The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

INTEGRATED ALGEBRA

Thursday, January 29, 2009 – 1:15 to 4:15 p.m., only

Print Your Name: Steve Watson

Print Your School's Name: THS @ 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. 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.

The formulas that you may need to answer some questions in this examination are found at the end of the examination. This sheet is perforated so you may remove it from this booklet.

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 graphing calculator and a straightedge (ruler) 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 On a certain day in Toronto, Canada, the temperature was 15° Celsius (C). Using the formula $F = \frac{9}{5}C + 32$, Peter converts this temperature to degrees Fahrenheit (F). Which temperature represents 15°C in degrees Fahrenheit?

(1) –9
(2) 35
(3) 59
(4) 85

$F = \frac{9}{5}C + 32$

$F = \frac{9}{5}(15) + 32$

$F = \left(\frac{9}{5}\right)\left(\frac{15}{1}\right)^{3} + 32$

$F = 27 + 32 \Rightarrow 59$

2 What is the speed, in meters per second, of a paper airplane that flies 24 meters in 6 seconds?

(1) 144
(2) 30
(3) 18
(4) 4

$\frac{\text{meters}}{\text{seconds}} \quad \frac{24}{6} = \frac{x}{1}$

$6x = 24$

$x = 4$

3 The faces of a cube are numbered from 1 to 6. If the cube is rolled once, which outcome is *least* likely to occur?

(1) rolling an odd number $P_{(odd)} = \frac{3}{6}$
(2) rolling an even number $P_{(even)} = \frac{3}{6}$
(3) rolling a number less than 6 $P_{(<6)} = \frac{5}{6}$
(4) rolling a number greater than 4 $P_{(>4)} = \frac{2}{6}$

$P_{(event)} = \frac{\#\text{ desirable outcomes}}{\#\text{ possible outcomes}}$

.07 m

Use this space for computations.

4 Tamara has a cell phone plan that charges $0.07 per minute plus a monthly fee of $19.00. She budgets $29.50 per month for total cell phone expenses without taxes. What is the maximum number of minutes Tamara could use her phone each month in order to stay within her budget?

(1) 150

(2) 271

(3) 421

(4) 692

$19 + .07m \leq 29.50$

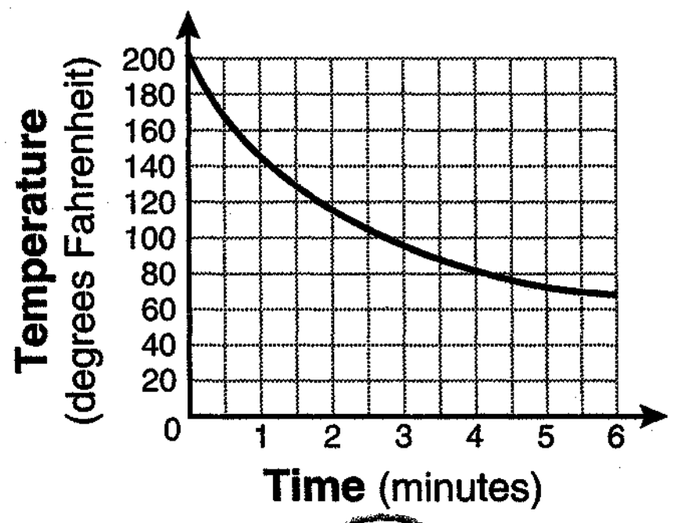
$-19 \quad -19.00$

$.07m \leq 10.50$

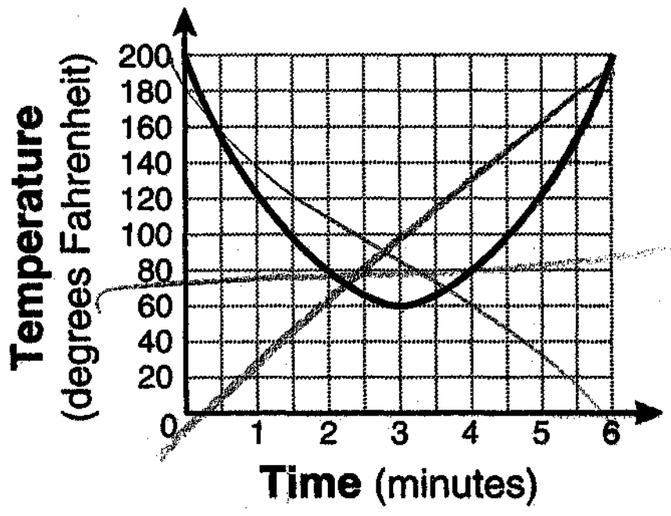
$m \leq \frac{10.50}{.07}$

$m \leq 150$

5 Antwaan leaves a cup of hot chocolate on the counter in his kitchen. Which graph is the best representation of the change in temperature of his hot chocolate over time?



(1)



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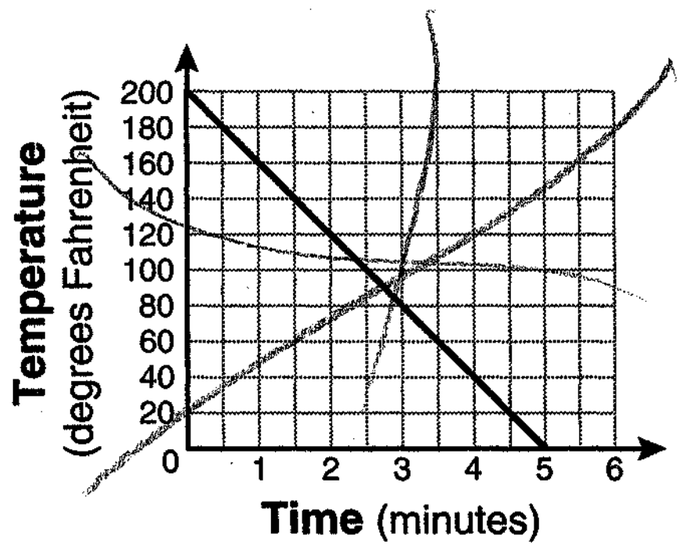

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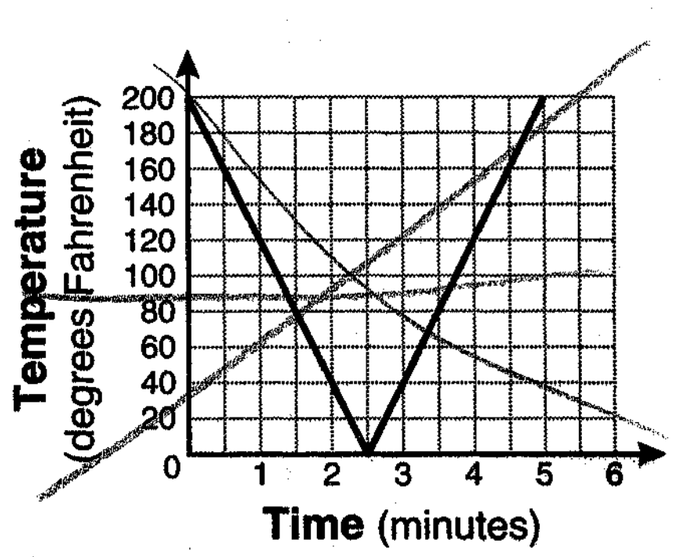


(4)

6 What is the solution of $\frac{k+4}{2} = \frac{k+9}{3}$?

(1) 1

(2) 5

(3) 6

(4) 14

$\frac{k+4}{2} = \frac{k+9}{3}$

$3(k+4) = 2(k+9)$

$3k+12 = 2k+18$

$-2k \quad -2k$

$k + 12 = 18$

$-12 \quad -12$

$k = 6$

Check $\frac{6+4}{2} = \frac{6+9}{3}$

$\frac{10}{2} = \frac{15}{3}$

$5 = 5$ ✓

Use this space for computations.

