The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

# MATHEMATICS A

**Thursday,** June 16, 2005 — 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. 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.**

**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

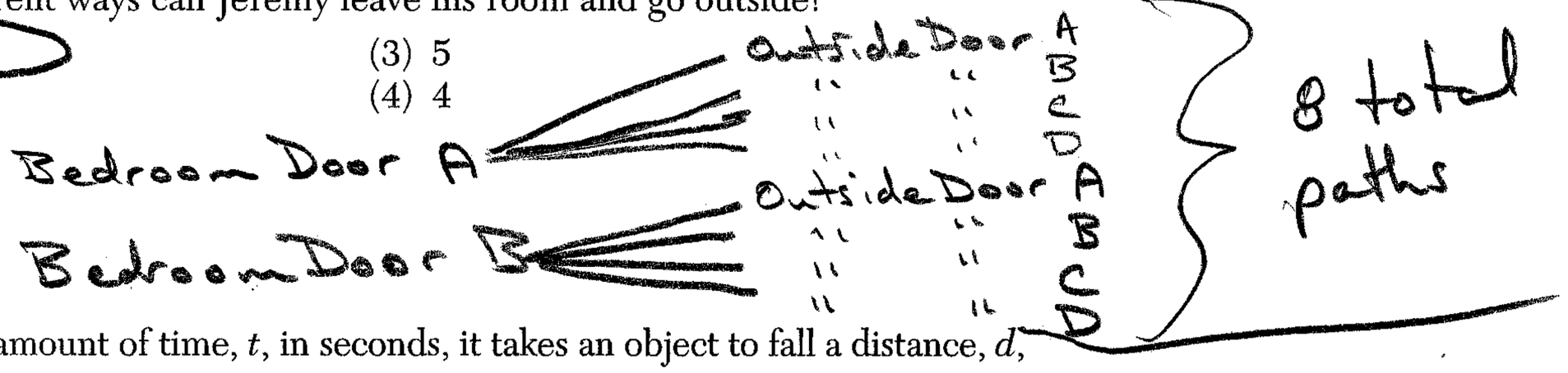
## Part I

**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]

**1** Jeremy's bedroom has two doors leading into the hallway. His house has four doors leading to the outside. Using the doorways, in how many different ways can Jeremy leave his room and go outside?

(1) 8
(2) 6
(3) 5
(4) 4

**Use this space for computations.**




**2** The amount of time, $t$, in seconds, it takes an object to fall a distance, $d$, in meters, is expressed by the formula $t = \sqrt{\frac{d}{4.9}}$. Approximately how long will it take an object to fall 75 meters?

(1) 0.26 sec
(2) 2.34 sec
(3) 3.9 sec
(4) 7.7 sec

$t = \sqrt{\frac{d}{4.9}}$
$d = 75$
$t = \sqrt{\frac{75}{4.9}}$
$t = 3.912303982$

**3** Which equation illustrates the distributive property?

(1) $5(a + b) = 5a + 5b$
(2) $a + b = b + a$
(3) $a + (b + c) = (a + b) + c$
(4) $a + 0 = a$

⇒ associative property of addition
⇒ Additive identity element
⇒ commutative property of addition

**4** The mass of an orchid seed is approximately 0.0000035 gram. Written in scientific notation, that mass is equivalent to $3.5 \times 10^n$. What is the value of $n$?

(1) –8
(2) –7
(3) –6
(4) –5

0.0000035
1 2 3 4 5 6

**5** A cake recipe calls for 1.5 cups of milk and 3 cups of flour. Seth made a mistake and used 5 cups of flour. How many cups of milk should he use to keep the proportions correct?

(1) 1.75
(2) 2
(3) 2.25
(4) 2.5

$\frac{\text{milk}}{\text{flour}} \Rightarrow \frac{1.5}{3} = \frac{x}{5}$
$1.5(5) = 3(x)$
$7.5 = 3x$
$2.5 = x$

**Use this space for computations.**

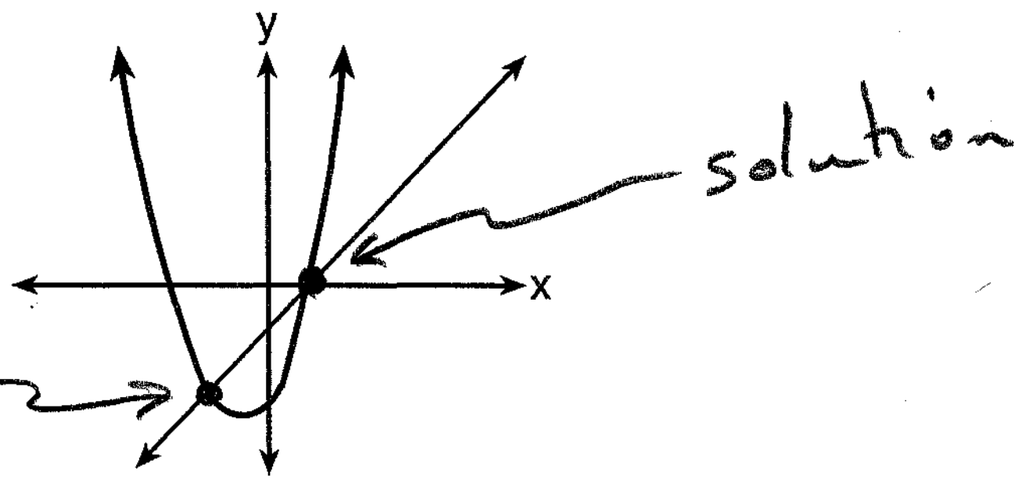
**6** When $3x^2 - 6x$ is divided by $3x$, the result is

