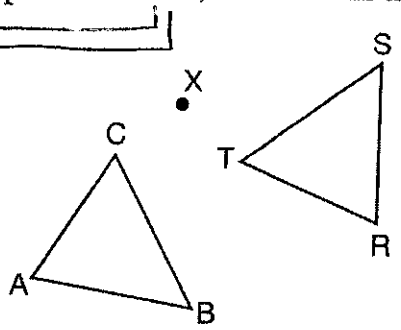
Part I

Answer all 24 questions in this part. Each correct answer will receive 2 credits. No partial credit will be allowed. 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. Record your answers on your separate answer sheet. [48]

Use this space for computations.

1 After a counterclockwise rotation about point X, scalene triangle ABC maps onto $\triangle RST$, as shown in the diagram below.



Which statement must be true?

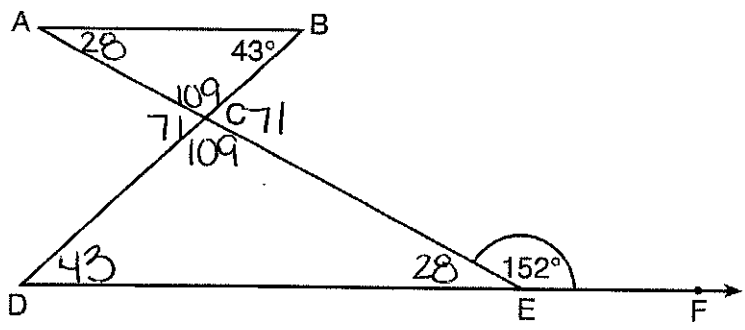
(1) $\angle A \cong \angle R$

(2) $\angle A \cong \angle S$

(3) $\overline{CB} \cong \overline{TR}$

(4) $\overline{CA} \cong \overline{TS}$

2 In the diagram below, $\overline{AB} \parallel \overline{DEF}$, $\overline{AE}$ and $\overline{BD}$ intersect at C, $m\angle B = 43°$, and $m\angle CEF = 152°$.



180-152=28
180-71=109

Which statement is true?

(1) $m\angle D = 28°$

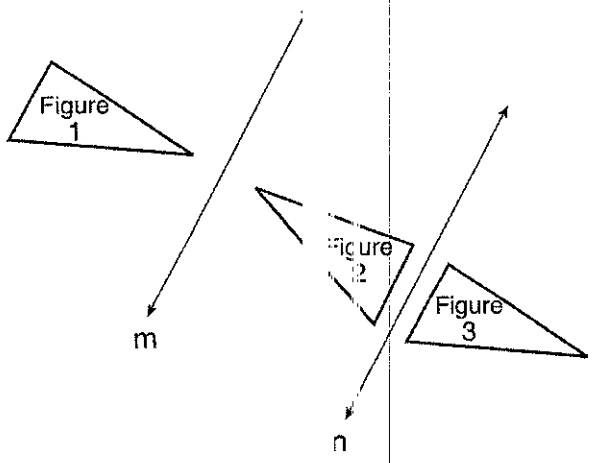
(2) $m\angle A = 43°$

(3) $m\angle ACD = 71°$

(4) $m\angle BCE = 109°$

Use this space for computations.

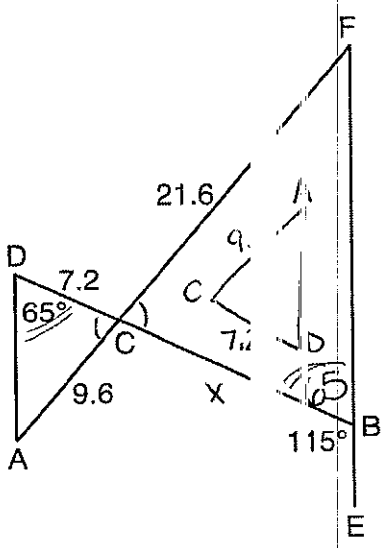
3 In the diagram below, line m is pa llel to line n. Figure 2 is the image of Figure 1 after a reflection ov line m. Figure 3 is the image of Figure 2 after a reflection over li n.



Which single transformation wou l carry Figure 1 onto Figure 3?

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

4 In the diagram below, $\overline{AF}$ and $\overline{B}$ intersect at C, and $\overline{AD}$ and $\overline{FBE}$ are drawn such that m$\angle D$ = 5°, m$\angle CBE$ = 115°, DC = 7.2, AC = 9.6, and FC = 21.6.



$\frac{21.6}{9.6} = \frac{X}{7.2}$

$\frac{9.6X}{9.6} = \frac{155.52}{9.6}$

$X = 16.2$

What is the length of $\overline{CB}$?

(1) 3.2
(2) 4.8
(3) 16.2
(4) 19.2

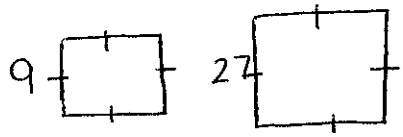
[3]

[OVER]

Use this space for computations.

5 Given square $RSTV$, where $RS = 9$ cm. If square $RSTV$ is dilated by a scale factor of 3 about a given center, what is the perimeter, in centimeters, of the image of $RSTV$ after the dilation?

