only positive integer above.

7 The expression $\frac{-32x^8}{4x^2}$, $x \neq 0$, is equivalent to

(1) $8x^4$
(2) $8x^6$
(3) $-8x^4$
(4) $-8x^6$

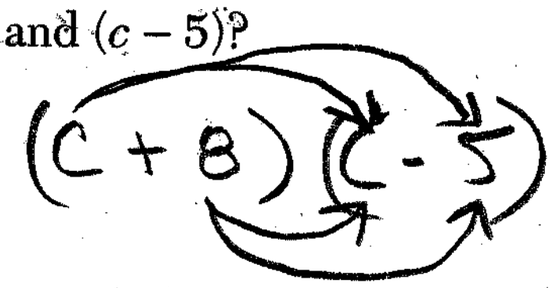
$\frac{-32x^8}{4x^2} = \left(\frac{-32}{4}\right)\left(\frac{x^8}{x^2}\right)$

$-8x^{(8-2)}$

$-8x^6$

8 What is the product of $(c + 8)$ and $(c - 5)$?

(1) $c^2 + 3c - 40$
(2) $c^2 - 3c - 40$
(3) $c^2 + 13c - 40$
(4) $c^2 - 40$



$C^2 - 5C + 8C - 40$

$C^2 + 3C - 40$

9 Andy is 6 feet tall. If 1 inch equals 2.54 centimeters, how tall is Andy, to the *nearest centimeter*?

(1) 15
(2) 30
(3) 183
(4) 213

$\frac{\text{feet}}{\text{inches}} \Rightarrow \frac{1}{12} = \frac{6}{x}$ $x = 72$

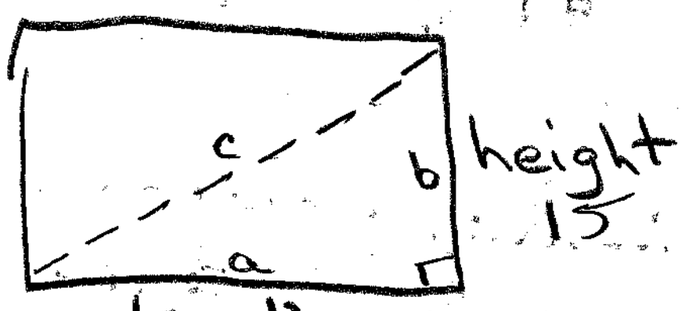
Andy is 72 inches tall.

$\frac{\text{inches}}{\text{Centimeters}} \Rightarrow \frac{1}{2.54} = \frac{72}{x}$

$x = 72(2.54)$
$x = 182.88$
nearest centimeter
$x = 183$

10 If the length of a rectangular television screen is 20 inches and its height is 15 inches, what is the length of its diagonal, in inches?

(1) 5
(2) 13.2
(3) 25
(4) 35



Pythagorean Theorem

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

$20^2 + 15^2 = c^2$

$400 + 225 = c^2$

$625 = c^2$

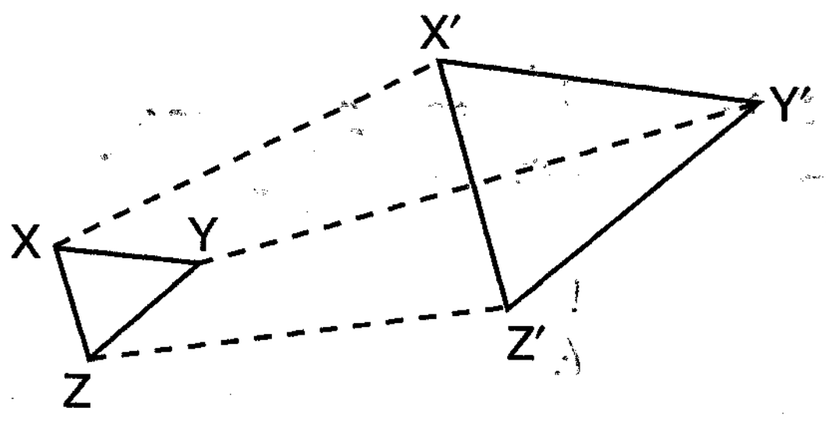
$\sqrt{625} = \sqrt{c^2}$

$25 = c$

Note: The ratio of these legs is $\frac{20}{15}$, which reduces to $\frac{4}{3}$, we are dealing w/ a 3/4/5 right Δ multiple

Use this space for computations.