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

$\frac{3x^2}{3x} - \frac{6x}{3x}$

$x - 2$

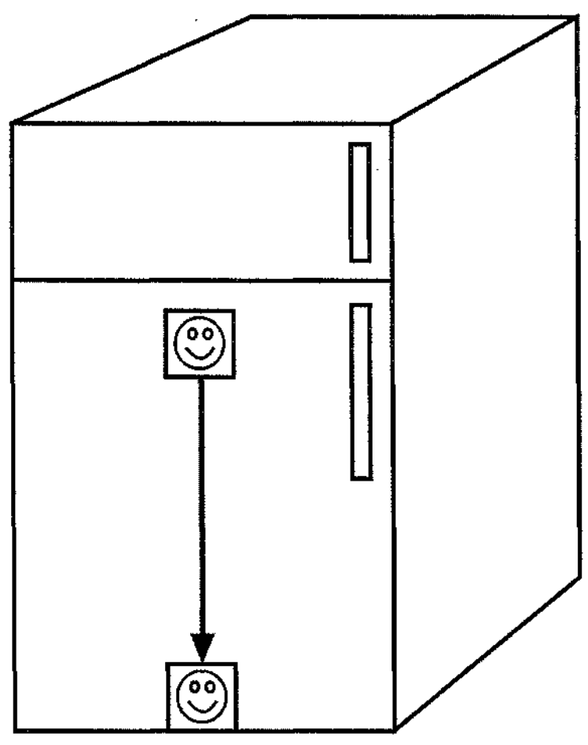
**7** The accompanying diagram shows the graphs of a linear equation and a quadratic equation.




How many solutions are there to this system of equations?

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

**8** A picture held by a magnet to a refrigerator slides to the bottom of the refrigerator, as shown in the accompanying diagram.



This change of position is an example of a

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

moves it in a circular direction

reflects it against a line or point.

makes it bigger or smaller

**9** Jorge made the accompanying stem-and-leaf plot of the weights, in pounds, of each member of the wrestling team he was coaching.

**Use this space for computations.**

| Stem | Leaf |
|---|---|
| 10 | 9 |
| 11 | |
| 12 | 3 8 |
| 13 | 2 4 4 6 8 |
| 14 | 1 3 5 5 9 |
| 15 | 2 3 7 7 9 |
| 16 | 1 3 7 8 8 8 9 |
| 17 | 3 8 |

Key: 16 | 1 = 161

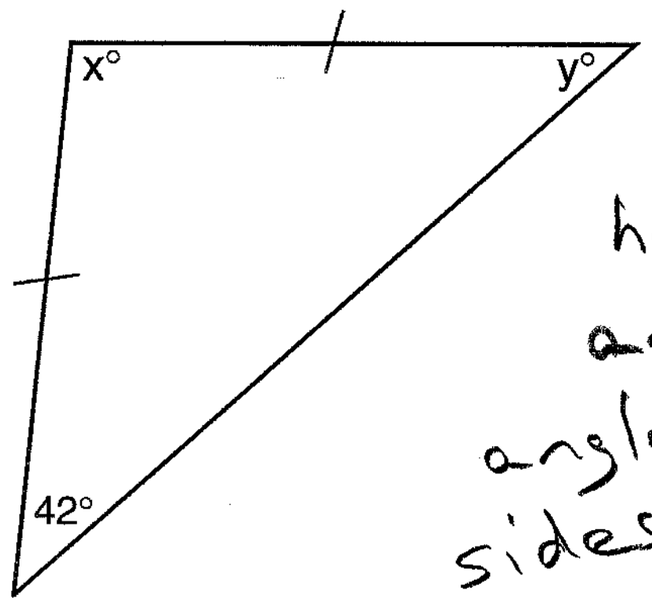
there are three 8s in this row. There are no other sets of three digits in any row. This is the most common number. It is 168, and it occurs three times

What is the mode of the weights?

(1) 145
(2) 150
(3) 152
(4) 168

Mode = most common #

**10** Tina wants to sew a piece of fabric into a scarf in the shape of an isosceles triangle, as shown in the accompanying diagram.




The Δ is isosceles, so it has 2 sides and 2 base angles that equal. The base angles are opposite the equal sides, so y must be 42°, the same as the other base angle. This leaves only option 4.

You can check it by adding 42+42+96 = 180, which is the correct # of degrees for a Δ.

What are the values of $x$ and $y$?