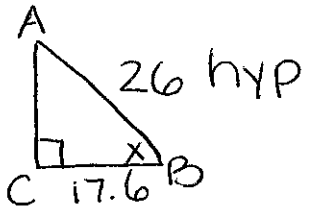
(1) 12
(3) 36
(2) 27
● 108



4(27) = 108

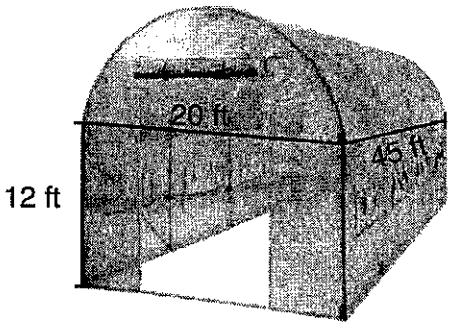
6 In right triangle ABC, hypotenuse $\overline{AB}$ has a length of 26 cm, and side $\overline{BC}$ has a length of 17.6 cm. What is the measure of angle B, to the *nearest degree*?

(1) 48°
(3) 43°
● 47°
(4) 34°



$\cos X = \frac{17.6}{26}$

7 The greenhouse pictured below can be modeled as a rectangular prism with a half-cylinder on top. The rectangular prism is 20 feet wide, 12 feet high, and 45 feet long. The half-cylinder has a diameter of 20 feet.



$V_{prism} + V_{halfcylinder}$

$lwh + \frac{1}{2}\pi r^2 h$

$12(20)(45) + \frac{1}{2}\pi(10)^2(45)$

$10800 + 2250\pi$

17868.58347

To the *nearest cubic foot*, what is the volume of the greenhouse?

● 17,869
(3) 39,074
(2) 24,937
(4) 67,349

Use this space for computations.

8 In a right triangle, the acute angles have the relationship $\sin(2x + 4) = \cos(46)$.

What is the value of x?

(1) 20 (3) 24

(2) 21 (4) 25

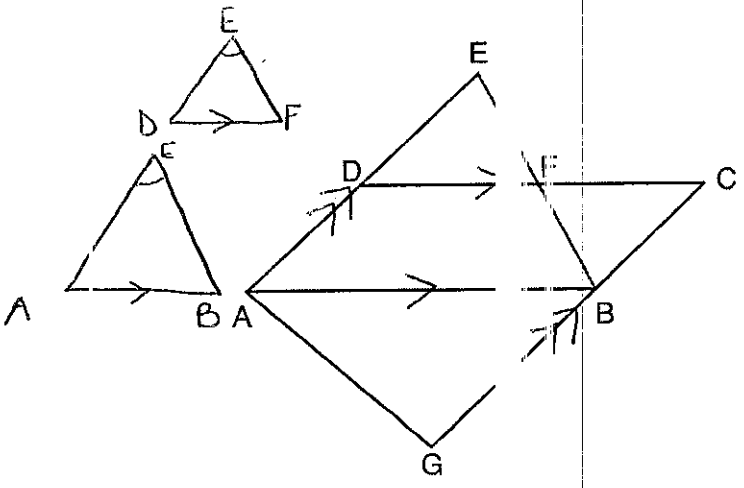
$2x+4+46=90$

$2x+50=90$

$2x=40$

$x=20$

9 In the diagram below, $\overline{AB} \parallel \overline{DFC}$, $\overline{DA} \parallel \overline{CBG}$, and $\overline{EFB}$ and $\overline{AG}$ are drawn.



Which statement is always true?

(1) $\triangle DEF \cong \triangle CBF$ (3) $\triangle BAG \sim \triangle AEB$

(2) $\triangle BAG \cong \triangle BAE$ (4) $\triangle DEF \sim \triangle AEB$

10 The base of a pyramid is a rectangle with a width of 4.6 cm and a length of 9 cm. What is the height, in centimeters, of the pyramid if its volume is 82.8 cm^3?

(1) 6 (3) 9

(2) 2 (4) 18

$V=\frac{1}{3}Bh$

$V=\frac{1}{3}lwh$

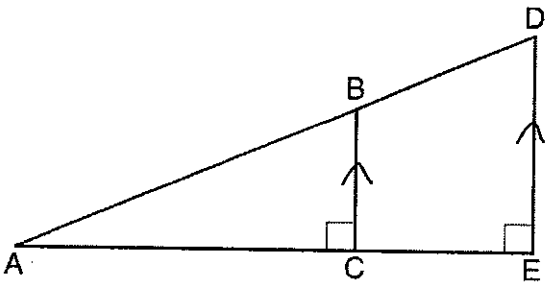
$82.8=\frac{1}{3}(4.6)(9)h$

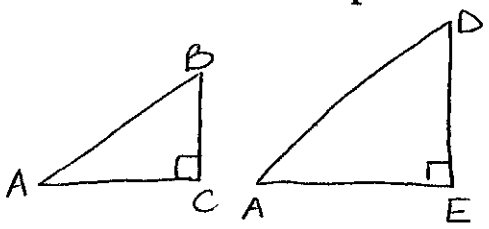
$\frac{82.8}{13.8}=\frac{13.8h}{13.8}$

$6=h$

11 In the diagram below of right triangle AED, $\overline{BC} \parallel \overline{DE}$.

Use this space for computations.





Which statement is always true?

(1) $\frac{AC}{BC} = \frac{DE}{AE}$

(3) $\frac{AC}{CE} = \frac{BC}{DE}$

● $\frac{AB}{AD} = \frac{BC}{DE}$

(4) $\frac{DE}{BC} = \frac{DB}{AB}$

12 What is an equation of the line that passes through the point (6,8) and is perpendicular to a line with equation $y = \frac{3}{2}x + 5$?

$m = \frac{3}{2}$

$\perp m = -\frac{2}{3}$

(1) $y - 8 = \frac{3}{2}(x - 6)$

(3) $y + 8 = \frac{3}{2}(x + 6)$

● $y - 8 = -\frac{2}{3}(x - 6)$

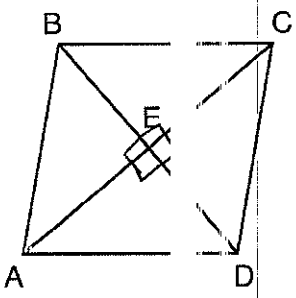
(4) $y + 8 = -\frac{2}{3}(x + 6)$

$y - y = m(x - x)$

$y - 8 = -\frac{2}{3}(x - 6)$

Use this space for computations.