7 Alex earned scores of 60, 74, 82, 87, 87, and 94 on his first six algebra tests. What is the relationship between the measures of central tendency of these scores?

(1) median < mode < mean
(2) mean < mode < median
(3) mode < median < mean
(4) mean < median < mode

60
74
82
87 } mode
87
94
484

mode = 87 median = $\frac{82+87}{2} = \frac{169}{2} = 84.5$

mean = $\frac{484}{6} = 80.6\overline{6}$ mode > median > mean
mean < median < mode

8 The New York Volleyball Association invited 64 teams to compete in a tournament. After each round, half of the teams were eliminated. Which equation represents the number of teams, t, that remained in the tournament after r rounds?

(1) $t = 64(r)^{0.5}$
(2) $t = 64(-0.5)^r$
(3) $t = 64(1.5)^r$
(4) $t = 64(0.5)^r$

r	teams left
0	64
1	32
2	16
3	8
4	4
5	2
6	1

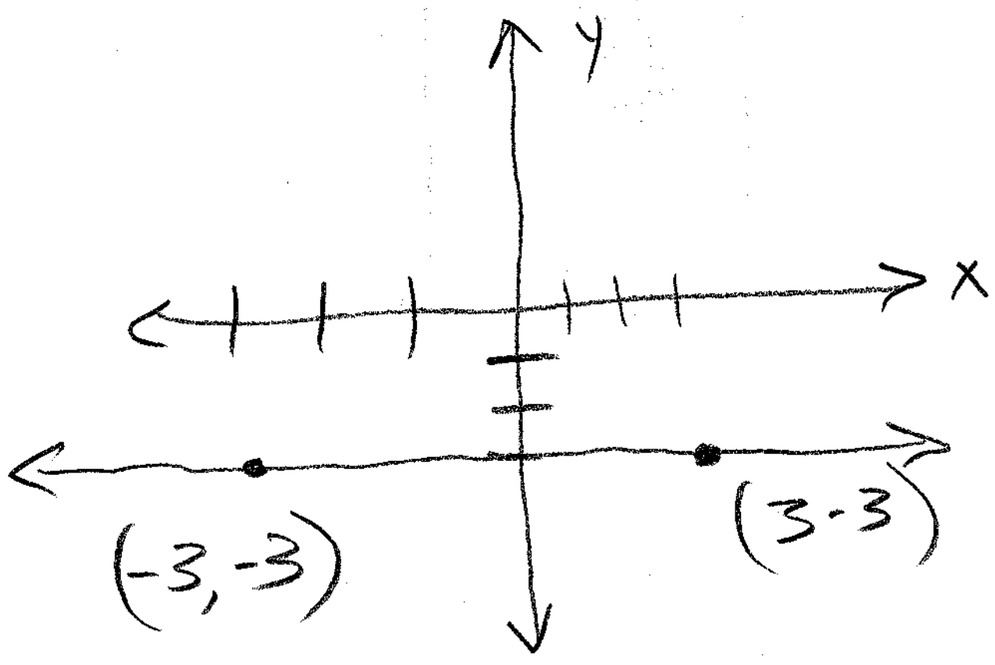
9 The expression $9x^2 - 100$ is equivalent to

(1) $(9x - 10)(x + 10)$
(2) $(3x - 10)(3x + 10)$
(3) $(3x - 100)(3x - 1)$
(4) $(9x - 100)(x + 1)$

Difference of perfect squares
$(a^2 - b^2) = (a+b)(a-b)$ $9x^2 - 100 = (3x+10)(3x-10)$

10 What is an equation of the line that passes through the points (3,–3) and (–3,–3)?

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



Use this space for computations.

11 If the formula for the perimeter of a rectangle is $P = 2l + 2w$, then w can be expressed as

(1) $w = \frac{2l - P}{2}$

(2) $w = \frac{P - 2l}{2}$

(3) $w = \frac{P - l}{2}$

(4) $w = \frac{P - 2w}{2l}$

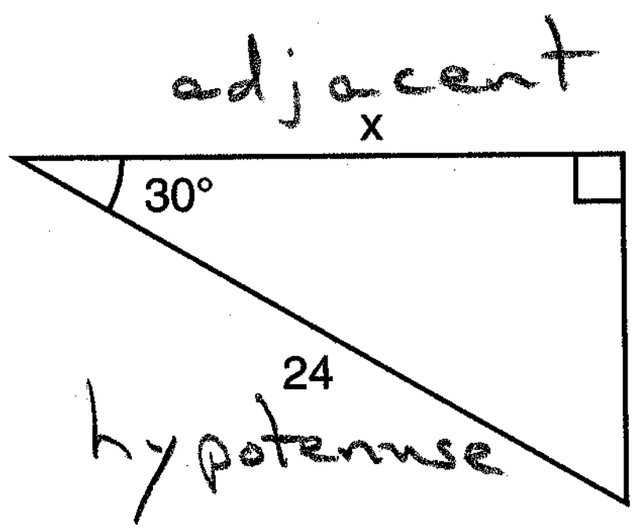
$P = 2l + 2w$

$-2l \quad -2l$

$P - 2l = 2w$

$\frac{P - 2l}{2} = w$

12 In the right triangle shown in the diagram below, what is the value of x to the *nearest whole number*?



adjacent

opposite

hypotenuse

(1) 12

(2) 14

(3) 21

(4) 28

SOH - CAH - TOA

We know hypotenuse

We want to know adjacent.

hypotenuse + adjacent

CAH

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

$\cos 30° = \frac{x}{24}$

$24 \cos 30° = x$

* Set calculator to degrees

$20.78460969 = x$

Note: This is a 30-60-90 Δ, so x is in the ratio of $\frac{\sqrt{3}}{2}$ w/ hypotenuse $\frac{\sqrt{3}}{2} = \frac{x}{24}$

13 What is the slope of the line that passes through the points (2,5) and (7,3)?

(1) $-\frac{5}{2}$

(2) $-\frac{2}{5}$

(3) $\frac{8}{9}$

(4) $\frac{9}{8}$

$(x_1, y_1) \quad (x_2, y_2)$

$(2, 5) \quad (7, 3)$

$m = \frac{y_2 - y_1}{x_2 - x_1}$

$m = \frac{3 - 5}{7 - 2}$

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

Use this space for computations.

