



**Hustle  
Geometry  
Mu Alpha Theta 2006**

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**# 1**

Square BDFH is inscribed inside square ACEG such that:

A, B, and C are collinear; C, D, and E are collinear,  
AB=3, and DE=4

Find: (area of BDFH) – (area of ABH + area of CDB + area of EFD + area of GHF)

**Answer:**



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**# 2**

A steel cylinder with radius and height of 7 has a cone of maximum volume cut directly from it. The remaining piece of the cylinder is melted into a hemisphere. What is the radius of the hemisphere?

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**# 3**

Space-farmer Xordo has a cube-shaped space-barn. Xordo's space cow is harnessed so that it can freely move as long as it is within 5 space yards (sy) of the barn in any direction. The barn has edges of length 10 sy and is 50 sy above the ground. Assuming that space cows can fly, through what volume can the cow fly-roam?

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**# 4**

Trapezoid WXYZ exists such that  $WX=10$ ,  $YZ=16$ ,  $XY=ZW=5$ ,  $\angle X \cong \angle W$ , and A and B are midpoints of WX and ZY, respectively.

A solid is formed by rotating WXYZ about AB. Find the volume of the solid.

**Answer:**



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**#5**

A doughnut is made by connecting opposite ends of a cylinder of dough with radius=1 and height =10.

If its volume remains constant, find the diameter of the hole in the middle of the newly formed doughnut.

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What is the expression that is the exact value of the golden ratio “ $\phi$ ” ?

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# 7

Triangle  $RAD$  is inscribed in Equilateral triangle  $JIM$ .

$$m\angle JRA = m\angle IAD = m\angle MDR = 90^\circ$$

The area of  $\Delta JIM = 4\sqrt{3}$ .

Find the area of  $\Delta RAD$ .

**Answer:**



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The area of  $\Delta JIM = 4\sqrt{3}$ .

Find the area of  $\Delta RAD$ .

**Answer:**



# 8

Chord  $\overline{AB}$  is 6 units from the center of circle Q. If  $\overline{AB}=12$ , find the area of the smaller segment of the circle which is defined by  $\overline{AB}$  and arc  $AB$ .

Answer:



# 8

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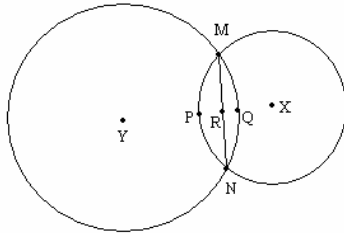
Answer:





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# 9 Find the length of  $\overline{PQ}$  given the following arc lengths: arc MPN is  $2\pi$ , arc MQN is  $\frac{4\pi\sqrt{2}}{3}$ ; and arc measures:  $\angle MPN=90^\circ$ ,  $\angle MQN = 60^\circ$ , and given points Y, P, R, Q, and X are collinear

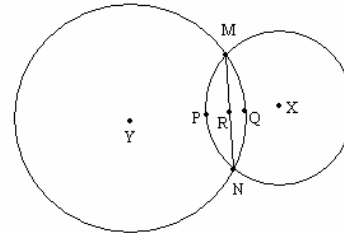


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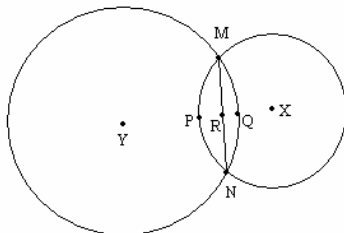


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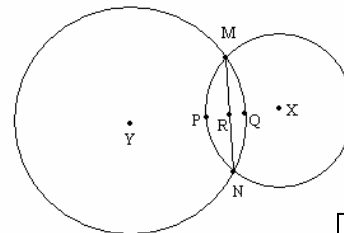


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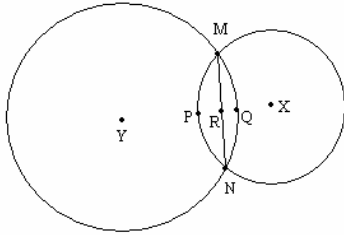


