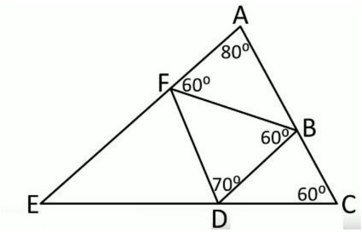
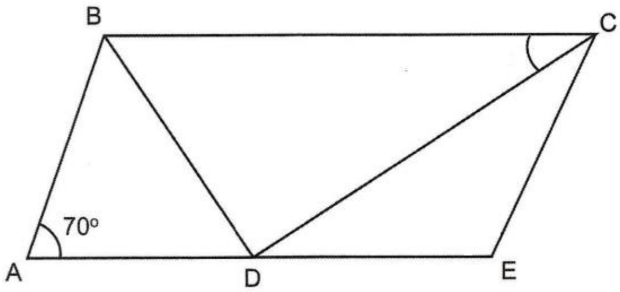
1. Find the measure of $\angle EDF$ in degrees.



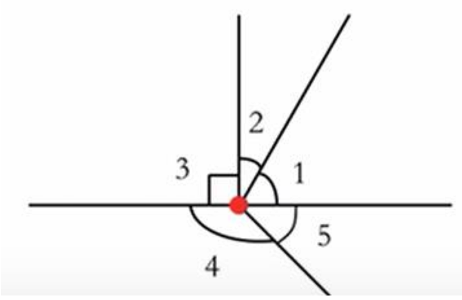
[Solution] 70 degrees.
In $\triangle ACE$, $\angle E = 180 - 80 - 60 = 40$ degrees.
In $\triangle BDF$, $\angle BFD = 180 - 70 - 60 = 50$ degrees.
A, F, E are on the same line, making $\angle EFD = 180 - 60 - 50 = 70$ degrees.
Finally, in $\triangle EDF$, $\angle EDF = 180 - 70 - 40 = 70$ degrees.

2. As shown below, ABCE is a parallelogram, EC=ED, find $\angle BCD$ in degrees.



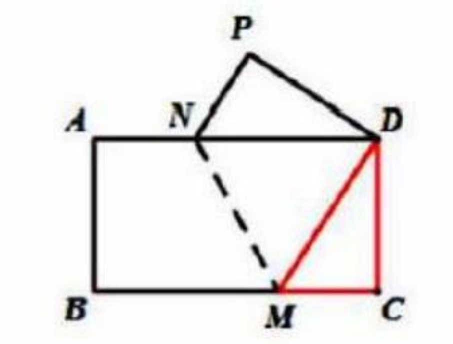
[Solution] 35 degrees.
AB//EC, making $\angle E = 180 - 70 = 110$ degrees.
$\triangle CDE$ is an isosceles triangle and therefore $\angle EDC = \angle ECD = (180 - 110) \div 2 = 35$ degrees.
BC//AE, making $\angle BCD = \angle EDC = 35$ degrees.

3. As shown below, if $\angle 2$=30°, $\angle 5$=50°, $\angle 3$=90°. Find $\angle 4 - \angle 1$ in degrees.



[Solution] 70°
$\angle 1 = 90 - \angle 2 = 60$°, and
$\angle 4 = 180 - \angle 5 = 130$°.
Hence $\angle 4 - \angle 1$=70°

4. There is a piece of rectangular paper, ABCD. This paper is folded along the dotted line NM, such that point B overlaps with point D. If $\angle MDC = 24^\circ$, find $\angle DNM$ in degrees.