14 What are the roots of the equation $x^2 - 10x + 21 = 0$?

(1) 1 and 21

(3) 3 and 7

(2) –5 and –5

(4) –3 and –7

$x^2 - 10x + 21 = 0$

$(x-3)\quad (x-7) = 0$

$x - 3 = 0 \qquad x - 7 = 0$

$x = 3 \qquad x = 7$

-or- put the equation in a graphing calculator and see where the graph crosses the x-axis

15 Rhonda has \$1.35 in nickels and dimes in her pocket. If she has six more dimes than nickels, which equation can be used to determine x, the number of nickels she has?

(1) $0.05(x + 6) + 0.10x = 1.35$

(2) $0.05x + 0.10(x + 6) = 1.35$

(3) $0.05 + 0.10(6x) = 1.35$

(4) $0.15(x + 6) = 1.35$

Let n = # nickels

Let d = # dimes

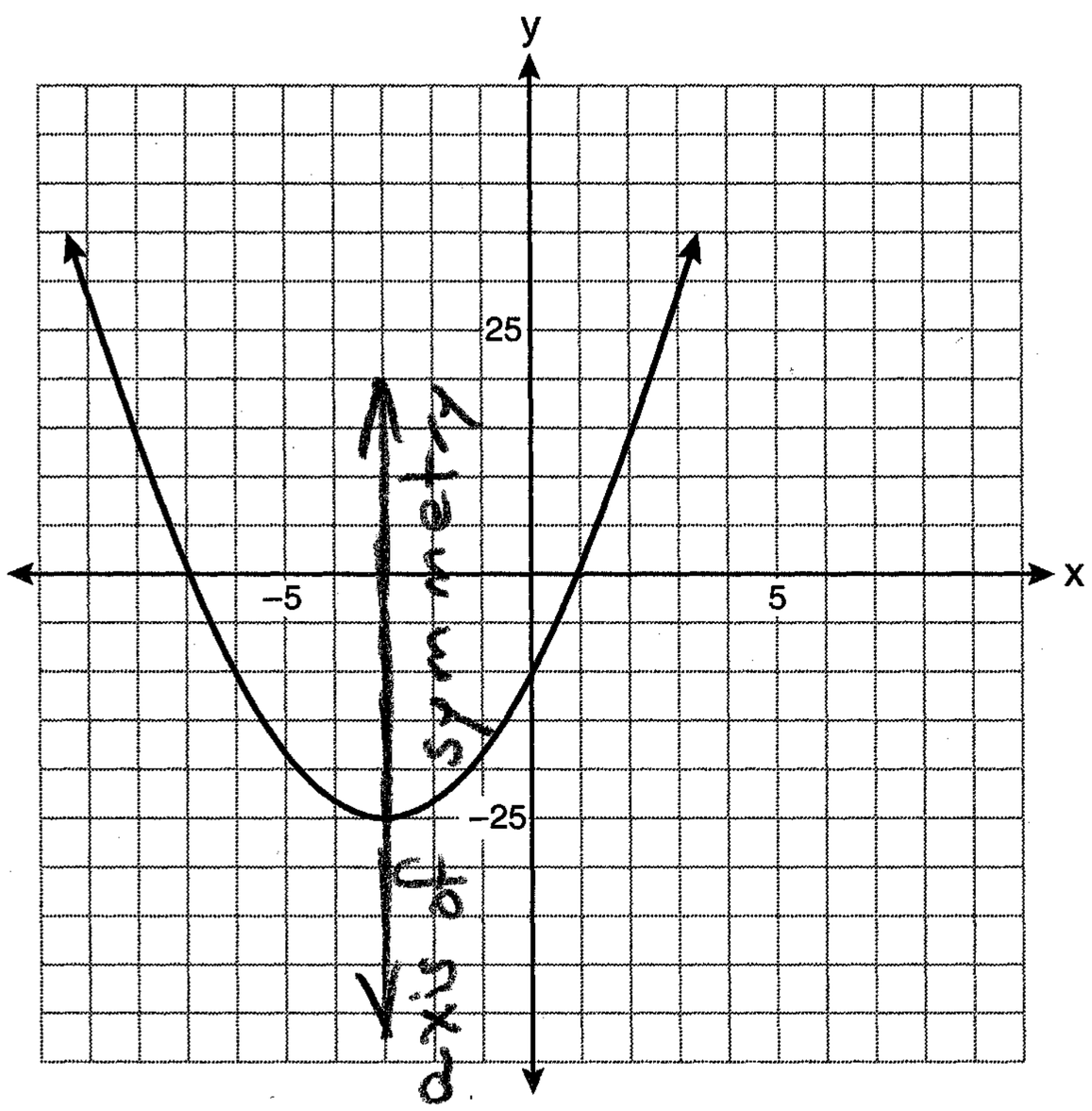
$d = n + 6$

$.05n + .10d = 1.35$

$.05n + .10(n+6) = 1.35$

(substitute x for n)

16 Which equation represents the axis of symmetry of the graph of the parabola below?



(1) $y = -3$

(3) $y = -25$

(2) $x = -3$

(4) $x = -25$

Use this space for computations.

17 The set $\{1,2,3,4\}$ is equivalent to

(1) $\{x \mid 1 < x < 4, \text{where } x \text{ is a whole number}\}$ 1 is not in this set. Neither is 4

(2) $\{x \mid 0 < x < 4, \text{where } x \text{ is a whole number}\}$ 4 is not in this set

(3) $\{x \mid 0 < x \leq 4, \text{where } x \text{ is a whole number}\}$

(4) $\{x \mid 1 < x \leq 4, \text{where } x \text{ is a whole number}\}$ 1 is not in this set

18 What is the value of x in the equation $\frac{2}{x} - 3 = \frac{26}{x}$?

(1) -8

(2) $-\frac{1}{8}$

(3) $\frac{1}{8}$

(4) 8

$\frac{2}{x} - 3 = \frac{26}{x}$

$-\frac{2}{x} \qquad -\frac{2}{x}$

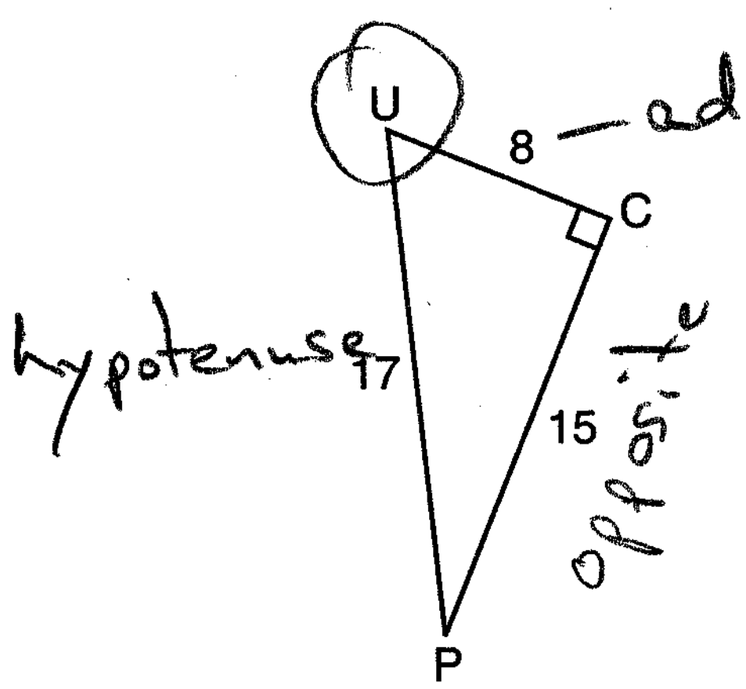
$\frac{-3}{1} = \frac{24}{x}$

$-3x = 24$

$x = \frac{24}{-3}$

$x = -8$

19 The diagram below shows right triangle UPC.



8 – adjacent

hypotenuse

opposite

Which ratio represents the sine of $\angle U$?

