The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

MATHEMATICS A

Thursday, August 16, 2007 — 8:30 to 11:30 a.m., only

Print Your Name: Steve Watson

Print Your School's Name: IHS @ 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.

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

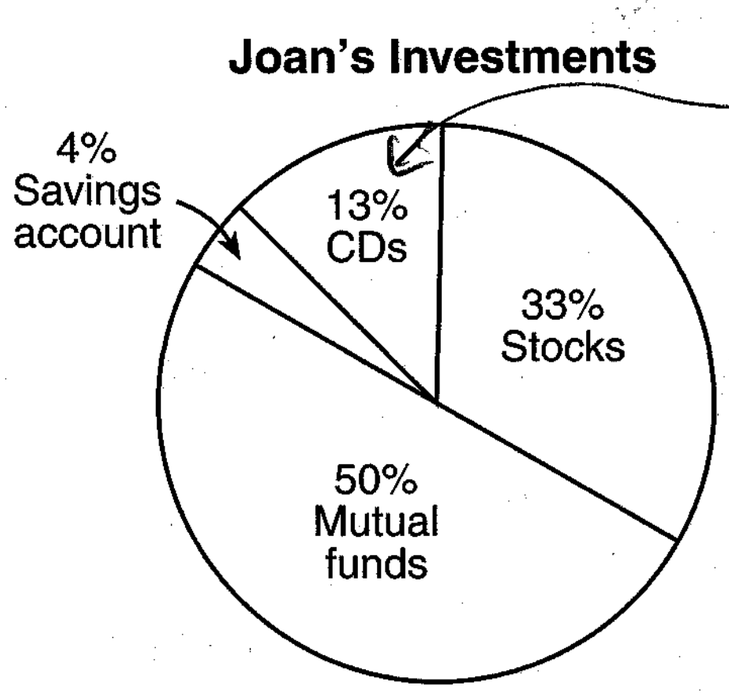
Answer all questions in this part. Each correct answer will receive 2 credits. No partial credit will be allowed. For each question, write on the separate answer sheet the numeral preceding the word or expression that best completes the statement or answers the question. [60]

Use this space for computations.

1 Given the true statements: "t is a multiple of 3" and "t is even." What could be a value of t?

(1) 8 not multiple of 3
(2) 9 not even
(3) 15 not even
(4) 24 even ✓ multiple of 3 ✓

2 The accompanying circle graph shows how Joan invested her money.



13% of #12,000
.13 times 12,000
.13(12,000)
#1560

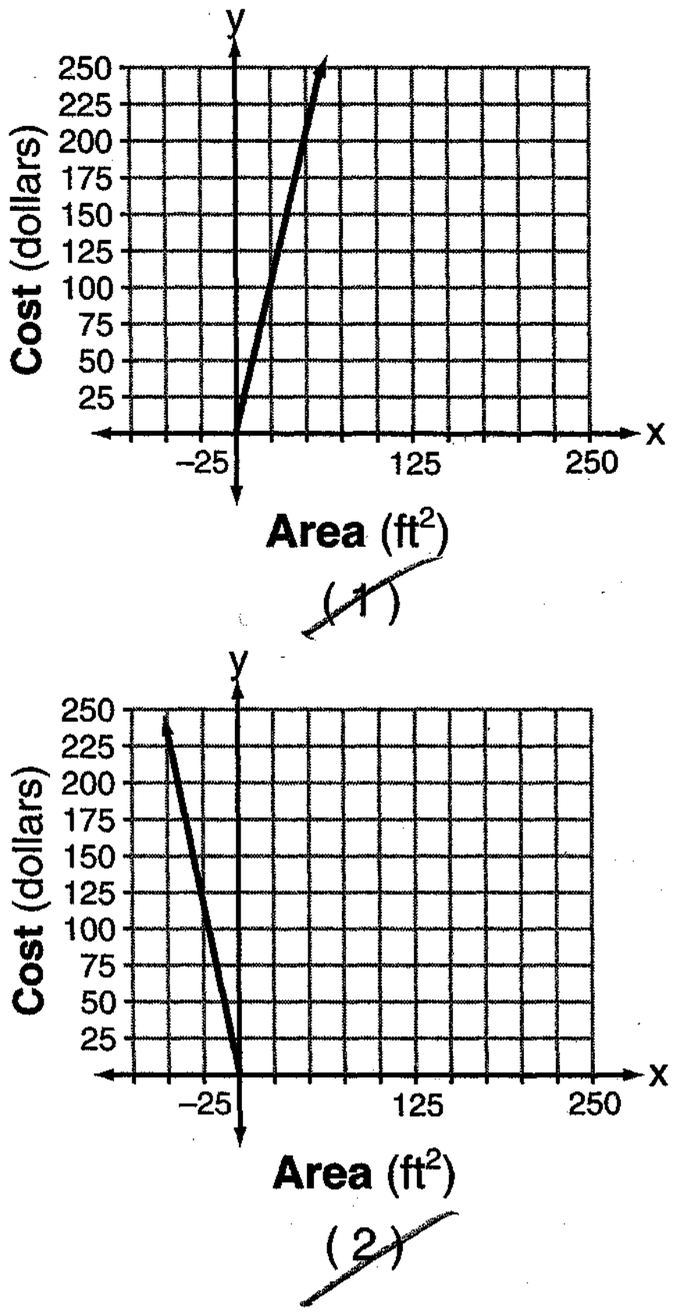
If she invested a total of $12,000, how much money did she invest in CDs?