11 The accompanying diagram shows the transformation of ΔXYZ to $\Delta X'Y'Z'$.



This transformation is an example of a

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

Makes the image bigger or smaller and keeps the same shape.

12 When a fair coin was tossed ten times, it landed heads up the first seven times. What is the probability that on the eighth toss the coin will land with tails up?

(1) $\frac{3}{10}$
(2) $\frac{1}{2}$
(3) $\frac{7}{10}$
(4) $\frac{3}{7}$

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

$P(\text{tail}) = \frac{1 \text{ tail}}{2 \text{ possible outcomes}} = \frac{1}{2}$

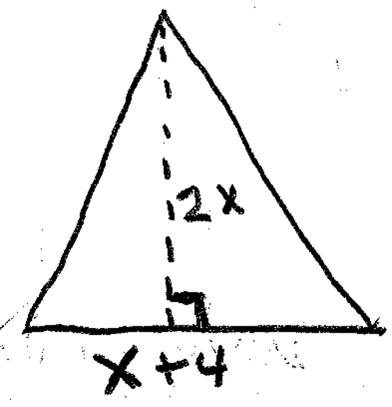
A coin has no memory. On the eighth toss, the coin does not remember the first seven tosses.

13 If the base of a triangle is represented by $x + 4$ and the height is represented by $2x$, which expression represents the area of the triangle?

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

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

$A_\Delta = \frac{1}{2}(x+4)2x$



14 Which property is illustrated by the equation $\frac{3}{2}x + 0 = \frac{3}{2}x$?

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

Same

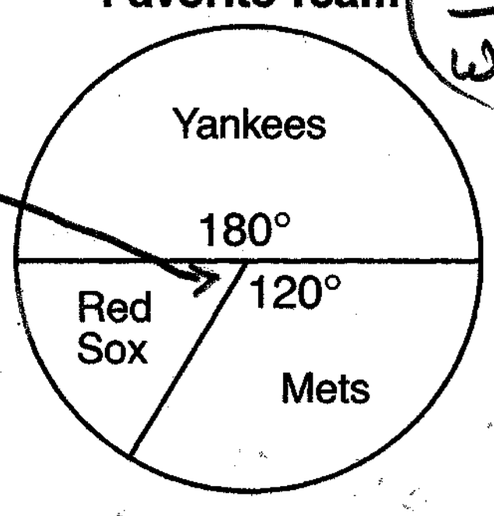
Additive

The identity element for an operation does not change the other term.

Use this space for computations.

15 In a recent poll in Syracuse, New York, 3,000 people were asked to pick their favorite baseball team. The accompanying circle graph shows the results of that poll.

All slices of the pie chart must sum to 360°



This central angle is
360° − (180° + 120°)
360° − (300°)
60°

Part/Whole ⇒ $\frac{60°}{360°} = \frac{x}{3000}$

$\frac{1}{6} = \frac{x}{3000}$

$6x = 3000$

$x = 500$

How many of the people polled picked the Red Sox as their favorite team?

(1) 300
(2) 500
(3) 1,200
(4) 1,800

16 Which ordered pair satisfies the system of equations below?

$$3x - y = 8$$
$$x + y = 2$$

(1) (3,−1)
(2) (2.5,−0.5)
(3) (2.5,0.5)
(4) (5,−3)

$3x - y = 8$ $\quad$ $x + y = 2$

$+y \quad +y$ $\quad$ $-x \quad -x$

$3x = 8 + y$ $\quad$ $y = -x + 2$

$-8 \quad -8$

$3x - 8 = y$

$3x - 8 = -x + 2$

$+x \quad +x$

$4x - 8 = 2$

$+8 \quad +8$

$4x = 10$

$x = 2.5$

$x + y = 2$

$2.5 + y = 2$

$-2.5 \quad -2.5$

$y = -.5$

17 What is the converse of the statement "If the Sun rises in the east, then it sets in the west"?

(1) If the Sun does not set in the west, then it does not rise in the east.
(2) If the Sun does not rise in the east, then it does not set in the west.
(3) If the Sun sets in the west, then it rises in the east.
(4) If the Sun rises in the west, then it sets in the east.

