The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

GEOMETRY (Common Core)

Tuesday, June 2, 2015 — 1:15 to 4:15 p.m., only

Student Name: Answer Key ♡

School Name: MAP ♡

The possession or use of any communications device is strictly prohibited when taking this examination. If you have or use any communications device, no matter how briefly, your examination will be invalidated and no score will be calculated for you.

Print your name and the name of your school on the lines above.

A separate answer sheet for Part I has been provided to you. Follow the instructions from the proctor for completing the student information on your answer sheet.

This examination has four parts, with a total of 36 questions. You must answer all questions in this examination. Record 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. All work should be written in pen, except for graphs and drawings, which should be done in pencil. Clearly indicate the necessary steps, including appropriate formula substitutions, diagrams, graphs, charts, etc. Utilize the information provided for each question to determine your answer. Note that diagrams are not necessarily drawn to scale.

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.

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.

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, a straightedge (ruler), and a compass must be available for you to use while taking this examination.

DO NOT OPEN THIS EXAMINATION BOOKLET UNTIL THE SIGNAL IS GIVEN.

GEOMETRY (COMMON CORE)

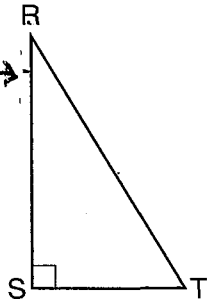
Part I

Answer all 24 questions in this part. Each correct answer will receive 2 credits. Utilize the information provided for each question to determine your answer. Note that diagrams are not necessarily drawn to scale. For each statement or question, choose the word or expression that, of those given, best completes the statement or answers the question. [48]

Use this space for computations.

1 Which object is formed when right triangle RST shown below is rotated around leg $\overline{RS}$?

Think of this triangle spinning around $\overline{RS}$.



What 3-D figure would it make

(1) a pyramid with a square base
(2) an isosceles triangle
(3) a right triangle
(4) a cone

2 The vertices of $\triangle JKL$ have coordinates $J(5,1)$, $K(-2,-3)$, and $L(-4,1)$. Under which transformation is the image $\triangle J'K'L'$ *not* congruent to $\triangle JKL$?

(1) a translation of two units to the right and two units down
(2) a counterclockwise rotation of 180 degrees around the origin
(3) a reflection over the x-axis
(4) a dilation with a scale factor of 2 and centered at the origin

All RIGID transformations!

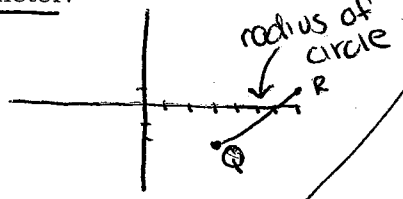
Size does not change

creates similar $\triangle$s

3 The center of circle Q has coordinates $(3,-2)$. If circle Q passes through $R(7,1)$, what is the length of its diameter?

(1) 50
(2) 25
(3) 10
(4) 5

diameter = 2 × radius



Use distance formula! [2]

$D=\sqrt{(x_2-x_1)^2+(y_2-y_1)^2}$

$Q(3,-2)$ $R(7,1)$
$x_1\ y_1$ $x_2\ y_2$

$\sqrt{(7-3)^2+(1--2)^2}$

$\sqrt{4^2+3^2}$

$\sqrt{16+9}=\sqrt{25}=5$ radius

diameter $= 2(5) = 10$

Use this space for computations.

4 In the diagram below, congruent figures 1, 2, and 3 are drawn.

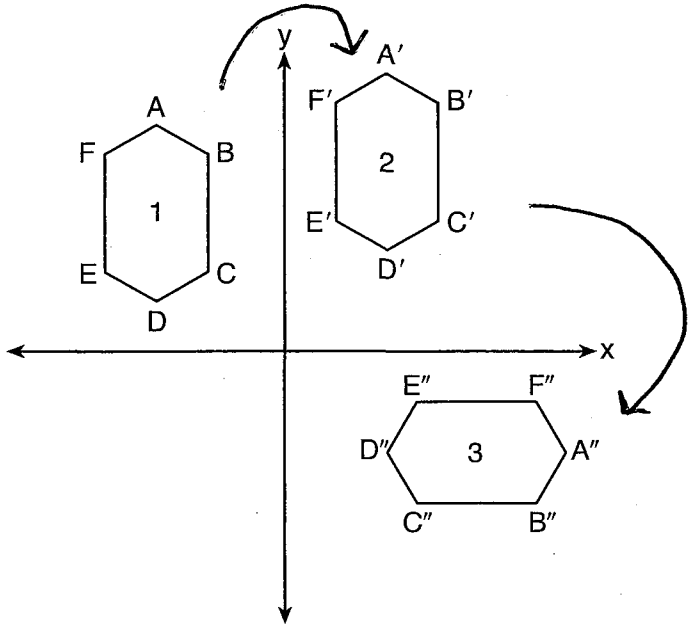


Figure 1 → Figure 2
Translation

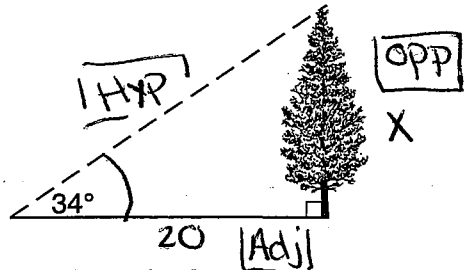
Figure 2 → Figure 3
Rotation

Which sequence of transformations maps figure 1 onto figure 2 and then figure 2 onto figure 3?

(1) a reflection followed by a translation
(2) a rotation followed by a translation
(3) a translation followed by a reflection
(4) a translation followed by a rotation

Key words for $S\frac{O}{H}C\frac{A}{H}T\frac{O}{A}$

5 As shown in the diagram below, the angle of elevation from a point on the ground to the top of the tree is 34°.



*we are looking for our opposite side and we have our adjacent side → which teig function uses O & A? *

If the point is 20 feet from the base of the tree, what is the height of the tree, to the *nearest tenth of a foot*?

(1) 29.7
(2) 16.6
(4) 11.2

$\tan 34 = \frac{x}{20}$

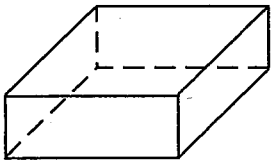
$x = 20 \tan 34$

$x = 13.490170\ldots$

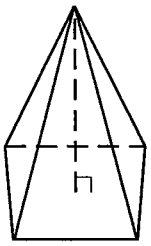
Use this space for computations.