(1) $\frac{15}{8}$

(2) $\frac{15}{17}$

(3) $\frac{8}{15}$

(4) $\frac{8}{17}$

SOH-CAH-TOA

$\sin = \frac{\text{opposite}}{\text{hypotenuse}}$

$\sin(U) = \frac{15}{17}$

Use this space for computations.

20 What is $\sqrt{72}$ expressed in simplest radical form?

(1) $2\sqrt{18}$
(2) $3\sqrt{8}$
(3) $6\sqrt{2}$
(4) $8\sqrt{3}$

$\sqrt{72}$
$\sqrt{2}\sqrt{36}$
$\sqrt{2}\ 6$
$6\sqrt{2}$

21 What is $\frac{6}{5x} - \frac{2}{3x}$ in simplest form?

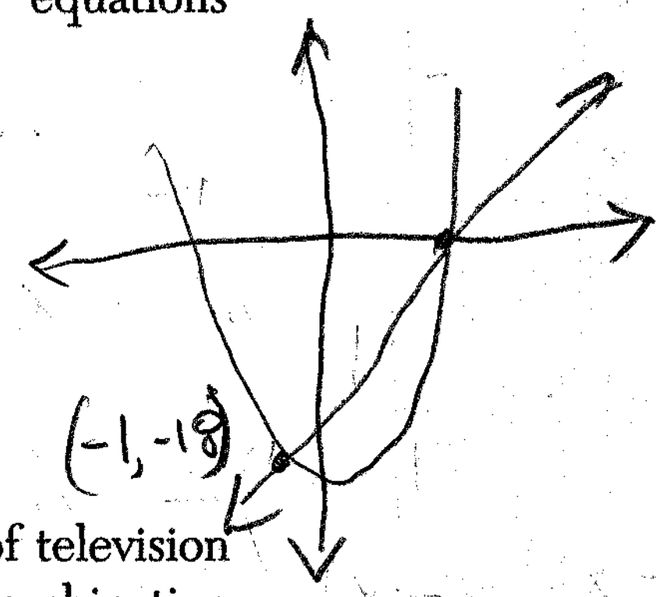
(1) $\frac{8}{15x^2}$
(2) $\frac{8}{15x}$
(3) $\frac{4}{15x}$
(4) $\frac{4}{2x}$

$\frac{6}{5x} - \frac{2}{3x}$ → $\frac{8x}{15x^2}$
$\frac{18x - 10x}{15x^2}$
$\frac{8}{15x}$

22 Which ordered pair is a solution of the system of equations $y = x^2 - x - 20$ and $y = 3x - 15$?

(1) (–5,–30)
(2) (–1,–18)
(3) (0,5)
(4) (5,–1)

From Graphing Calculator



23 A survey is being conducted to determine which types of television programs people watch. Which survey and location combination would likely contain the most bias?

(1) surveying 10 people who work in a sporting goods store
(2) surveying the first 25 people who enter a grocery store
(3) randomly surveying 50 people during the day in a mall
(4) randomly surveying 75 people during the day in a clothing store

These people probably like sports more than the average person.

length = −7 + 3w

Use this space for computations.

24 The length of a rectangular room is 7 less than three times the width, w, of the room. Which expression represents the area of the room?

(1) $3w - 4$

(2) $3w - 7$

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

(4) $3w^2 - 7w$

Let w = width

Length = −7 + 3w

A = lw

A = w(−7 + 3w)

A = −7w + 3w²

⇒ 3w² − 7w

25 The function $y = \frac{x}{x^2 - 9}$ is undefined when the value of x is

(1) 0 or 3

(2) 3 or −3

(3) 3, only

(4) −3, only

A rational function is undefined when the denominator is equal to zero.

x² − 9 = 0 ← Difference of perfect squares

(x + 3)(x − 3) = 0

x = −3 x = 3

26 Which equation represents a line that is parallel to the line $y = 3 - 2x$?

(1) $4x + 2y = 5$

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

(3) $y = 3 - 4x$

(4) $y = 4x - 2$

y = 3 − 2x

y = −2x + 3 ⟶ y-intercept = 3

↳ slope = $\frac{-2}{1}$

(1) 4x + 2y = 5

2y = −4x + 5

y = −2x + $\frac{5}{2}$ ⟶ different y-intercept

↳ slope = $\frac{-2}{1}$

27 What is the product of 8.4×10^8 and 4.2×10^3 written in scientific notation?

(1) 2.0×10^5

(2) 12.6×10^{11}

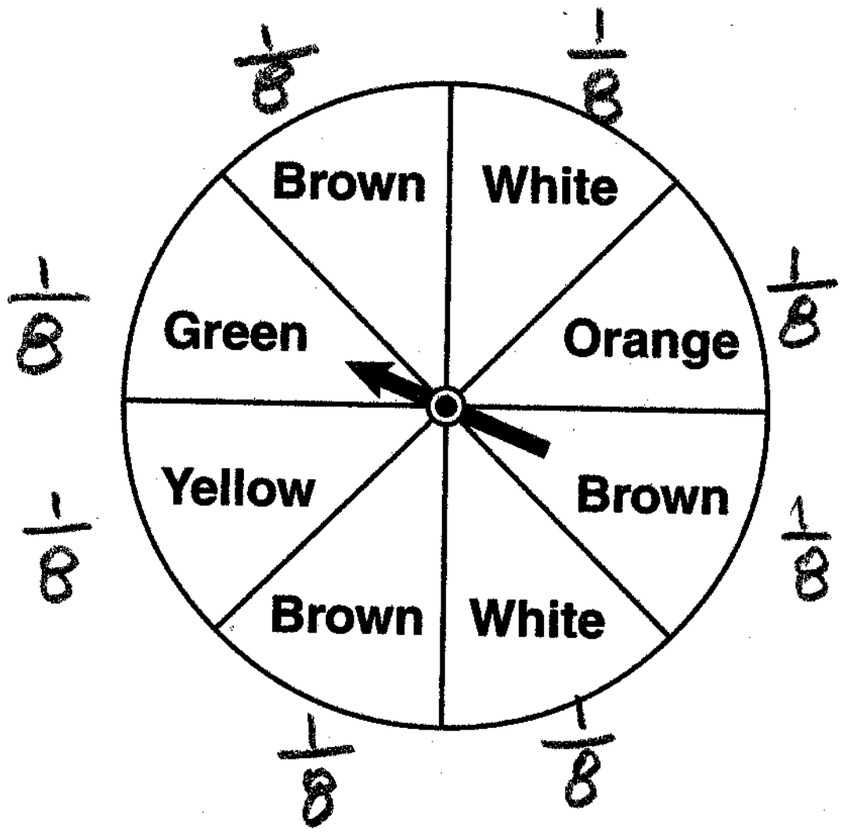
(3) 35.28×10^{11}

(4) 3.528×10^{12}

Use this space for computations.