(1) $x = 42$ and $y = 96$
(2) $x = 69$ and $y = 69$
(3) $x = 90$ and $y = 48$
(4) $x = 96$ and $y = 42$

**11** The expression $(x^2 - 5x - 2) - (-6x^2 - 7x - 3)$ is equivalent to

(1) $7x^2 - 12x - 5$
(2) $7x^2 - 2x + 1$
(3) $7x^2 + 2x + 1$
(4) $7x^2 + 2x - 5$

To subtract, change the signs and add.

$x^2 - 5x - 2$
$+6x^2 + 7x + 3$
$7x^2 + 2x + 1$

**12** The expression $\sqrt{50} + \sqrt{32}$ is equivalent to

(1) $9\sqrt{2}$

(2) $\sqrt{82}$

(3) 6

(4) 18

$\sqrt{50} + \sqrt{32}$

$(\sqrt{2})(\sqrt{25}) + (\sqrt{2})(\sqrt{16})$

$\sqrt{2}(5) + \sqrt{2}(4)$

$5\sqrt{2} + 4\sqrt{2}$

$9\sqrt{2}$

**Use this space for computations.**

**13** If $7x + 2a = 3x + 5a$, then $x$ is equivalent to

(1) $\frac{7a}{10}$

(2) $\frac{7a}{4}$

(3) $\frac{3a}{10}$

(4) $\frac{3a}{4}$

$7x + 2a = 3x + 5a$

$-2a \quad -2a$

$7x = 3x + 3a$

$-3x \quad -3x$

$4x = 3a$

$x = \frac{3a}{4}$

**14** What is the solution set of the equation $x^2 + 11x + 28 = 0$?

(1) $\{-7,4\}$

(2) $\{-7,-4\}$

(3) $\{3,4\}$

(4) $\{-3,-4\}$

$x^2 + 11x + 28 = 0$

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

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

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

**15** Which set could *not* represent the lengths of the sides of a triangle?

(1) $\{3,4,5\}$

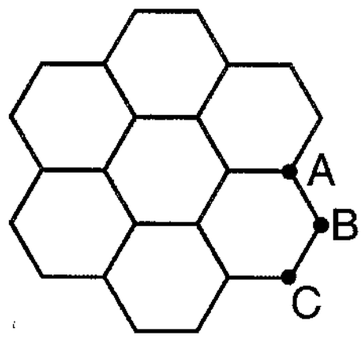
(2) $\{2,5,9\}$

(3) $\{5,10,12\}$

(4) $\{7,9,11\}$

↳ The sum of any two sides must be greater than the third side. $2 + 5 \neq 9$

**16** The accompanying figure represents a section of bathroom floor tiles shaped like regular hexagons.




What is the measure of angle $ABC$?

(1) 60°

(2) 90°

(3) 120°

(4) 150°

Sum of Interior Angles

△ = 180

▭ = 360

⬠ = 540

⬡ = 720

The question wants us to find the measure of an interior ∠ of a hexagon.

- There are 6 interior ∠s in a regular hexagon.
- The sum of the interior ∠s is 720°

$180°(\#\text{sides} - 2) = 720°$

$\frac{720°}{6} = 120°$

**17** The statement "If $x$ is prime, then it is odd" is *false* when $x$ equals

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

2 is prime and it is even, not odd.

**Use this space for computations.**

**18** If $x \neq 0$, then $\frac{(x^2)^3}{x^5} \cdot 1000$ is equivalent to

(1) $1000x$
(2) $1000 + x$
(3) 1000
(4) 0

$\frac{(x^2)^3}{x^5} \Rightarrow \frac{x^6}{x^5} = x$

Simplify the first term

Then multiply by 1000

**19** If $-2x + 3 = 7$ and $3x + 1 = 5 + y$, the value of $y$ is

(1) 1
(2) 0
(3) $-10$
(4) 10

$-2x + 3 = 7$
$-3 \quad -3$
$-2x = 4$
$x = -2$

$3x + 1 = 5 + y$
$3(-2) + 1 = 5 + y$
$-6 + 1 = 5 + y$
$-5 = 5 + y$
$-5 \quad -5$
$-10 = y$

**20** What is the converse of the statement "If it is Sunday then I do not go to school"?

(1) If I do not go to school, then it is Sunday.
(2) If it is not Sunday, then I do not go to school.
(3) If I go to school, then it is not Sunday.
(4) If it is not Sunday, then I go to school.

1 = it is Sunday
2 = I do not go to school

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

If I do not go to school, then it is Sunday.

