

FIFTY-EIGHTH ANNUAL MATHEMATICS CONTEST
sponsored by
THE TENNESSEE MATHEMATICS TEACHERS' ASSOCIATION

Geometry 2014

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Scoring formula: $4R - W + 40$

DIRECTIONS:

Do not open this booklet until you are told to do so.

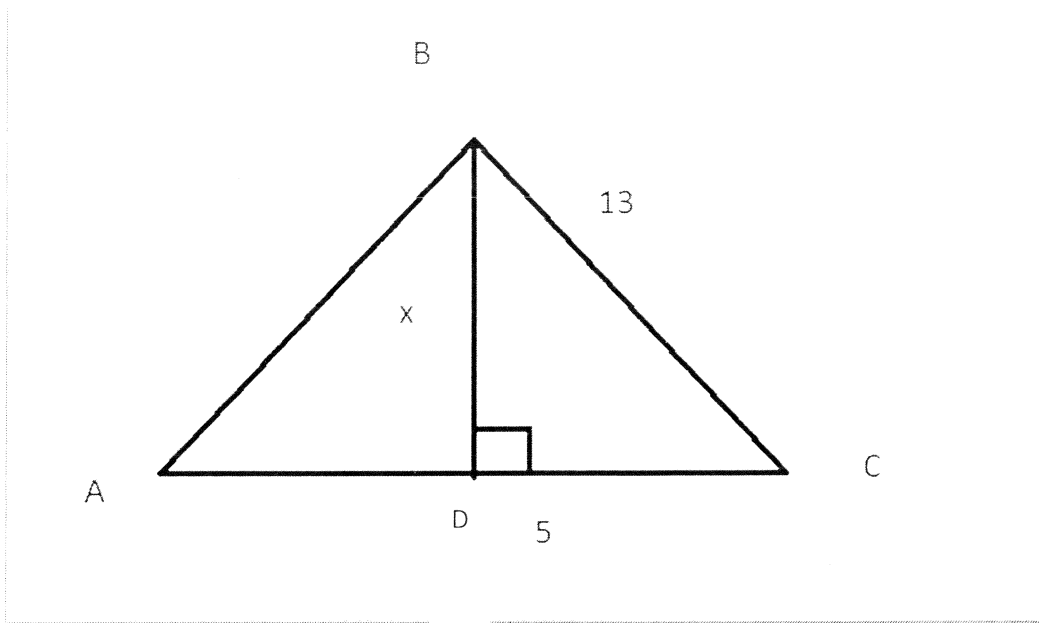
This is a test of your competence in high school mathematics. For each problem, determine the best answer and indicate your choice by making a heavy black mark in the proper place on the separate answer sheet provided. You must use a pencil with a soft head (No. 2 lead or softer).

This test has been constructed so that most of you are not expected to answer all of the questions. Do your best on the questions you feel you know how to work. You will be penalized for incorrect answers, so wild guesses are not advisable.

If you change your mind about an answer, be sure to erase completely. Do not mark more than one answer for any problem. Make no stray marks of any kind on the answer sheet. The answer sheets will not be returned to you. If you wish a record of your performance, mark your answers in this booklet also. You will keep the booklet after the test is completed.

When told to do so, open your test booklet and begin. You will have exactly 80 minutes to work.