If 1, then 2	Given
If not 1, then not 2	Inverse
If 2, then 1	Converse
If not 2, then not 1	Contra-positive

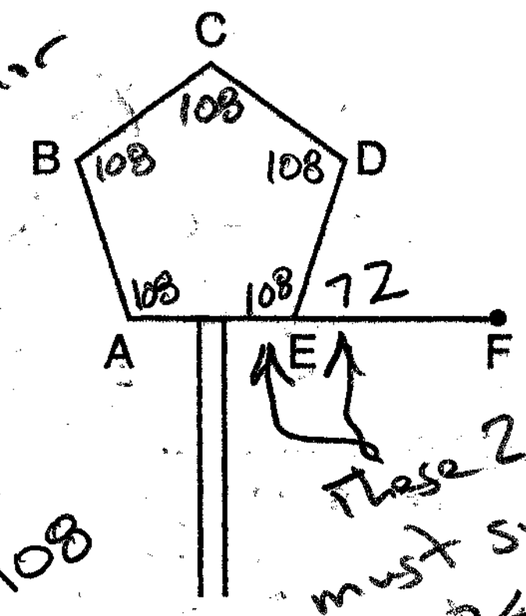
Memory Jogger
Inverse begins with in which rhymes with "n" which stands for not.

If 2, then 1

If the sun sets in the west, then the sun rises in the east

Use this space for computations.

18 One piece of the birdhouse that Natalie is building is shaped like a regular pentagon, as shown in the accompanying diagram.



Solution 1

5 equal angles

The sum of the interior angles is

$(n-2)180°$

$(5-2)180°$

$(3)180°$

$540°$

$n=5$

$\frac{540}{5} = 108$

These 2 angles must sum to $180°$ ← straight line

supplementary angles

$180-108 = 72°$

Solution 2

Exterior angles sum to $360°$

$\frac{360}{5} = 72°$

If side AE is extended to point F, what is the measure of exterior angle DEF?

(1) 36°
(2) 72°
(3) 108°
(4) 144°

19 If $c = 2m + d$, then m is equal to

(1) $\frac{c-d}{2}$
(2) $\frac{c}{2} - d$
(3) $c - \frac{d}{2}$
(4) $d - 2c$

Given $c = 2m + d$

S(d) $-d \quad -d$

$c - d = 2m$

D(2) $\frac{c-d}{2} = \frac{2m}{2}$

Answer $\frac{c-d}{2} = m$

20 According to the 2000 census, the population of New York State was approximately 18,900,000. How is this number expressed in scientific notation?

(1) 1890×10^4
(2) 18.9×10^6
(3) 1.89×10^7
(4) 189×10^5

18900000.
7 6 5 4 3 2 1

1.89×10^7

Moving left is positive

Moving right is negative

The decimal moves left here.

21 The graph of the equation $2x + 6y = 4$ passes through point $(x,-2)$. What is the value of x?

(1) −4
(2) 8
(3) 16
(4) 4

$2(x) + 6(y) = 4$

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

$2x + -12 = 4$

$+12 \quad +12$

Add 12

[6]

$2x = 16$

$x = 8$

Definition of parallel lines = same slope different intercept

$y = mx + b$ (slope, y-intercept)

Use this space for computations.

22 Which statement describes the lines whose equations are $y = \frac{1}{3}x + 12$ and $6y = 2x + 6$?

(1) They are segments.
(2) They are perpendicular to each other.
(3) They intersect each other.
(4) They are parallel to each other.

$y = \frac{1}{3}x + 12$ → y-intercept is 12; slope = $\frac{1}{3}$

$6y = 2x + 6$ → $\frac{6y}{6} = \frac{2x}{6} + \frac{6}{6}$ → $y = \frac{1}{3}x + 1$ (slope, y-intercept)

These lines have same slope + different y-intercept.

Not in $y = mx + b$ form

23 What is the total number of different four-letter arrangements that can be formed from the letters in the word "VERTICAL," if each letter is used only once in an arrangement?