6 Which figure can have the same cross section as a sphere?

A ball

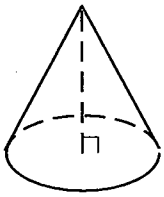


(1)

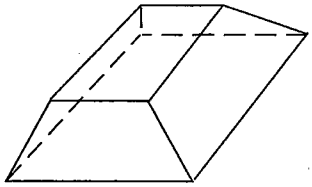


(3)

The cross section of a sphere is a circle



(2)



(4)

fancy word for BOX

7 A shipping container is in the shape of a right rectangular prism with a length of 12 feet, a width of 8.5 feet, and a height of 4 feet. The container is completely filled with contents that weigh, on average, 0.25 pound per cubic foot. What is the weight, in pounds, of the contents in the container?

"filled with contents" means VOLUME

(1) 1,632

(2) 408

(3) 102

(4) 92

$l = 12$

$w = 8.5$

$h = 4$

$V = l \times w \times h$

$V = 12 \times 8.5 \times 4$

$V = 408\ ft^3$

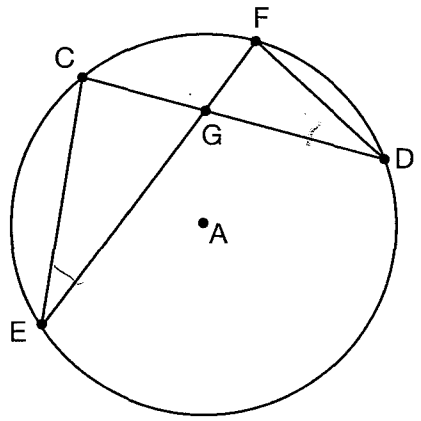
weight = 408

× .25

102 lbs

Use this space for computations.

8 In the diagram of circle A shown below, chords $\overline{CD}$ and $\overline{EF}$ intersect at G, and chords $\overline{CE}$ and $\overline{FD}$ are drawn.



Which statement is *not* always true?

(1) $\overline{CG} \cong \overline{FG}$

(2) $\angle CEG \cong \angle FDG$

(3) $\frac{CE}{EG} = \frac{FD}{DG}$

(4) $\triangle CEG \sim \triangle FDG$

↑ They are both inscribed angles intercepting the same arc

↳ they are similar △s

9 Which equation represents a line that is perpendicular to the line represented by $2x - y = 7$?

(1) $y = -\frac{1}{2}x + 6$

(2) $y = \frac{1}{2}x + 6$

(3) $y = -2x + 6$

(4) $y = 2x + 6$

- 2 lines that meet to form a Right angle
- perpendicular lines have negative reciprocal slopes

$2x - y = 7$
$-2x \quad -2x$

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

$y = 2x - 7$

slope $= 2 = \frac{2}{1}$ → negative reciprocal $= -\frac{1}{2}$

Use this space for computations.

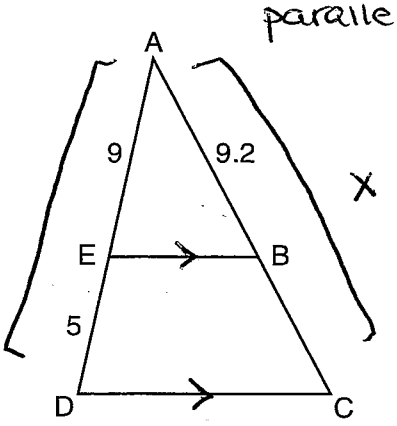
10 Which regular polygon has a minimum rotation of 45° to carry the polygon onto itself?

(1) octagon 8 sides
(3) hexagon 6 sides
(2) decagon 10 sides
(4) pentagon 5 sides

$360 \div 45 = 8$

11 In the diagram of $\triangle ADC$ below, $\overline{EB} \parallel \overline{DC}$, $AE = 9$, $ED = 5$, and $AB = 9.2$.

↑ parallel



9+5 = 14

What is the length of $\overline{AC}$, to the *nearest tenth*?

(1) 5.1
(3) 14.3
(2) 5.2
(4) 14.4

$\frac{9}{9.2} = \frac{14}{x} \rightarrow \frac{9x}{9} = \frac{128.8}{9} \rightarrow x = 14.3\overline{1}$

-OR-

Find $\overline{BC}$

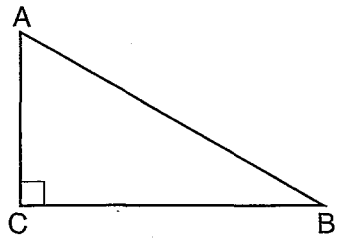
$\frac{9}{5} = \frac{9.2}{x} \rightarrow \frac{9x}{9} = \frac{46}{9} \rightarrow x = 5.1$

↓

9.2 + 5.1 = 14.3

Use this space for computations.

12 In scalene triangle ABC shown in the diagram below, $m\angle C = 90°$.



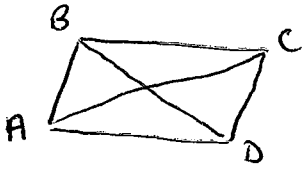
memorize this!

If A and B are complementary (add up to 90°) then $\sin A = \cos B$

Which equation is always true?

(1) $\sin A = \sin B$
(2) $\cos A = \cos B$
(3) $\cos A = \sin C$
(4) $\sin A = \cos B$

13 Quadrilateral $ABCD$ has diagonals $\overline{AC}$ and $\overline{BD}$. Which information is *not* sufficient to prove $ABCD$ is a parallelogram?



(1) $\overline{AC}$ and $\overline{BD}$ bisect each other.
(2) $\overline{AB} \cong \overline{CD}$ and $\overline{BC} \cong \overline{AD}$
(3) $\overline{AB} \cong \overline{CD}$ and $\overline{AB} \parallel \overline{CD}$
(4) $\overline{AB} \cong \overline{CD}$ and $\overline{BC} \parallel \overline{AD}$

Important Properties
① opposite sides ≅
② opposite sides parallel
③ diagonals bisect each other

14 The equation of a circle is $x^2 + y^2 + 6y = 7$. What are the coordinates of the center and the length of the radius of the circle?

(1) center (0,3) and radius 4
(2) center (0,−3) and radius 4
(3) center (0,3) and radius 16
(4) center (0,−3) and radius 16

we never did this topic b/c it is VERY VERY HARD → but I will show the steps here

$x^2 + y^2 + 6y = 7$ (I am going to complete the square)

$x^2 + 0x + ? + y^2 + 6y + ? = 7 + ? + ?$

$0 \div 2 = 0$ $\quad 0^2 = 0$ ok?