1. Given the isosceles triangle below, Find x . When $BC=13$, $CD=5$

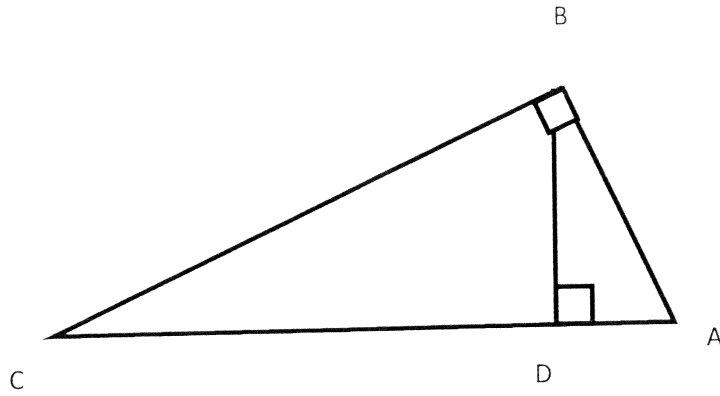


- a) 13.92 b) 12 c) 10.91 d) 11 e) 5

2. Given the isosceles triangle above, find the area of triangle ABC .

- a) 30 b) 60 c) 90 d) 180 e) 45

3. Given the triangle below where AC is 25 and AB is 10, find the measurement of DA.

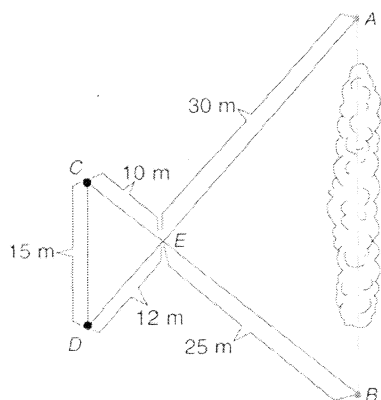


- a) 4 b) 2.5 c) 10 d) 62.5 e) 8

4.) The perimeter for $\triangle ABC$ in question #3 is:

- a) 22.9 b) 60 c) 35 d) 39 e) 57.9

5) If two sides of a triangle are proportional to two sides of another triangle and if the angles included between these sides are congruent, the triangles are similar. Find the measure of segment AB in meters when there is an obstruction that can't be removed.



a) 24

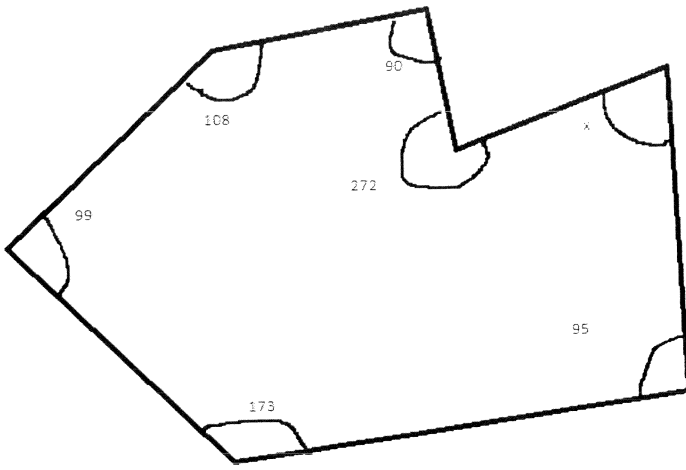
b) 6

c) 37.5

d) 44

e) 45

6) Given the figure below find the measure of angle x . All measurements are in degrees.

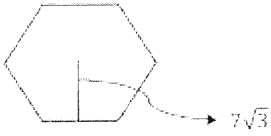


- a) 51.4 b) 60 c) 63 d) 68 e) 85

7. Find the measure in degrees of an exterior angle of a regular 7-gon.

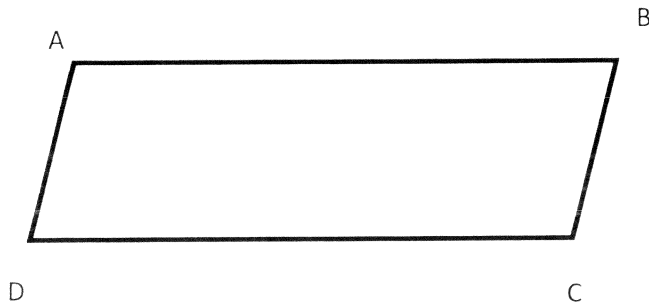
- a) 128.6
b) 51.4
c) 25.7
d) 37
e) 315

8. The area of the regular hexagon shown below is:



- a) $294\sqrt{3}$ b) $42\sqrt{3}$ c) 106 d) $50\sqrt{3}$ e) 84

9.) Let quadrilateral ABCD be a parallelogram. If angle $\angle ABC$ is 82° , then the measure of angle $\angle BCD$ in degrees is:

