Go GEO

CATERGORY- (JUNIOR)+(SECONDARY)

SESSION NAME	DESCRIPTION
An adventure into GEOMETRY	The history and mysteries of Geometry
(.) DOT- the beginning	Introduction to dot, ray, line, line segment, angle, plane and parallel lines. Solving problems using the ideas.
LIFE of POLYGON	The idea of AREA, Triangle, rectangle, square, parallelogram, rhombus and their properties (area, total angle, number of diagonal). AREA related problems from BdMO, APMO, and IMO.
MAGIC of CONGRUENCE	How to prove two triangles congruent? Perpendicular bisector of a line segment, drawing a perpendicular, Triangle: medians, center of mass, angle bisector, incentre, orthocentre, circumcentre, exocentre. BdMO, APMO, IMO problems using congruence.
KNOW your CIRCLE	Introduction to Circle, defining and calculating pi, area of circle by paper cutting, circle related theorems (chord, tangent etc). All important circle like circumcircle, incircle, excircle, nine point circle.
Geometry with Sherlock Holmes: thinking like a detective	Deductive reasoning in geometric proof and drawing .Different right and wrong ways of proof. Geometric Fallacies in a nutshell. Russian IMO problem geometric drawing.
The LEGEND of PYTHAGORAS	Life of Pythagorus, Proofs and application of Pythagoras theorem.

Al-Beruni Geo camp Schedule

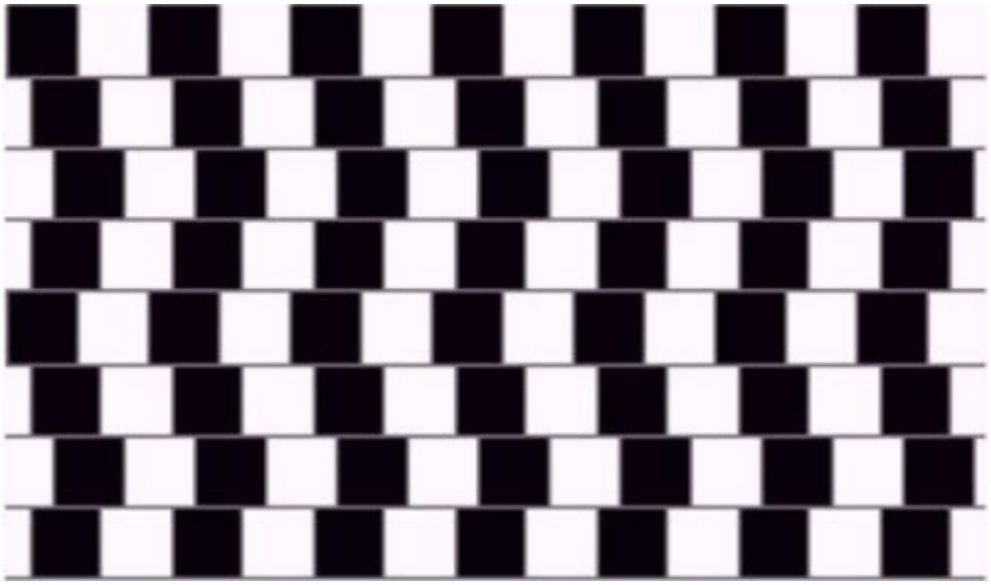
Junior Category			
Date	Time	Topic	Trainer
08-02-2021	3:00-5:00	The adventure of Geometry, DOT the beginning	Majedur Sourav
09-02-2021	3:00-5:00	Life of Polygon	Majedur Sourav
10-02-2021	3:00-5:00	Magic of Congruency	Majedur Sourav
11-02-2021	3:00-5:00	Camp Test: 01	N/A
12-02-2021	7:00-9:00	Know The circle Class	Sakal Roy
13-02-2021	7:00-9:00	Geometry with Sherlock holmes: Thinking Like a Detective Part: 01	Sakal Roy
14-02-2021	7:00-9:00	The Legend of Pythagoras	Sakal Roy
15-02-2021	3:00-5:00	Camp Test: 02	N/A
16-02-2021	3:00-5:00	Problem Solving	Academic Team of the camp

Senior Category			
Date	Time	Topic	Trainer
08-02-2021	7:00-9:00	The Big Picture-1	Saad Bin Quddus
09-02-2021	7:00-9:00	Length Chase	Masrooor Hasan
10-02-2021	7:00-9:00	Homothety	Raiyan Jamil
11-02-2021	3:00-5:00	Camp Test:01	N/A
11-02-2021	7:00-9:00	Power of Point	Masrooor Hasan
12-02-2021	3:00-5:00	The Big Picture-2	Saad Bin Quddus
13-02-2021	3:00-5:00	Inversion basics + Spiral Similarity	Raiyan Jamil
14-02-2021	3:00-5:00	Problem Solving	Masrooor Hasan
15-02-2021	3:00-5:00	Camp Test: 02	
15-02-2021	7:00-9:00	Problem Solving	Raiyan Jamil
16-02-2021	7:00-9:00	Problem Solving	Saad Bin Quddus

জুনিয়র ক্যাটাগরি

Session Plan

Geometric Illusion



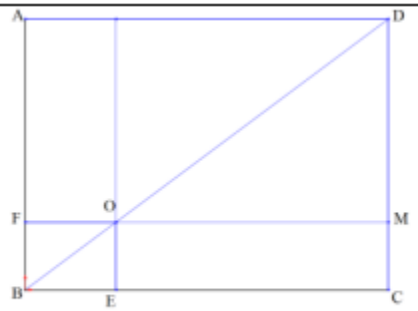
https://en.wikipedia.org/wiki/Optical_illusion

(.) DOT- the beginning

Angles and Parralel lines

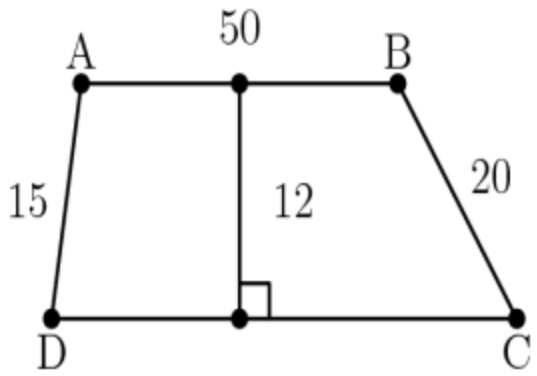
https://www.universalclass.com/articles/math/geometry/how-to-calculate-angles-and-parallelism.htm

Test Question

ABCD একটি আয়তক্ষেত্র।**AD=16, BE=4, AB=12,** **(ODM)** এর ক্ষেত্রফল কত? **ABCD** is a rectangle. **AD=16, BE=4, AB=12**, then what is the area of **(ODM)**?	