(1) $1,560
(2) $9,230
(3) $15,600
(4) $92,308

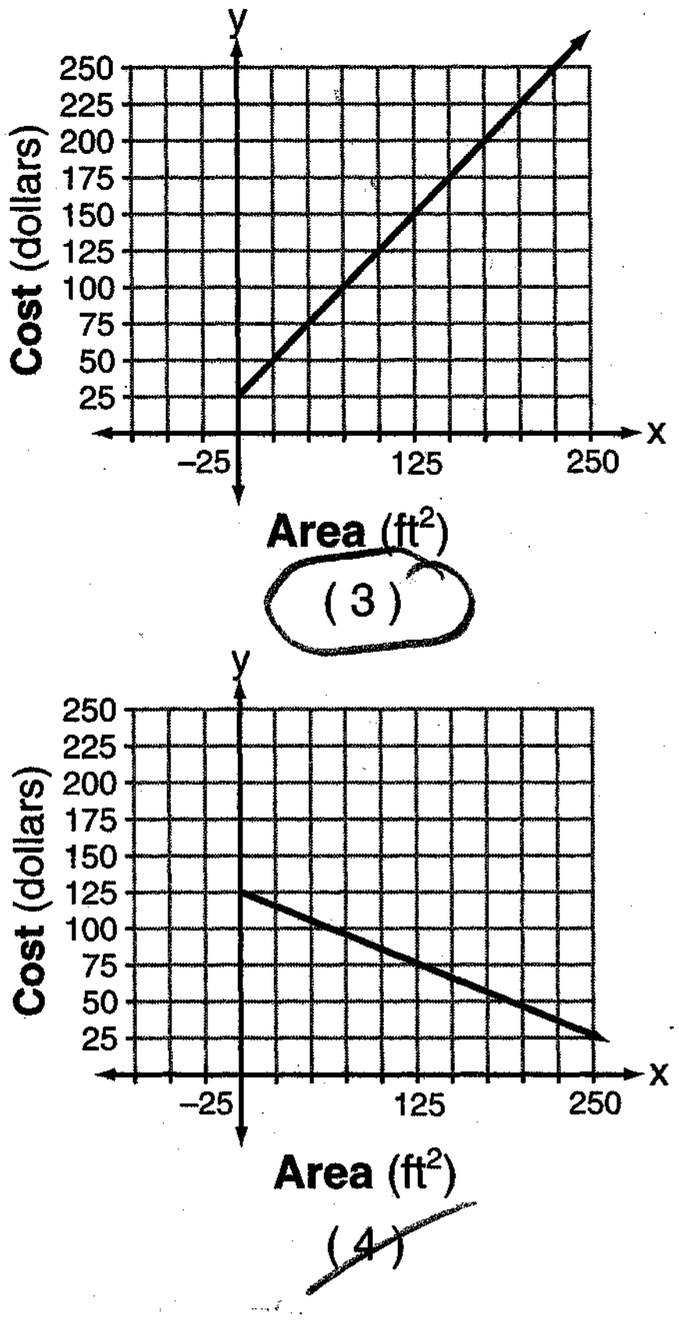
y-intercept — slope

3 Super Painters charges \$1.00 per square foot plus an additional fee of \$25.00 to paint a living room. If x represents the area of the walls of Francesca's living room, in square feet, and y represents the cost, in dollars, which graph best represents the cost of painting her living room?

Use this space for computations.



(1)



(3)

(2)

(4)

$y = mx + b$

$m = 1$

$b = 25$

$y = x + 25$

4 Jen and Barry's ice cream stand has three types of cones, six flavors of ice cream, and four kinds of sprinkles. If a serving consists of a cone, one flavor of ice cream, and one kind of sprinkles, how many different servings are possible?

(1) 90
(2) 72
(3) ${}_{13}C_3$
(4) ${}_{13}P_3$

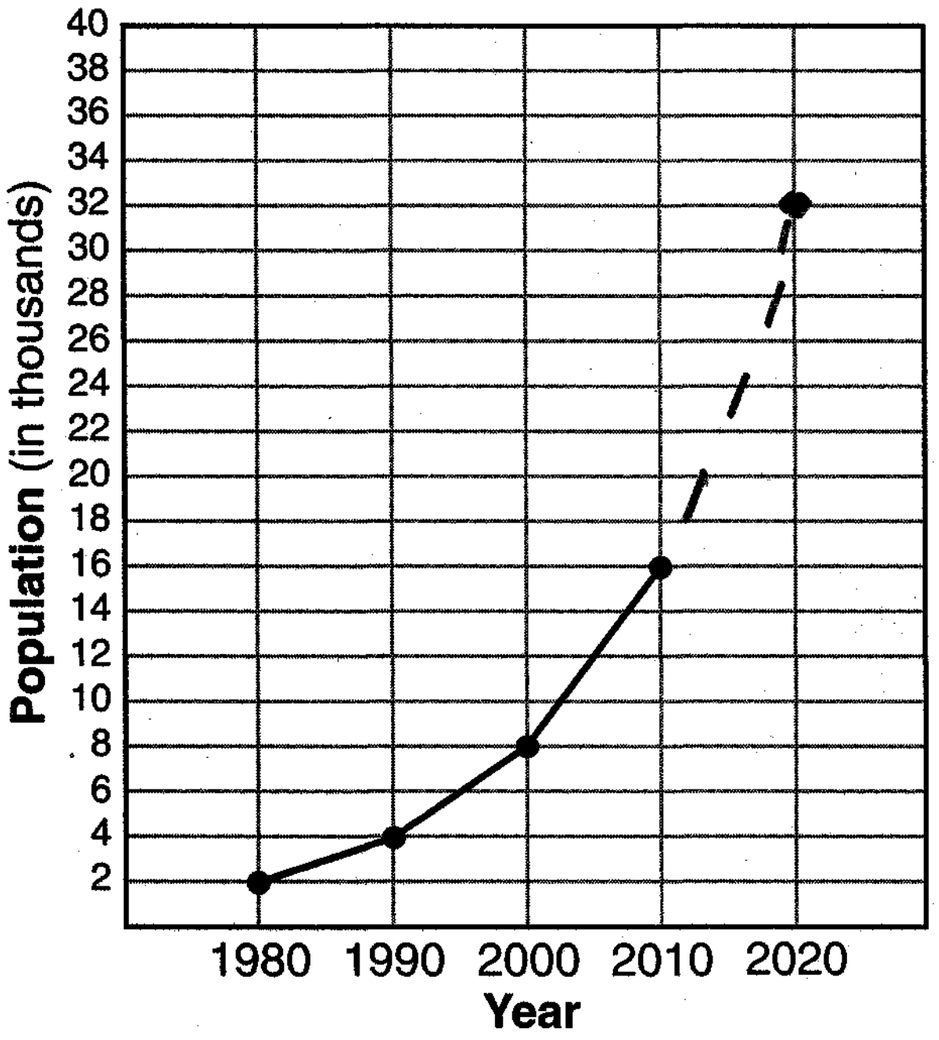
Cone choices × Flavor choices × Sprinkles Choices = Total Choices

3 × 6 × 4 = ?

3 × 6 × 4 = 72

Use this space for computations.

5 The population growth of Boomtown is shown in the accompanying graph.



doubles
doubles
doubles
doubles

y = 16
y = 8
y = 4
y = 2

If the same pattern of population growth continues, what will the population of Boomtown be in the year 2020?