13 The diagram below shows parallelogram $ABCD$ with diagonals $\overline{AC}$ and $\overline{BD}$ intersecting at E.



What additional information is sufficient to prove that parallelogram $ABCD$ is also a rhombus?

(1) $\overline{BD}$ bisects $\overline{AC}$.
(3) $\overline{AC}$ is congruent to $\overline{BD}$.
(2) $\overline{AB}$ is parallel to $\overline{CD}$.
(4) $\overline{AC}$ is perpendicular to $\overline{BD}$.

14 Directed line segment DE has endpoints $D(-4,-2)$ and $E(1,8)$. Point F divides $\overline{DE}$ such that $DF:FE$ is 2:3. What are the coordinates of F?

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

$D(-4,-2) \xrightarrow{T\langle 5,10\rangle} E(1,8)$

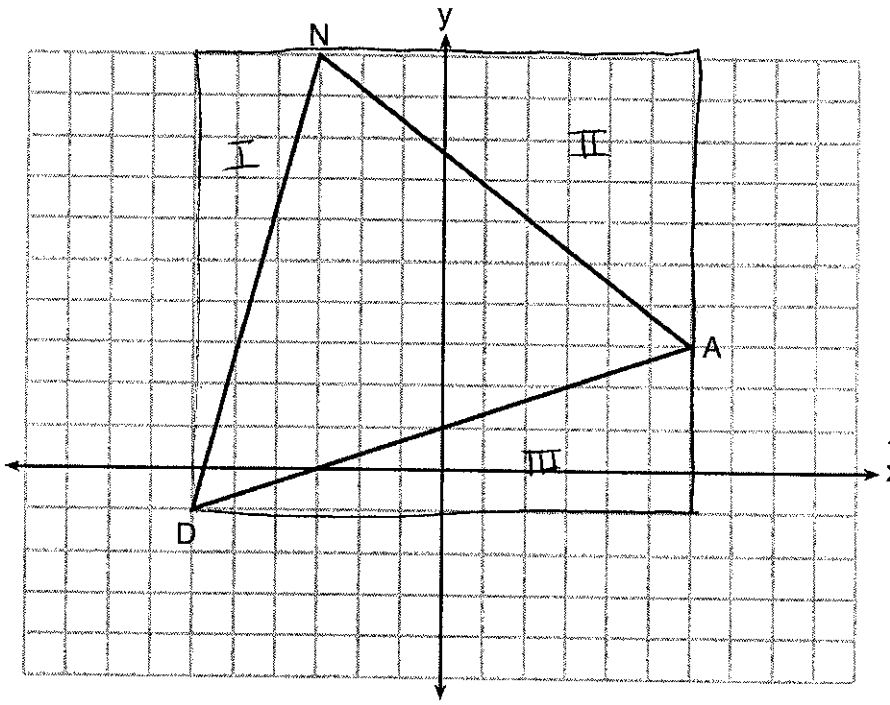
$5\left(\frac{2}{5}\right)\ 10\left(\frac{2}{5}\right)$

$T\langle 2,4\rangle$

$D(-4,-2) \longrightarrow F(-2,2)$

15 Triangle *DAN* is graphed on the set of axes below. The vertices of $\triangle DAN$ have coordinates $D(-6,-1)$, $A(6,3)$, and $N(-3,10)$.

Use this space for computations.



□ = 11(12) = 132

ΔI = $\frac{1}{2}$(11)(3) = 16.5

ΔII = $\frac{1}{2}$(9)(7) = 31.5

ΔIII = $\frac{1}{2}$(4)(12) = 24

132 − 16.5 − 31.5 − 24 = 60

What is the area of $\triangle DAN$?

(1) 60

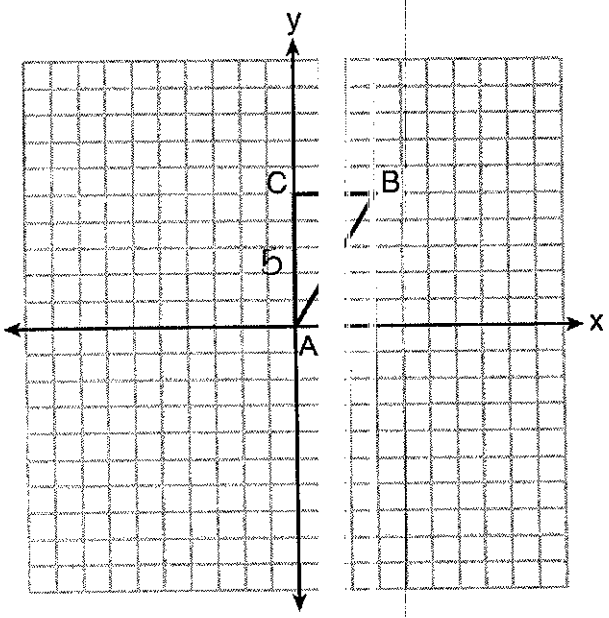
(2) 120

(3) $20\sqrt{13}$

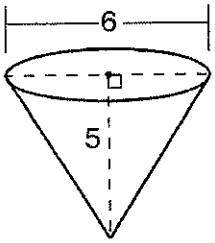
(4) $40\sqrt{13}$

Use this space for computations.