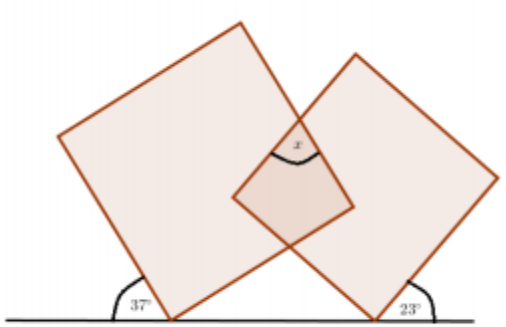
ABCD একটি ট্রাপিজিয়াম।**AD=15, AB=50 , BC=20** ট্রাপিজিয়াম এর উচ্চতা **12** । **ABCD** ট্রাপিজিয়ামের ক্ষেত্রফল কত?

Quadrilateral **ABCD** is a trapezoid, **AD=15,AB=50 ,BC=20** and the altitude is 12. What is the area of the **ABCD** trapezoid?



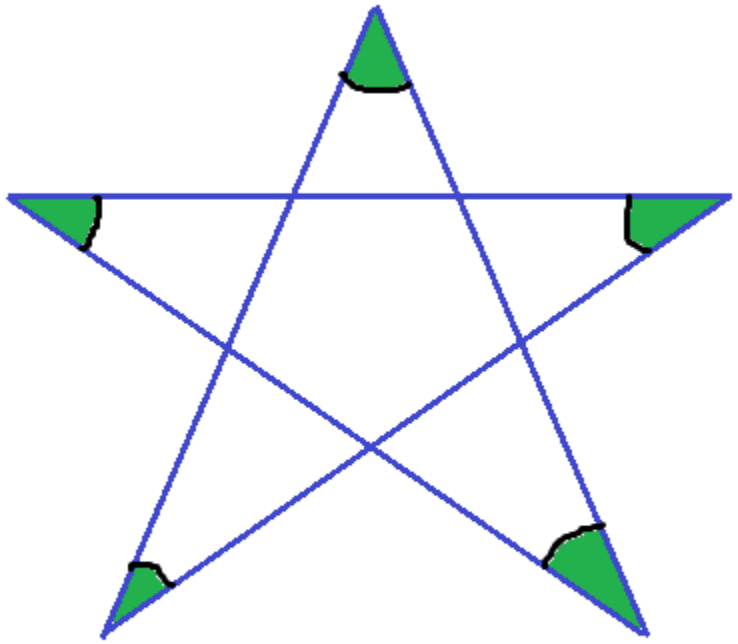
চিত্রে দেখানো চতুর্ভুজগুলো বর্গ হলে x কোণের মান ডিগ্রিতে কত?

In this figure these two quadreleterals are square. then find x in degree



LIFE of POLYGON

Twinkle Twinkle little star

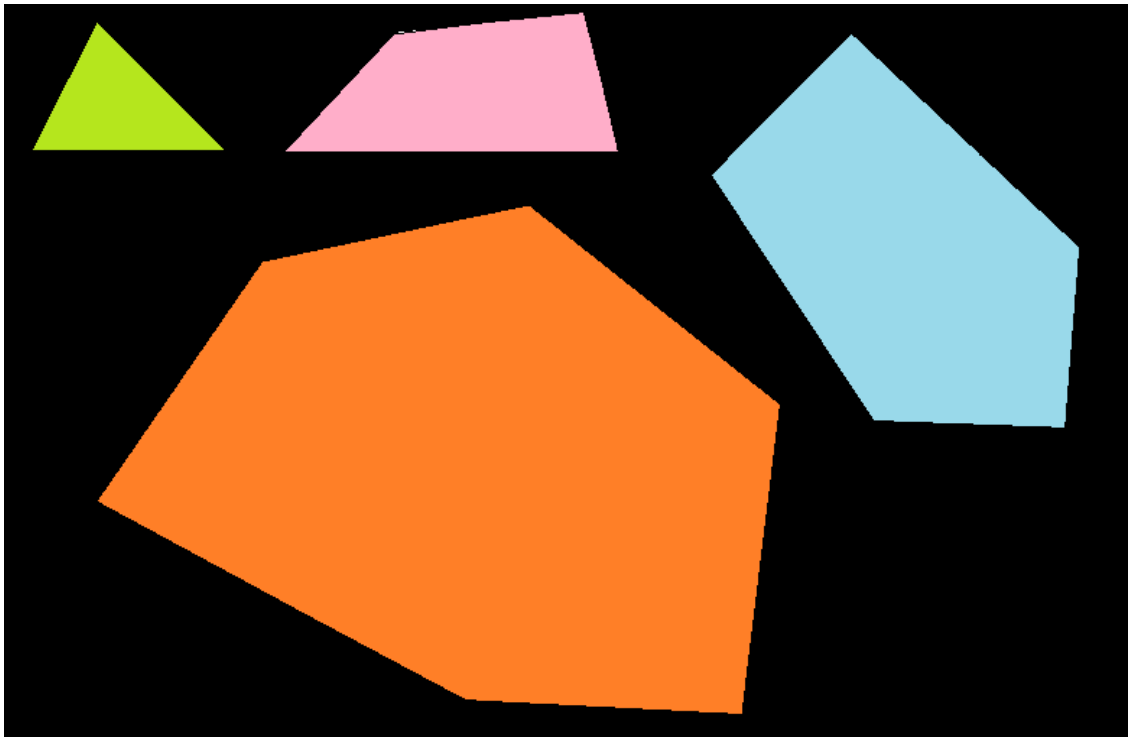


এই তারাটির মধ্যে সবুজ রঙে চিহ্নিত সবগুলো কোণের যোগফল কত?