(1) 20,000
(2) 32,000
(3) 40,000
(4) 64,000

$a+3b=13$ | $M(1) \Rightarrow a+3b=13$
$a+b=5$ | $M(-1) \Rightarrow -a-b=-5$

Add together $0a+2b=8$

$2b=8$

$b=4$

6 If $a+3b=13$ and $a+b=5$, the value of b is

(1) 1
(2) 7
(3) 4.5
(4) 4

Check

$a+b=5$

$a+4=5$

$a=1$

$a+3b=13$

$1+3(4)=13$

$1+12=13$

$13=13$ ✓

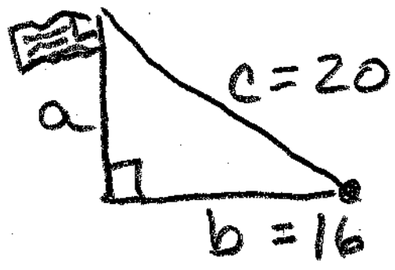
$a+b=5$

$1+4=5$

$5=5$ ✓

7 A cable 20 feet long connects the top of a flagpole to a point on the ground that is 16 feet from the base of the pole. How tall is the flagpole?

(1) 8 ft
(2) 10 ft
(3) 12 ft
(4) 26 ft



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

$a^2+(16)^2=(20)^2$

$a^2+256=400$

$-256 \quad -256$

$a^2=144$

$\sqrt{a^2}=\sqrt{144} \Rightarrow a=12$

8 In the equation $\frac{1}{4}n + 5 = 5\frac{1}{2}$, n is equal to

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

$\frac{1}{4}n + 5 = 5\frac{1}{2}$

$\left(\frac{1}{4}\right)\left(\frac{n}{1}\right) + \frac{5}{1} = \frac{11}{2}$

$\frac{n}{4} + \frac{5}{1} = \frac{11}{2}$

$M(4)\ \frac{4}{1}\left(\frac{1}{4}\right) + \frac{4}{1}\left(\frac{5}{1}\right) = \frac{4}{1}\left(\frac{11}{2}\right)$

$\frac{n}{1} + \frac{20}{1} = \frac{44}{2} \Rightarrow n + 20 = 22$

$-20 \quad -20$

$n = 2$

Check

$\frac{1}{4}(n) + 5 = 5\frac{1}{2}$

$\frac{1}{4}(2) + 5 = 5\frac{1}{2}$

$\frac{1}{4}\left(\frac{2}{1}\right) + 5 = 5\frac{1}{2}$

$\frac{2}{4} + 5 = 5\frac{1}{2}$

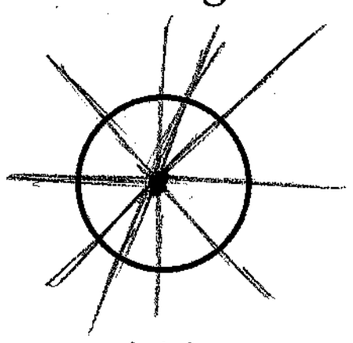
$\frac{1}{2} + 5 = 5\frac{1}{2}$

$5\frac{1}{2} = 5\frac{1}{2}$ ✓

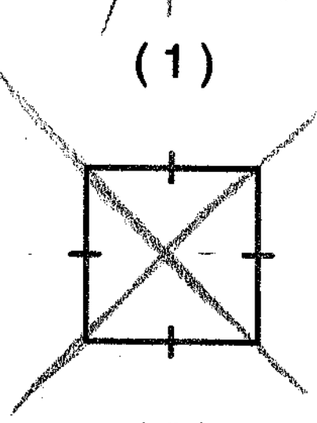
Use this space for computations.

9 Which geometric shape does *not* have any lines of symmetry?

(1)



(2)



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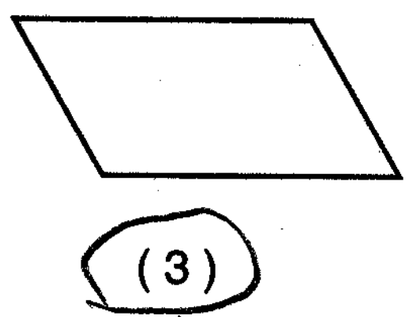
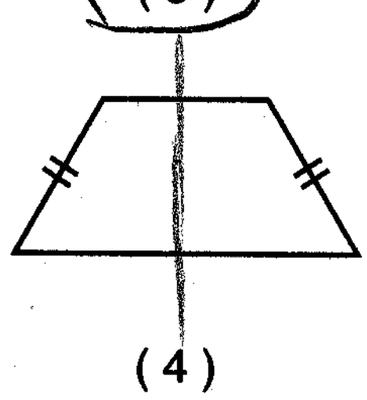


(4)



10 The sum of $8x^2 - x + 4$ and $x - 5$ is

(1) $8x^2 + 9$
(2) $8x^2 - 1$
(3) $8x^2 - 2x + 9$
(4) $8x^2 - 2x - 1$

$8x^2 - x + 4$

$x - 5$

$8x^2 + 0x - 1$

$8x^2 - 1$

11 One factor of the expression $x^2y^2 - 16$ is

(1) $xy - 4$
(2) $xy - 8$
(3) $x^2 - 4$
(4) $x^2 + 8$

Difference of Perfect Squares

$\sqrt{x^2y^2} = xy$

$\sqrt{16} = 4$

$(xy + 4)(xy - 4) = x^2y^2 - 16$

12 What is the sum of $\sqrt{50}$ and $\sqrt{8}$?

(1) $\sqrt{58}$
(2) $7\sqrt{2}$
(3) $9\sqrt{2}$
(4) $29\sqrt{2}$

$\sqrt{50} + \sqrt{8}$

$\sqrt{2}\sqrt{25} + \sqrt{2}\sqrt{4}$

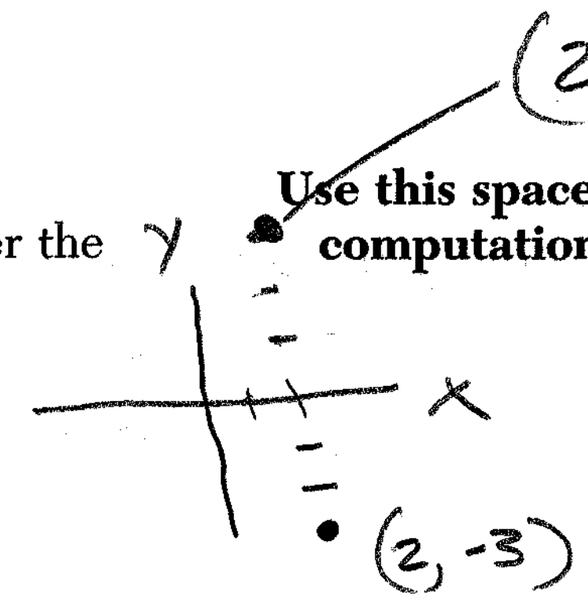
$\sqrt{2}(5) + \sqrt{2}(2)$

$5\sqrt{2} + 2\sqrt{2} \Rightarrow 7\sqrt{2}$

13 What are the coordinates of point (2,–3) after it is reflected over the x-axis?

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

Use this space for computations.