**21** If point $(-1,0)$ is on the line whose equation is $y = 2x + b$, what is the value of $b$?

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

$(x, y)$
$(-1, 0)$
$y = 2x + b$
$0 = 2(-1) + b$
$0 = -2 + b$
$+2 \quad +2$
$2 = b$

**22** If $r = 2$ and $s = -7$, what is the value of $|r| - |s|$?

(1) 5
(2) –5
(3) 9
(4) –9

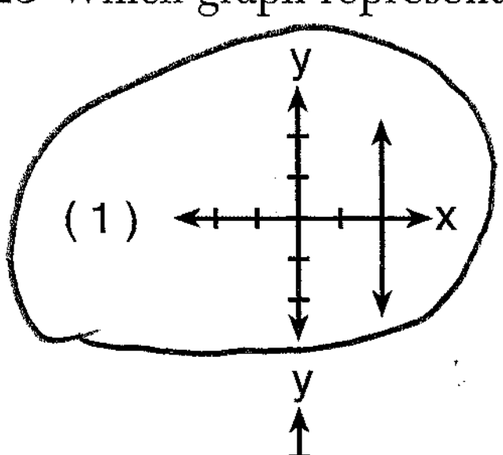
$|r| - |s|$

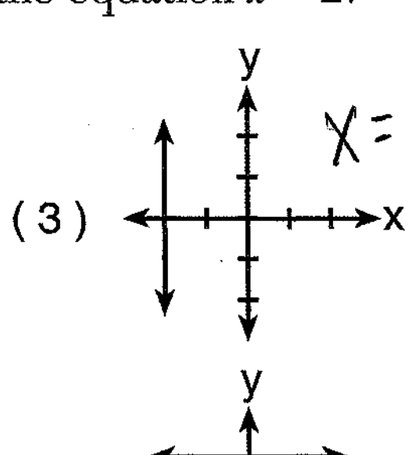
$|2| - |-7|$

$2 - 7 \Longrightarrow -5$

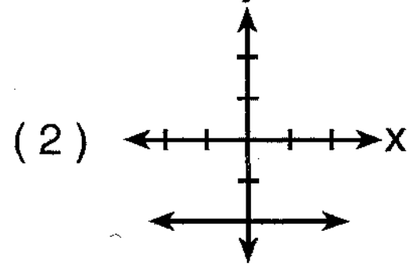
**Use this space for computations.**

**23** Which graph represents the equation $x = 2$?

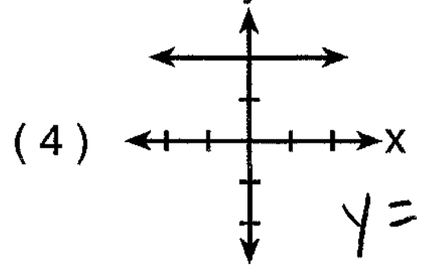
(1)



(3)


x = -2

(2)


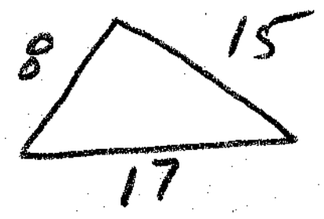
y = -2

(4)


y = 2

**24** On a scale drawing of a new school playground, a triangular area has sides with lengths of 8 centimeters, 15 centimeters, and 17 centimeters. If the triangular area located on the playground has a perimeter of 120 meters, what is the length of its longest side?

(1) 24 m
(2) 40 m
(3) 45 m
(4) 51 m




$P_\Delta = 8 + 15 + 17$

$P_\Delta = 40$ cm

$\frac{120}{40} = \frac{3 \text{ meters}}{1 \text{ cm}}$

The scale is 3 meters for every centimeter

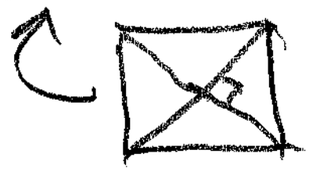
$17 \text{ cm} \times \frac{3 \text{ m}}{\text{cm}} = 51 \text{ m}$

**25** If $a$ and $b$ are both odd integers, which expression must always equal an odd integer?

(1) $a + b$ even
(2) $a - b$ even
(3) $a \cdot b$
(4) $\frac{a}{b}$ could be a non-integer fraction

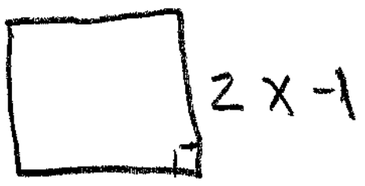
**26** Which quadrilateral must have diagonals that are congruent and perpendicular?

(1) rhombus ⊥, but not congruent
(2) square
(3) trapezoid — not ⊥ or congruent
(4) parallelogram — not necessarily ⊥ or congruent



**27** The length of a side of a square window in Jessica's bedroom is represented by $2x - 1$. Which expression represents the area of the window?

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




**Use this space for computations.**

$(2x-1)^2$
$(2x-1)(2x-1)$
$4x^2 - 2x - 2x + 1$
$4x^2 - 4x + 1$

**28** Which equation represents a line that is perpendicular to the line whose equation is $-2y = 3x + 7$?

(1) $y = x + 7$
(2) $2y = 3x - 3$
(3) $y = \frac{2}{3}x - 3$
(4) $y = \frac{3}{2}x - 3$

$-2y = 3x + 7$
$y = \frac{3x}{-2} + \frac{7}{-2}$
$y = -\frac{3}{2}x - 3\frac{1}{2}$
$m = \frac{-3}{2}$ $\perp m = \frac{2}{3}$

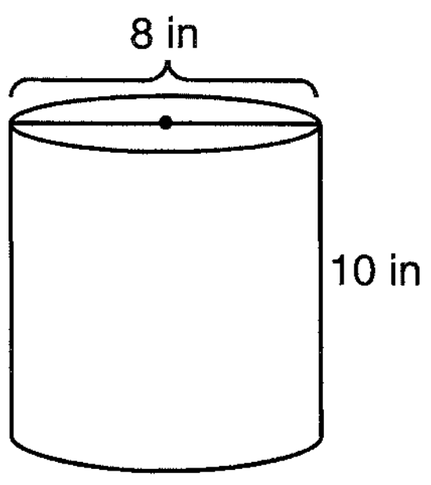
Perpendicular lines have slopes that are negative reciprocals.