(1) 8
(2) 1,680
(3) 6,720
(4) 40,320

1st 2nd 3rd 4th: $8 \times 7 \times 6 \times 5 = 1680$

Letter Choices: V E R T I C A L

24 The expression $\sqrt{28} + \sqrt{63}$ is equivalent to

(1) $\sqrt{91}$
(2) $5\sqrt{7}$
(3) $6\sqrt{7}$
(4) $13\sqrt{7}$

$\sqrt{28} + \sqrt{63}$

$\sqrt{4}\sqrt{7} + \sqrt{9}\sqrt{7}$

$2\sqrt{7} + 3\sqrt{7} = 5\sqrt{7}$

25 The solution set of the equation $x^2 - 4x - 12 = 0$ is

(1) {−6,2}
(2) {−4,3}
(3) {−2,6}
(4) {−3,4}

$x^2 - 4x - 12$

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

$x - 6 = 0$ $\quad x + 2 = 0$

$x = 6$ $\quad x = -2$

26 If $a = 3$ and $b = -1$, what is the value of $ab - b^2$?

(1) −2
(2) 2
(3) −4
(4) 4

$(a)(b) - (b)^2$

$3(-1) - (-1)^2$

$-3 - (1)$

-4

addition

27 What is the sum of $\frac{3}{7n}$ and $\frac{7}{3n}$?

(1) $\frac{1}{n}$

(2) $\frac{10}{21n}$

(3) $\frac{42}{21n}$

(4) $\frac{58}{21n}$

$\frac{3}{7n} + \frac{7}{3n}$

$\frac{3(3n) + 7(7n)}{(7n)(3n)} \Rightarrow \frac{9n + 49n}{21n^2}$

$\frac{58}{21n}$

Use this space for computations.

28 Max goes through the cafeteria line and counts seven different meals and three different desserts that he can choose. Which expression can be used to determine how many different ways Max can choose a meal and a dessert?

(1) $7 \bullet 3$

(2) $7! \bullet 3!$

(3) ${}_7C_3$

(4) ${}_7P_3$

Meal Choices | Dessert Choices

7 x 3 = 21

29 If the product of x and $\frac{1}{m}$ is -1, $m \neq 0$, then x is equivalent to

(1) m

(2) $-m$

(3) $1 - m$

(4) $-\frac{1}{m}$

$x\left(\frac{1}{m}\right) = -1$

$\frac{x}{1}\left(\frac{1}{m}\right) = \frac{-1}{1}$

$\frac{x}{m} = \frac{-1}{1}$

$x = -m$

30 Given the statement: "A right angle measures 90°." How is this statement written as a biconditional?

(1) If an angle is a right angle, then it measures 90°

(2) An angle is a right angle if, and only if, it measures 90°.

(3) An angle measures 90° and it is a right angle.

(4) If an angle does not measure 90°, then it is not a right angle.

biconditional ⟺ if and only if

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 If a United States dollar is worth $1.41 in Canadian money, how much is $100 in Canadian money worth in United States money, to the *nearest cent*?

$\frac{\text{United States}}{\text{Canada}} \Rightarrow \frac{1.00}{1.41} = \frac{X}{100.00}$

$1 \times 100 = 1.41X$ Cross Multiply

$100 = 1.41X$

$\frac{100}{1.41} = \frac{1.41X}{1.41}$ Divide 1.41

$70.9219... = X$

$\$70.92 = X$

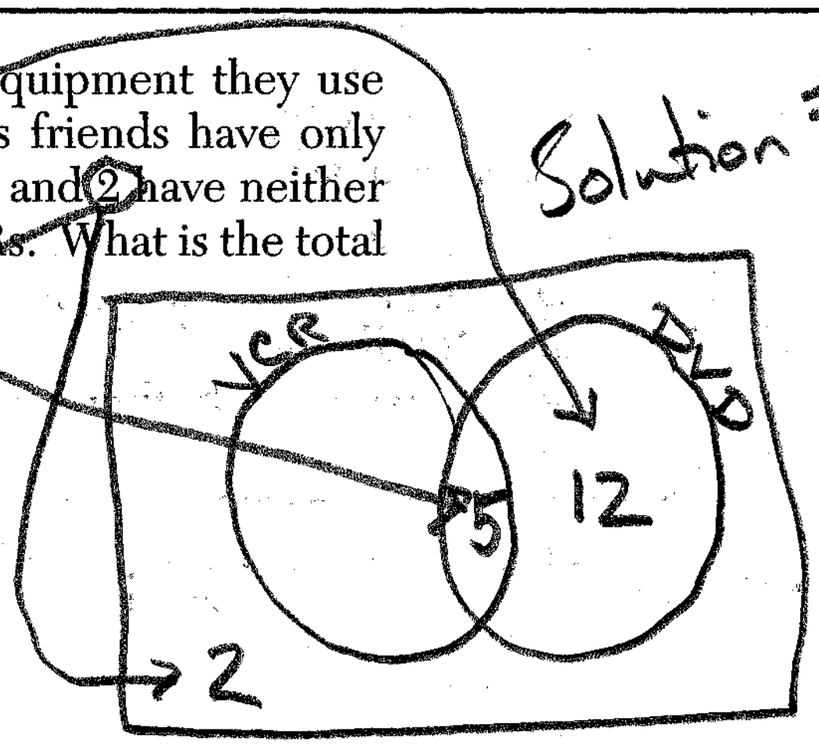
32 José surveyed 20 of his friends to find out what equipment they use to play recorded movies. He found that 12 of his friends have only DVD players, 5 have both DVD players and VCRs, and 2 have neither type of player. The rest of his friends have only VCRs. What is the total number of his friends that have VCRs?