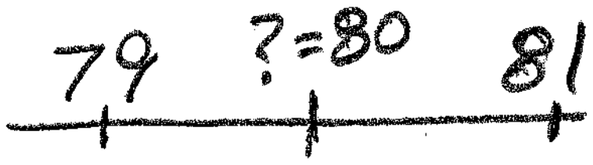
14 The accompanying stem-and-leaf plot represents Ben's test scores this year.

6	5 8
7	2 3 3 3 8 9
8	1 3 3 6 7
9	6 9 9

Key: 7 | 2 = 72

What is the median score for this set of data?

(1) 73
(2) 79
(3) 80
(4) 81



median = middle

65 99
68 99
72 96
73 87
73 86
73 83
73 83

79 and 81 are the middle two numbers. The median is halway between two middle numbers

15 The video of the movie *Star Wars* earned \$193,500,000 in rental fees during its first year. Expressed in scientific notation, the number of dollars earned is

(1) 1935×10^8
(2) 193.5×10^6
(3) 1.935×10^6
(4) 1.935×10^8

going left is positive
going right is negative

193500000.
8 7 6 5 4 3 2 1

1.935×10^8

16 In the Ambrose family, the ages of the three children are three consecutive even integers. If the age of the youngest child is represented by $x + 3$, which expression represents the age of the oldest child?

(1) $x + 5$
(2) $x + 6$
(3) $x + 7$
(4) $x + 8$

youngest = x+3
middle = x+5
oldest = x+7

Add 2 to get to the next consecutive even integer.

(1) ? $0 < \sqrt{0}$

(2) $2 \overset{?}{<} \sqrt{2}$

$2 \not< 1.4142135562$

Use this space for computations.

17 If $t < \sqrt{t}$, t could be

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

(3) $\frac{1}{2} < \sqrt{\frac{1}{2}}$ ✓

$\frac{1}{2} < .70710678 12$

18 Which number is irrational?

(1) $\frac{5}{4} = \frac{5}{4}$
(2) $0.\overline{3} = \frac{1}{3}$
(3) $\sqrt{121} = 11 = \frac{11}{1}$
(4) π

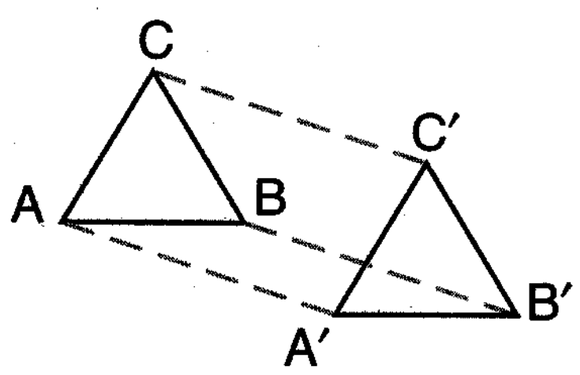
(4) $4 < \sqrt{4}$

$4 \not< 2$

irrational ⇒ cannot be expressed as ratio of two integers

Also - never ending and never repeating decimals are irrational #s

19 In the accompanying diagram, $\Delta A'B'C'$ is the image of ΔABC and $\Delta A'B'C' \cong \Delta ABC$.



Which type of transformation is shown in the diagram?

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

20 The expression ${}_8C_3$ is equivalent to

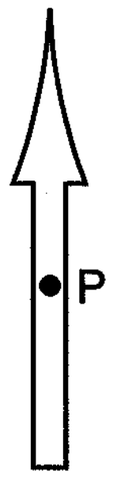
(1) ${}_8C_5$
(2) $\frac{8!}{3!}$
(3) ${}_8P_3$
(4) ${}_8P_5$

${}_8C_3 = \frac{8 \cdot 7 \cdot 6}{3 \cdot 2 \cdot 1} = 56$

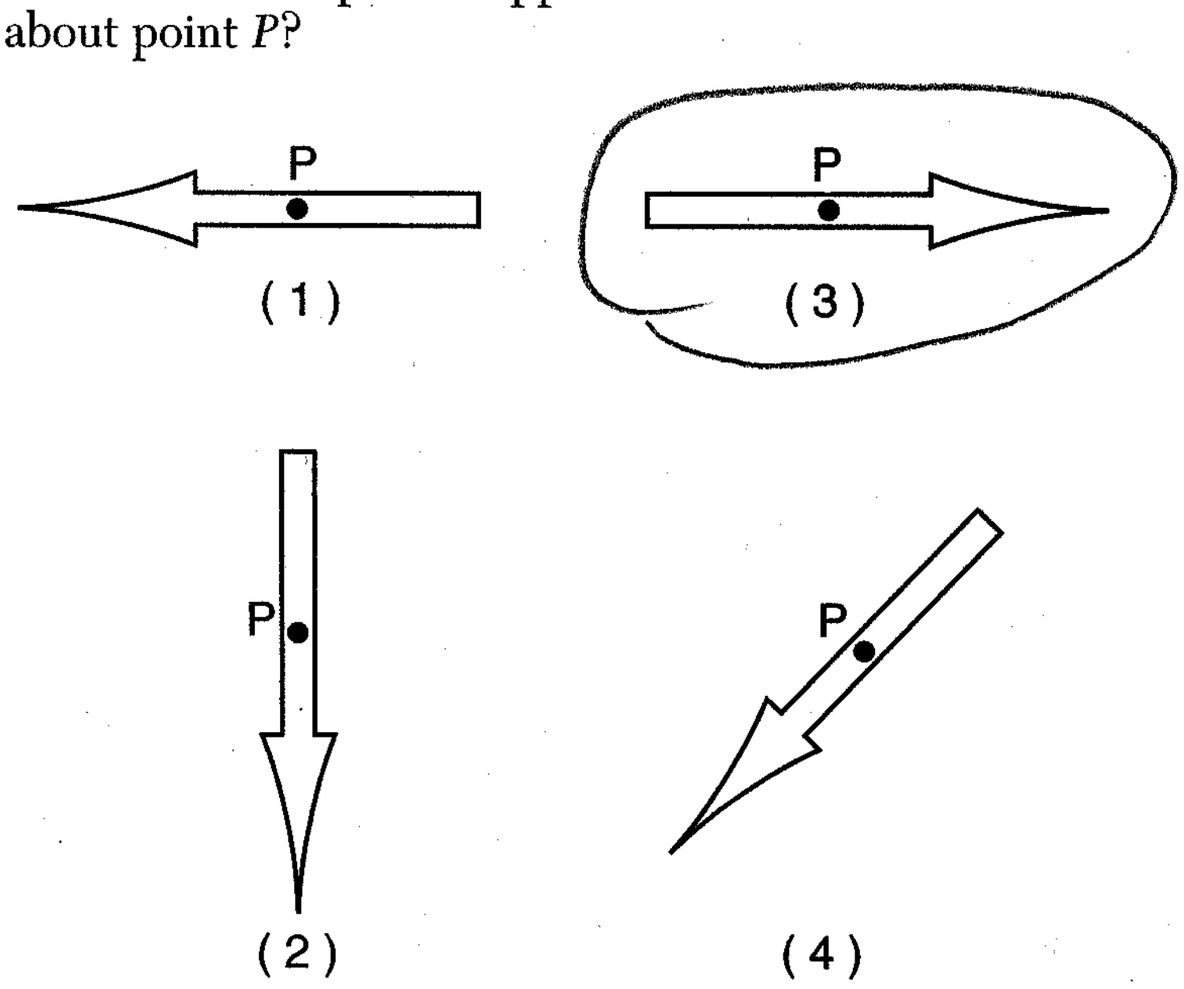
${}_8C_5 = \frac{8 \cdot 7 \cdot 6 \cdot 5 \cdot 4}{5 \cdot 4 \cdot 3 \cdot 2 \cdot 1} = 56$