8.4×10^8
4.2×10^3
$35.28 \times 10^{(8+3)}$
35.28×10^{11}
3.528×10^{12}

28 Keisha is playing a game using a wheel divided into eight equal sectors, as shown in the diagram below. Each time the spinner lands on orange, she will win a prize.



$P_{(multiple\ events)} = P_{(A)} * P_{(B)}$

There is only 1 orange sector, the probability of landing on orange is $\frac{1}{8}$

If Keisha spins this wheel twice, what is the probability she will win a prize on *both* spins?

(1) $\frac{1}{64}$

(2) $\frac{1}{56}$

(3) $\frac{1}{16}$

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

$P_{(A)}$ = first spin on orange $= \frac{1}{8}$

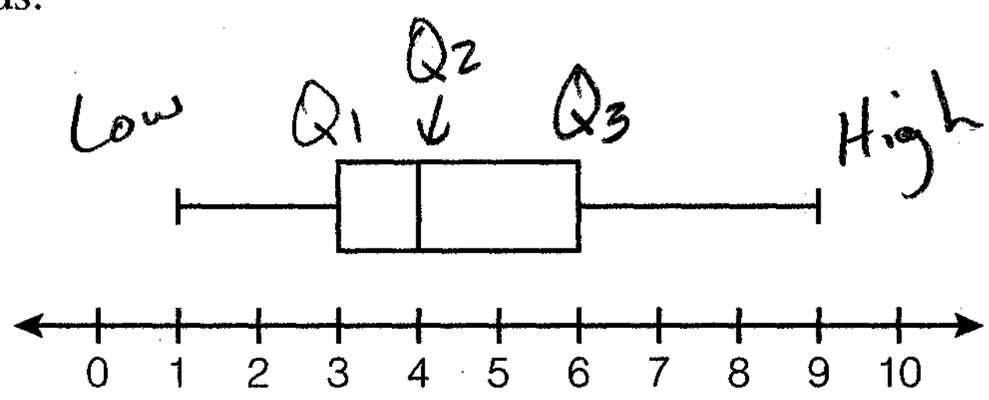
$P_{(B)}$ = second spin on orange $= \frac{1}{8}$

$P_{(A+B)} = \left(\frac{1}{8}\right)\left(\frac{1}{8}\right) = \frac{1}{64}$

Both spins on orange

Use this space for computations.

29 A movie theater recorded the number of tickets sold daily for a popular movie during the month of June. The box-and-whisker plot shown below represents the data for the number of tickets sold, in hundreds.



Which conclusion can be made using this plot?

(1) The second quartile is 600.

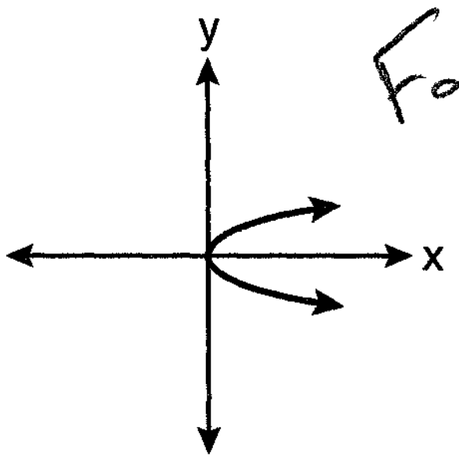
(2) The mean of the attendance is 400.

(3) The range of the attendance is 300 to 600.

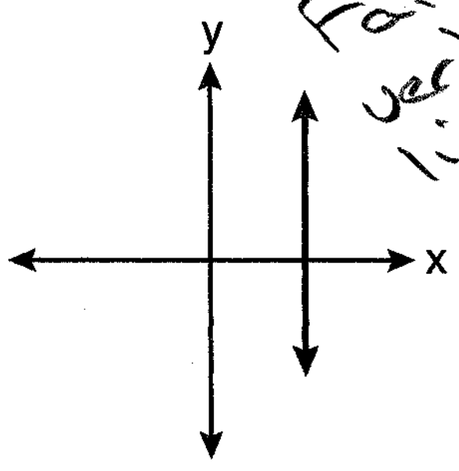
(4) Twenty-five percent of the attendance is between 300 and 400.

30 Which graph represents a function?

(1)



(2)



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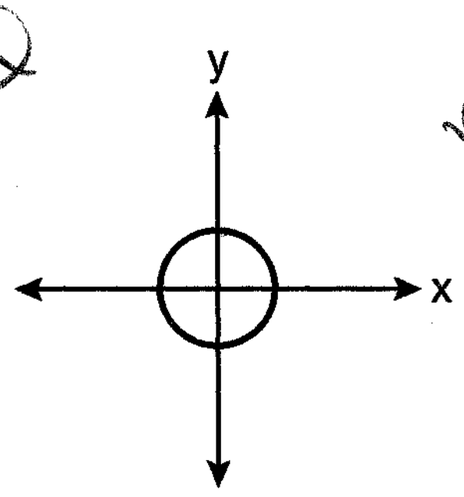