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**# 10** Find the area bordered by arcs MPN and MQN given the following

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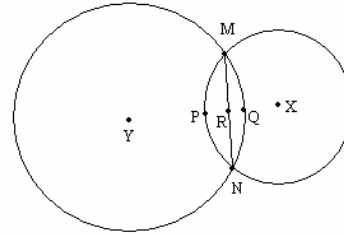


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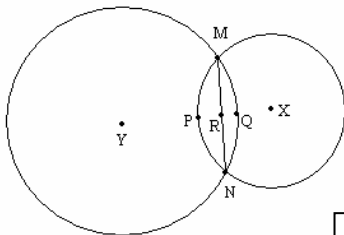


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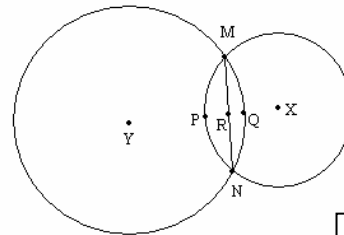


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**Answer:**



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**# 11**

Two circles whose centers are 13 units apart have radii of 2 and 7. What is the length of a common external tangent between them?

**Answer:**



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# 12

Two circles whose centers are  $6x$  apart have radii of  $x$  and  $2x$ . Find the length of the internal tangent in terms of  $x$ .

Answer:



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Answer:



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**# 13**

If  $p$ ,  $q$ ,  $r$ ,  $s$ , and  $t$  are the number of faces on each platonic solid, respectively, what is the least common multiple of  $p$ ,  $q$ ,  $r$ ,  $s$ , and  $t$ ?

**Answer:**



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**Answer:**



# 14

How many distinct figures can be formed by four congruent squares if each square must share at least one edge with another square?

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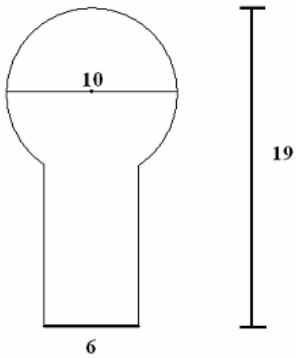
How many distinct figures can be formed by four congruent squares if each square must share at least one edge with another square?

**Answer:**



# 15

A cylinder of radius 3 intersects a sphere of radius 5. A cross section through the center of the sphere and the central axis of the cylinder is shown. Find the volume of the solid.

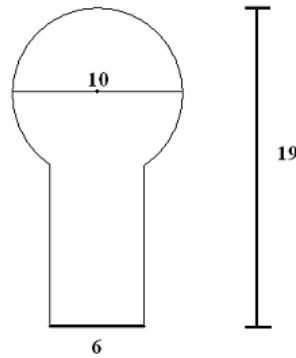


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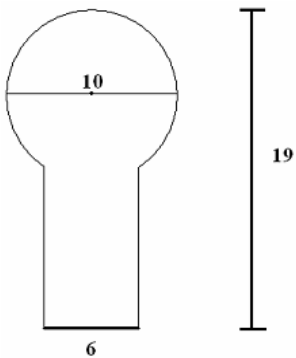


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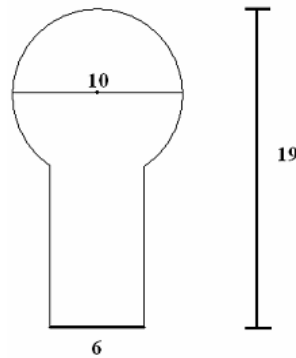


Answer:



# 15

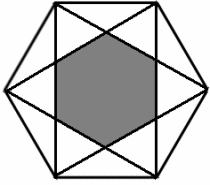
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Answer:



# 16

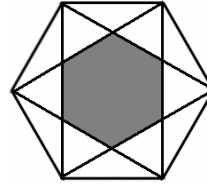


Find the area of the shaded region if both hexagons are regular and the larger hexagon's area is  $54\sqrt{3}$ .