Solution #1

	VCR	No VCR	Total
DVD	5	12	17
No DVD	1	2	3
Total	6	14	20

Total # of friends with VCRs = 6

Solution #2



Total = 20

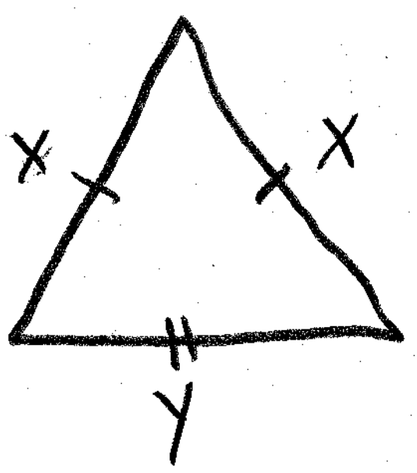
$20 - (2 + 12)$

$20 - (14)$

6

2 equal sides
2 equal angles

33 The perimeter of an isosceles triangle is 71 centimeters. The measure of one of the sides is 22 centimeters. What are all the possible measures of the other two sides?



22 cm,
27cm or 24.5cm

$X + X + Y = 71$

either X is 22
or Y is 22

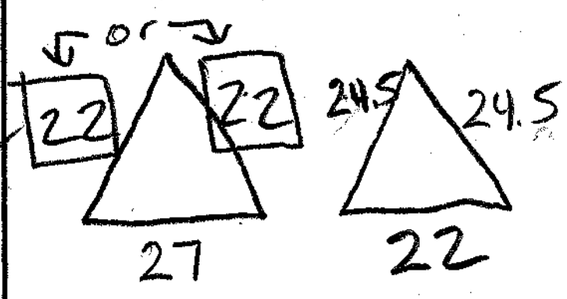
Let X be 22

$22 + 22 + Y = 71$
$44 + Y = 71$
$Y = 27$

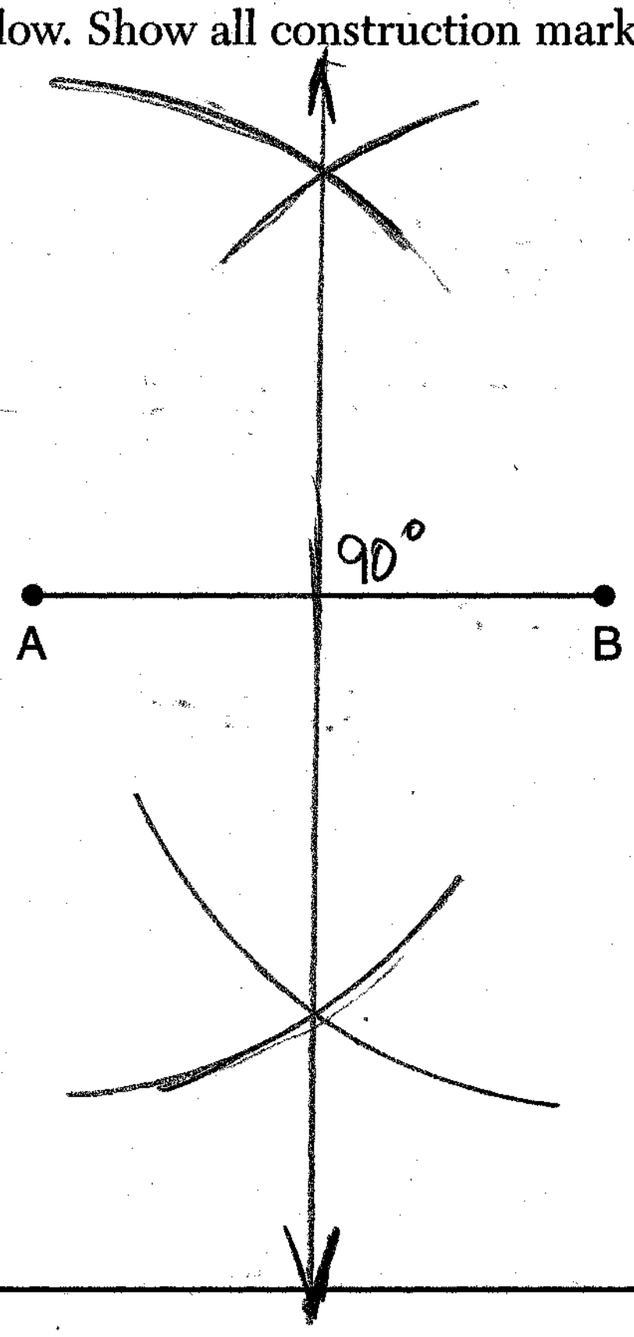
Let Y be 22

$X + X + 22 = 71$
$2X + 22 = 71$
$2X = 49$
$X = 24.5$

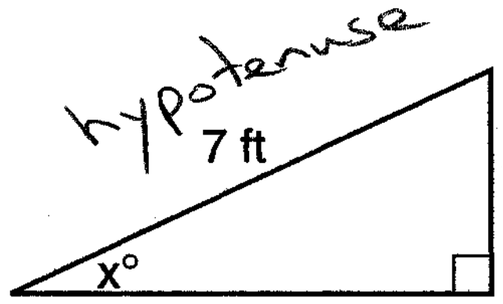
Check



34 Using a compass and straightedge, construct the perpendicular bisector of $\overline{AB}$ shown below. Show all construction marks.