$6 \div 2 = 3$ $\quad 3^2 = 9$ ok?

$x^2 + 0x + 0 + y^2 + 6y + 9 = 7 + 0 + 9$

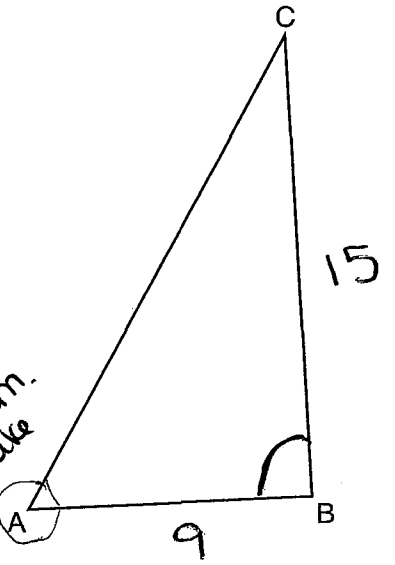
$x^2 + (y+3)(y+3) = 16$

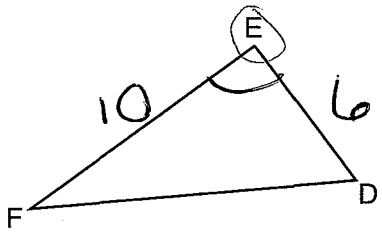
$x^2 + (y+3)^2 = 16$ → center (0, −3), radius $= \sqrt{16} = 4$

LABEL YOUR DIAGRAMS!

Use this space for computations.

15 Triangles ABC and DEF are drawn below.





look at the diagram. doesn't make sense

If $AB = 9$, $BC = 15$, $DE = 6$, $EF = 10$, and $\angle B \cong \angle E$, which statement is true?

X (1) $\angle CAB \cong \angle DEF$

(3) $\triangle ABC \sim \triangle DEF$ ← similar → similar by SAS

X (2) $\frac{AB}{CB} = \frac{FE}{DE}$ → $\frac{9}{15} \stackrel{?}{=} \frac{10}{6}$, $.6 \neq 1.\overline{6}$

X (4) $\frac{AB}{DE} = \frac{FE}{CB}$ → $\frac{9}{6} \stackrel{?}{=} \frac{10}{15}$, $1.5 \neq .\overline{6}$

16 If $\triangle ABC$ is dilated by a scale factor of 3, which statement is true of the image $\triangle A'B'C'$?

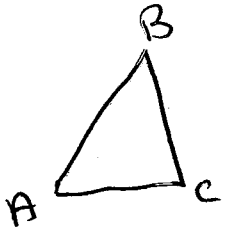
(1) $3A'B' = AB$

(3) $B'C' = 3BC$

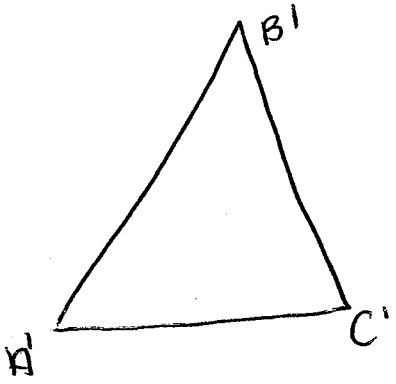
(2) $m\angle A' = 3(m\angle A)$

(4) $3(m\angle C') = m\angle C$

] automatically out b/c angle measures DO NOT change

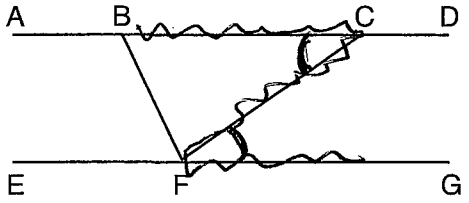


x3



Use this space for computations.

17 Steve drew line segments $ABCD$, EFG, BF, and CF as shown in the diagram below. Scalene $\triangle BFC$ is formed.



parallel

LOOK FOR THE "Z" or the "F"

Which statement will allow Steve to prove $\overline{ABCD} \parallel \overline{EFG}$?

(1) $\angle CFG \cong \angle FCB$

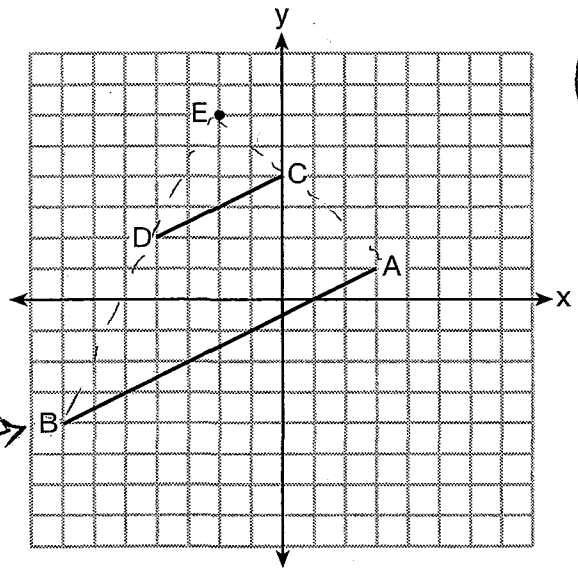
(2) $\angle ABF \cong \angle BFC$

(3) $\angle EFB \cong \angle CFB$

(4) $\angle CBF \cong \angle GFC$

* go through your multiple choice options and see what makes sense! *

18 In the diagram below, $\overline{CD}$ is the image of $\overline{AB}$ after a dilation of scale factor k with center E.



I woke up like this!

If $\overline{CD}$ is the image then we are starting at $\overline{AB}$ and going to $\overline{CD}$. Which means our scale factor $k < 1$

Which ratio is equal to the scale factor k of the dilation?

(1) $\frac{EC}{EA}$

(2) $\frac{BA}{EA}$

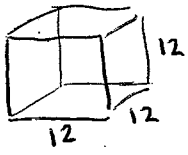
(3) $\frac{EA}{BA}$

(4) $\frac{EA}{EC}$

Cube = 3-D square → 6 ≅ sides

19 A gallon of paint will cover approximately 450 square feet. An artist wants to paint all the outside surfaces of a cube measuring 12 feet on each edge. What is the *least* number of gallons of paint he must buy to paint the cube?