**29** The probability that the Cubs win their first game is $\frac{1}{3}$. The probability that the Cubs win their second game is $\frac{3}{7}$. What is the probability that the Cubs win both games?

(1) $\frac{16}{21}$
(2) $\frac{1}{7}$
(3) $\frac{6}{7}$
(4) $\frac{2}{5}$

$P_{(A+B)} = P_{(A)} \cdot P_{(B)}$
$P(\text{win+win}) = \frac{1}{3} \cdot \frac{3}{7}$
$= \frac{3}{21} \Rightarrow \frac{1}{7}$

**30** A storage container in the shape of a right circular cylinder is shown in the accompanying diagram.




$V = (\text{area})(\text{height})$
$A_0 = \pi r^2$
$D = 8$
$r = 4$
$A_0 = \pi 4^2 \Rightarrow 16\pi$
$V = (16\pi)\,10 \Rightarrow 160\pi$
$160\pi \approx 502.654824$

What is the volume of this container, to the *nearest hundredth*?

(1) 56.55 $in^3$
(2) 125.66 $in^3$
(3) 251.33 $in^3$
(4) 502.65 $in^3$

## 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** A ribbon 56 centimeters long is cut into two pieces. One of the pieces is three times longer than the other. Find the lengths, in centimeters, of *both* pieces of ribbon.


$x + 3x = 56$

$4x = 56$

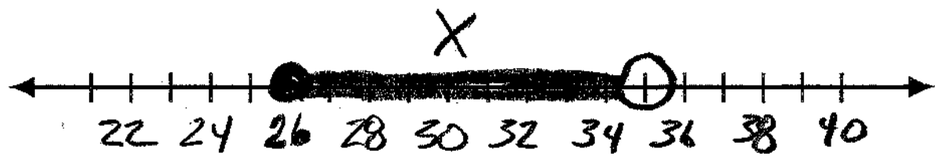
$x = 14$

The short piece is 14 cm

The long piece is 42 cm

check: $14 + 42 = 56$ ✓

**32** The manufacturer of Ron's car recommends that the tire pressure be at least 26 pounds per square inch and less than 35 pounds per square inch. On the accompanying number line, graph the inequality that represents the recommended tire pressure.



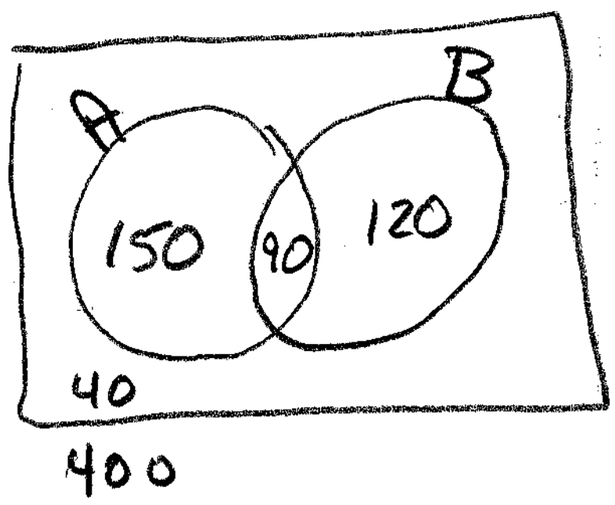

$26 \leq X < 35$

**33** In a survey of 400 teenage shoppers at a large mall, 240 said they shopped at Abernathy's, 210 said they shopped at Bongo Republic, and 90 said they shopped at both stores. How many of the teenage shoppers surveyed did not shop at either store?

Solution #1

| | A | Not A | Total |
|---|---|---|---|
| B | 90 | 120 | 210 |
| Not B | 150 | 40 | 190 |
| Total | 240 | 160 | 400 |

Solution #2




40 students did not shop at either store

**34** An algebra class of 21 students must send 5 students to meet with the principal. How many different groups of 5 students could be formed from this class?