[Solution] 57°

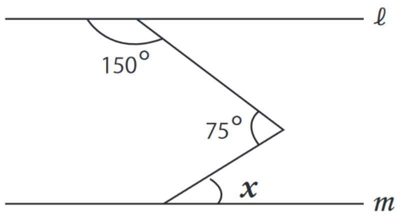
$\angle MDC = 24^\circ$, then $\angle CMD = 90 - 24 = 66^\circ$

Because of folding, $\angle NMB = \angle NMD$, hence $\angle NMB = \angle NMD = (180 - 66) \div 2 = 57^\circ$

Method 1: In $\triangle NMD, \angle NMD = 57^\circ, \angle NDM = 66^\circ$, hence $\angle DNM = 180 - 57 - 66 = 57^\circ$

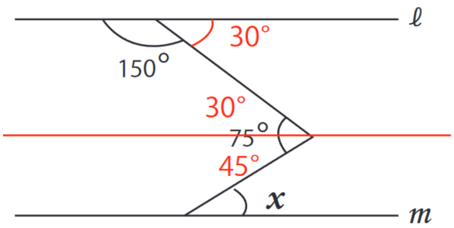
Method 2: since AD//BC, $\angle DNM = \angle NMB = 57^\circ$

5. In the figure below, straight line *m* and *l* are parallel to each other, the measure of two angles are given. Find $\angle x$.

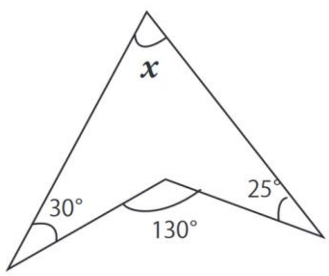


[Solution] 45°

x = 75-(180-150) = 45°

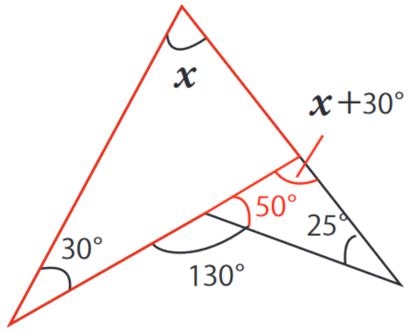


6. As shown below, three angles are known. Find $\angle x$.

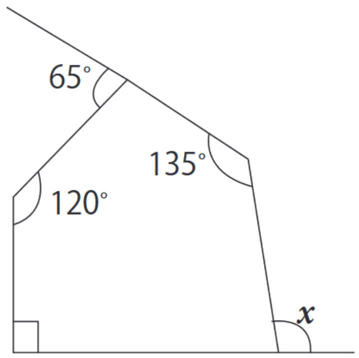


[Solution] 75°

x+30=180-50-25, find x=75.

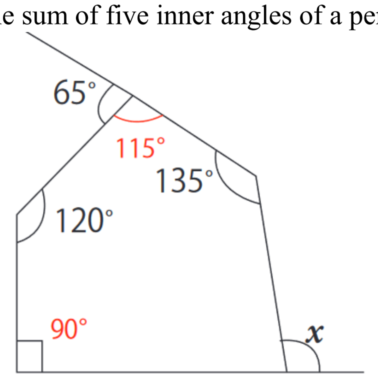


7. As shown below, four angles are already known. Find ∠x.

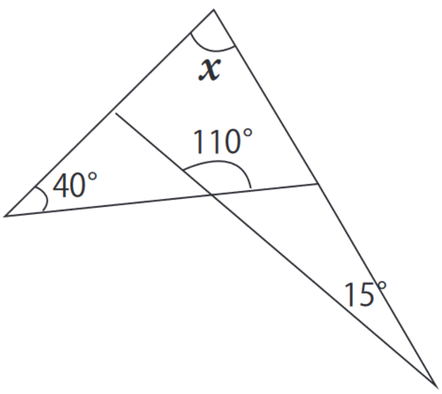


[Solution] 100°

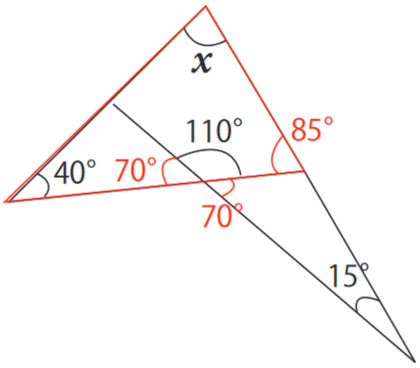
The sum of five inner angles of a pentagon is 540°. 180-x= 540-90-120-115-135 =80, indicating x =100°.