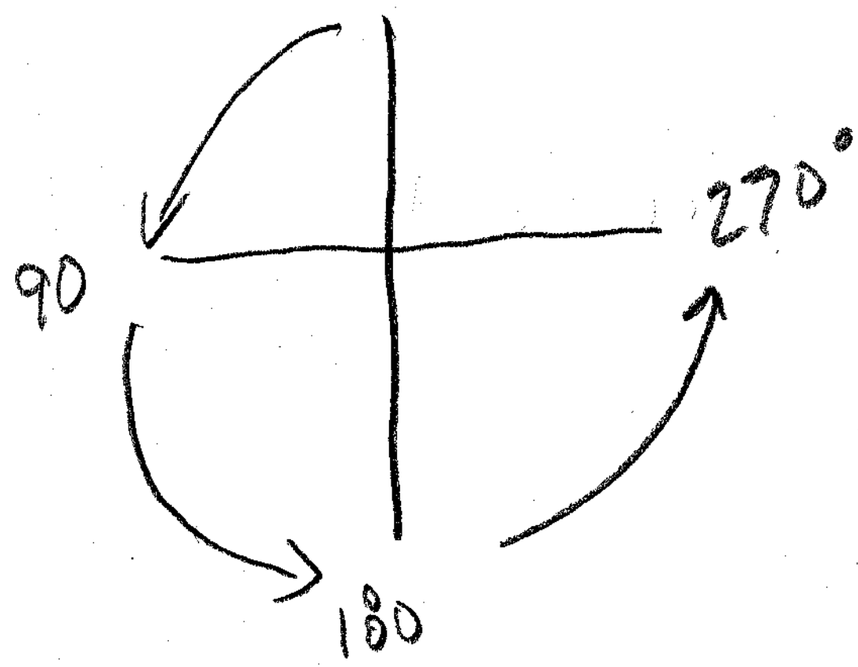
Use this space for computations.

21 The accompanying diagram shows the starting position of the spinner on a board game.



How does this spinner appear after a 270° counterclockwise rotation about point *P*?





22 Which equation is equivalent to $3x + 4y = 15$?

(1) $y = \frac{15 - 3x}{4}$

(2) $y = \frac{3x - 15}{4}$

(3) $y = 15 - 3x$

(4) $y = 3x - 15$

Isolate y

$3x + 4y = 15$

$-3x \quad -3x$

$4y = -3x + 15$

D(4) $\frac{4y}{4} = \frac{-3x}{4} + \frac{15}{4}$

$y = \frac{-3x + 15}{4}$

$y = \frac{15 - 3x}{4}$

Parabola

Use this space for computations.

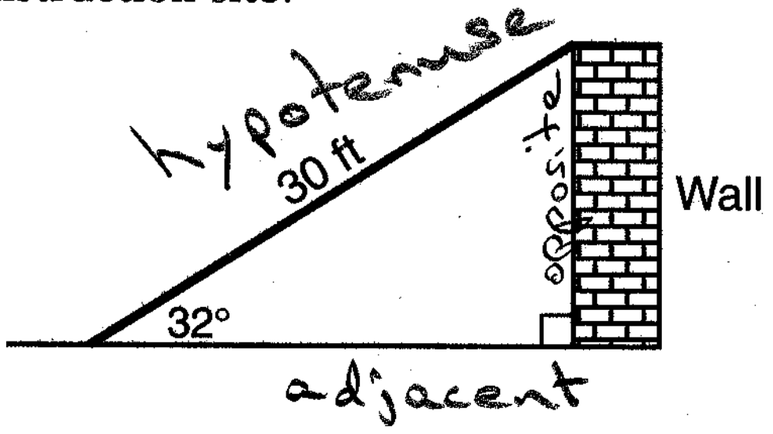
23 When graphed on the coordinate plane, the equations $y = 2x^2 + 4x + 5$ and $x^2 + y^2 = 36$ form ← circle

(1) a parabola and a straight line
(2) a parabola and a circle
(3) two parabolas
(4) two circles

Parabola $ax^2 + bx + c = 0$

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

24 The accompanying diagram shows a ramp 30 feet long leaning against a wall at a construction site.



If the ramp forms an angle of 32° with the ground, how high above the ground, to the *nearest tenth*, is the top of the ramp?

(1) 15.9 ft
(2) 18.7 ft
(3) 25.4 ft
(4) 56.6 ft

SOH-CAH-TOA
$\sin = \frac{\text{opposite}}{\text{hypotenuse}}$ ← This is the one
$\cos = \frac{\text{adjacent}}{\text{hypotenuse}}$
$\tan = \frac{\text{opposite}}{\text{adjacent}}$