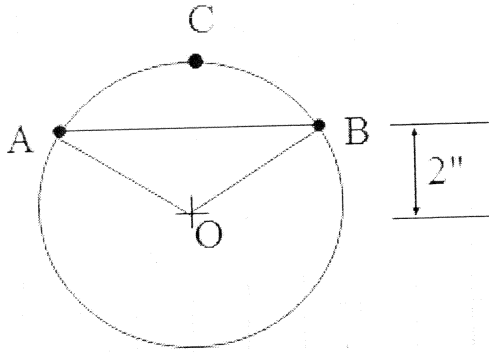


- a) 82 b) 278 c) 8 d) 98 e) 78

10. A circle has the equation $x^2 - 6x + y^2 - 4y - 3 = 0$. The area of the circle is:

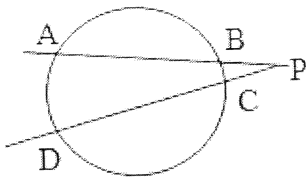
- a) 4π b) 16 c) 16π d) 13π e) 8π

11. Find the area of segment ACB (in square inches) in the figure below, given that $\angle AOB = 85^\circ$, the radius of the circle is 4 in, the height of the triangle is 2, and AB is 6 in:



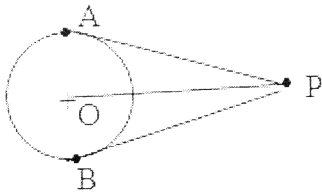
- a) $\frac{34}{9}\pi - 6$ b) $\frac{9}{34}\pi - 6$ c) $6 - \frac{34}{9}\pi$ d) 12 e) $\frac{17}{72}4\pi$

12. Determine $\angle APD$ in the figure below, given that arc AD = 98° and arc BC = 40° :



- a) 29° b) 69° c) 58° d) 50° e) 45°

13. Find the degree measure of $\angle APO$ in the figure below, given that $\angle APB = 84^\circ$:

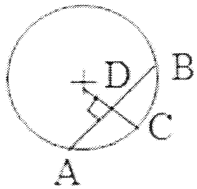


- a) 24 b) 42 c) 28 d) 16 e) none of the given answers

14. A golden rectangle could have sides of length

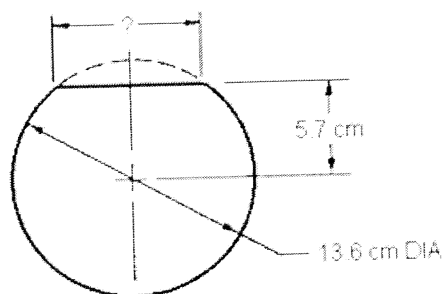
- a) $1, 1 + \sqrt{5}$ b) 4, 7 c) $1, \frac{\sqrt{5}}{2}$ d) $1, 1/5$ e) 24.270, 15

15. Determine DB and arc ACB in the figure below, given that $AB = .6$ and arc AC = .4 where D is a point on segment AB. All measurements are in meters.



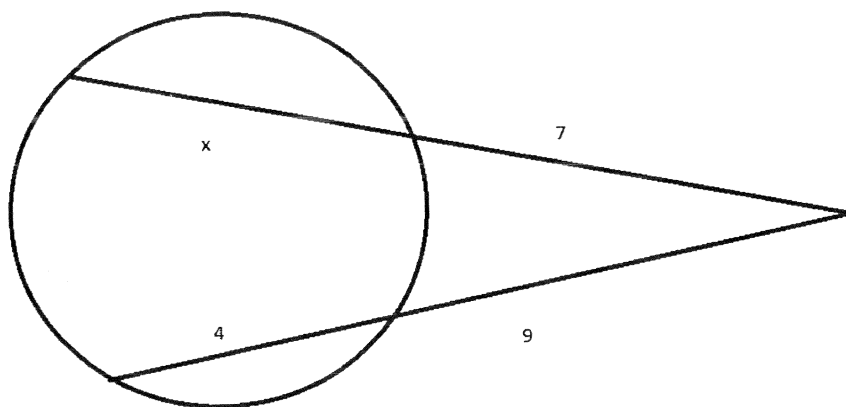
- a) $DB = .5, \text{ arc } ACB = .7$ b) $DB = .3, \text{ arc } ACB = .8$ c) $DB = .9, \text{ arc } ACB = .6$
 d) $DB = .2, \text{ arc } ACB = .7$ e) $DB = .4, \text{ arc } ACB = .9$