$_{21}C_5 = \frac{21 \cdot 20 \cdot 19 \cdot 18 \cdot 17}{5 \cdot 4 \cdot 3 \cdot 2 \cdot 1} = 20,349$

# boxes top + bottom

last # in bottom box

last # in top box

**35** Factor completely: $3x^2 + 15x - 42$

$3x^2 + 15x - 42$

$3(x^2 + 5x - 14)$

$3(x + \_\_)(x - \_\_)$

Factors of -14 are 2 and 7, 1 and 14

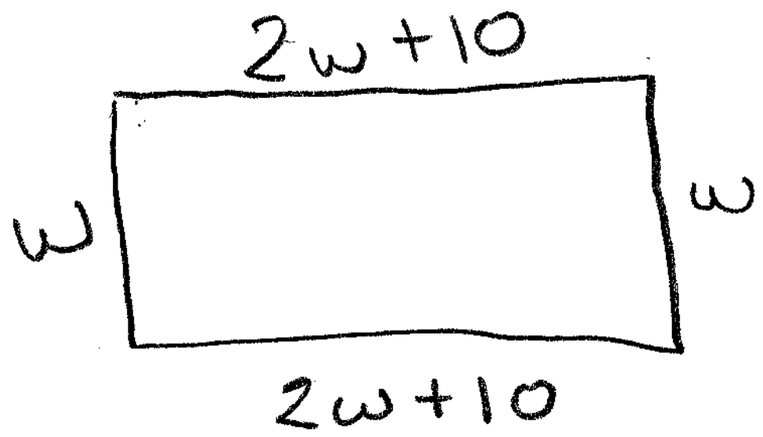
To get a negative 14, one must be + and one (-)

$3(x + 7)(x - 2)$

## 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** Mr. James wanted to plant a garden that would be in the shape of a rectangle. He was given 80 feet of fencing to enclose his garden. He wants the length to be 10 feet more than twice the width. What are the dimensions, in feet, for a rectangular garden that will use exactly 80 feet of fencing?