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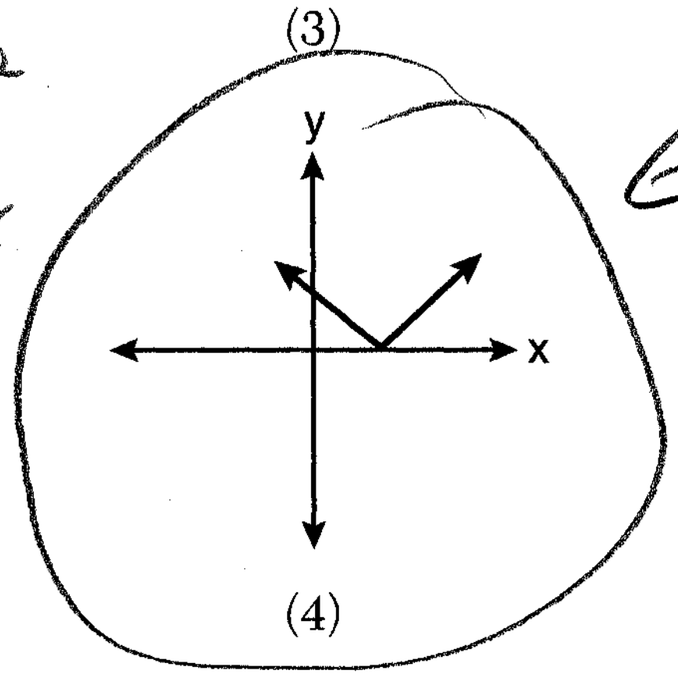
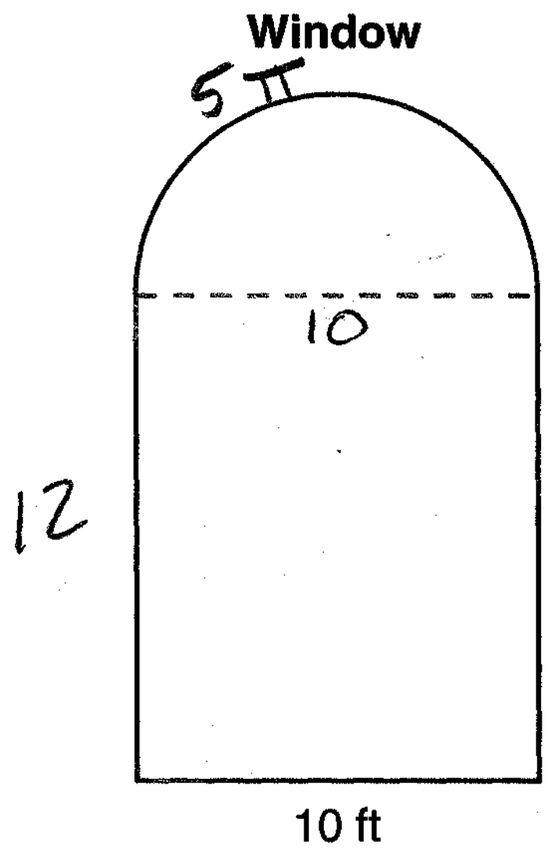


Part II

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. [6]

31 A window is made up of a single piece of glass in the shape of a semicircle and a rectangle, as shown in the diagram below. Tess is decorating for a party and wants to put a string of lights all the way around the outside edge of the window.



Circumference = πd
C = π10
We need ½ of circumference, which is $\frac{\pi 10}{2}$, or 5π

To the *nearest foot*, what is the length of the string of lights that Tess will need to decorate the window?

We need to add
12 ft.
10 ft.
12 ft
5π ft.

from calculator → 49.70796327

Tess needs 50 feet

32 Simplify: $\frac{27k^5m^8}{(4k^3)(9m^2)}$

$$\frac{27\ k^5\ m^8}{4\ k^3\ 9\ m^2}$$

$$\frac{\overset{3}{\cancel{27}}\quad k^5\quad m^8}{(4)\cancel{(9)}_{1}\quad k^3\quad m^2}$$

$$\frac{3}{4}\quad k^{(5-3)}\quad m^{(8-2)}$$

$$\frac{3}{4}\quad k^2\quad m^6$$

$$\boxed{\frac{3k^2m^6}{4}}$$

33 The table below represents the number of hours a student worked and the amount of money the student earned.

Number of Hours (h)	Dollars Earned (d)
8	$50.00
15	$93.75
19	$118.75
30	$187.50

$\frac{50}{8} = \$6.25$

$\frac{93.75}{15} = \$6.25$

$\frac{118.75}{19} = \$6.25$

$\frac{187.50}{30} = \$6.25$

Write an equation that represents the number of dollars, d, earned in terms of the number of hours, h, worked.

$d = 6.25h$

Using this equation, determine the number of dollars the student would earn for working 40 hours.

$d = 6.25(h)$

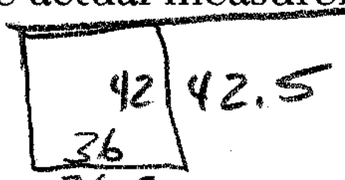
$d = 6.25(40)$

$d = \$250.00$

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. [9]

34 Sarah measures her rectangular bedroom window for a new shade. Her measurements are 36 inches by 42 inches. The actual measurements of the window are 36.5 inches and 42.5 inches.



Using the measurements that Sarah took, determine the number of square inches in the area of the window.

$A = lw$

Sarah's Measurements

$A = (36)(42)$

$A = 1512$ square inches

Determine the number of square inches in the actual area of the window.

Actual measurements

$A = (36.5)(42.5)$

$A = 1551.25$

Determine the relative error in calculating the area. Express your answer as a decimal to the *nearest thousandth.*

$$\text{Relative error} = \frac{\text{Actual} - \text{Measured}}{\text{Actual}}$$

$$\frac{1551.25 - 1512}{1551.25}$$

$$\frac{39.25}{1551.25} = .025302175?$$

.025 too small

35 Perform the indicated operation and simplify: $\frac{3x+6}{4x+12} \div \frac{x^2-4}{x+3}$

$$\frac{3x+6}{4x+12} \div \frac{x^2-4}{x+3}$$

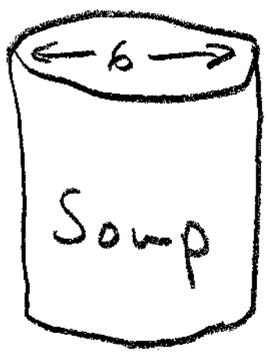
$$\left(\frac{3x+6}{4x+12}\right)\frac{(x+3)}{(x^2-4)}$$

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

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

$$\boxed{\frac{3}{4x-8}}$$

36 A soup can is in the shape of a cylinder. The can has a volume of 342 cm^3 and a diameter of 6 cm. Express the height of the can in terms of π.