16. A 'flat' is machined on the disk shown. The length of the flat, indicated by the '?', is _____. Round the answer to one decimal place.



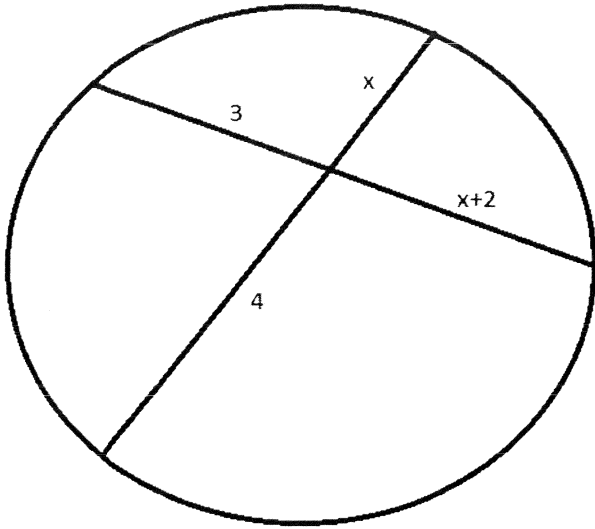
- a) 3 b) 3.7 c) 8.8 d) 7.4 e) 3.6

17. Find the value for x.



- a) 7 b) $23 \frac{5}{7}$ c) $9 \frac{5}{7}$ d) $8 \frac{9}{8}$ e) 4

18. Find the value for x in the circle below.



a) $x=6$

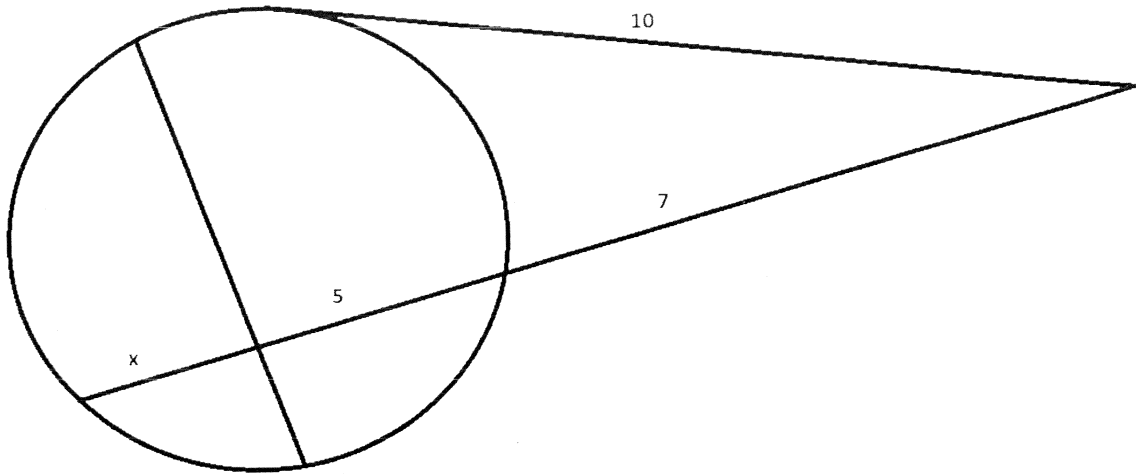
b) $x=4$

c) $x=3$

d) $x=2$

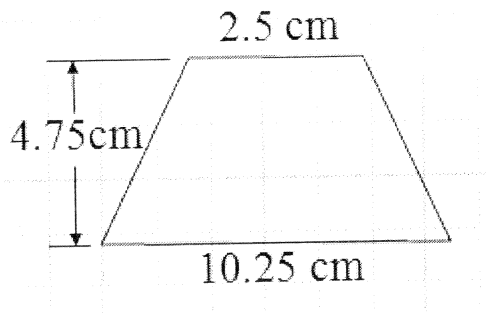
e) none of the answers

19. Find the value of x in the figure below.



- a) $26 \frac{2}{7}$ b) $18 \frac{2}{3}$ c) 2 d) $2 \frac{2}{7}$ e) 3

20. Find the area in square centimeters of the figure shown below:

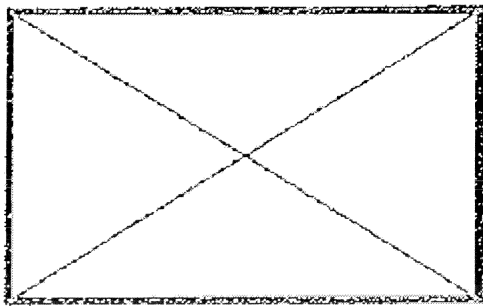


- a) 30.28 b) 31.22 c) 18.40 d) 22.13 e) 20.52

21. A girl 160 cm tall, stands 360 cm from a lamp post at night. Her shadow from the light is 90 cm long. How tall is the lamp post?