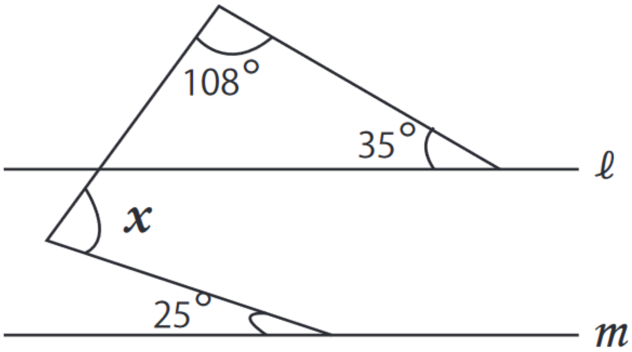
8. As shown below, three angles are known. Find ∠x.



[Solution] 55°

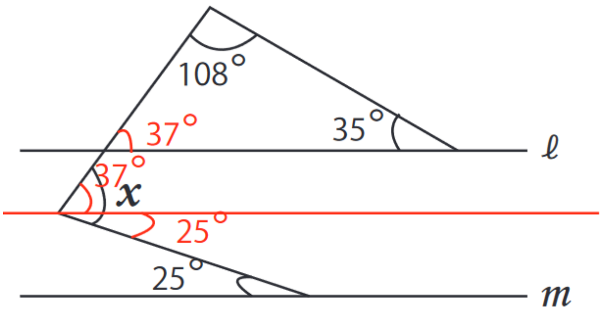


9. In the figure below, straight line *m* and *l* are parallel to each other, the measure of 3 angles are given. Find $\angle x$.

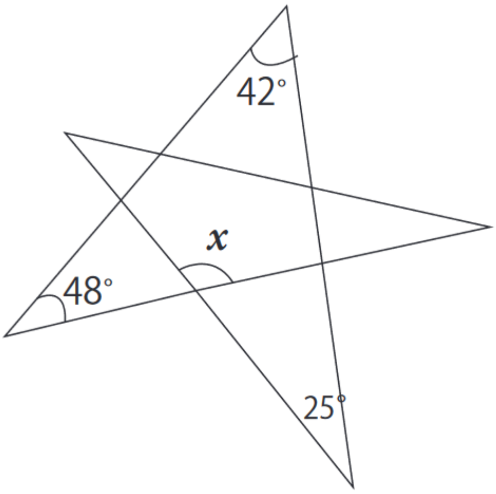


[Solution] 62°

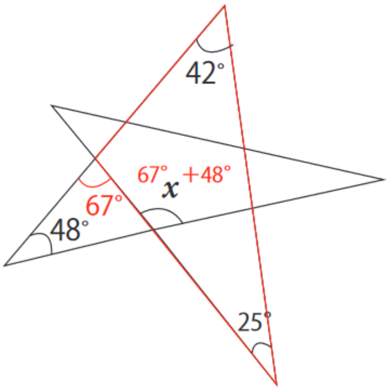
$x = (180\text{-}108\text{-}35) + 25 = 37 + 25 = 62^\circ$



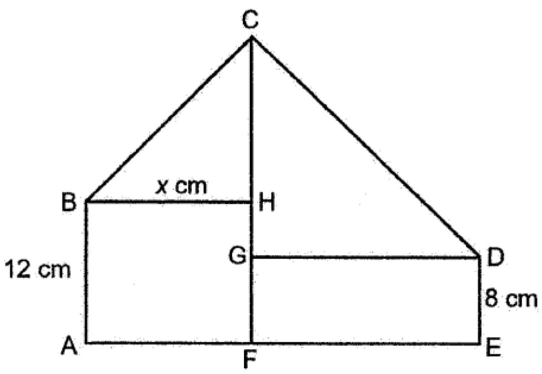
10. As shown below, three angles are known. Find $\angle x$.