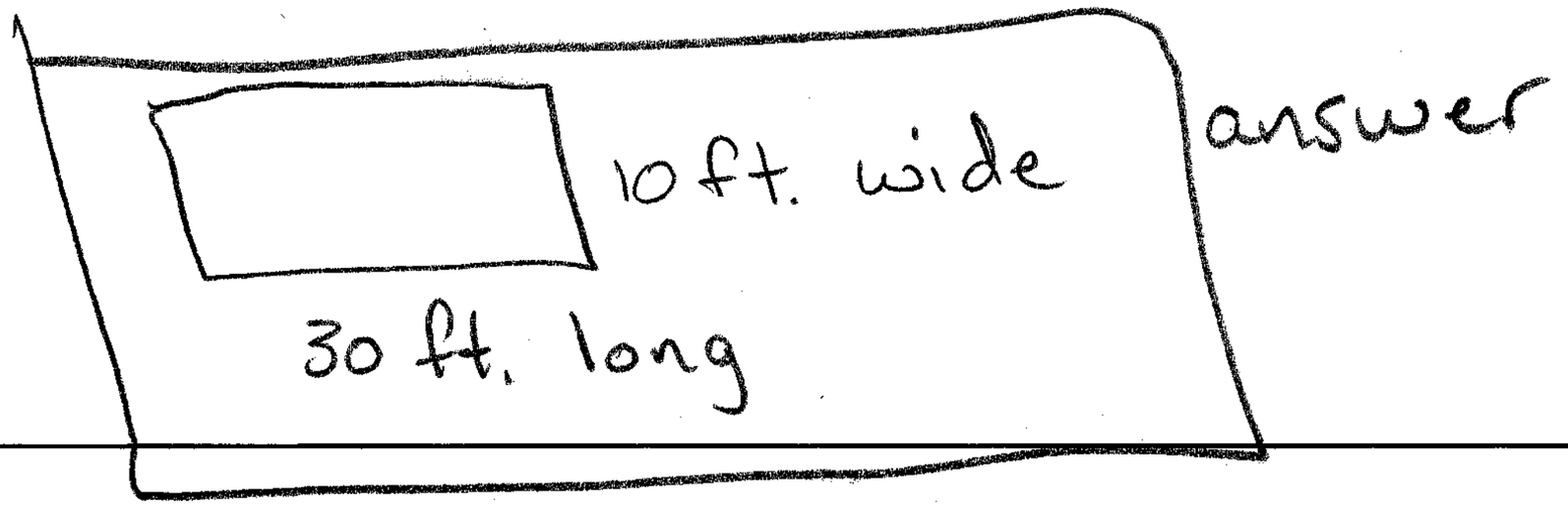

$2(w + 2w + 10) = 80$

$2w + 4w + 20 = 80$

$-20 \quad -20$

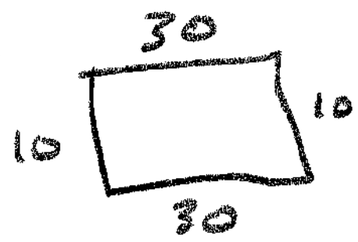
$6w = 60$

$w = 10$




answer

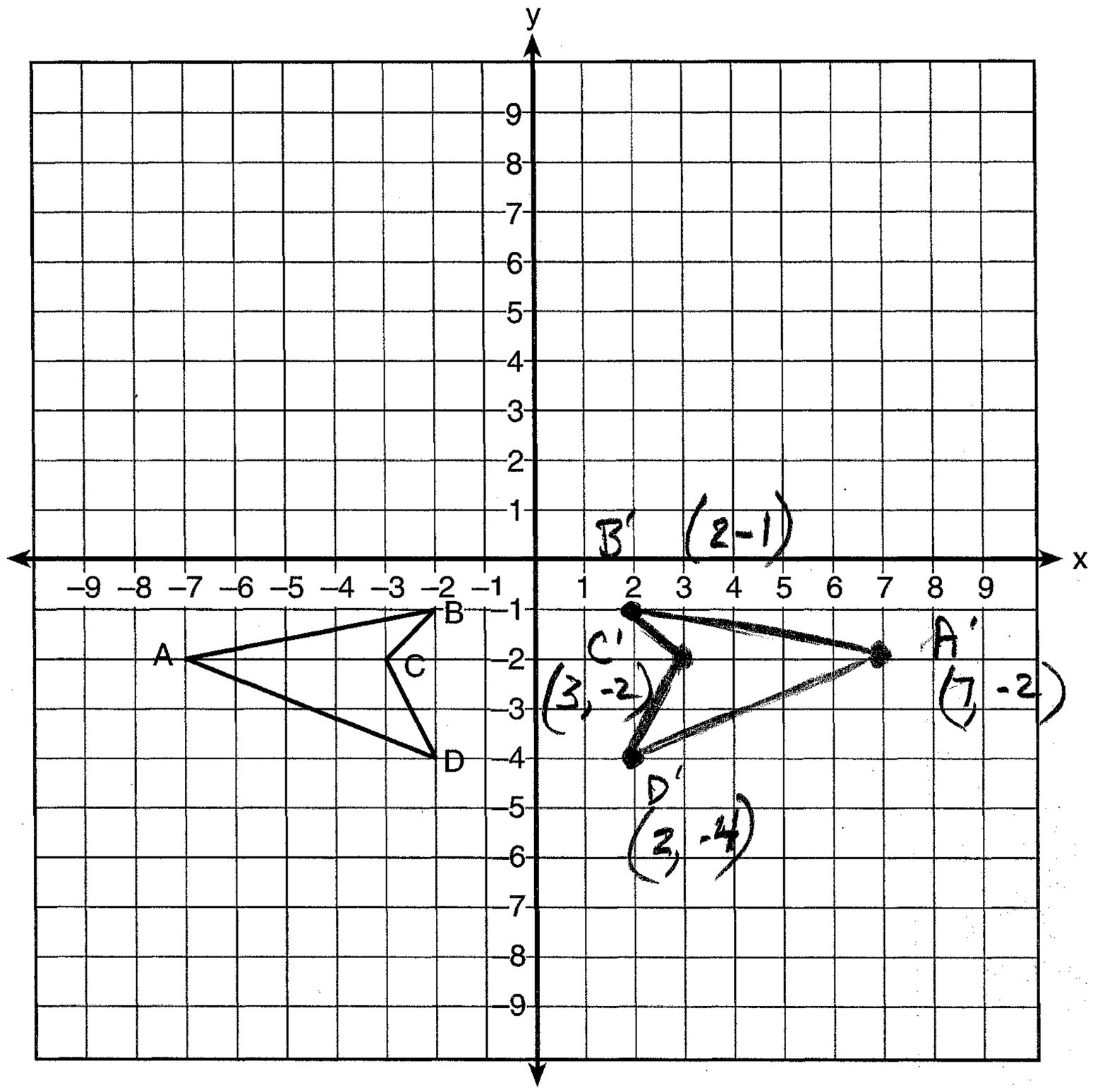
check




$30 + 10 + 30 + 10 = 80$ ✓

[12]

**37** On the accompanying set of axes, draw the reflection of $ABCD$ in the $y$-axis. Label and state the coordinates of the reflected figure.