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



Use this space for computations.

painting outside surfaces = area

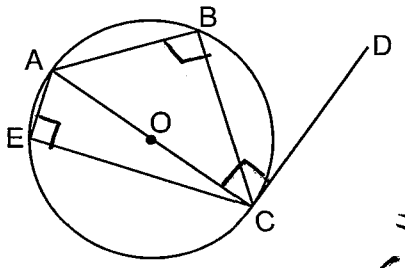
$A_{square} = l \times w$
$= 12 \times 12$
$= 144 \text{ ft}^2$

all 6 sides have this area!

$144 \times 6 = 864 \text{ ft}^2$

$864 \div 450 = 1.92$

20 In circle O shown below, diameter $\overline{AC}$ is perpendicular to $\overline{CD}$ at point C, and chords $\overline{AB}$, $\overline{BC}$, $\overline{AE}$, and $\overline{CE}$ are drawn.



inscribed angles intercepting the same arc

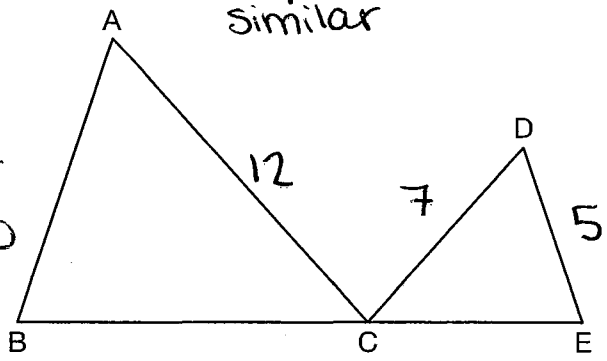
Which statement is *not* always true?

(1) $\angle ACB \cong \angle BCD$
(2) $\angle ABC \cong \angle ACD$
(3) $\angle BAC \cong \angle DCB$
(4) $\angle CBA \cong \angle AEC$

→ $\angle ABC$ is a right $\angle$ (90°) b/c it is an inscribed $\angle$ intercepting half a circle. Half of a circle measures 180°.
$180 \div 2 = 90°$
→ same reasoning for $\angle AEC$

21 In the diagram below, $\triangle ABC \sim \triangle DEC$.

similar ↑



Perimeter $\triangle ABC = 30$

Set up a proportion!

If $AC = 12$, $DC = 7$, $DE = 5$, and the perimeter of $\triangle ABC$ is 30, what is the perimeter of $\triangle DEC$?

(1) 12.5
(2) 14.0
(3) 14.8
(4) 17.5

$$\frac{\text{side } \triangle ABC}{\text{Perimeter } \triangle ABC} = \frac{\text{side } \triangle DEC}{\text{perimeter } \triangle DEC}$$

$$\frac{12}{30} = \frac{7}{x} \rightarrow \frac{12x}{12} = \frac{210}{12}$$

$x = 17.5$

$\frac{3}{3}y = -\frac{2}{3}x + \frac{8}{3}$ → $y = -\frac{2}{3}x + \frac{8}{3}$

slope = $-\frac{2}{3}$ ← will have same slope as original line

22 The line $3y = -2x + 8$ is transformed by a dilation centered at the origin. Which linear equation could be its image?

Use this space for computations.

* go through your multiple choice options to see who has a slope of $-\frac{2}{3}$ *

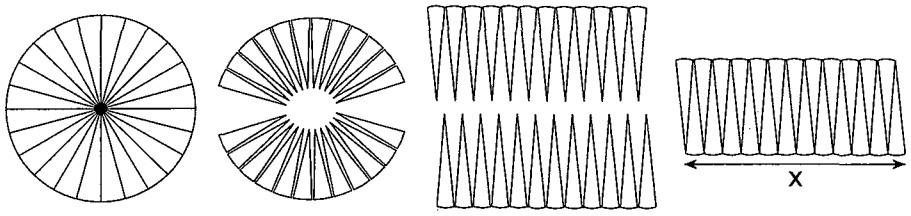
(1) $2x + 3y = 5$ (3) $3x + 2y = 5$

(2) $2x - 3y = 5$ (4) $3x - 2y = 5$

$2x + 3y = 5$

$-2x \quad -2x$ → $\frac{3}{3}y = -\frac{2}{3}x + \frac{5}{3}$ → $y = -\frac{2}{3}x + \frac{5}{3}$ ☺

23 A circle with a radius of 5 was divided into 24 congruent sectors. The sectors were then rearranged, as shown in the diagram below.



To the *nearest integer*, the value of x is

(1) 31 (3) 12

(1) 16 (4) 10

circumference (on your formula sheet)

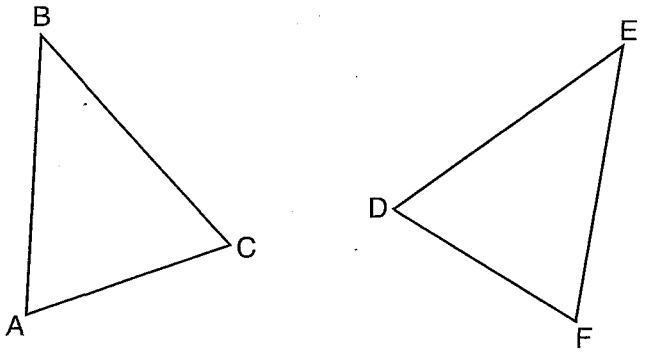
$C = 2\pi r$

$C = 2\pi(5) = 10\pi$

but $x = \frac{1}{2}$ of the outside of the circle!

→ $10\pi \div 2 = 5\pi = 15.7079..$

24 Which statement is sufficient evidence that $\triangle DEF$ is congruent to $\triangle ABC$?



5 ways to prove 2 △s are congruent

① SSS
② SAS
③ ASA
④ AAS
⑤ HL

(1) $AB = DE$ and $BC = EF$

(2) $\angle D \cong \angle A$, $\angle B \cong \angle E$, $\angle C \cong \angle F$

(1) There is a sequence of rigid motions that maps $\overline{AB}$ onto $\overline{DE}$, $\overline{BC}$ onto $\overline{EF}$, and $\overline{AC}$ onto $\overline{DF}$. (SSS)

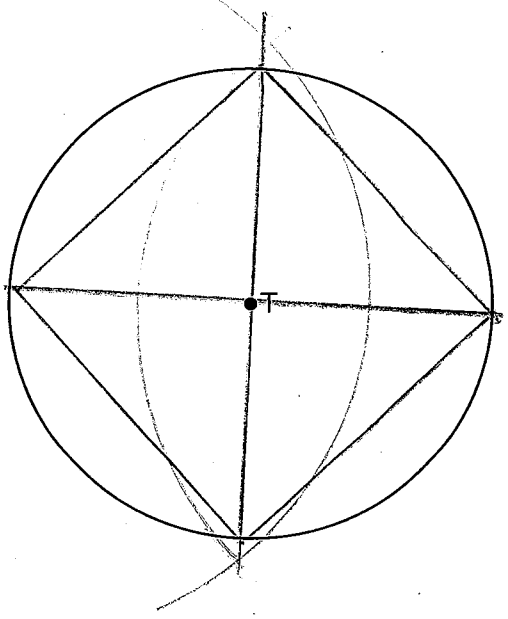
(4) There is a sequence of rigid motions that maps point A onto point D, $\overline{AB}$ onto $\overline{DE}$, and $\angle B$ onto $\angle E$.