[Solution] 115°



11. The figure is made up of two rectangles, ABHF and FGDE, and two right-angled isosceles triangles, BCH and DCG. BA = 12 cm, DE = 8 cm. If BH = x cm and GD = (2x-10) cm, find the total area of this figure.

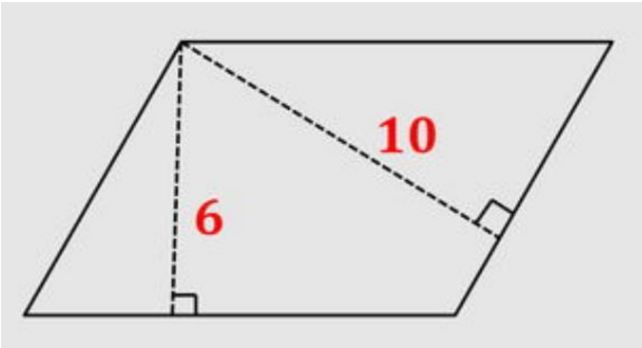


[Solution] 572 cm^2

CF =CH +HF =CG +GF, showing x +12 =(2x-10) +8, making x = 14.

The total area = $12\times14+14\times14\times\frac{1}{2}+18\times8+18\times18\times\frac{1}{2}=572$

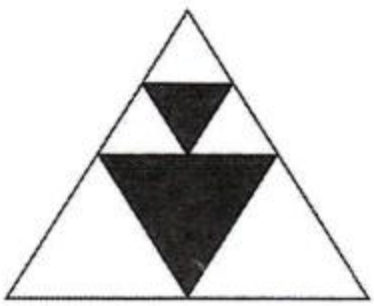
12. The figure shown below is a parallelogram, with a perimeter of 48 cm. The two heights drawn are 6 cm and 10 cm respectively. Find the area of this parallelogram.



[Solution] 90 cm^2

Suppose this parallelogram is x in length and y in width. Then the area can be expressed as 6x as well as 10y, meaning 6x=10y. Perimeter 48 = 2x+2y, meaning x+y =24. Hence, x =15 and y=9. Area = 6x =90.

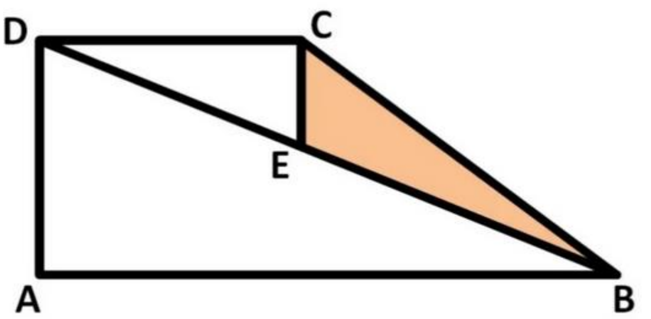
13. The figure below is made up of equilateral triangles. If the largest triangle has an area of 64, what is the total area of the shaded region?



[Solution] 20

64÷4=16; 64÷4÷4=4; 16+4=20

14. As shown below, ABCD is a trapezium. E is the midpoint of BD. The area of triangle BCE is 15. CE is perpendicular to CD. Find the area of trapezium ABCD.



[Solution] 90

Extend CE, intersecting AB at point F.

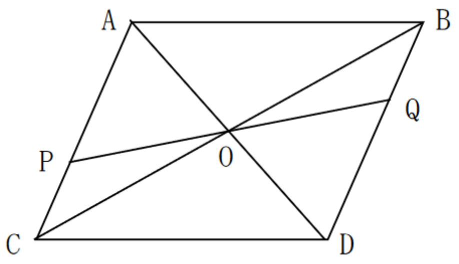
FC⊥CD, making AFCD a rectangle.

DE =EB, hence [DCE]=[BCE]=15.

DCF and DCB have the same base and the same height, and therefore the same area.