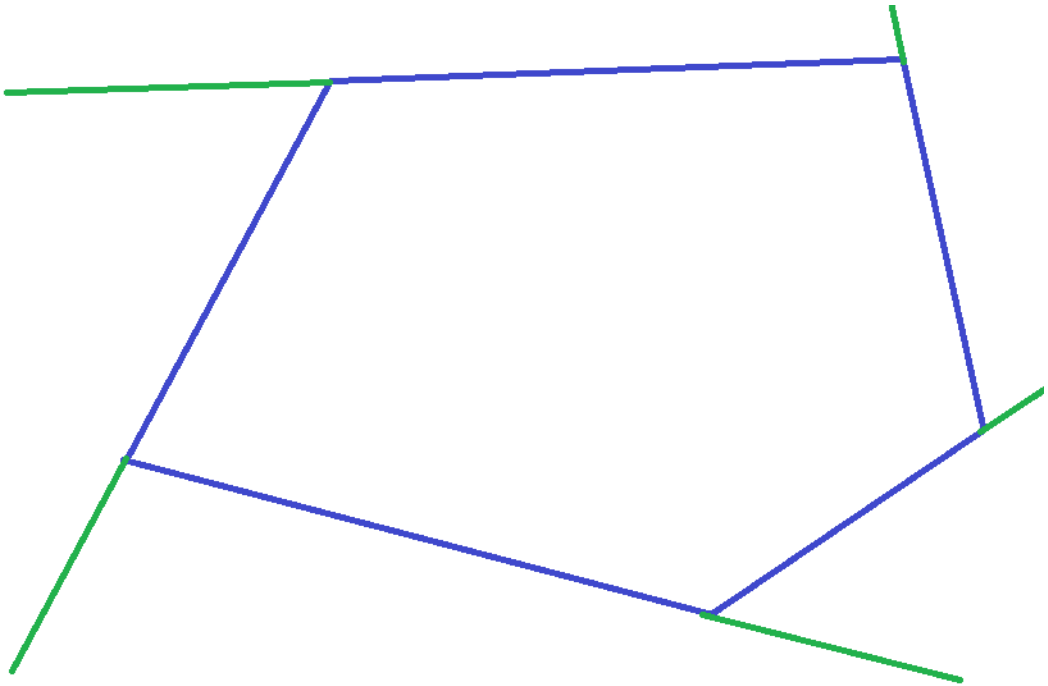
Facts about Polygon

https://www.universalclass.com/articles/math/geometry/how-to-solve-geometry-problems-involving-polygons.htm