Part II

Answer all 7 questions in this part. Each correct answer will receive 2 credits. Clearly indicate the necessary steps, including appropriate formula substitutions, diagrams, graphs, charts, etc. Utilize the information provided for each question to determine your answer. Note that diagrams are not necessarily drawn to scale. For all questions in this part, a correct numerical answer with no work shown will receive only 1 credit. All answers should be written in pen, except for graphs and drawings, which should be done in pencil. [14]

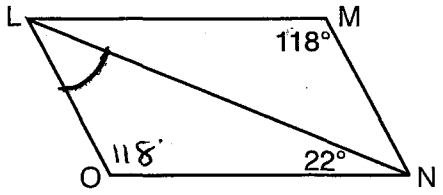
25 Use a compass and straightedge to construct an inscribed square in circle T shown below. [Leave all construction marks.]

watch construction video on Youtube



WeinsteinMAPMATH

26 The diagram below shows parallelogram $LMNO$ with diagonal $\overline{LN}$, $m\angle M = 118°$, and $m\angle LNO = 22°$.



Explain why $m\angle NLO$ is 40 degrees.

① $\measuredangle LON = 118°$ b/c opposite angles in a parallelogram are congruent

② $\triangle LON = 180°$ (b/c all triangles must add up to 180°)

③ $118 + 22 = 140$

$180 - 140 = 40°$

therefore $m\measuredangle NLO = 40°$

27 The coordinates of the endpoints of $\overline{AB}$ are $A(-6,-5)$ and $B(4,0)$. Point P is on $\overline{AB}$. Determine and state the coordinates of point P, such that $AP:PB$ is 2:3.
[The use of the set of axes below is optional.]

Step #1: 2+3=5 (dividing the line into 5 congruent sections)

X-distance

$-6-4=-10$ ← distance can't be negative

(10)

X-coordinate

$-6+\frac{2}{5}(10)=-2$

↑ x-distance

y-distance

$-5-0=-5$

↓

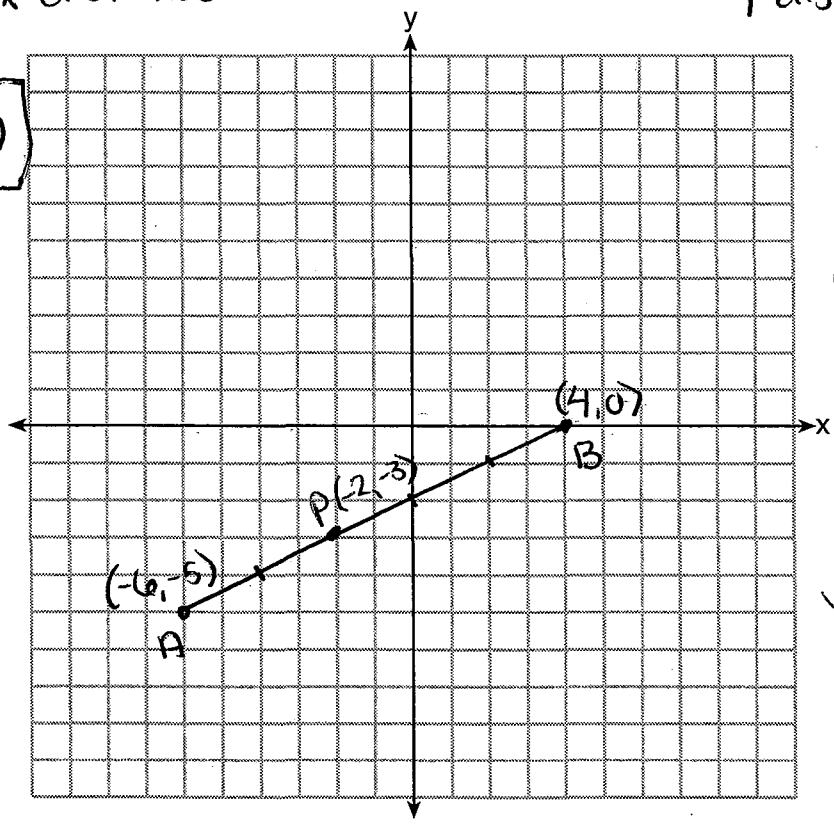
(5)

y-coordinate

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

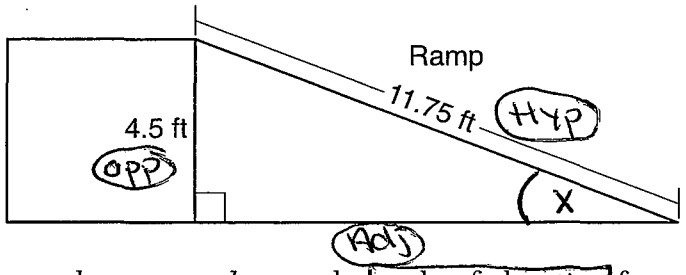
↑ y-distance

P(-2,-3)



NOTE: the $\frac{2}{5}$ comes from the ratio 2:3. The 5 is the total # of ≅ sections

28 The diagram below shows a ramp connecting the ground to a loading platform 4.5 feet above the ground. The ramp measures 11.75 feet from the ground to the top of the loading platform.



Determine and state, to the *nearest degree*, the angle of elevation formed by the ramp and the ground.

nearest whole #

this means to use $S\frac{O}{H}C\frac{A}{H}T\frac{O}{A}$

* we have information about the O and H → which mean we are using sin *

$$\sin x = \frac{4.5}{11.75} \longrightarrow x = 22.5183\ldots$$

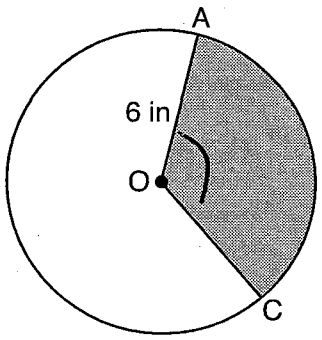
$x = 23°$

→ In your calculator, hit 2nd sin (4.5/11.75)

↓

$\sin^{-1}(4.5/11.75)$

29 In the diagram below of circle O, the area of the shaded sector AOC is 12π in^2 and the length of $\overline{OA}$ is 6 inches. Determine and state m$\angle AOC$.