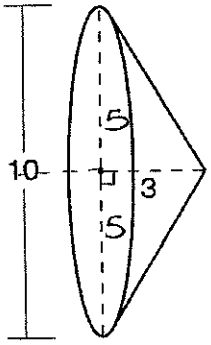
16 Triangle ABC, with vertices at $A(\ ,\ )$, $B(3,5)$, and $C(0,5)$, is graphed on the set of axes shown below.

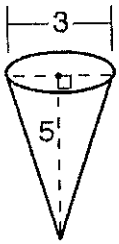


Which figure is formed when $\triangle ABC$ is rotated continuously about $\overline{BC}$?

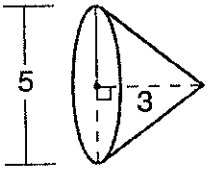


(1)





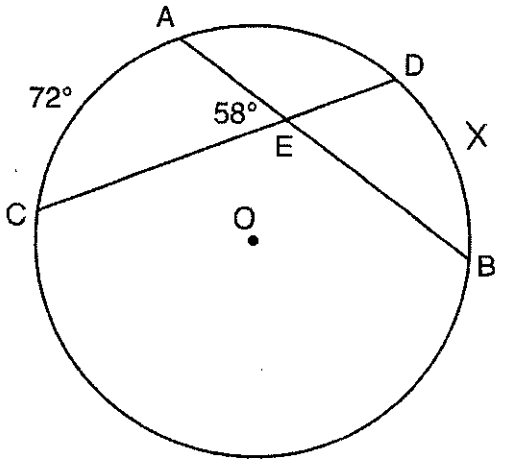
(2)



(4)

Use this space for computations.

17 In the diagram below of circle O, chords $\overline{AB}$ and $\overline{CD}$ intersect at E.



$\frac{58}{1} = \frac{72+X}{2}$

$116 = 72 + X$

$-72 \quad -72$

$44 = X$

If $m\overset{\frown}{AC} = 72°$ and $m\angle AEC = 58°$, how many degrees are in $m\overset{\frown}{DB}$?

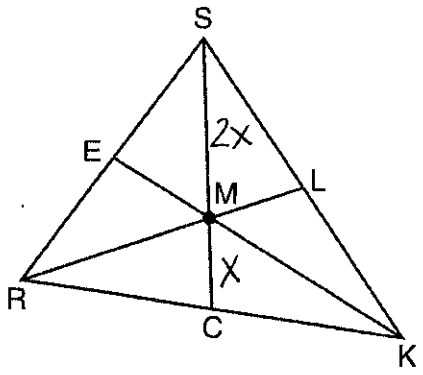
(1) 108°

(2) 65°

(3) 44°

(4) 14°

18 In triangle SRK below, medians $\overline{SC}$, $\overline{KE}$, and $\overline{RL}$ intersect at M.



Which statement must always be true?

(1) $3(MC) = SC$

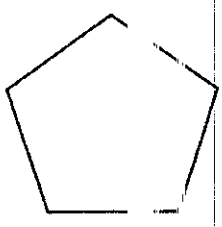
(2) $MC = \frac{1}{3}(SM)$

(3) $RM = 2MC$

(4) $SM = KM$

Use this space for computations.

19 The regular polygon below is rotated about its center.



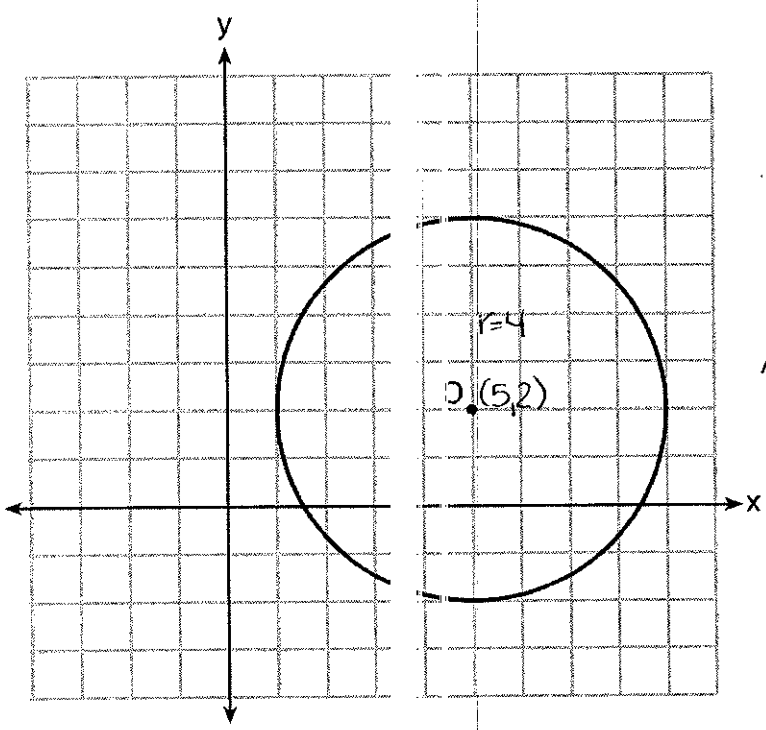
$\frac{360}{5} = 72$

Which angle of rotation will carry the figure onto itself?