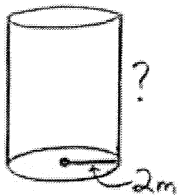
- a) 800 cm b) 640 cm c) 253 cm d) 58 cm e) 6 cm

22. In the rectangular figure shown find the measure of the height in meters if the base is 16 m and one half a diagonal is 10 m.



- a) 12 b) 20 c) 8 d) $2\sqrt{3}$ e) 13

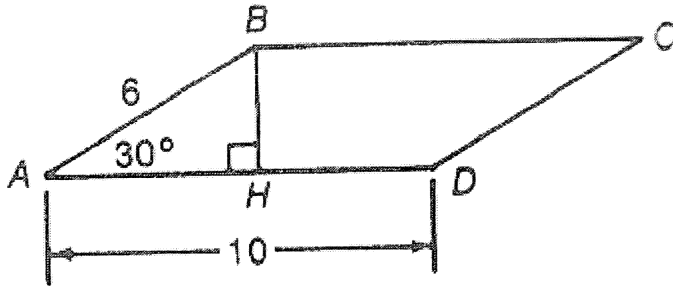
23. Given the following figure and information find the height of the cylinder in meters. (Round to whole number)



$$V = 87.92 \text{ m}^3$$

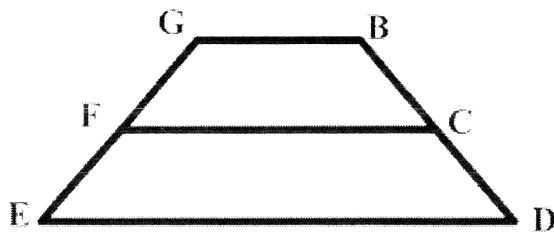
- a) 6 b) 7 c) 8 d) 9 e) 10

24. A pair of adjacent sides of a parallelogram are 6 and 10 centimeters. If the measure of their included angle is 30° , find the area of the parallelogram.



- a) 28 b) 30 c) 45 d) 60 e) cannot compute with given data.

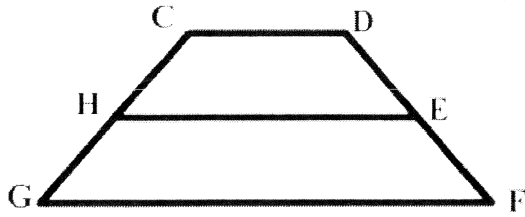
25. BDEG is an isosceles trapezoid with median



The trapezoid has bases of 34 cm. and 52 cm. Find the measure of its median in cm.