Total interior angle of polygon



Total exterior angle of polygon

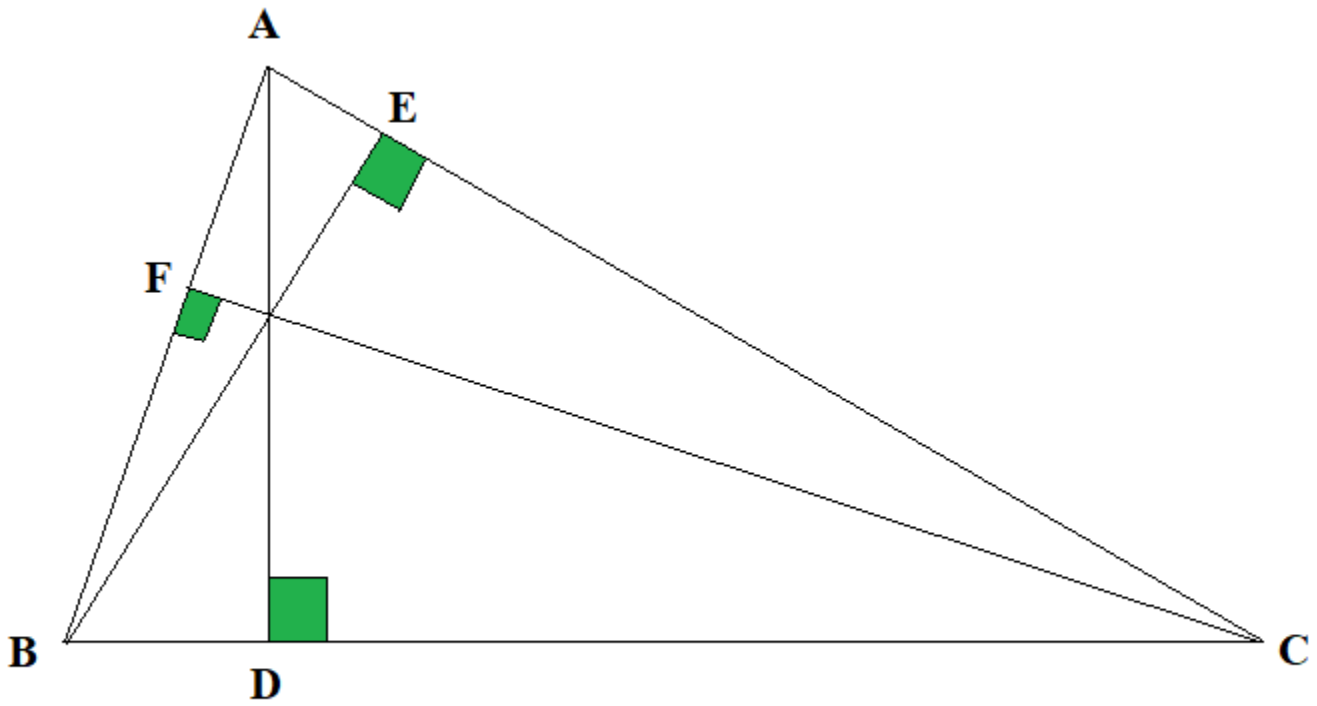


Regular polygon

Number of diagonal in a polygon

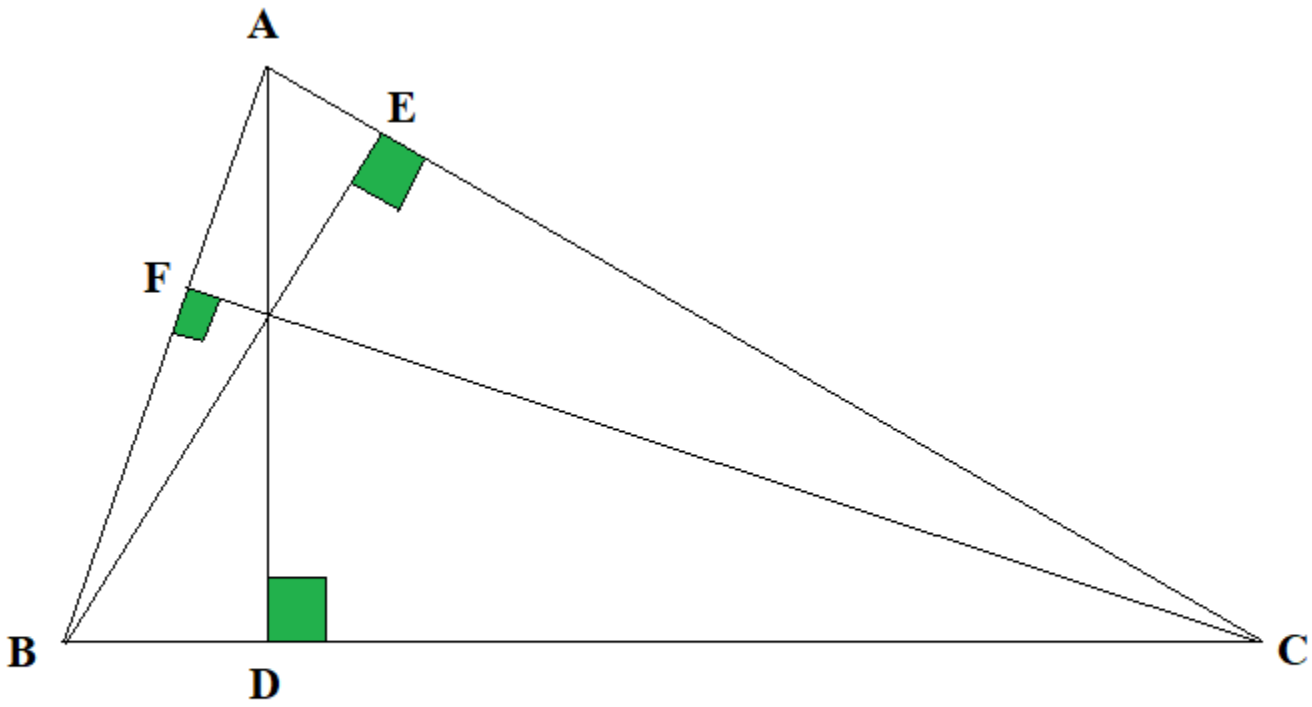
Easy problems that are hard to solve

1)



AB = 2020, AD = 20, CF = 10 হলে BC = ?

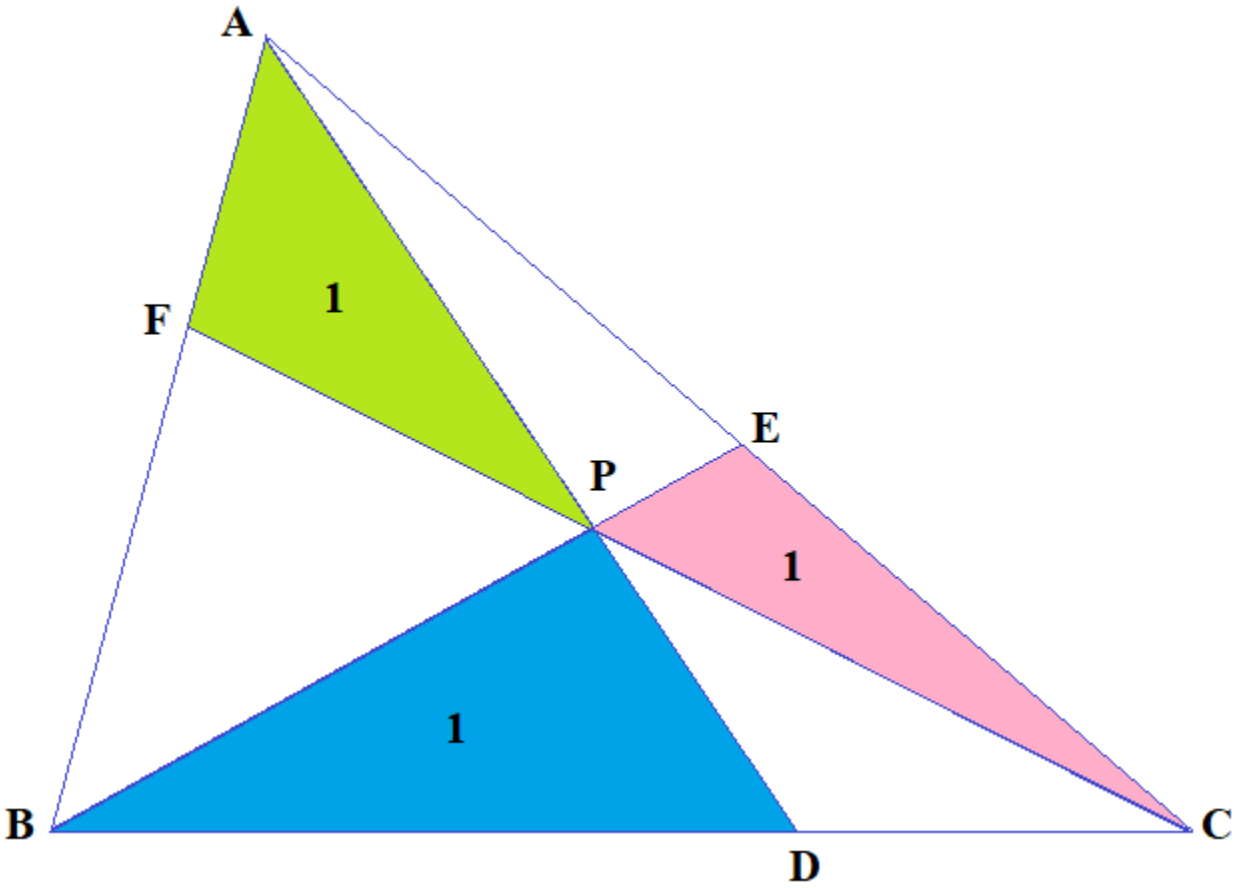
2)



AB : BC : CA = 2: 5: 4 হলে AD : BE : CF = ?