Remember Set Calculator to Degree Mode

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

$\sin 32° = \frac{\text{opposite}}{30}$

$30(\sin 32) = \text{opposite}$

$15.89577793 = \text{opposite}$

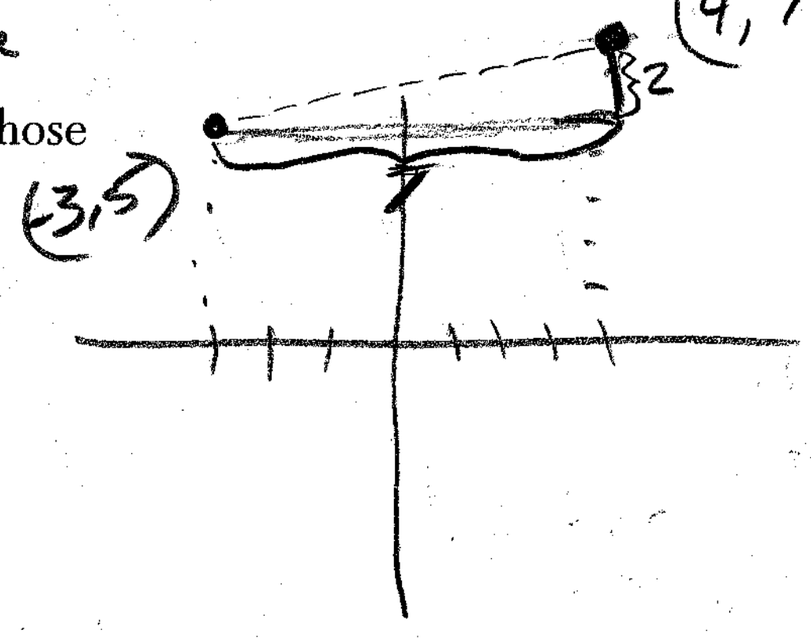
$15.9 = \text{opposite}$

25 Which equation illustrates the associative property?

(1) $a(1) = a$ Mult. Identity
(2) $a + b = b + a$ Commutative
(3) $a(b + c) = (ab) + (ac)$ Distributive
(4) $(a + b) + c = a + (b + c)$ → Associative

26 What is the length of the line segment that joins the points whose coordinates are (4,7) and (–3,5)?

(1) $\sqrt{5}$
(2) $\sqrt{53}$
(3) $\sqrt{193}$
(4) $3\sqrt{6}$



$\Delta Y = 7 - 5 = 2$

$\Delta X = 4 - (-3) = 7$

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

$7^2 + 2^2 = c^2$

$49 + 4 = c^2$

$53 = c^2$

$\sqrt{53} = c$

Use this space for computations.

27 Which expression represents the number of different 8-letter arrangements that can be made from the letters of the word "SAVANNAH" if each letter is used only once?

(1) $\frac{8!}{5!}$

(2) $\frac{8!}{3!2!}$

(3) ${}_8P_5$

(4) 8!

choices for each letter in word

8 7 6 5 4 3 2 1 = 8!

3 2 1 2 1 = 3! 2!

A's N's

m

28 Line segment AB has a slope of $\frac{3}{4}$. If the coordinates of point A are (2,5), the coordinates of point B could be

(1) (6,8)

(2) (5,9)

(3) (–1,1)

(4) (6,2)

(2,5)

Same Shape Different Size

29 Which is *not* a property of all similar triangles?

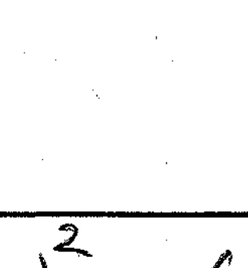
(1) The corresponding angles are congruent. Is

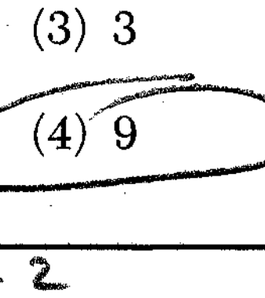
(2) The corresponding sides are congruent. Is Not

(3) The perimeters are in the same ratio as the corresponding sides. Is

(4) The altitudes are in the same ratio as the corresponding sides. Is

P = 12





P = 24

$\frac{5}{10} = \frac{12}{24}$

30 The expression $\left(\frac{3}{4}\right)^2 \bullet \left(\frac{1}{4}\right)^{-2}$ is equivalent to

(1) $\frac{9}{16}$

(2) $\frac{9}{256}$

(3) 3

(4) 9

$\left(\frac{3}{4}\right)^2 \cdot \left(\frac{1}{4}\right)^{-2} \Rightarrow \left(\frac{3}{4}\right)^2 \cdot \frac{1}{(1/4)^2}$

Remember

$\frac{a}{b}$ $\frac{c}{d}$ outers inners $\Rightarrow \frac{\text{Product of outers}}{\text{Product of Inners}}$

$\Rightarrow \frac{ad}{bc}$

$\rightarrow \frac{9}{16} \cdot \frac{1}{\frac{1}{16}} \Rightarrow \frac{9}{16} \cdot \frac{1}{\frac{1}{16}} \Rightarrow \frac{9}{16} \cdot \frac{16}{1}$

$= \frac{9}{1} = 9$

Step 1. - Find equation of line

$y = mx + b$

$y = \frac{3}{4}x + b$

$5 = \frac{3}{4}\left(\frac{2}{1}\right) + b$

$5 = \frac{6}{4} + b$

$-\frac{6}{4} \quad -\frac{6}{4}$

$3\frac{1}{2} = b$

$y = \frac{3}{4}x + 3\frac{1}{2}$

Step 2: Test Answer Choices

(6,8)

$8 = \frac{3}{4}\left(\frac{6}{1}\right) + 3\frac{1}{2}$

$8 = \frac{18}{4} + 3\frac{1}{2}$

$8 = 4\frac{1}{2} + 3\frac{1}{2}$

BINGO!

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 Solve for x: $5(x - 2) = 2(10 + x)$

$5X - 10 = 20 + 2X$

$+10 \quad +10$

$5X = 30 + 2X$

$-2X \qquad -2X$

$3X = 30$

$\boxed{X = 10}$

Check

$X = 10$

$5(X-2) = 2(10+X)$

$5(10-2) = 2(10+10)$

$5(8) = 2(20)$

$40 = 40$ ✓

32 Thelma and Laura start a lawn-mowing business and buy a lawnmower for $225. They plan to charge $15 to mow one lawn. What is the *minimum* number of lawns they need to mow if they wish to earn a profit of *at least* $750?

It costs 225 to get the lawnmower.
They have to mow $\frac{225}{15}$ to pay for it,
so they have to mow 15 lawns to
pay for the lawnmower.
After the mower is paid for, they
have to mow $\frac{750}{15}$ to earn #750.00,
so they have to mow 50 more lawns.
15 lawns plus 50 more lawns is 65 lawns.
They have to mow **65 lawns** to make
#750.00. If they mow more than
65 lawns they will make more than
#750.00.