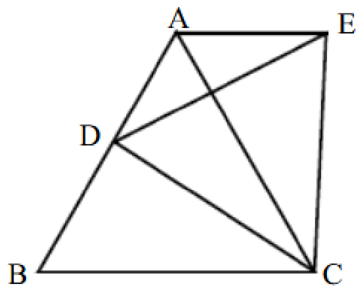
[DCF]=[DCB], hence [DCF]-[DCE]]=[DCB]-[DCE], that is [FED]= [BCE]=15.
Since DE =EB, [BEF]= [FED]=15.
[CDF]=[CDE]+[FED]=15+15=30.
AFCD is a rectangle, hence its area is equal to twice the area of CDF. [AFCD]=60
Hence, the trapezium area is [ABCD]=60+30=90

15. ABCD is a parallelogram. AP=2PC. Triangle AOP has an area of 40. Find the total area of ABCD.



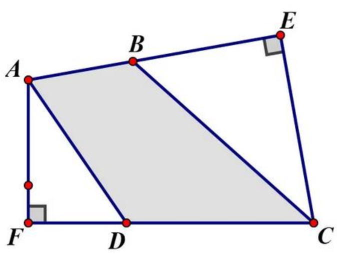
[Solution] 240
[AOP]=40, [POC]=20. [AOC]=60. [ABCD]=60×4=240.

16. In the right-angled trapezium ABCE, CE⊥BC. D is the midpoint of AB. If AE = 10, BC = 22 and CE = 20. Find the area of triangle CDE.



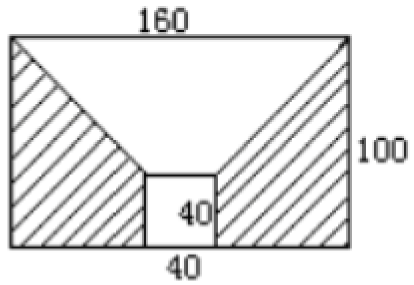
[Solution]160
Trapezium ABCD has Area [ABCD] = (10+22)×20÷2=320
D is the midpoint.
So triangle ADE has base AE=10 and [the height on AE] =20÷2=10. Area [ADE]=50.
Triangle BDC has base BC=22 and [the height on BC] =20÷2=10. Area [BDC] =110.
Hence, Area [CDE] = [ABCD]-[ADE]-[BDC] =320-50-110=160.

17. As shown below, if AB =2, CE =6, DC=5 and AF =4, and ∠E =∠F = 90°, find the area of the quadrilateral ABCD.



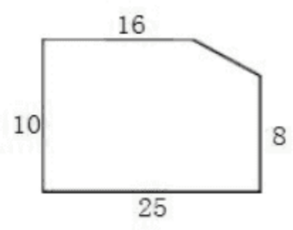
[Solution] 16
Link AC.
Triangle ABC has base AB=2 and height CE=6, and therefore an area of 6.
Triangle ADC has base DC=5 and height AF=4, and therefore an area of 10. 6+10=16.

18. As shown below, a square with a side length of 40 is put inside a large rectangle with length =160 and width =100. Find the total area of the shaded region.



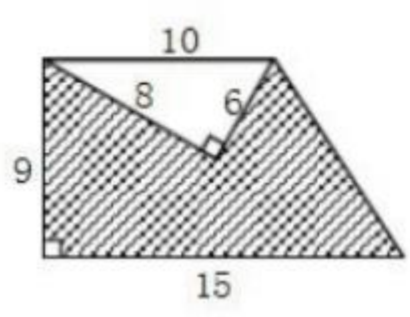
[Solution] 8400
Rectangle=160×100=16000
Square=40×40=1600
Trapezium=(40+160)×(100-40)÷2=6000
Shaded=R-S-T=16000-1600-6000=8400

19. The figure below is formed by cutting a small triangle off an entire rectangle. Find the area of this figure.



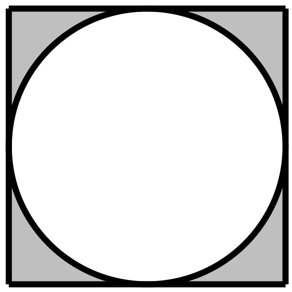
[Solution] 241
10×25-0.5×(25-16)×(10-8)=250-9=241