$A = \pi r^2$

$A = \pi 3^2$

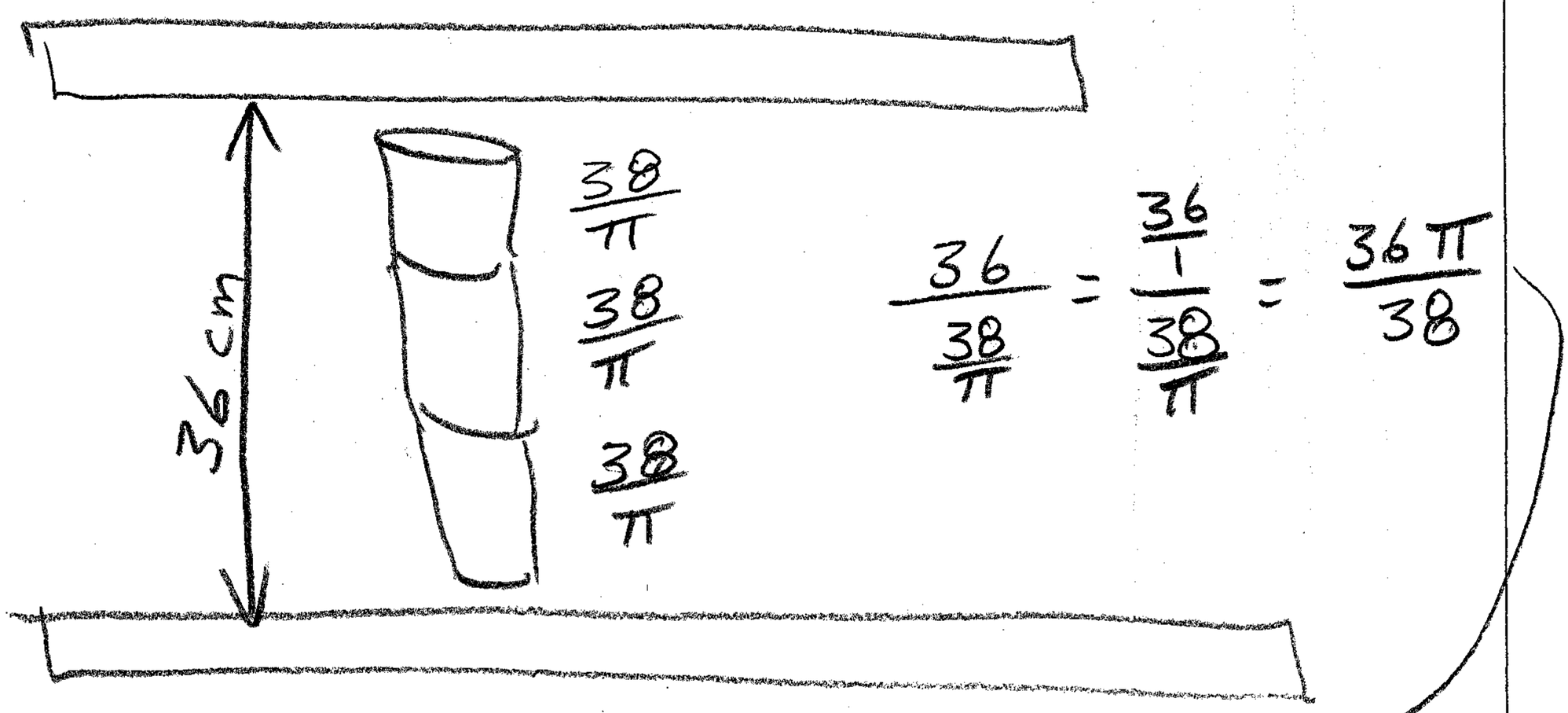
The area of the top of the can is 9π

$V = (\text{area})(\text{height})$

$342 = 9\pi\,(\text{height})$

$\frac{342}{9\pi} = \text{height} \Rightarrow \boxed{\frac{38}{\pi}\,cm = \text{height}}$

Determine the maximum number of soup cans that can be stacked on their base between two shelves if the distance between the shelves is exactly 36 cm. Explain your answer.



$\frac{36}{\frac{38}{\pi}} = \frac{\frac{36}{1}}{\frac{38}{\pi}} = \frac{36\pi}{38}$

$\frac{36\pi}{38} = 2.976245672$

2 Cans

Each can is ≈ 1.2009 cm high. Two cans are less than 36 cm. Three cans are more then 36cm

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. [12]

37 Solve the following system of equations algebraically:

$3x + 2y = 4$
$4x + 3y = 7$

-2, 5

[Only an algebraic solution can receive full credit.]

m(4) $3x + 2y = 4 \Rightarrow 12x + 8y = 16$

M(3) $4x + 3y = 7 \Rightarrow 12x + 9y = 21$

$-y = -5$

$y = 5$

$3x + 2y = 4$

$3x + 2(5) = 4$

$3x + 10 = 4$

$= 4 - 10$

$3x = -6$

$3x = -6$

$x = -2$

Check

$3x + 2y = 4$

$3(-2) + 2(5) = 4$

$-6 + 10 = 4$

$4 = 4$ ✓

$4x + 3y = 7$

$4(-2) + 3(5) = 7$

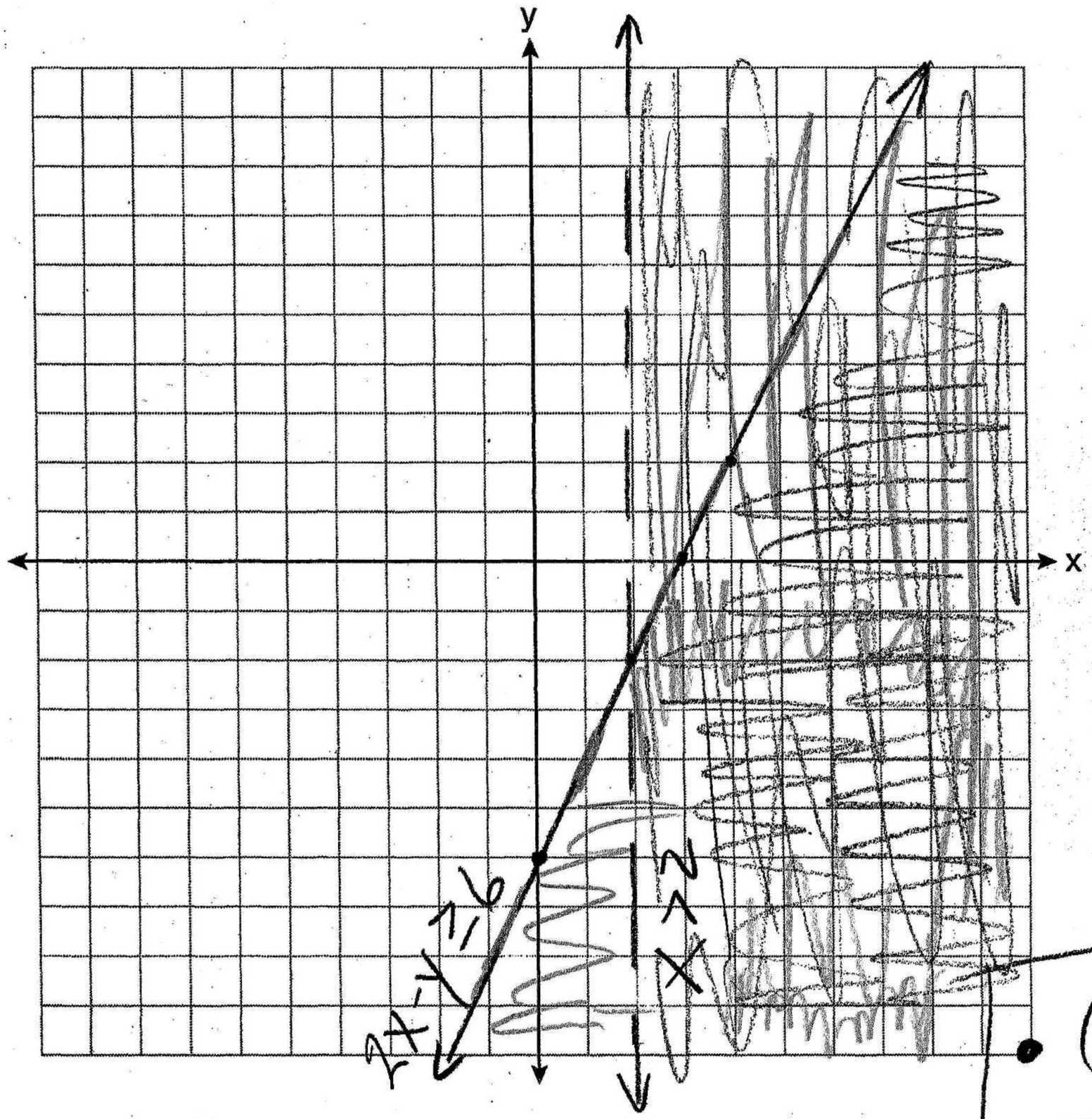
$-8 + 15 = 7$

$7 = 7$ ✓

38 On the set of axes below, graph the following system of inequalities and state the coordinates of a point in the solution set.