Another Solution

P = profit
L = # lawns mowed

$P \leq -225 + 15(L)$

$750 \leq -225 + 15L$

$+225 \quad +225$

$975 \leq 15L \Rightarrow \frac{975}{15} \leq L \Rightarrow 65 \leq L$

33 What is the positive solution of the equation $4x^2 - 36 = 0$?

$4x^2 - 36 = 0$

Perfect Square of $2x$ — Perfect Square of 6

this is difference of perfect squares,

$4x^2 - 36 = 0$

$(2x+6)(2x-6) = 0$

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

$2x = -6$ $\qquad$ $2x = 6$

$x = -3$ $\qquad$ $x = 3$

Check

$4x^2 - 36 = 0$

$4(3)^2 - 36 = 0$

$4(9) - 36 = 0$

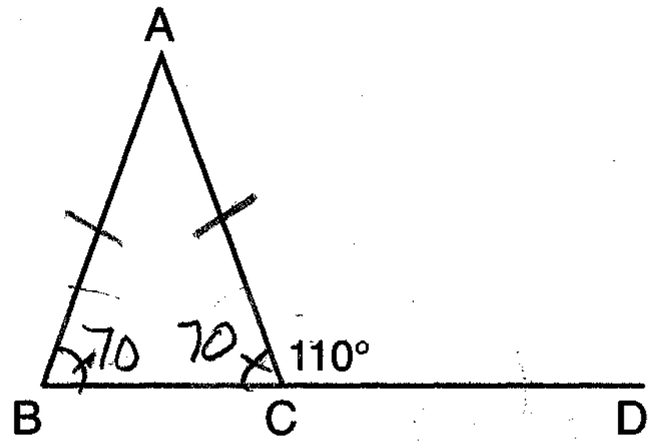
$36 - 36 = 0$

$0 = 0$ ✓

2 equal sides

34 In the accompanying diagram of isosceles triangle ABC, $\overline{AB} \cong \overline{AC}$, and exterior angle $ACD = 110°$. What is $m\angle BAC$?

2 equal base angles



One base angle = 180 - 110
= 70°

Other base angle must be the same.

$180° - (70° + 70°) = m\angle BAC$

$180 - 140 = m\angle BAC$

$\boxed{40°} = m\angle BAC$

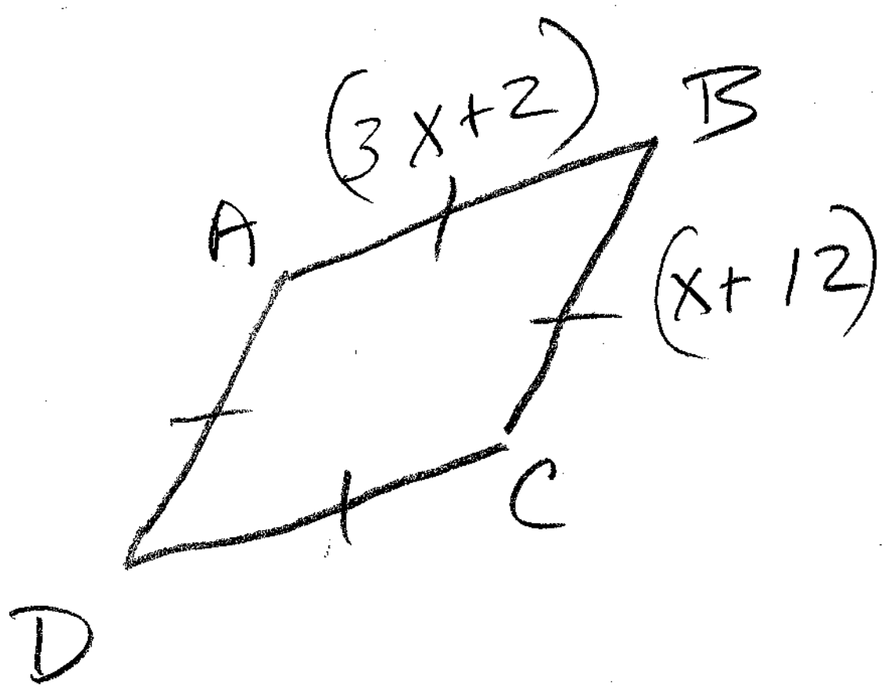
Check

$40 + 70 + 70 = 180$ ✓

$70 + 110 = 180$ ✓

4 equal sides

35 In rhombus $ABCD$, the measure, in inches, of $\overline{AB}$ is $3x + 2$ and $\overline{BC}$ is $x + 12$. Find the number of inches in the length of $\overline{DC}$.



$3x+2 = x+12$

$-x \quad -x$

$2x+2 = 12$

$-2 \quad -2$

$2x = 10$

$x = 5$

Each side of the rhombus is 17 inches, so the length of $\overline{DC}$ is 17 inches

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 The trip from Manhattan to Montauk Point is 120 miles by train or by car. A train makes the trip in 2 hours, while a car makes the trip in $2\frac{1}{2}$ hours. How much faster, in miles per hour, is the average speed of the train than the average speed of the car?

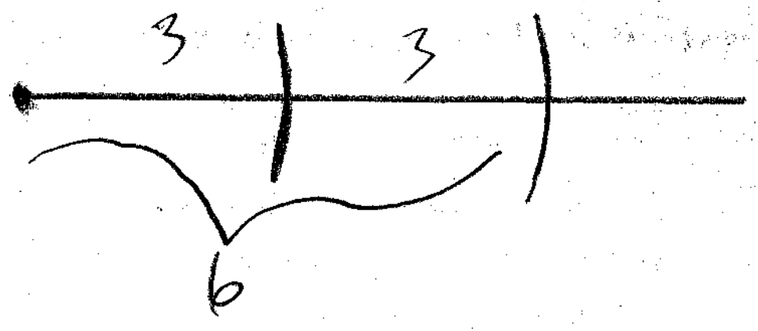
$$\text{speed} = \frac{\text{distance}}{\text{time}}$$