20. The figure below is a right-angled trapezium. Find the area of the shaded part.



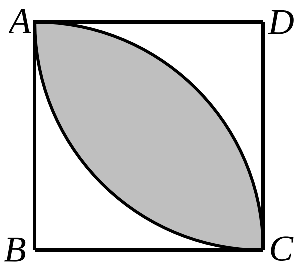
[Solution] 88.5
Trapezium = (10+15)×9÷2=112.5
Triangle =8×6÷2=24
Shaded =112.5-24 = 88.5

21. As shown in the diagram, given a circle with a radius of 2, find the area of the shaded region. (Take π as 3.14)

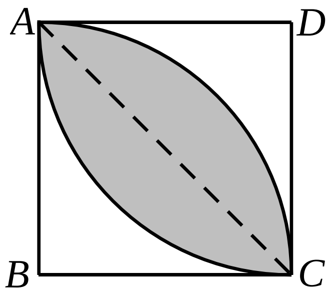


【解析】圆的半径是 2，正方形的边长是$2\times2=4$，
则正方形面积为：$4\times4=16$，圆的面积为：$3.14\times2\times2=12.56$，
阴影部分面积为：$16-12.56=3.44$

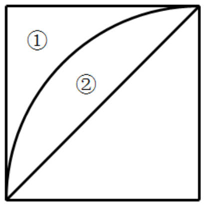
22. As shown in the diagram, the area of square ABCD is 6 square centimeters. Quarter circles are drawn with centers at points B and D within the square. Find the area of the shaded region. （Take π =3）



【解析】连接 AC，我们发现阴影部分面积的一半就是扇形减去三角形的面积，所以阴影部分面积$=2\times\left(\frac{1}{4}\times\pi\times6-6\div2\right)=3$（平方厘米）.



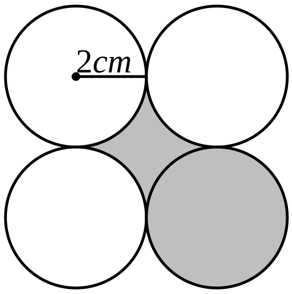
23. In the diagram, if the area of the square is 20, then what are the respective areas of ① and ②? （π =3.14）



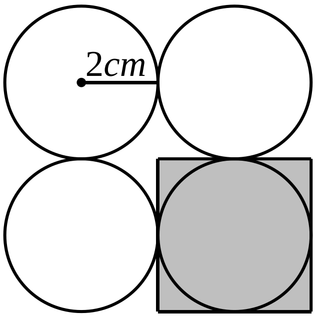
【解析】$S_{弯角}=S_{正}-S_{扇形}=20-\frac{1}{4}\pi r^2=20-\frac{1}{4}\times 3.14\times 20=4.3$

$S_{弓形}=S_{扇形}-S_{三角形}=\frac{1}{4}\pi r^2-20\div 2=\frac{1}{4}\times 3.14\times 20-10=5.7$

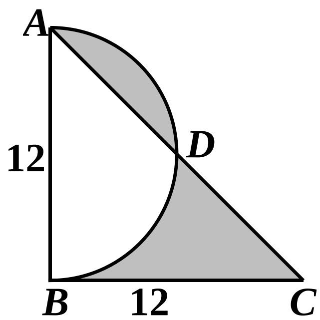
24．As shown in the diagram, the radius of each of the four circles is 2 cm. What is the area of the shaded region?（π =3.14）



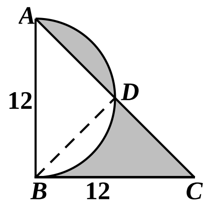
【解析】如图，割补后阴影部分的面积与正方形的面积相等，等于$(2\times 2)^2=16(cm^2)$．



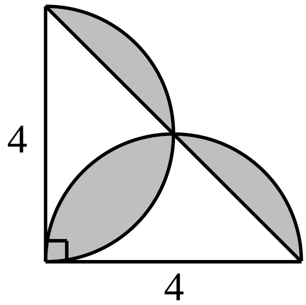
25. the isosceles right triangle ABC, a semicircle is drawn with AB as the diameter. Calculate the total area of the shaded region in the diagram. (Take π as 3.14)