(1) 60°
(2) 108°
(3) 216°
(4) 540°

72, 144, 216

20 What is an equation of circle O shown in the graph below?



$(x-5)^2 + (y-2)^2 = 4^2$

$x^2 - 5x - 5x + 25 + y^2 - 2y - 2y + 4 =$

$x^2 - 10x + y^2 - 4y + 29 = 16$

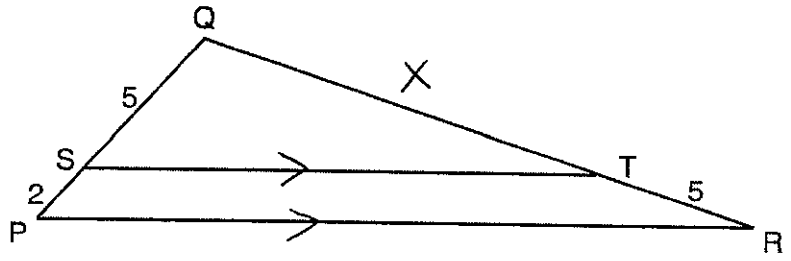
$-29 \quad -29$

$x^2 - 10x + y^2 - 4y = -13$

(1) $x^2 + 10x + y^2 + 4y = -13$
(2) $x^2 - 10x + y^2 - 4y = -13$
(3) $x^2 + 10x + y^2 + 4y = -25$
(4) $x^2 - 10x + y^2 - 4y = -25$

Use this space for computations.

21 In the diagram below of $\triangle PQR$, $\overline{ST}$ is drawn parallel to $\overline{PR}$, $PS = 2$, $SQ = 5$, and $TR = 5$.



What is the length of $\overline{QR}$?

(1) 7

(2) 2

(3) $12\frac{1}{2}$

● $17\frac{1}{2}$

$\frac{5}{2} = \frac{X}{5}$

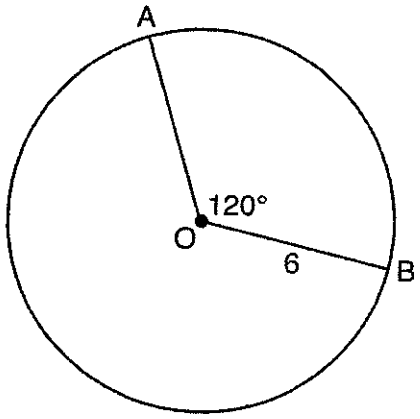
$\frac{2X}{2} = \frac{25}{2}$

$X = 12.5$

$+ 5$

17.5

22 The diagram below shows circle O with radii $\overline{OA}$ and $\overline{OB}$. The measure of angle AOB is 120°, and the length of a radius is 6 inches.



Which expression represents the length of arc AB, in inches?

(1) $\frac{120}{360}(6\pi)$

(2) $120(6)$

(3) $\frac{1}{3}(36\pi)$

● $\frac{1}{3}(12\pi)$

$\frac{n}{360} \cdot \pi D$

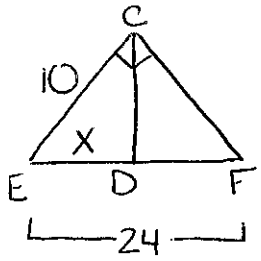
$\frac{120}{360} \cdot \pi(12)$

$\frac{1}{3}(12\pi)$

Use this space for computations.

23 Line segment CD is the altitude drawn to hypotenuse $\overline{EF}$ in right triangle ECF. If $EC = 10$ and $EF = 24$, then, to the *nearest tenth*, ED is

(1) 4.2
(2) 5.4
(3) 15.5
(4) 21.8



$\frac{24}{10} = \frac{10}{X}$

$\frac{24X}{24} = \frac{100}{24}$

$X = 4.2$

24 Line MN is dilated by a scale factor of 2 centered at the point (0,6). If $\overline{MN}$ is represented by $y = -3x + 6$, which equation can represent $\overline{M'N'}$, the image of $\overline{MN}$?

(1) $y = -3x + 12$
(2) $y = -3x + 6$
(3) $y = -6x + 12$
(4) $y = -6x + 6$

ok (0,6) is on the line so the line stays the same

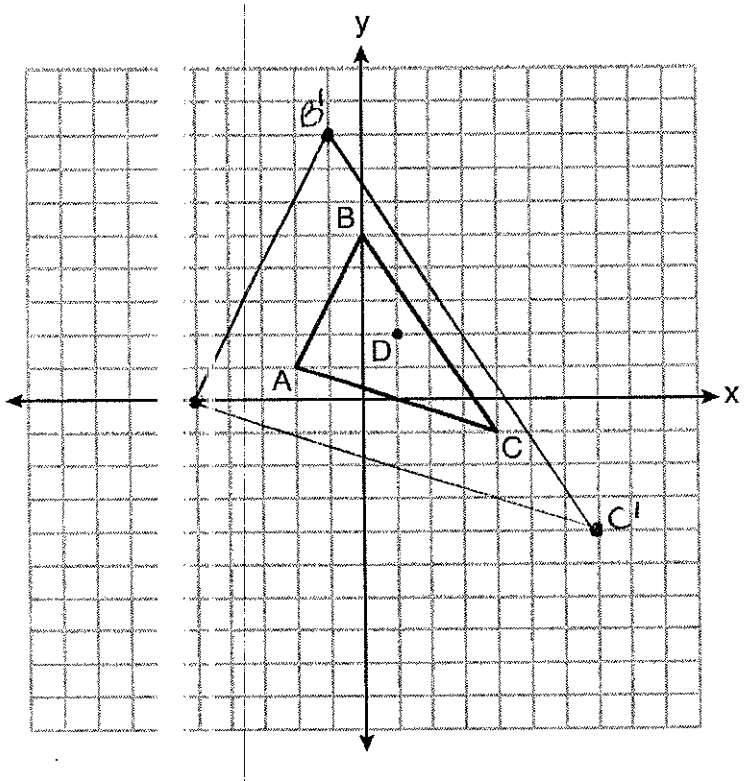
Part II

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 Triangle $A'B'C'$ is the image of triangle ABC after a translation of 2 units to the right and 3 units up. Is triangle ABC congruent to triangle $A'B'C'$? Explain why.