Area Sector $= \left(\frac{x}{360}\right)\pi r^2$

x = # of degrees
r = radius

* In this example, we are solving for x in the formula *

$$\frac{12\pi}{\pi} = \frac{\left(\frac{x}{360}\right)\pi(6)^2}{\pi}$$

$$\frac{12}{1} = \left(\frac{x}{360}\right)\left(\frac{6^2}{1}\right)$$

$$\frac{12}{1} = \left(\frac{x}{360}\right)\left(\frac{36}{1}\right)$$

$$\frac{12}{1} = \frac{36x}{360}$$

$$\frac{12}{1} = \frac{36x}{360}$$

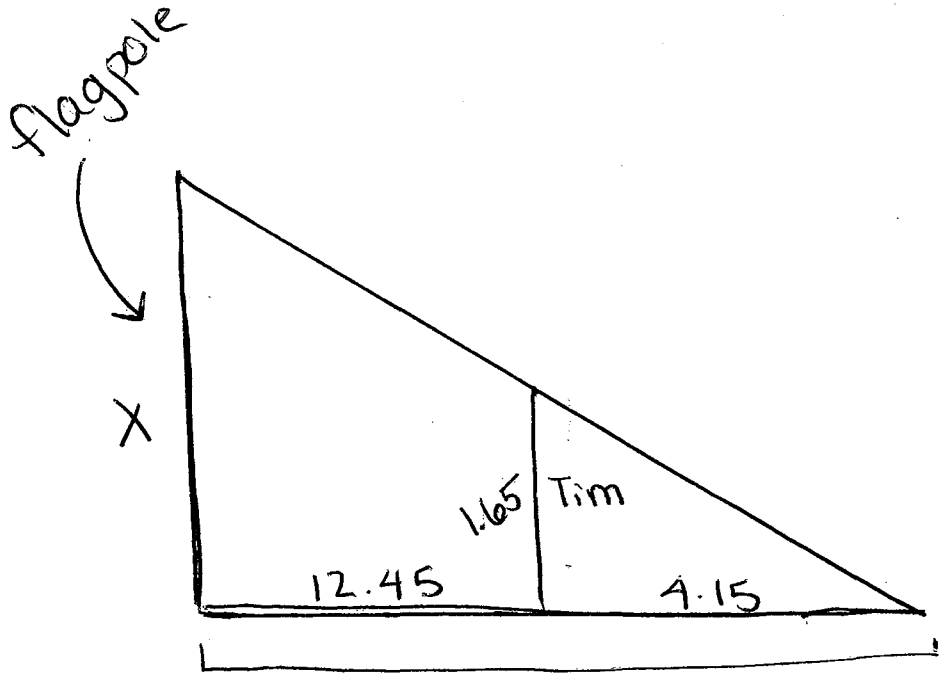
$$\frac{36x}{36} = \frac{4320}{36}$$

$x = 120°$

30 After a reflection over a line, $\triangle A'B'C'$ is the image of $\triangle ABC$. Explain why triangle ABC is congruent to triangle $A'B'C'$.

$\triangle ABC$ is congruent to $\triangle A'B'C'$ b/c a reflection is a Rigid Transformation. This means that size is preserved.

31 A flagpole casts a shadow 16.60 meters long. Tim stands at a distance of 12.45 meters from the base of the flagpole, such that the end of Tim's shadow meets the end of the flagpole's shadow. If Tim is 1.65 meters tall, determine and state the height of the flagpole to the *nearest tenth of a meter.*



16.60 m
(flagpole shadow)

16.60
−12.45
4.15

Similar Triangles

proportion

$$\frac{X}{16.60} = \frac{1.65}{4.15}$$

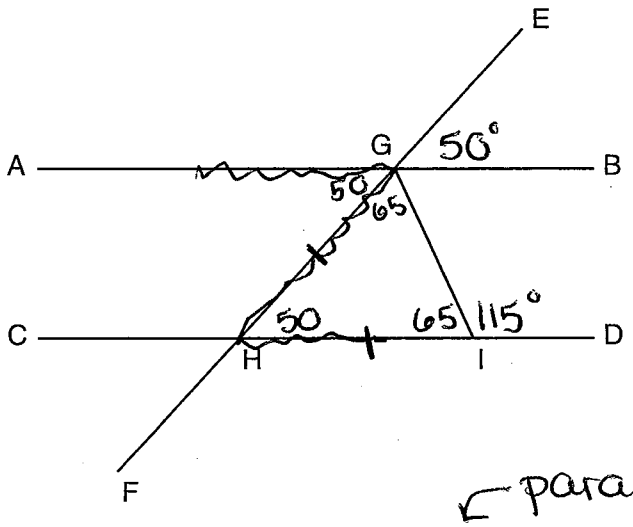
$$\frac{4.15X}{4.15} = \frac{27.39}{4.15} \rightarrow X = 6.6\text{m}$$

Part III

Answer all 3 questions in this part. Each correct answer will receive 4 credits. Clearly indicate the necessary steps, including appropriate formula substitutions, diagrams, graphs, charts, etc. Utilize the information provided for each question to determine your answer. Note that diagrams are not necessarily drawn to scale. For all questions in this part, a correct numerical answer with no work shown will receive only 1 credit. All answers should be written in pen, except for graphs and drawings, which should be done in pencil. [12]

32 In the diagram below, $\overline{EF}$ intersects $\overline{AB}$ and $\overline{CD}$ at G and H, respectively, and $\overline{GI}$ is drawn such that $\overline{GH} \cong \overline{IH}$.

LABEL YOUR DIAGRAM!



← parallel

If $m\angle EGB = 50°$ and $m\angle DIG = 115°$, explain why $\overline{AB} \parallel \overline{CD}$.