35 Ron and Francine are building a ramp for performing skateboard stunts, as shown in the accompanying diagram. The ramp is 7 feet long and 3 feet high. What is the measure of the angle, x, that the ramp makes with the ground, to the *nearest tenth of a degree*?



opposite

Method 1 SOH-CAH-TOA

We are dealing with an angle, its opposite, and the hypotenuse

SOH-CAH-TOA ⇒ O and H are associated with the sine function

$\sin = \frac{O}{H}$ $\sin X = \frac{3}{7}$ opposite / hypotenuse

Note: Put calculator in degree mode

$\arcsin \frac{3}{7} = 25.3769....$

$= 25.4°$

2nd | sin | 3 | ÷ | 7 |) | Enter

Method 2 Law of Sines $\frac{\sin A}{a} = \frac{\sin B}{b} = \frac{\sin C}{c}$

$\frac{\sin 90°}{7} = \frac{\sin X}{3}$

$\frac{1}{7} = \frac{\sin X}{3}$

Cross multiply: $1(3) = 7(\sin X)$

$3 = 7 \sin X$

D(3): $\frac{3}{7} = \sin X$

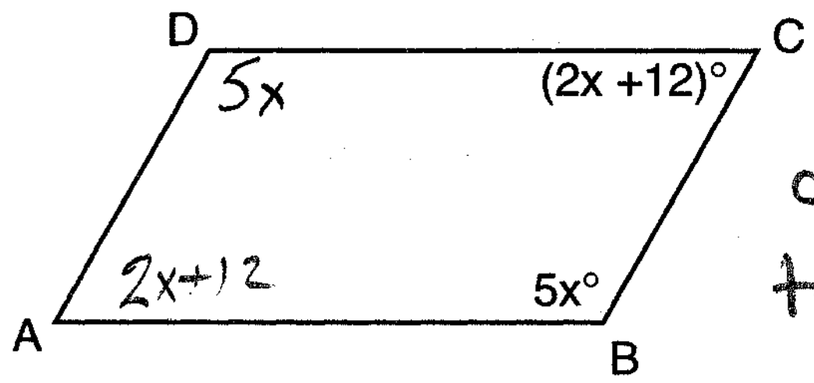
$\arcsin \frac{3}{7} = 25.3769...$

$= 25.4°$

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 In the accompanying diagram of parallelogram $ABCD$, $m\angle B = 5x$ and $m\angle C = 2x + 12$. Find the number of degrees in $\angle D$.