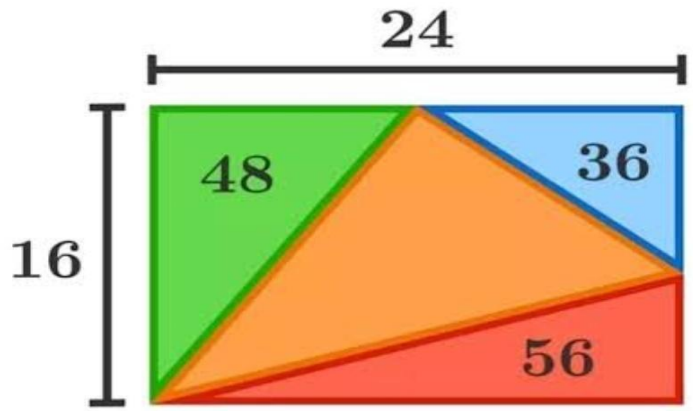
APMO 2012 -P1

Problem 1. Let P be a point in the interior of a triangle ABC, and let D, E, F be the point of intersection of the line AP and the side BC of the triangle, of the line BP and the side CA, and of the line CP and the side AB, respectively. Prove that the area of the triangle ABC must be 6 if the area of each of the triangles PFA, PDB and PEC is 1.



More Problems:

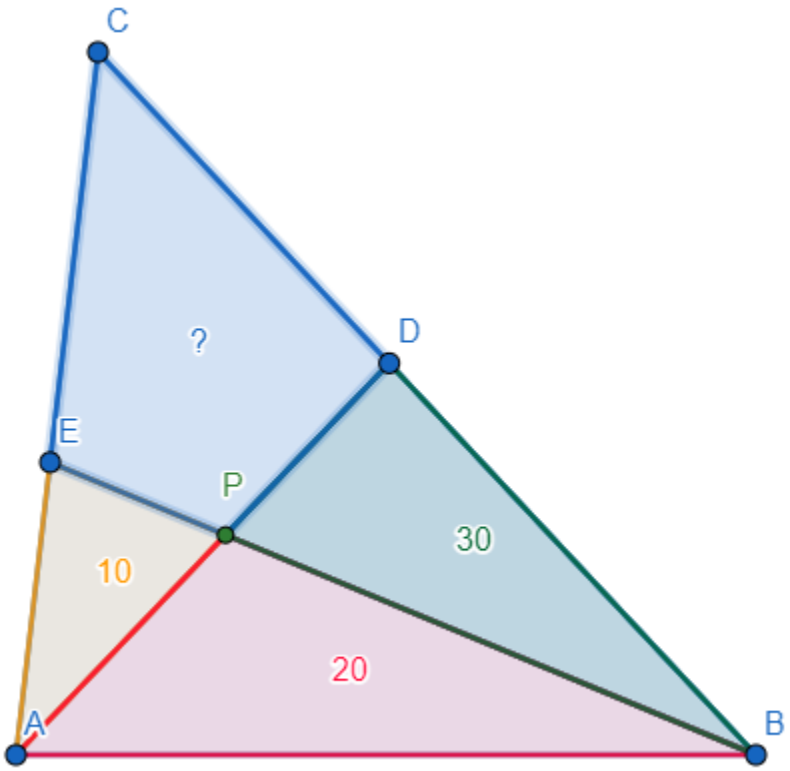
1)



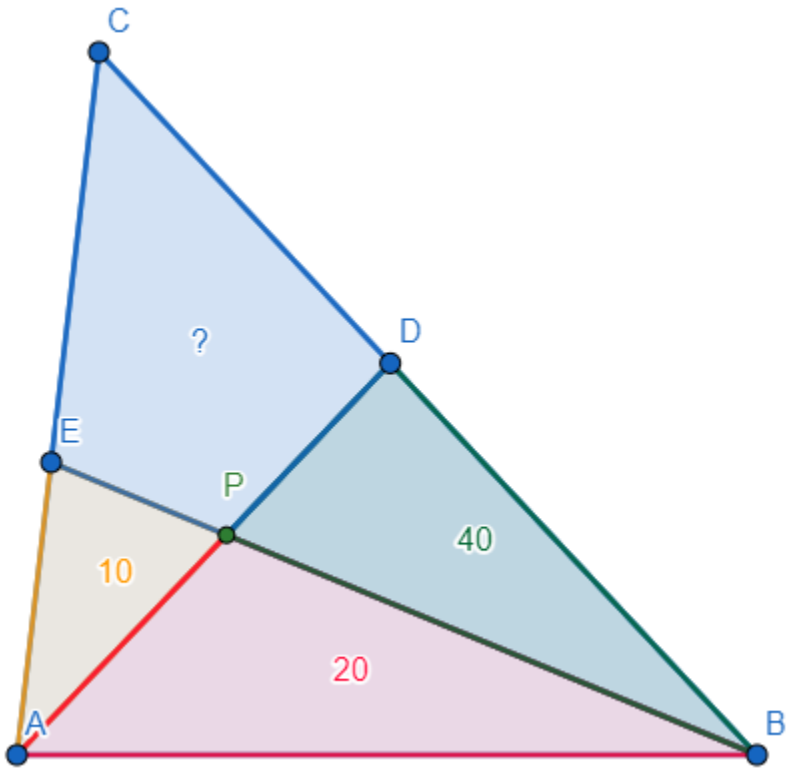
The 16×24 rectangle above is cut up into 4 triangles, 3 of which have perimeters of 48, 36, and 56, as indicated by the numbers inside them.

What is the perimeter of the remaining orange triangle?

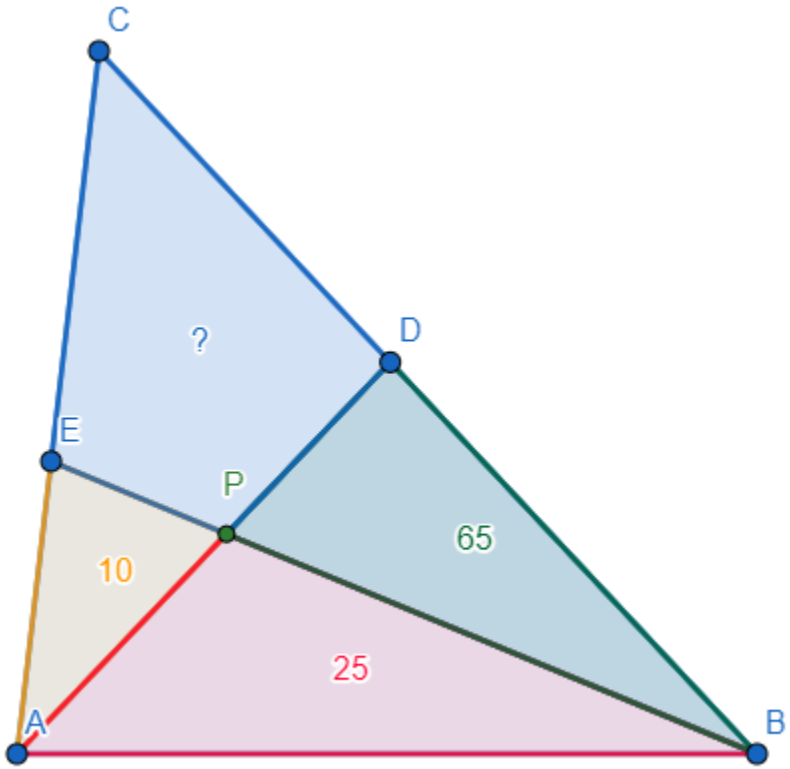
2)