Answer:



# 16

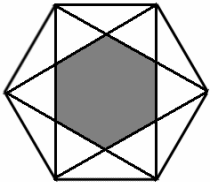


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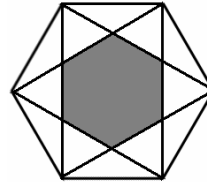


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Answer:





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**# 17**

A three foot tall man sees the reflection of a nine foot high street light in a puddle four feet in front of him. How far away is he from the light post (along the ground)?

**Answer:**



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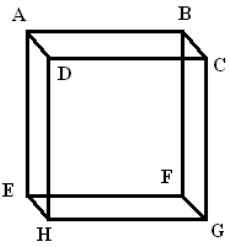
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# 18



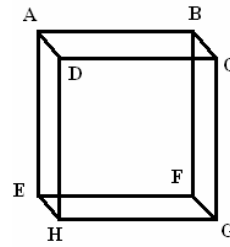
In cube  
 $ABCDEFGH$ ,  $AB = 6$ .  
Find the area of  $\triangle AHF$

Answer:



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# 18



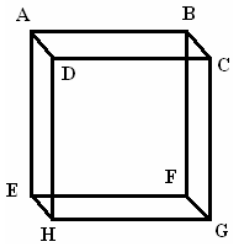
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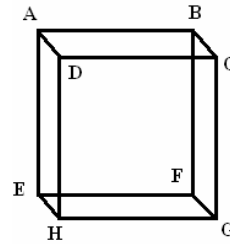
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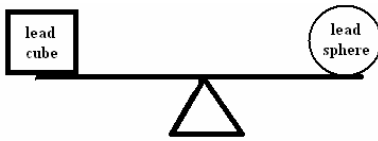
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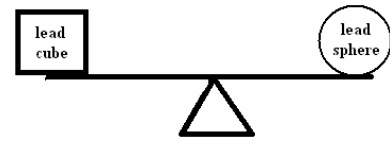
A balance is arranged so that a lead cube is on one side and a lead sphere is on the other. The lead cube's center of mass is  $\pi$  ft from the fulcrum. The lead cube has side length  $\pi$  ft. The lead sphere has diameter length  $\pi$  ft. Find the distance from the sphere's center of mass to the fulcrum.

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# 19



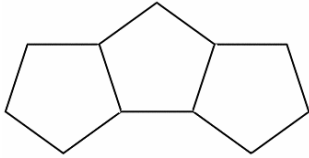
A balance is arranged so that a lead cube is on one side and a lead sphere is on the other. The lead cube's center of mass is  $\pi$  ft from the fulcrum. The lead cube has side length  $\pi$  ft. The lead sphere has diameter length  $\pi$  ft. Find the distance from the sphere's center of mass to the fulcrum.

Answer:



# 20

What is the minimal number of congruent pentagons necessary (including the three pentagons shown) to complete a closed ring by following the pattern shown?

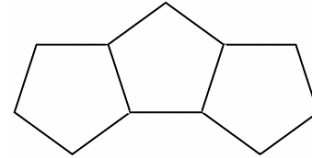


Answer:



# 20

What is the minimal number of congruent pentagons necessary (including the three pentagons shown) to complete a closed ring by following the pattern shown?

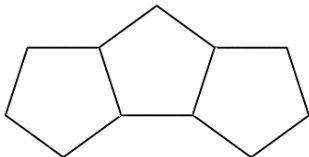


Answer:



# 20

What is the minimal number of congruent pentagons necessary (including the three pentagons shown) to complete a closed ring by following the pattern shown?

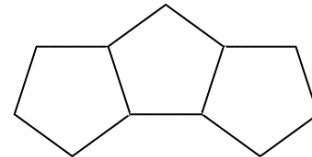


Answer:



# 20

What is the minimal number of congruent pentagons necessary (including the three pentagons shown) to complete a closed ring by following the pattern shown?



Answer:



**Hustle  
Geometry  
Mu Alpha Theta 2006**

---

**# 21**

What is the length of the longest line segment that can fit entirely within a unit hypercube (4D figure)?

**Answer:**



**Hustle  
Geometry  
Mu Alpha Theta 2006**

---

**# 21**

What is the length of the longest line segment that can fit entirely within a unit hypercube (4D figure)?