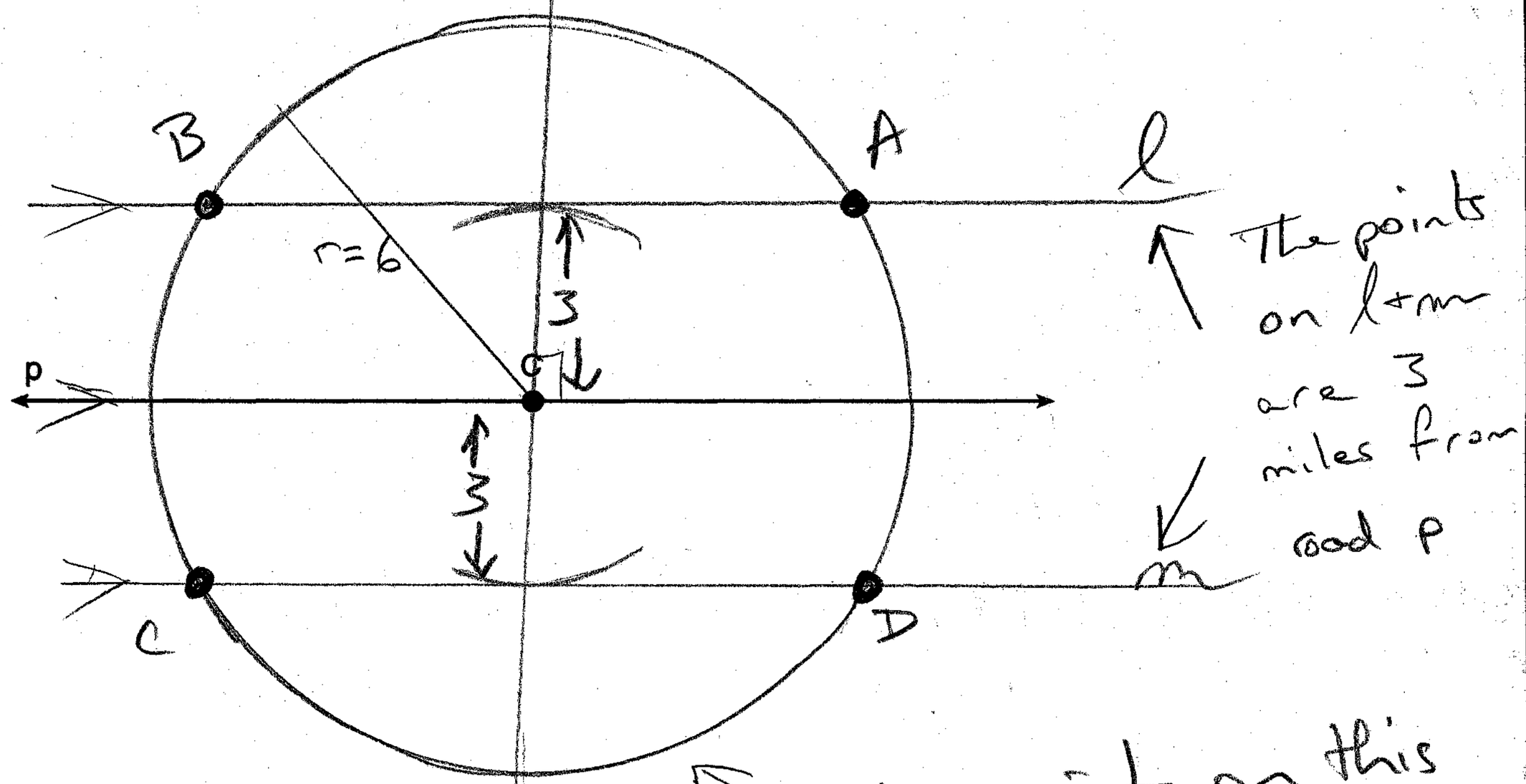
$$\text{train speed} = \frac{120 \text{ miles}}{2 \text{ hours}} = \frac{60 \text{ miles}}{1 \text{ hour}} = 60 \text{ mph.}$$

$$\text{car speed} = \frac{120 \text{ miles}}{2\frac{1}{2} \text{ hours}} = \frac{120}{2.5} = 48 \text{ mph}$$

$$60 \text{ mph} - 48 \text{ mph} = \boxed{12 \text{ mph}}$$

37 In the diagram below, town C lies on straight road p. Sketch the points that are 6 miles from town C. Then sketch the points that are 3 miles from road p. How many points satisfy both conditions?



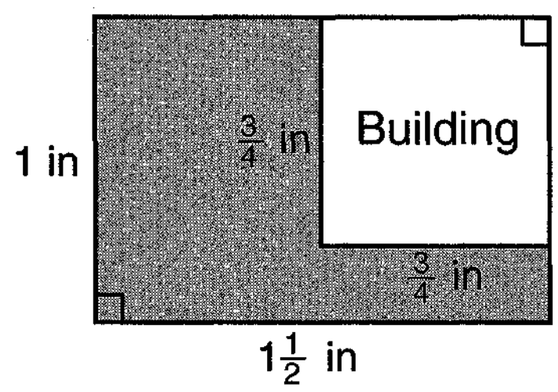


There are 4 points (A, B, C, and D) that satisfy both conditions.

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 The accompanying diagram represents a scale drawing of the property where Brendan's business is located. He needs to purchase rock salt to melt the ice on the parking lot (shaded area) around his building. A bag of rock salt covers an area of 1,500 square feet. How many bags of rock salt does Brendan need to purchase to salt the entire parking lot?



Scale: $\frac{1}{4}$ in = 18 ft

strategy
① Find the area of the shaded parking lot in scale measure.
② Convert scale measure to real life measure.
③ Divide real life measure by 1500

Step 1 $A = lw$

Total Area $= 1(1.5)\ in^2$
$= 1.5\ in^2$

Area of Bldg $= \left(\frac{3}{4}\right)\left(\frac{3}{4}\right) in^2$
$= \frac{9}{16}\ in^2$

Area of Parking Lot
$= 1\frac{1}{2} - \frac{9}{16}$
$= \frac{3}{2} - \frac{9}{16}$

$= \frac{3(16) - 2(9)}{2(16)}$

$\frac{48-18}{32} = \frac{30}{32} = \frac{15}{16} in^2$

Step 2
$\frac{1}{4}$ in $= 18$ ft
$\left(\frac{1}{4} in\right)^2 = (18\ ft)^2$
$\frac{1}{16} in^2 = 324\ ft^2$
$15\left(\frac{1}{16} in^2\right) = 15(324 ft^2)$
$\frac{15}{16} in^2 = 4860\ ft^2$

Step 3
$\frac{4860\ ft^2}{1500\ ft^2/bag} = 3.24$ bags
Round up

Brendan needs **4 bags**

1 2

39 Given the statement: "If I live in Albany, then I am a New Yorker."

In the spaces provided below, write the inverse, the converse, and the contrapositive of this statement.

Inverse: If not 1, then not 2

Inverse begins with "in" which rhymes with "n" which stands for "not" - Add not

If I do not live in Albany, then I am not a New Yorker

Converse: If 2, then 1

Converse begins with "c" which stands for change. Change the order.

If I am a New Yorker, then I live in Albany.

Contrapositive: If not 2, then not 1

Contra-positive - Do both Change order and add not

If I am not a New Yorker, then I do not live in Albany.

Which conditional is logically equivalent to its original ~~statement~~?

inverse converse contrapositive

Strategy

Forget the meanings of the words and convert the given to If 1, then 2 reasoning. Determine the structure of the inverse, converse, or contra-positive, and then convert your reasoning back to words.

Tear Here

The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

MATHEMATICS A

Thursday, August 16, 2007 — 8:30 to 11:30 a.m., only

ANSWER SHEET

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

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

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

Tear Here