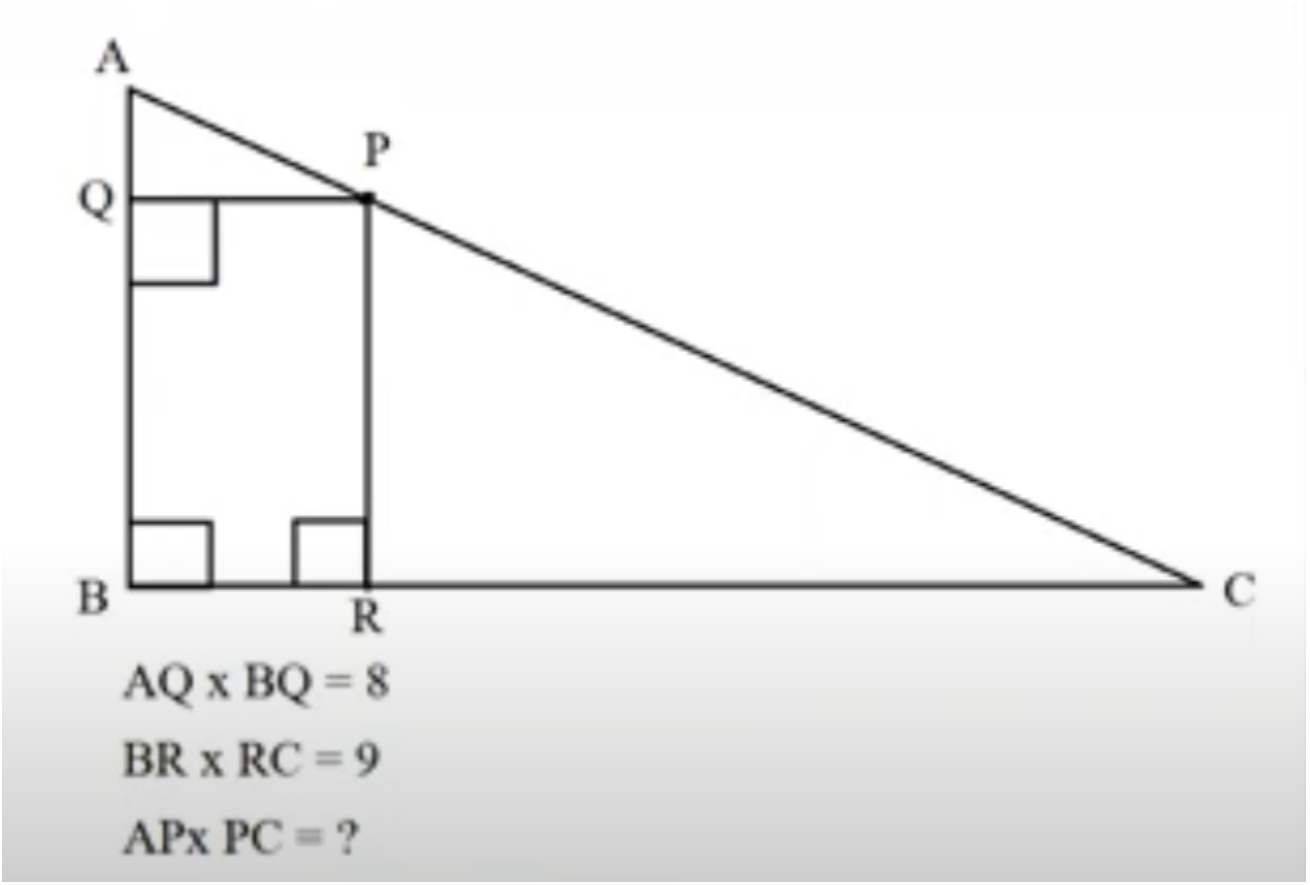
3)



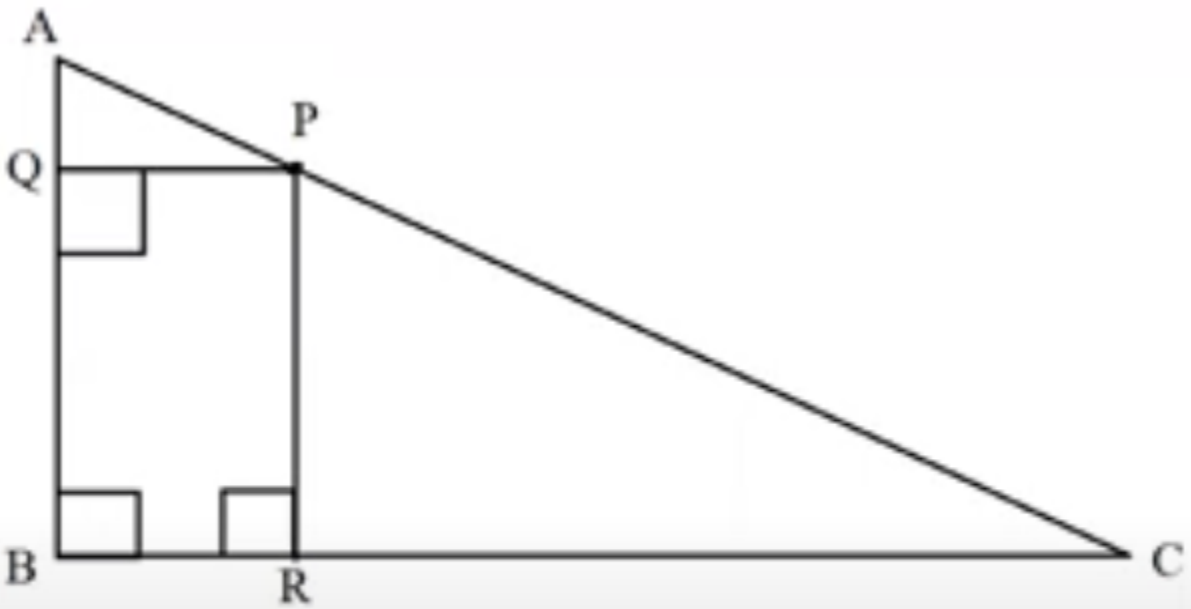
4)



5)



6)



AQ x BQ = 8

BR x RC = 9

APx PC = ?