- a) 45 b) 43 c) 8.5 d) 23 e) 70

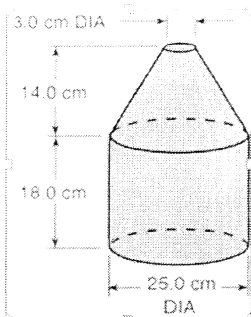
26. CDFG is an isosceles trapezoid with median



Given: $m\angle CGF = 3x + 5$ and $m\angle CDF = 115^\circ$ find the value of x in degrees.

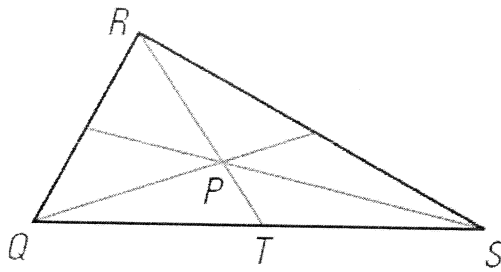
- a) 12 b) 20 c) 25 d) 65 e) 40

27. Determine the volume of the figure shown below:



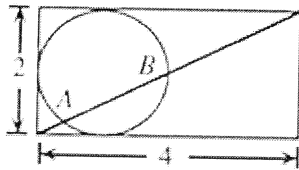
- a) 35368.92 b) 11434.35 c) 12523.32 d) 8999.35 e) None of the answers given

28. P is the centroid of $\triangle QRS$ shown below and $PT = 5$. Find RT and RP .



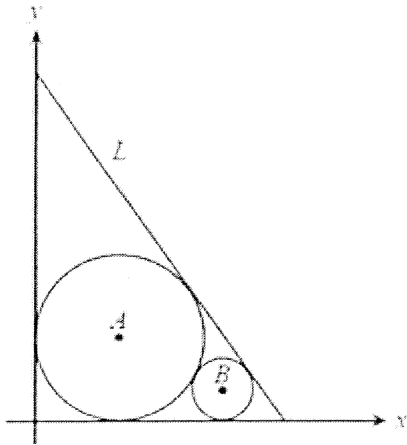
- a) $RT = 5, RP = 10$ b) $RT = 10, RP = 15$ c) $RT = 15, RP = 10$ d) $RT = 20, RP = 15$ e) $RT = 10, RP = 5$

29.) A circle is tangent to three sides of a rectangle having side's length 2 and 4 as shown. A diagonal of the rectangle intersects the circle at points A and B . The length of segment AB is:



- a) $2\sqrt{5}$ b) $\frac{4\sqrt{5}}{5}$ c) $\frac{4\sqrt{3}}{5}$ d) $5\sqrt{5}$ e) 1

30. A circle with center A has radius 3 and is tangent to both the positive x-axis and positive y-axis, as shown. Also, the circle with center B has radius 1 and is tangent to both the positive x axis and the circle with center A. The Line L is tangent to both circles. The y intercept of line L is



- a) $3\sqrt{3}+6$ b) $3\sqrt{3}+9$ c) $6\sqrt{3}+12$ d) $\sqrt{3}+1$ e) none of the answers

31. Determine the length of the major axis of an ellipse if its area is 236.34 square yards and the minor axis is 12.3 yards. The answer in yards is

- a) 1.56 b) 24.465 c) 55.263 d) 17.6 e) 1.15

32. Euclid's 4th Postulate States:

- a) There are infinitely many lines through the points, parallel to the given line.
 b) An angle at the foot of one perpendicular equals an angle at the foot of any other perpendicular.
 c) the same principle as the parallel postulate.
 d) Given any two points such as A and B, there is a line AB which has them as endpoints.
 e) A line is a figure with no depth, no width.

33. According to the triangle inequality,

- a) Any length of one side of a triangle must be less than the sum of the two other sides.
- b) Any length of one side of a triangle must be greater than the sum of the two other sides.
- c) The area of a right triangle is greater than or equal to that of a non- right triangle with equal sides.
- d) The sum of any two sides of a triangle is greater than or equal to that of the remaining side.
- e) None of the above.