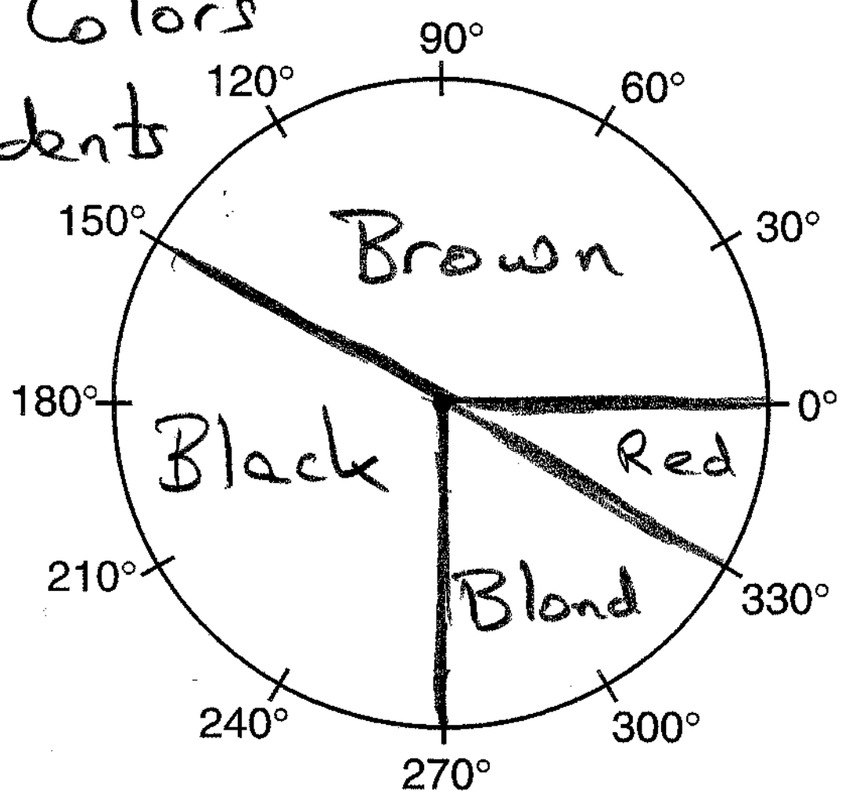


## Part IV

**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 a class of 24 students, 10 have brown hair, 8 have black hair, 4 have blond hair, and 2 have red hair. On the accompanying diagram, construct a circle graph to show the students' hair color.

Hair Colors of Students




$\frac{1}{24} = \frac{X}{360°}$

$360° = 24X$

$15° = X$

$15° = 1$ student

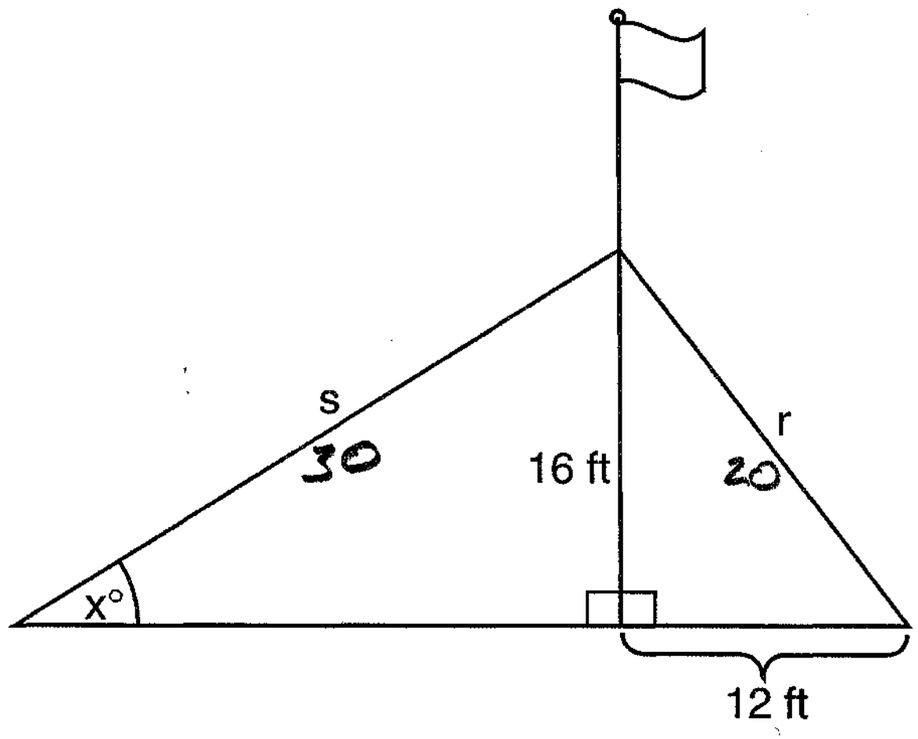
Brown $\frac{10}{24}$ $150°$ $10 \times 15° = 150°$

Black $\frac{8}{24}$ $120°$ $8 \times 15° = 120°$

Blond $\frac{4}{24}$ $60°$ $4 \times 15° = 60°$

Red $\frac{2}{24}$ $30°$ $2 \times 15° = 30°$

**39** The accompanying diagram shows a flagpole that stands on level ground. Two cables, $r$ and $s$, are attached to the pole at a point 16 feet above the ground. The combined length of the two cables is 50 feet. If cable $r$ is attached to the ground 12 feet from the base of the pole, what is the measure of the angle, $x$, to the *nearest degree*, that cable $s$ makes with the ground?




$s + r = 50$

$r^2 = (12)^2 + (16)^2$

$r^2 = 144 + 256$

$r^2 = 400$

$r = 20$

$s + r = 50$

$r = 20$

$\therefore s = 30$

SOH - CAH - TOA

$S = \frac{O}{H}$ $C = \frac{A}{H}$ $T = \frac{O}{A}$

$\sin X^\circ = \frac{16}{30}$

$\sin X^\circ = .5\overline{33}$

$\arcsin .5\overline{33} = 32^\circ$

Tear Here

**The University of the State of New York**

REGENTS HIGH SCHOOL EXAMINATION

# MATHEMATICS A

**Thursday,** June 16, 2005 — 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 1 | 9 4 | 17 2 | 25 3 |
| 2 3 | 10 4 | 18 1 | 26 2 |
| 3 1 | 11 3 | 19 3 | 27 4 |
| 4 3 | 12 1 | 20 1 | 28 3 |
| 5 4 | 13 4 | 21 2 | 29 2 |
| 6 4 | 14 2 | 22 2 | 30 4 |
| 7 2 | 15 2 | 23 1 | |
| 8 1 | 16 3 | 24 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.**

RSW

**Signature**

Tear Here