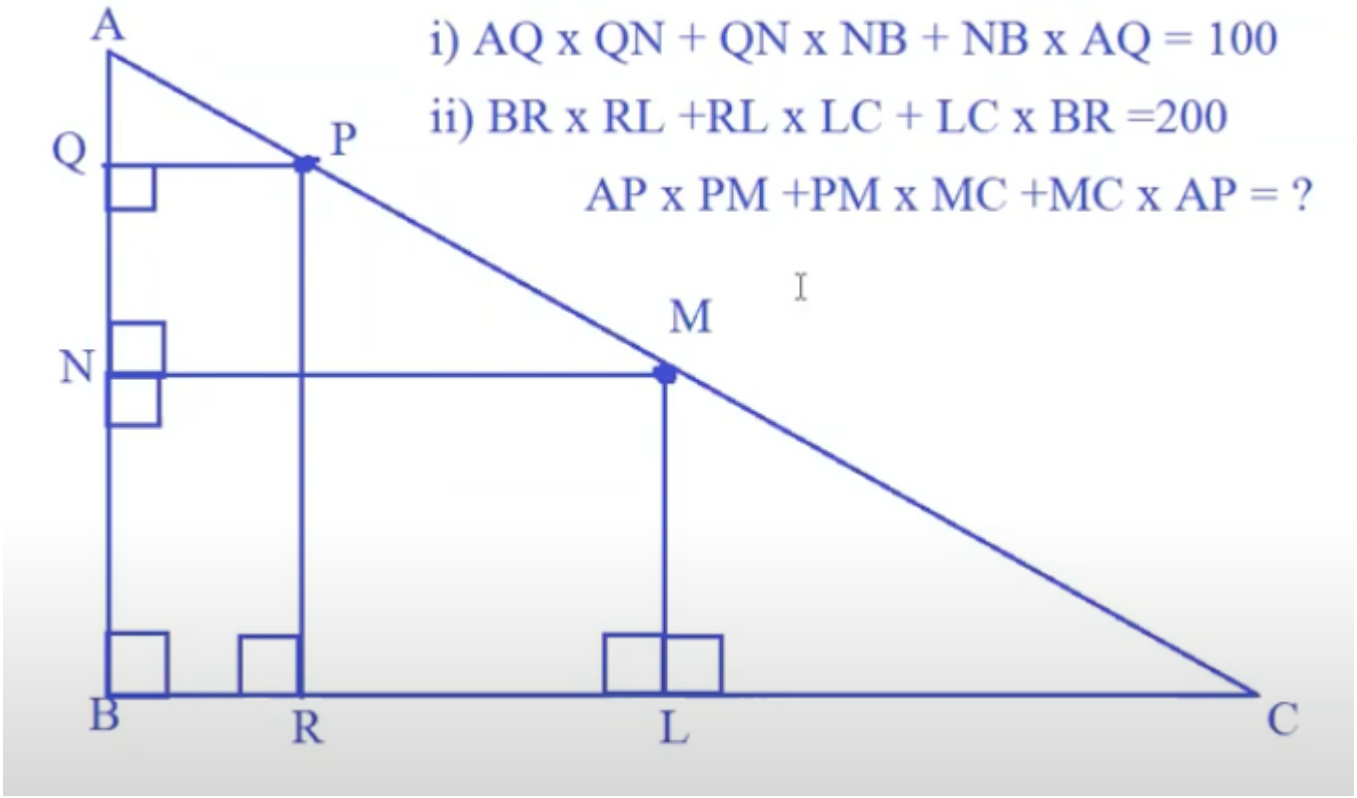
i) [ABC] = ?

ii) PR =?

iii) APQ

উপরের (i) , (ii) ও (iii) তিনটা আলাদা আলাদা সমস্যা। প্রতিটির জন্যই ছবির তথ্যগুলি সত্যি।
এই সমস্যা তিনটি আসলেই সমাধান করা সম্ভব কিনা সেটা কেউ জানে না। তোমরা যদি জানতে চাও তো চেষ্টা করে দেখো।

7)


A
Q
P
N
M
B
R
L
C
i) AQ x QN + QN x NB + NB x AQ = 100
ii) BR x RL +RL x LC + LC x BR =200
AP x PM +PM x MC +MC x AP = ?

MAGIC of CONGRUENCE

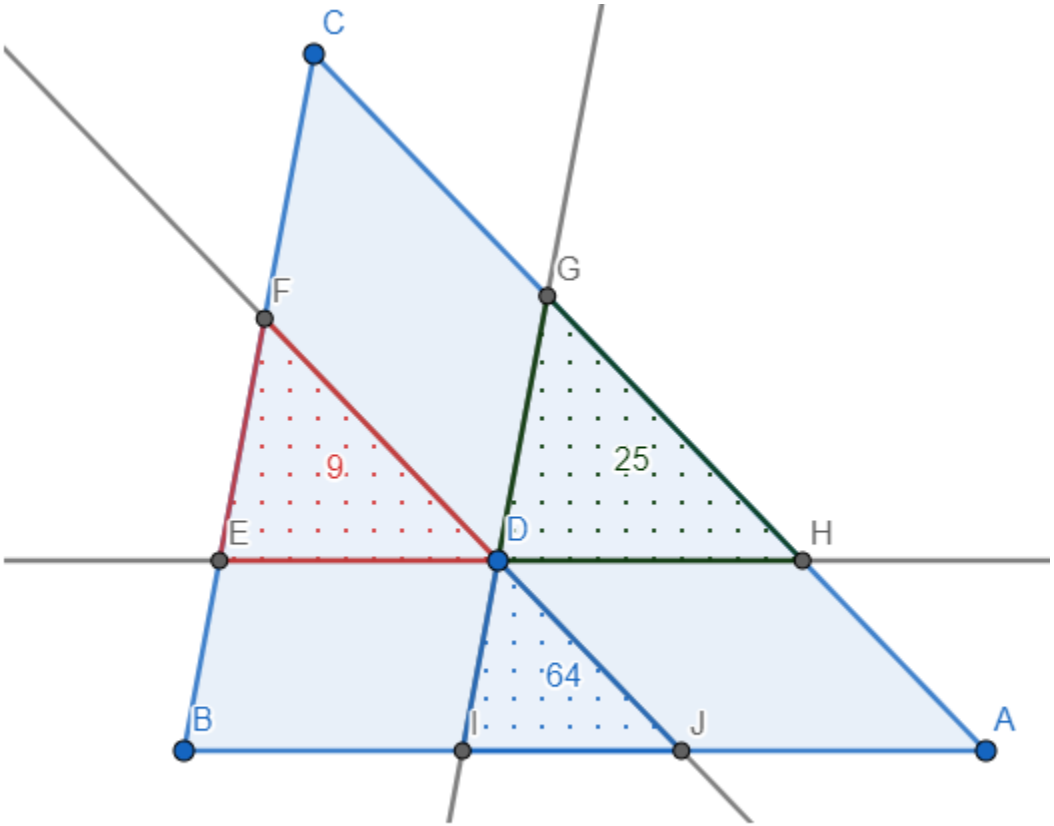
সম্পাদ্য এর প্রমাণগুলাঃ
https://www.universalclass.com/articles/math/geometry/using-classical-geometric-construction-techniques.htm