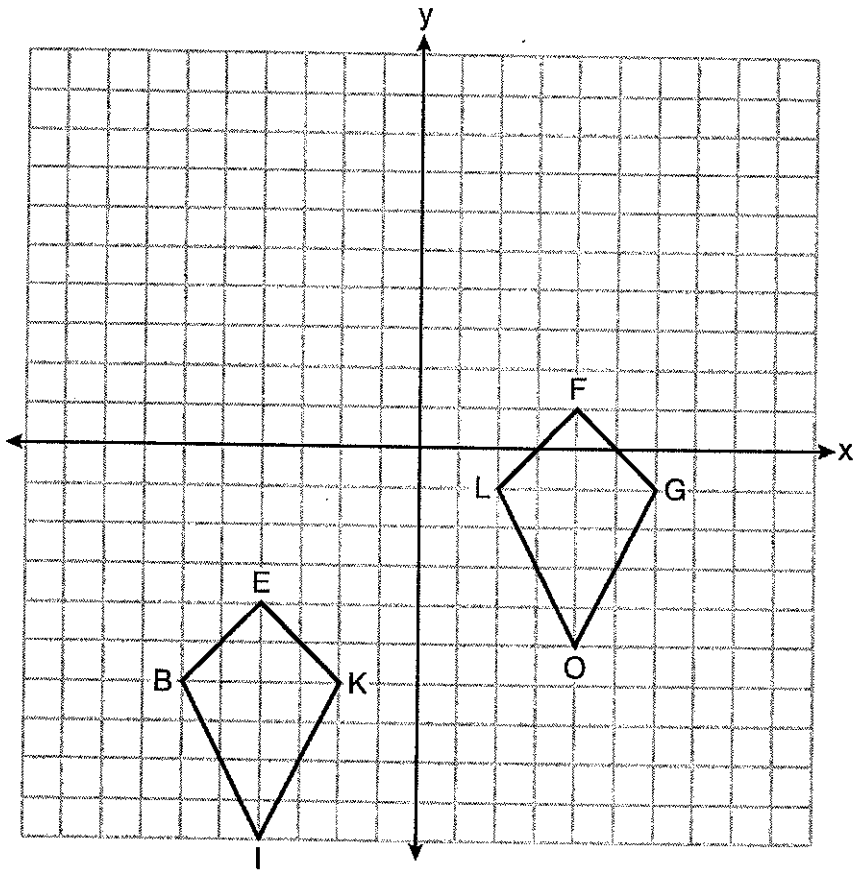
Yes b/c a translation is a rigid motion which preserves distance & angle measure

26 Triangle ABC and point $D(1,2)$ are graphed on the set of axes below.



Graph and label $\triangle A'B'C'$, the image of $\triangle ABC$, after a dilation of scale factor 2 centered at point D.

27 Quadrilaterals *BIKE* and *GOLF* are graphed on the set of axes below.

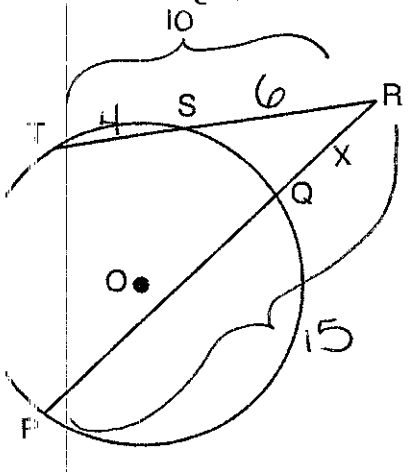


Describe a sequence of transformations that maps quadrilateral *BIKE* onto quadrilateral *GOLF*.

reflection over the y-axis

translation up 5 units

28 In the diagram below, secant $\overline{TST}$ and $\overline{RQP}$, drawn from point R, intersect circle O at S, T, Q, and P.



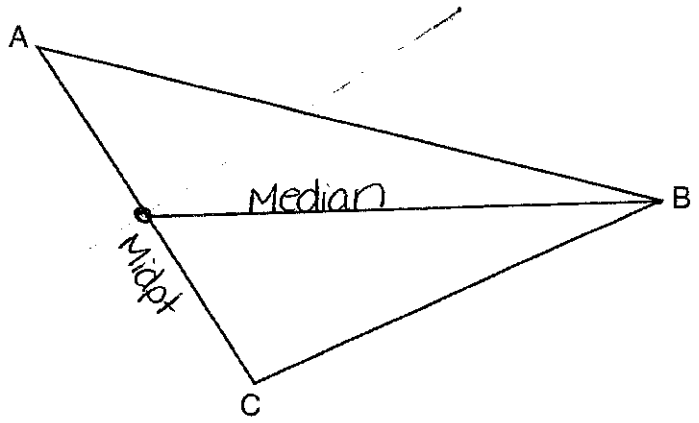
If $RS = 6$, $ST = 4$, and $RP =$, what is the length of $\overline{RQ}$?

$6(10) = x(15)$

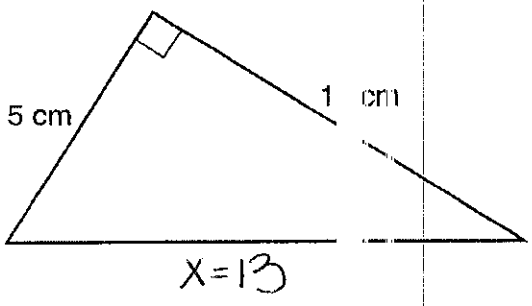
$\frac{60}{15} = \frac{15x}{15}$

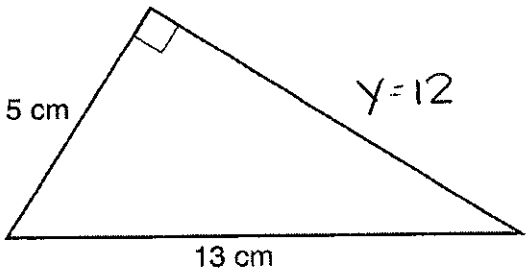
$4 = x$

29 Using a compass and straightedge, construct the <u>median</u> to side $\overline{AC}$ in $\triangle ABC$ below. [Leave all construction marks.]