The interior angles of any quadrilateral sum to 360°.

$5x + (2x+12) + 5x + (2x+12) = 360$

$7x+12 \quad +7x+12 = 360$

$14x + 24 = 360$

$-24 \quad -24$

$14x = 336$

$x = 24$

$\angle D = 5x$

$\angle D = 5(24)$

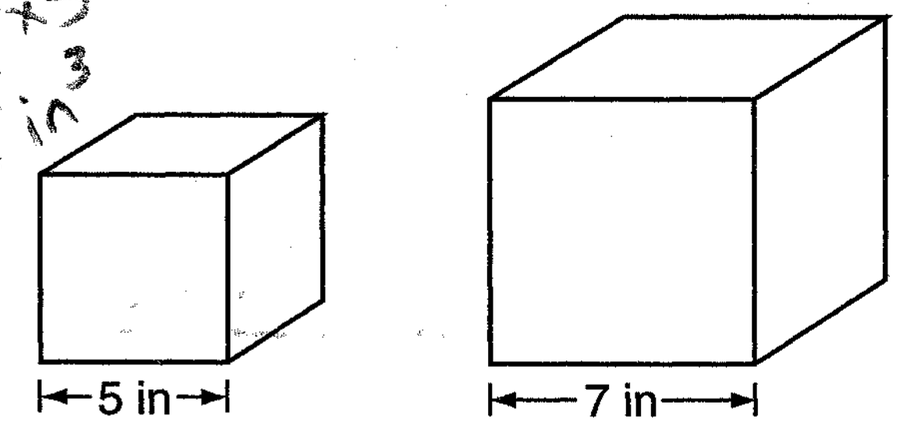
$\angle D = 120°$

37 Tracey has two empty cube-shaped containers with sides of 5 inches and 7 inches, as shown in the accompanying diagram. She fills the smaller container completely with water and then pours all the water from the smaller container into the larger container. How deep, to the *nearest tenth of an inch*, will the water be in the larger container?

Method 1

$V = 5 \times 5 \times 5$

$V = 125 \text{ in}^3$



$V = 7 \times 7 \times 7$

$V = 343 \text{ in}^3$

$$\frac{125 \text{ in}^3}{343 \text{ in}^3} = .3644314869\ldots$$

$$.3644314869\ldots \times 7 \text{ inches}$$

$$2.5510204408\ldots$$

2.6 inches

Method 2

Small Cube's Volume $= 5^3 = 125 \text{ in}^3$

Large Cube Volume = length × width × height

$= 7 \times 7 \times h$

$= 49h$

We want to know how high is 125 in^3 in the larger cube. Therefore

$D(49)$ $\quad 125 = 49h$

$2.5510204408 = h$

2.6 inches = h

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 Angelo, Brandon, and Carl work in the same office. Angelo's age is 4 years more than twice Carl's age. Brandon is 5 years younger than Carl. The average of the three ages is 41. Find the age of *each* of the men.