→ ∠HIG = 180 − 115 = 65° (b/c they are a linear pair making them supplementary)

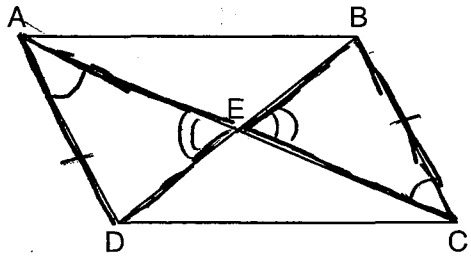
→ ∠HGI = 65° b/c △HGI is an isosceles △ and isosceles △s have 2 ≅ base angles

→ ∠AGH = 50° b/c all vertical angles are ≅

→ ∠GHI = 180 − 65 − 65 = 50 b/c △HGI adds up to 180°

→ ∠AGH ≅ ∠GHI → since they are alternate interior angles, that means $\overline{AB} \parallel \overline{CD}$

33 Given: Quadrilateral $ABCD$ is a parallelogram with diagonals $\overline{AC}$ and $\overline{BD}$ intersecting at E



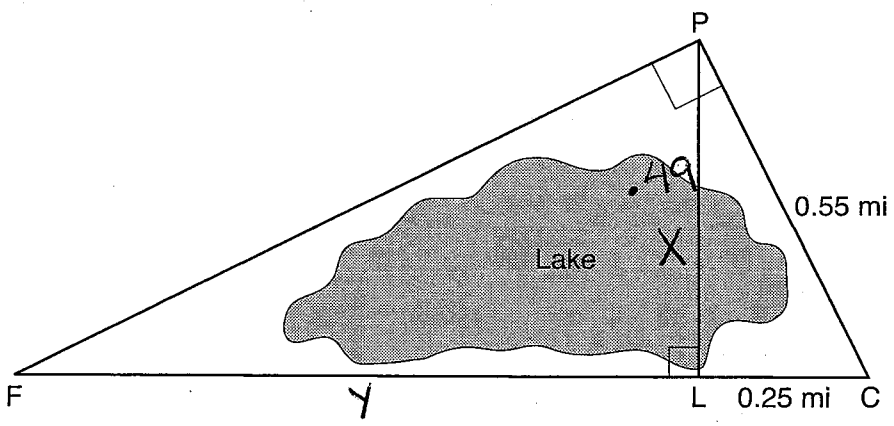
Prove: $\triangle AED \cong \triangle CEB$

Statements	Reasons
① Quad ABCD is a parallelogram w/ diagonals $\overline{AC}$ and $\overline{BD}$ int. at E.	① given
② $\overline{AD} \cong \overline{BC}$ and $\overline{AD} \parallel \overline{BC}$	② opposite sides of a parallelogram are congruent and parallel
③ $\angle DAE \cong \angle ECB$	③ If 2 lines are parallel, then alternate interior angles are $\cong$
④ $\angle AED \cong \angle CEB$	④ All vertical angles are $\cong$
⑤ $\triangle AED \cong \triangle CEB$	⑤ AAS $\cong$ AAS

Describe a single rigid motion that maps $\triangle AED$ onto $\triangle CEB$.

Rotation around point E

34 In the diagram below, the line of sight from the park ranger station, P, to the lifeguard chair, L, on the beach of a lake is perpendicular to the path joining the campground, C, and the first aid station, F. The campground is 0.25 mile from the lifeguard chair. The straight paths from both the campground and first aid station to the park ranger station are perpendicular.



If the path from the park ranger station to the campground is 0.55 mile, determine and state, to the *nearest hundredth of a mile*, the distance between the park ranger station and the lifeguard chair.

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

$x^2+.25^2=.55^2$

$x^2+.0625=.3025$

$-.0625 \quad -.0625$

$\sqrt{x^2}=\sqrt{.24}$

$x=.48989794486$

$x=.49$ miles

Gerald believes the distance from the first aid station to the campground is at least 1.5 miles. Is Gerald correct? Justify your answer.

Alt^2 = piece × piece

$.49^2=(25)(y)$

$\frac{.2401}{.25}=\frac{.25y}{.25}$

$y=.9604$

$.9604$

$+ .25$

1.2104 miles

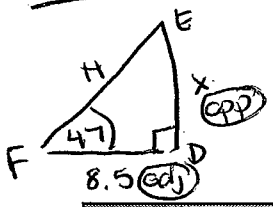
Gerald is incorrect

Part IV

Answer the 2 questions in this part. Each correct answer will receive 6 credits. Clearly indicate the necessary steps, including appropriate formula substitutions, diagrams, graphs, charts, etc. Utilize the information provided for each question to determine your answer. Note that diagrams are not necessarily drawn to scale. For all questions in this part, a correct numerical answer with no work shown will receive only 1 credit. All answers should be written in pen, except for graphs and drawings, which should be done in pencil. [12]

35 The water tower in the picture below is modeled by the two-dimensional figure beside it. The water tower is composed of a hemisphere, a cylinder, and a cone. Let C be the center of the hemisphere and let D be the center of the base of the cone.

Side note



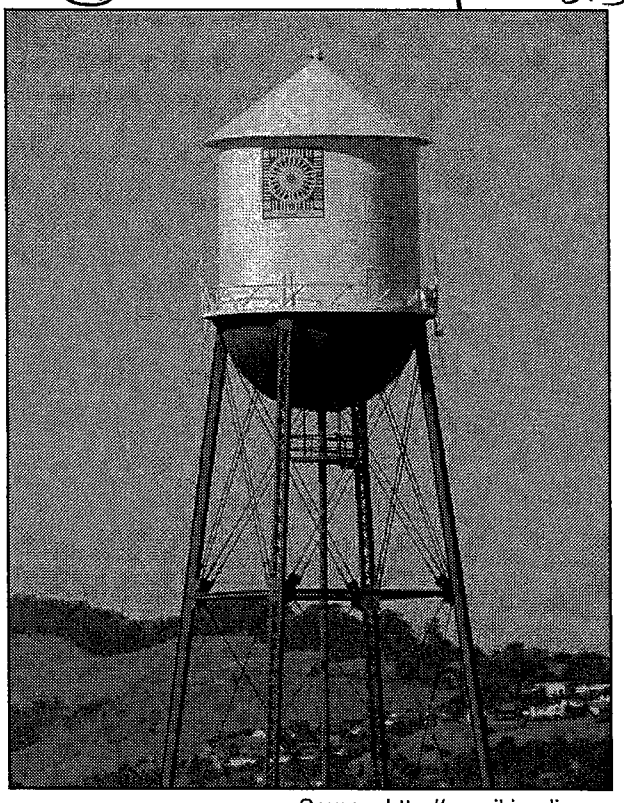
SOH CAH TOA

$\tan 47 = \frac{x}{8.5}$

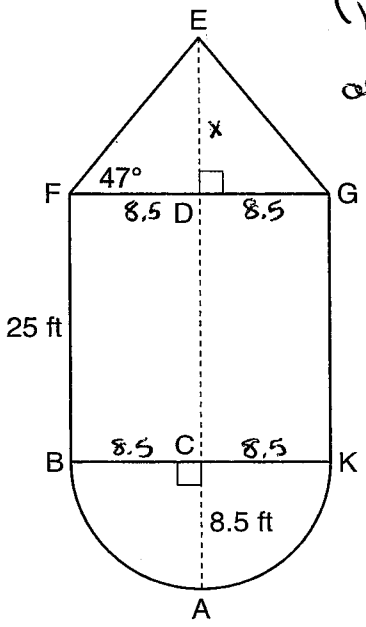
$x = 8.5 \tan 47$

$x = 9.1151$

↑ height of the cone



Source: http://en.wikipedia.org



Question 35 is continued on the next page.