30 Skye says that the two triangle below are congruent. Margaret says that the two triangles are similar.





Are Skye and Margaret both correct? Explain why. Yes SSS≅ SSS~

$5^2+12^2=X^2$

$25+144=X^2$

$\sqrt{169}=\sqrt{X^2}$

$13=X$

$5^2+Y^2=13^2$

$25+Y^2=169$

$\sqrt{Y^2}=\sqrt{144}$

$Y=12$

31 Randy's basketball is in the shape of a sphere with a maximum circumference of 29.5 inches. Determine and state the volume of the basketball, to the *nearest cubic inch*.

$C = \pi D$

$\frac{29.5}{\pi} = \frac{\pi D}{\pi}$

$9.390141642 = D$

$4.695070821 = R$

$V = \frac{4}{3}\pi r^3$

$V = \frac{4}{3}\pi(4.695070821)^3$

$\boxed{V = 434}$

Part III

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

32 Triangle ABC has vertices witl coordinates $A(-1,-1)$, $B(4,0)$, and $C(0,4)$. Prove that $\triangle ABC$ is an isosceles triangle but *not* an quilateral triangle. [The use of the set of axes below is optional.]

$AB = \sqrt{(-1-4)^2+(-1-0)^2}$

$\sqrt{(-5)^2+(-1)^2}$

$\sqrt{25+1}$

$\sqrt{26}$

$BC = \sqrt{(4-0)^2+(0-4)^2}$

$\sqrt{(4)^2+(-4)^2}$

$\sqrt{16+16}$

$\sqrt{32}$

$CA = \sqrt{(-1-0)^2+(-1-4)^2}$

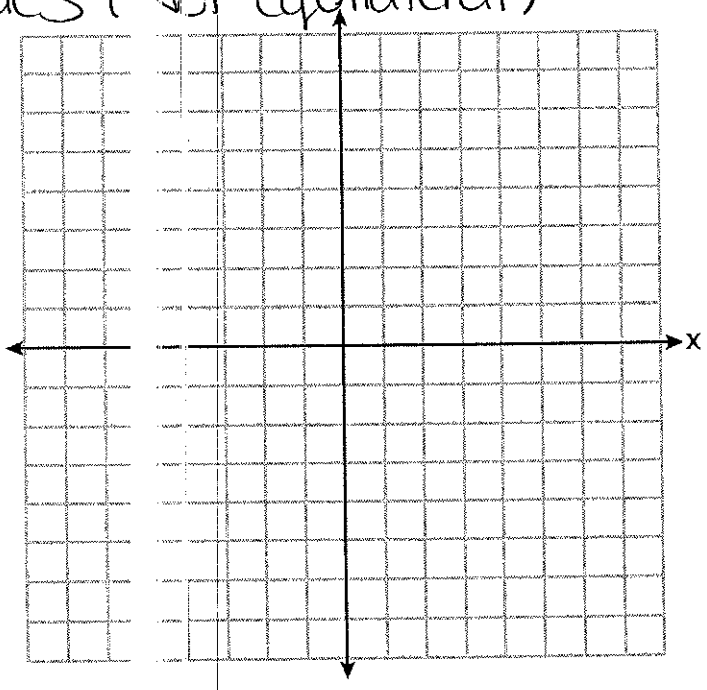
$\sqrt{(-1)^2+(-5)^2}$

$\sqrt{1+25}$

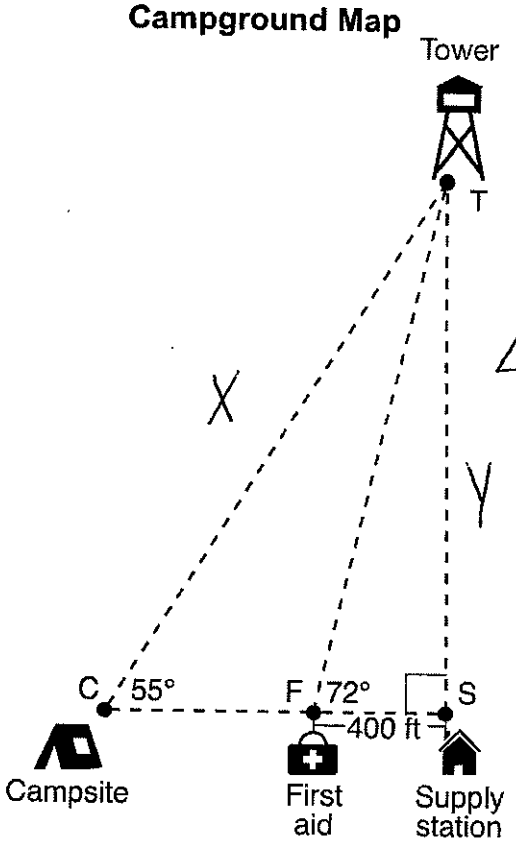
$\sqrt{26}$

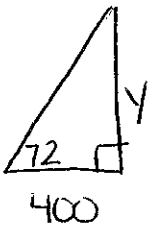
2 ≅ sides (isa celes)

Not 3 ≅ sides (ot equilateral)



33 The map of a campground is shown below. Campsite C, first aid station F, and supply station S lie along a straight path. The path from the supply station to the tower, T, is perpendicular to the path from the supply station to the campsite. The length of path $\overline{FS}$ is 400 feet. The angle formed by path $\overline{TF}$ and path $\overline{FS}$ is 72°. The angle formed by path $\overline{TC}$ and path $\overline{CS}$ is 55°.