34. When the triangle is not isosceles, A Euler line passes through all the following points except:

- a) Orthocenter
- b) Circumcenter
- c) Centroid
- d) Exeter point
- e) Incenter

35. A spherical water tank has a diameter of 8 feet. It is to be repainted, and the total cost of the paint job is \$0.28 per square foot. Compute the total cost of repainting the tank.

- a) \$56.30
- b) \$75.06
- c) \$225
- d) \$85.03
- e) \$42.20

36. Find the perimeter of the triangle whose vertices are A(2,3) B(4,8) and C (-1,-6)

a) $4\sqrt{85}$

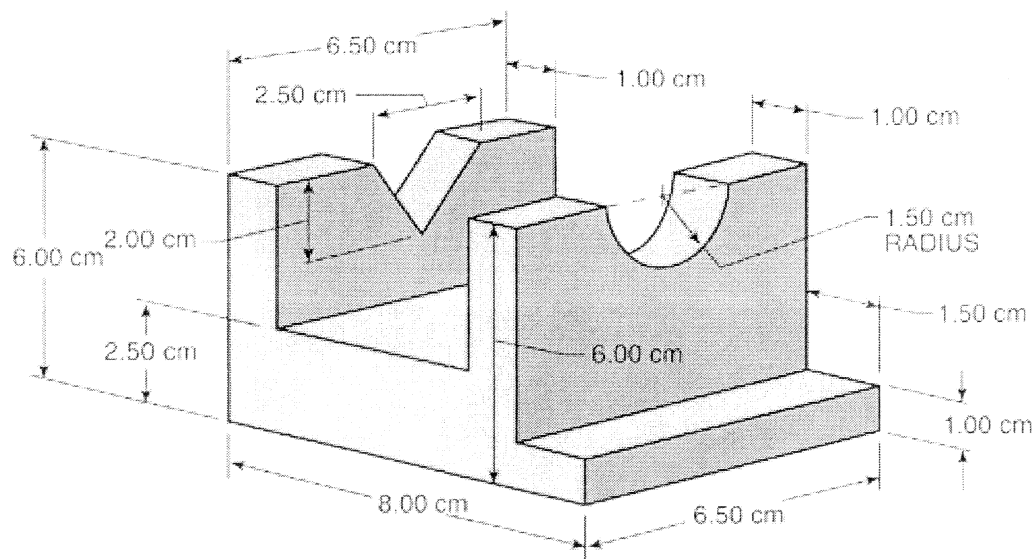
b) $\sqrt{221} + \sqrt{29} + 3\sqrt{10}$

c) $\sqrt{57} + \sqrt{85} + 3\sqrt{10}$

d) 22

e) None of the above

37.) Compute the number of cubic centimeters of material in the locating saddle below.



a) 157.34

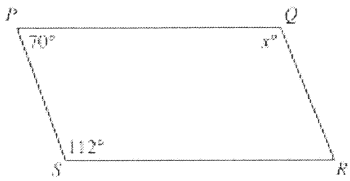
b) 85.38

c) 154.84

d) 192.4

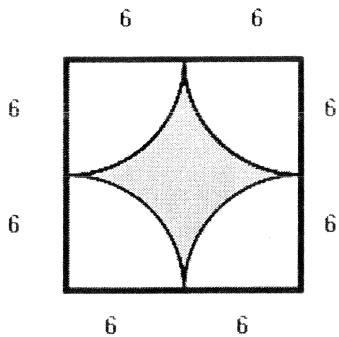
e) 75.2

38. In quadrilateral $PQRS$ below, sides PS and QR are parallel. What is the value of x ?



- A. 158
- B. 132
- C. 120
- D. 110
- E. 112

39. What is the area of the shaded region below?



- a) $48-6\pi$
- b) $144-6\pi$
- c) $144-36\pi$
- d) $48-36\pi$
- e) $144-12\pi$

40. A regular decagon with a perimeter of 24 is inscribed in a circle. To the nearest tenth, how far is it from the center to each side of the decagon?

- a) 7.4
- b) 3.7
- c) 5.5
- d) 6.4
- e) 3.2