* FORMULAS ON YOUR FORMULA SHEET *

Question 35 continued

If $AC = 8.5$ feet, $BF = 25$ feet, and $m\angle EFD = 47°$, determine and state, to the *nearest cubic foot*, the volume of the water tower.

$V_{cone} = \frac{1}{3}\pi r^2 h = \frac{1}{3}\pi(8.5)^2(9.1151) = 689.64867 63$

$V_{cylinder} = \pi r^2 h = \pi(8.5)^2(25) = 5674.501731$

$V_{sphere} = \frac{4}{3}\pi r^3 = \frac{4}{3}\pi(8.5)^3 = 2572.440785$

↑ divide this by 2 b/c ½ a sphere

$V_{½ sphere} = 1286.220392$

Add all of them up!

$689.64867 63 + 5674.501731 + 1286.220392$

$= 7650.354327 \approx \boxed{7650\ ft^3}$

The water tower was constructed to hold a maximum of 400,000 pounds of water. If water weighs 62.4 pounds per cubic foot, can the water tower be filled to 85% of its volume and *not* exceed the weight limit? Justify your answer.

weight = $7650 \times 62.4 = 477,360$ pounds

$\times .85$

$405,756$ pounds

NO, b/c $405,765 > 400,000$

Right $\Delta \rightarrow$ 2 sides $\perp$

36 In the coordinate plane, the vertices of $\triangle RST$ are $R(6,-1)$, $S(1,-4)$, and $T(-5,6)$. Prove that $\triangle RST$ is a right triangle.
[The use of the set of axes on the next page is optional.]

method: 3 slopes

slope formula $\frac{y_2 - y_1}{x_2 - x_1}$

slope $\overline{RS}$ $R(6,-1)$ $S(1,-4)$
$x_1\ y_1$ $x_2\ y_2$

$\frac{-4 \overset{+}{(-)} 1}{1-6} = \frac{-3}{-5} = \frac{3}{5}$

slope $\overline{RT}$ $R(6,-1)$ $T(-5,6)$
$x_1\ y_1$ $x_2\ y_2$

$\frac{6 - -1}{-5-6} = \frac{7}{-11}$

slope $\overline{TS}$ $T(-5,6)$ $S(1,-4)$
$x_1\ y_1$ $x_2\ y_2$

$\frac{-4-6}{1--5} = \frac{-10}{6} = -\frac{5}{3}$

ΔRST is a Right Δ b/c $\overline{RS}$ and $\overline{TS}$ have negative reciprocal slopes, which makes them perpendicular. $\perp$ lines form Right angles. A Δ with one Right angle is a Right triangle

State the coordinates of point P such that quadrilateral $RSTP$ is a rectangle.

$P(0,9)$

(use your diagram)

Question 36 is continued on the next page.

Question 36 continued

Prove that your quadrilateral *RSTP* is a rectangle.
[The use of the set of axes below is optional.]

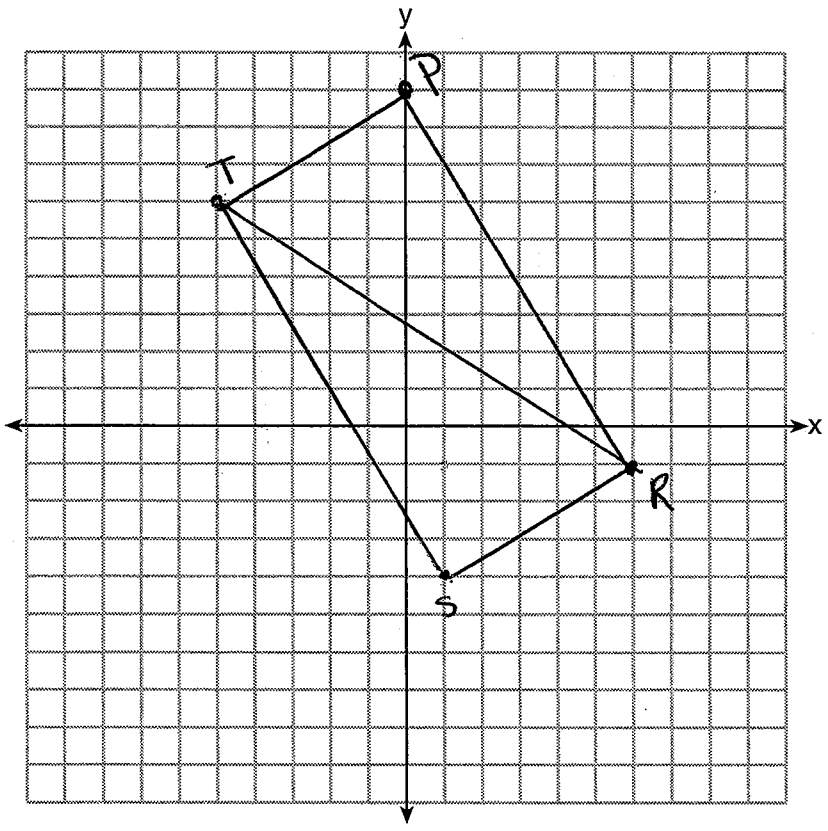
slope $\overline{RP}$ $R(6,-1)$ $P(0,9)$
$X_1\ Y_1$ $X_2\ Y_2$

$\frac{9--1}{0-6} = \frac{10}{6} = \frac{5}{3}$

slope $\overline{PT}$ $P(0,9)$ $T(-5,6)$
$X_1\ Y_1$ $X_2\ Y_2$

$\frac{6-9}{-5-0} = \frac{-3}{-5} = \frac{3}{5}$

negative reciprocal slopes



concluding statement on the back →

Quadrilateral RSTP is a rectangle b/c adjacent sides have negative reciprocal slopes. If 2 lines have negative reciprocal slopes, this means that they are perpendicular. Perpendicular lines form right angles. A Quadrilateral with 4 Right angles is a rectangle.