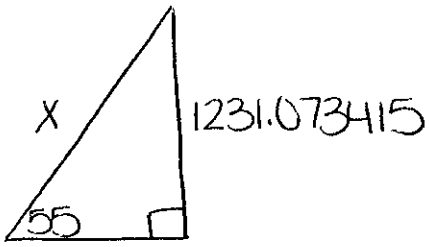




$\frac{\tan 72}{1} = \frac{Y}{400}$

$Y = 1231.073415$

Determine and state, to the *nearest foot*, the distance from the campsite to the tower.

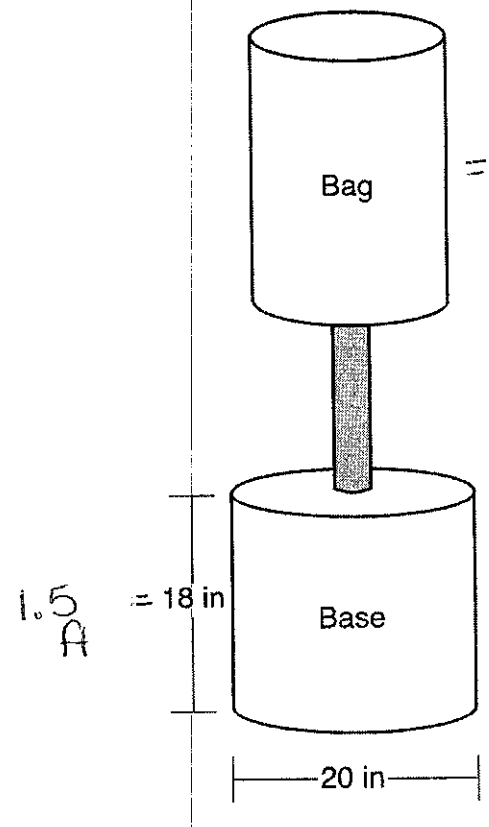


$\frac{\sin 55}{1} = \frac{1231.073415}{X}$

$X \frac{\sin 55}{\sin 55} = \frac{1231.073415}{\sin 55}$

$X = 1503$

34 Shae has recently begun kickbo ng and purchased training equipment as modeled in the diagram below. The total weight of the g, pole, and unfilled base is 270 pounds. The cylindrical base is 18 inches tall with a diameter 20 inches. The dry sand used to fill the base weighs 95.46 lbs per cubic foot.



= 270 lbs

r = 10 in = $\frac{5}{6}$ ft

To the *nearest pound*, determ e and state the total weight of the training equipment if the base is filled to 85% of its capacity.

$V = \pi r^2 h$

$V = \pi(\frac{5}{6})^2(1.5)$

$V = 3.272492234$

$\times \quad .85$

2.781618495

$D = \frac{M}{V}$

$\frac{95.46}{1} = \frac{M}{2.781618495}$

$M = 265.533$

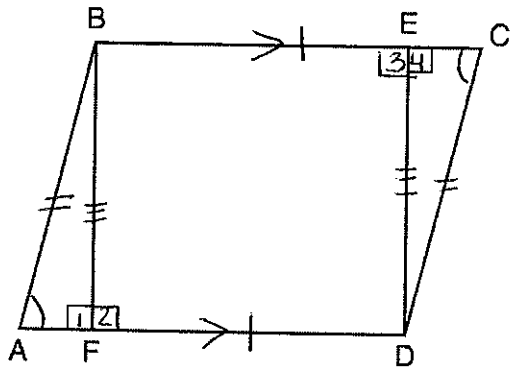
$+ 270$

$\boxed{536}$

Part IV

Answer the question in this part. A correct answer will receive 6 credits. Clearly indicate the necessary steps, including appropriate formula substitutions, diagrams, graphs, charts, etc. Utilize the information provided for the question to determine your answer. Note that diagrams are not necessarily drawn to scale. 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. [6]

35 Given: Parallelogram $ABCD$, $\overline{BF} \perp \overline{AFD}$, and $\overline{DE} \perp \overline{BEC}$



Prove: $BEDF$ is a rectangle

S	R
① llogram ABCD	① Given
② $\overline{BF} \perp \overline{AFD}$ $\overline{DE} \perp \overline{BEC}$	② Given
③ $\angle 1, \angle 2, \angle 3$ & $\angle 4$ are right $\angle$s	③ $\perp$ lines form right $\angle$s
④ $\angle 1 \cong \angle 2 \cong \angle 3 \cong \angle 4$	④ All right $\angle$s are $\cong$
⑤ $\angle A \cong \angle C$	⑤ In a llogram opp angles are $\cong$
⑥ $AB \cong DC$	⑥ In a llogram opp sides are $\cong$
⑦ $\triangle ABF \cong \triangle CDE$	⑦ AAS $\cong$ AAS
* ⑧ $BF \cong DE$	⑧ CPCTC
* ⑨ $BF \parallel DE$	⑨ 2 lines $\perp$ to 11 lines are 11
⑩ BEDF is a llogram	⑩ A llogram has 1 pair of opp $\cong$ and 11 sides
⑪ BEDF is a rectangle	⑪ A llogram with a right $\angle$ is a rectangle

Work space for question 35 is continued on the next page.