【解析】如图，连接BD，可知阴影部分的面积与三角形BCD的面积相等，即为$12\times 12\div 2\div 2=36$．



26. As shown below, in the isosceles right triangle, there are two semicircles. Calculate the combined area of the shaded regions in the diagram. (Take π as 3)



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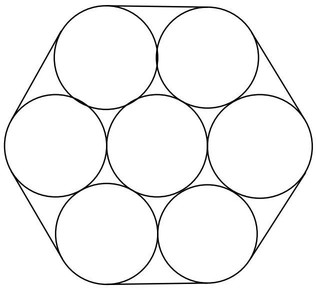
【解析】$S_{阴影}=S_{半圆}+S_{半圆}-S_{三角形}=S_{圆}-S_{三角形}=\pi\times(4\div2)^2-4\times4\div2=4(cm^2)$.

27. There are seven plastic pipes with a diameter of 5 centimeters each. They are bundled tightly with a rubber band as shown in the diagram. What is the length of the rubber band in centimeters? (Take π as 3)



【解析】由右图知，绳长等于 6 个线段 AB 与 6 个 BC 弧长之和.

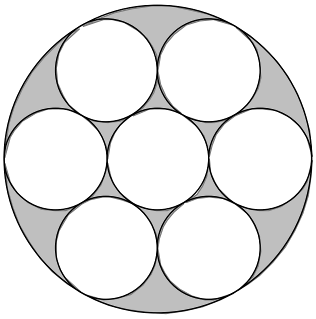
将图中与 BC 弧相似的 6 个弧所对的圆心角平移拼补，可得到 6 个角的和是 $360°$，

所以 BC 弧所对的圆心角是 $60°$，6 个 BC 弧合起来等于直径 5 厘米的圆的周长.

而线段 AB 等于塑料管的直径，

由此知绳长为：$5\times6+5\pi=45$(厘米).

28. A circular aluminum sheet with an area of 36 square centimeters is cut to create 7 identical circular aluminum pieces. What is the total area of the remaining edge and corner materials?

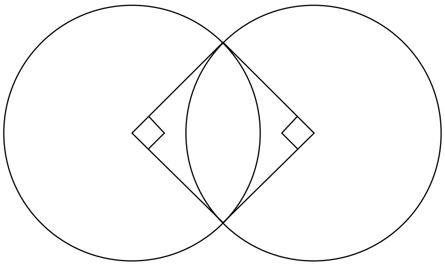


【解析】大圆直径是小圆的 3 倍，半径也是 3 倍，小圆面积：大圆面积$=\pi r^2:\pi R^2=1:9$，

小圆面积$=36\times\frac{1}{9}=4$， 7 个小圆总面积$=4\times7=28$，

边角料面积$=36-28=8$(平方厘米)．

29. In the diagram, the side length of the square is 5 cm, and two vertices coincide with the centers of the two circles. What is the total area of the figure? (Take π as 3.14)



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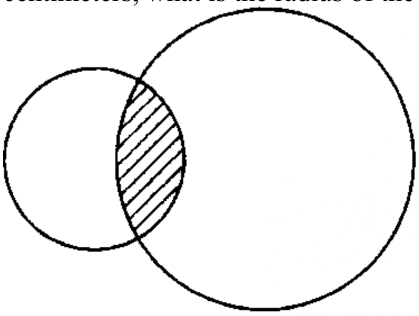
【解析】$\left(\pi\times5^2\times\frac{3}{4}+5\times5\div2\right)\times2=142.75(\text{cm}^2)$．

30. In the diagram, the area of the intersection between the two circles (i.e., the shaded region) is equal to $\frac{4}{15}$ of the area of the larger circle and also equal to $\frac{3}{5}$ of the area of the smaller circle. If the radius of the smaller circle is 5 centimeters, what is the radius of the larger circle in centimeters?



【解析】7.5