$2x - y \geq 6$
$x > 2$

$2x - y \geq 6$
$-y \geq -2x + 6$
$y \leq 2x - 6$



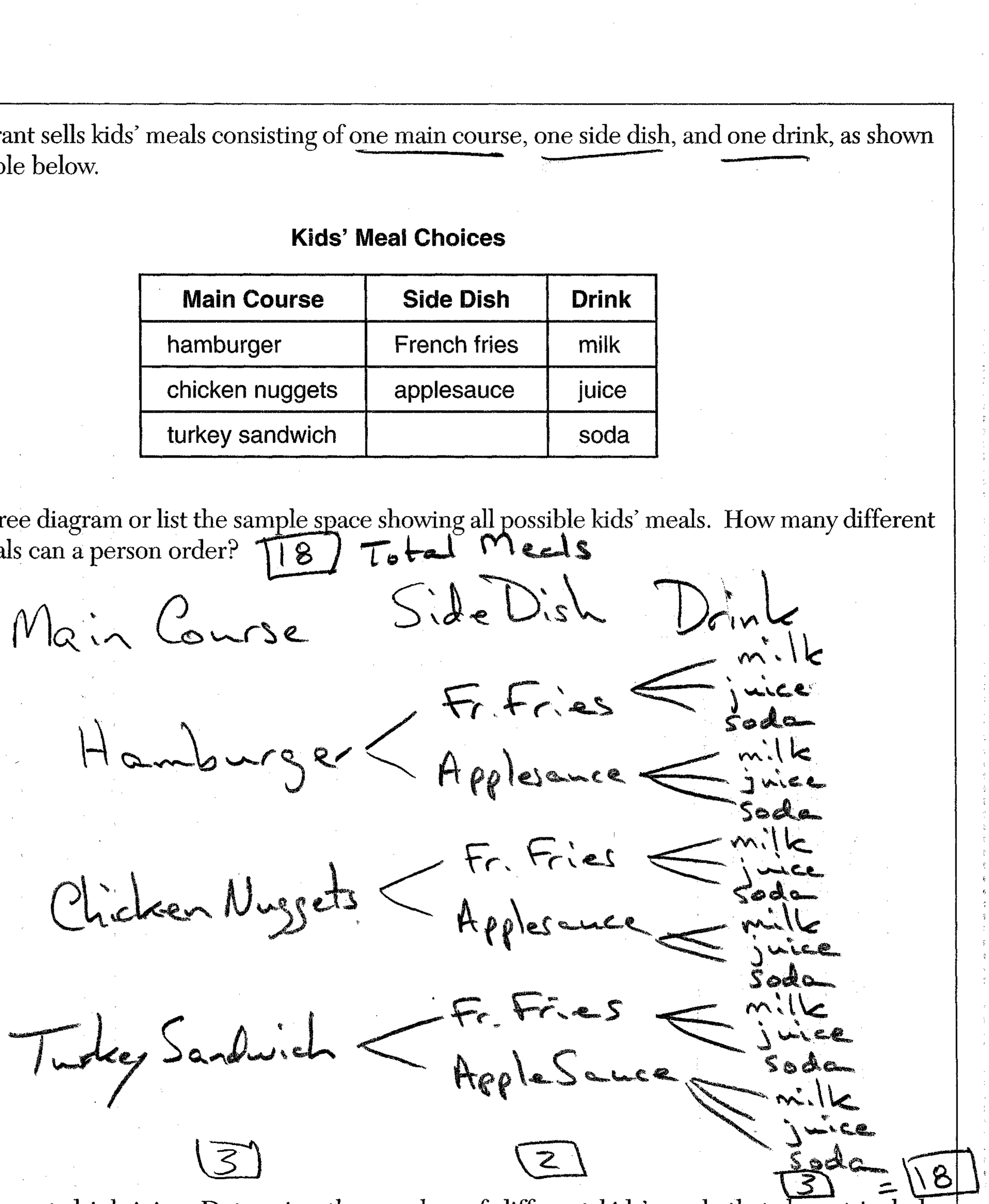
this point is in the solution set

39 A restaurant sells kids' meals consisting of one main course, one side dish, and one drink, as shown in the table below.

Kids' Meal Choices

Main Course	Side Dish	Drink
hamburger	French fries	milk
chicken nuggets	applesauce	juice
turkey sandwich		soda

Draw a tree diagram or list the sample space showing all possible kids' meals. How many different kids' meals can a person order? 18 Total Meals



José does not drink juice. Determine the number of different kids' meals that do *not* include juice.

3 x 2 x 2 = 12 without juice

José's sister will eat *only* chicken nuggets for her main course. Determine the number of different kids' meals that include chicken nuggets.

1 x 2 x 3 = 6 with chicken nuggets

Tear Here

Reference Sheet

Trigonometric Ratios		$\sin A = \frac{opposite}{hypotenuse}$
		$\cos A = \frac{adjacent}{hypotenuse}$
		$\tan A = \frac{opposite}{adjacent}$
Area	trapezoid	$A = \frac{1}{2}h(b_1 + b_2)$
Volume	cylinder	$V = \pi r^2 h$
Surface Area	rectangular prism	$SA = 2lw + 2hw + 2lh$
	cylinder	$SA = 2\pi r^2 + 2\pi rh$
Coordinate Geometry		$m = \frac{\Delta y}{\Delta x} = \frac{y_2 - y_1}{x_2 - x_1}$

Tear Here

Tear Here

The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

INTEGRATED ALGEBRA

Thursday, January 29, 2009 – 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 ... 3 ...	9 ... 2 ...	17 ... 3 ...	25 ... 2 ...
2 ... 4 ...	10 ... 3 ...	18 ... 1 ...	26 ... 1 ...
3 ... 4 ...	11 ... 2 ...	19 ... 2 ...	27 ... 4 ...
4 ... 1 ...	12 ... 3 ...	20 ... 3 ...	28 ... 1 ...
5 ... 1 ...	13 ... 2 ...	21 ... 2 ...	29 ... 4 ...
6 ... 3 ...	14 ... 3 ...	22 ... 2 ...	30 ... 4 ...
7 ... 4 ...	15 ... 2 ...	23 ... 1 ...	
8 ... 4 ...	16 ... 2 ...	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

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Question		**Maximum Credit**	**Credits Earned**	**Rater's/Scorer's Initials**
Part I	**1–30**	**60**		
Part II	**31**	**2**		
	32	**2**		
	33	**2**		
Part III	**34**	**3**		
	35	**3**		
	36	**3**		
Part IV	**37**	**4**		
	38	**4**		
	39	**4**		
Maximum Total		**87**		

Rater's/Scorer's Name (minimum of three)

Total Raw Score | **Checked by** | **Scaled Score** (from conversion chart)

Tear Here

Tear Here

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