**Answer:**



**Hustle  
Geometry  
Mu Alpha Theta 2006**

---

**# 21**

What is the length of the longest line segment that can fit entirely within a unit hypercube (4D figure)?

**Answer:**



**Hustle  
Geometry  
Mu Alpha Theta 2006**

---

**# 21**

What is the length of the longest line segment that can fit entirely within a unit hypercube (4D figure)?

**Answer:**



**Hustle  
Geometry  
Mu Alpha Theta 2006**

---

**# 22**

What is the angle between the second hand and the minute hand of an accurate analog clock at 7:15:40 am? Give your answer in degrees.

**Answer:**



**Hustle  
Geometry  
Mu Alpha Theta 2006**

---

**# 22**

What is the angle between the second hand and the minute hand of an accurate analog clock at 7:15:40 am? Give your answer in degrees.

**Answer:**



**Hustle  
Geometry  
Mu Alpha Theta 2006**

---

**# 22**

What is the angle between the second hand and the minute hand of an accurate analog clock at 7:15:40 am? Give your answer in degrees.

**Answer:**



**Hustle  
Geometry  
Mu Alpha Theta 2006**

---

**# 22**

What is the angle between the second hand and the minute hand of an accurate analog clock at 7:15:40 am? Give your answer in degrees.

**Answer:**



**Hustle  
Geometry  
Mu Alpha Theta 2006**

---

**# 23**

Correctly spell the one-word name for a truncated cone or pyramid

**Answer:**



**Hustle  
Geometry  
Mu Alpha Theta 2006**

---

**# 23**

Correctly spell the one-word name for a truncated cone or pyramid

**Answer:**



**Hustle  
Geometry  
Mu Alpha Theta 2006**

---

**# 23**

Correctly spell the one-word name for a truncated cone or pyramid

**Answer:**



**Hustle  
Geometry  
Mu Alpha Theta 2006**

---

**# 23**

Correctly spell the one-word name for a truncated cone or pyramid

**Answer:**



**Hustle  
Geometry  
Mu Alpha Theta 2006**

---

**# 24**

How many right triangles of integral side length have one side of length 15?

**Answer:**



**Hustle  
Geometry  
Mu Alpha Theta 2006**

---

**# 24**

How many right triangles of integral side length have one side of length 15?

**Answer:**



**Hustle  
Geometry  
Mu Alpha Theta 2006**

---

**# 24**

How many right triangles of integral side length have one side of length 15?

**Answer:**



**Hustle  
Geometry  
Mu Alpha Theta 2006**

---

**# 24**

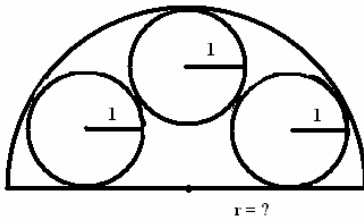
How many right triangles of integral side length have one side of length 15?

**Answer:**





# 25

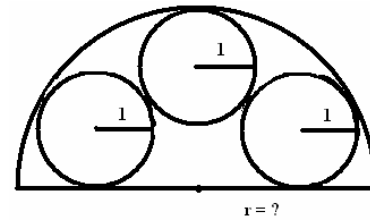


What is the radius of the large semicircle?

**Answer:**



# 25

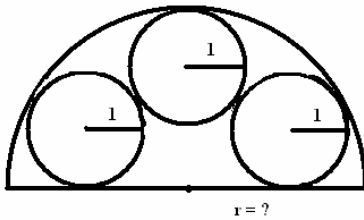


What is the radius of the large semicircle?

**Answer:**



# 25

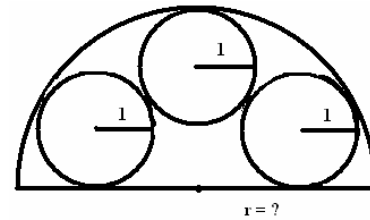


What is the radius of the large semicircle?

**Answer:**



# 25



What is the radius of the large semicircle?

**Answer:**