Angelo $= 2X+4$

Brandon $= X-5$

Carl $= X$

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

$41 = \frac{(2x+4)+(x-5)+x}{3}$

M(3) $41 = \frac{4x-1}{3}$

A(1) $123 = 4x-1$

D(4) $124 = 4x$

$31 = x$

Carl is 31 years old

Angelo is 66 years old

Brandon is 26 years old

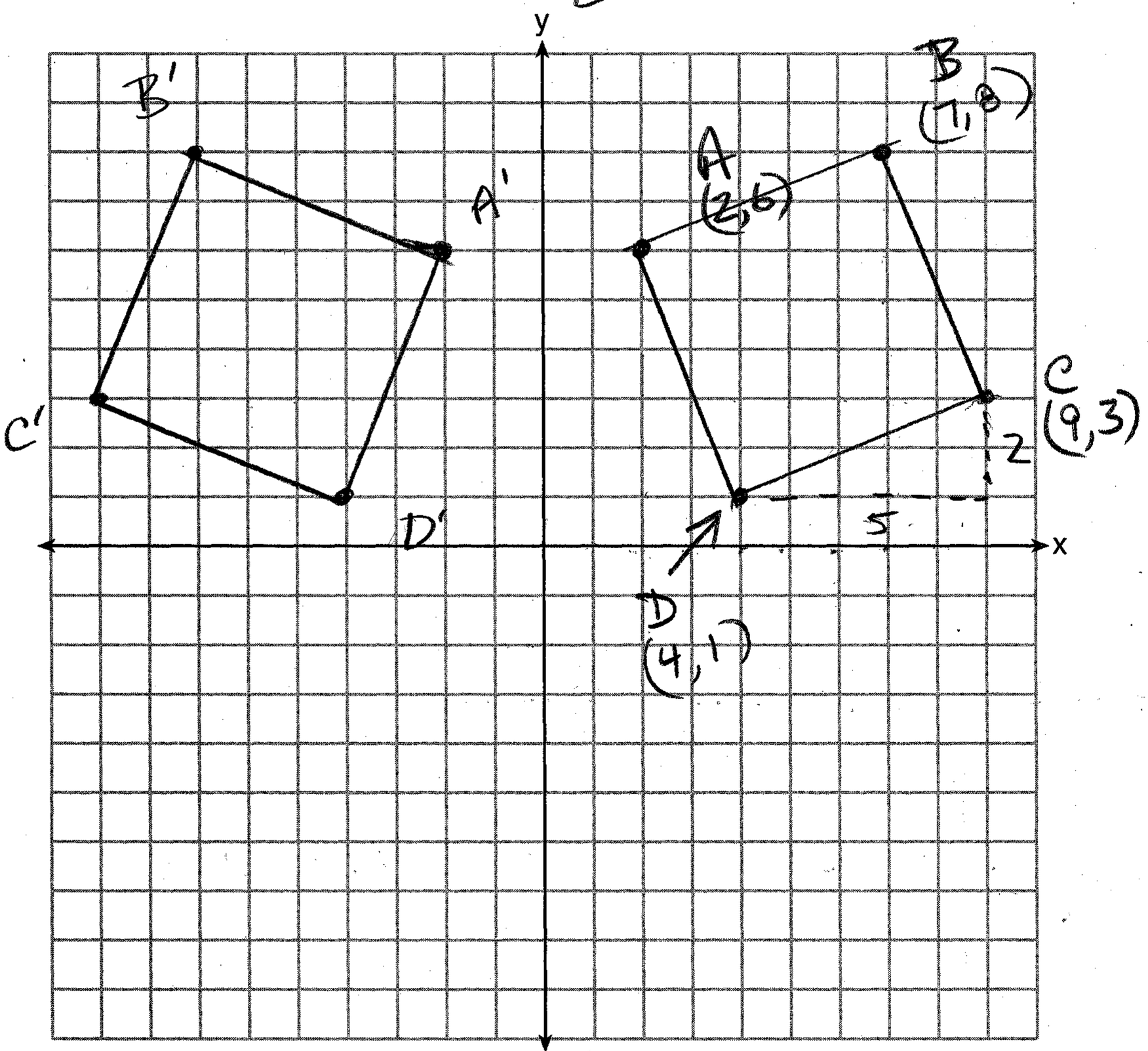
$x = 31$

$2X+4 \Rightarrow 2(31)+4$

$X-5 \Rightarrow 31-5$

39 Carson is a decorator. He often sketches his room designs on the coordinate plane. He has graphed a square table on his grid so that its corners are at the coordinates $A(2,6)$, $B(7,8)$, $C(9,3)$, and $D(4,1)$. To graph a second identical table, he reflects $ABCD$ over the y-axis.

On the accompanying set of coordinate axes, sketch and label $ABCD$ and its image $A'B'C'D'$, which show the locations of the two tables. Then find the number of square units in the area of $ABCD$.



Use Pythagorean Theorem to find length of one side of the square (See dotted lines)

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

$5^2+2^2=c^2$

$25+4=c^2$

$29=c^2$

$\rightarrow c=\sqrt{29} \Rightarrow$ each side is $\sqrt{29}$ of the square

$A_{\square}=s^2$

$A_{ABCD}=\left(\sqrt{29}\right)^2=$ **29 sq. units**

The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

MATHEMATICS A

Thursday, June 14, 2007 — 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	3	17	3	25	3
2	3	10	3	18	2	26	3
3	1	11	4	19	1	27	4
4	1	12	2	20	3	28	1
5	2	13	4	21	2	29	2
6	1	14	4	22	4	30	2
7	4	15	2	23	2		
8	1	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.

RSW

Signature