লম্ব রেখা আকার কৌশল, কোণ সমদ্বিখন্ডিত । এগুলো কেন কাজ করে। প্রমাণ কী?

কাগজ ভাঁজ করার ধাঁধাঁঃ

একটা আয়তকার কাগজ থেকে বর্গ কীভাবে বানানো যায়?
এরপর ভাঁজ করে যেটা বানাইছে ওইটা যে আসলেই বর্গ তার প্রমাণ করা লাগবে।

Beauty of Similarity



ABC ত্রিভুজের ক্ষেত্রফল কত?

IMO 2018- P1

Problem 1. Let Γ be the circumcircle of acute-angled triangle ABC. Points D and E lie on segments AB and AC, respectively, such that $AD = AE$. The perpendicular bisectors of BD and CE intersect the minor arcs AB and AC of Γ at points F and G, respectively. Prove that the lines DE and FG are parallel (or are the same line).

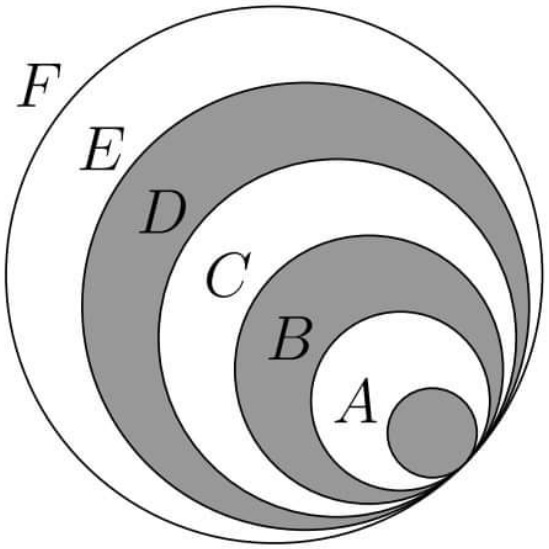
KNOW your CIRCLE

Basic Theorems:

1) https://www.mathplanet.com/education/geometry/circles/basic-information-about-circles#:~:text=A%20line%20segment%20that%20has,midpoint%20is%20called%20a%20chord.&text=A%20circle%20is%20the%20same%20as%20360%C2%B0.
2) https://www.mathplanet.com/education/geometry/circles/inscribed-angles-and-polygons
3) https://www.mathplanet.com/education/geometry/circles/advanced-information-about-circles

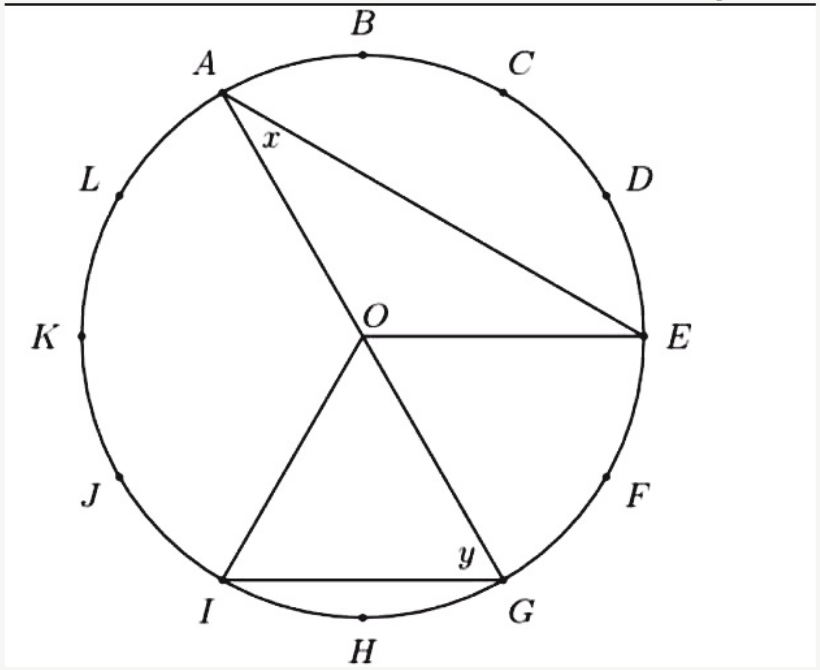
1)

চিত্রে সবচেয়ে ছোট বৃত্তের ব্যাসার্ধ 2 একক। পরবর্তী বৃত্তের ব্যাসার্ধ ঠিক আগের বৃত্তের ব্যাসার্ধ অপেক্ষা 2 একক বেশী। যদি চিত্রের সমগ্র সাদা অংশের ক্ষেত্রফল $x\pi$ হয়, তাহলে x এর মান কত হয়?



2)

O কেন্দ্র বিশিষ্ট বৃত্তের পরিধিকে সমান 12 টি অংশে ভাগ করা হয়েছে। পাশের চিত্রে $x = \angle OAE$ এবং $y = \angle OGI$, তাহলে $x + y$ এর মান কত?



The LEGEND of PYTHAGORAS

Many Proofs of Pythagoras Theorem:

https://www.cut-the-knot.org/pythagoras/index.shtml#7

1) Move and Prove

https://upload.wikimedia.org/wikipedia/commons/9/9e/Pythagoras-proof-anim.svg

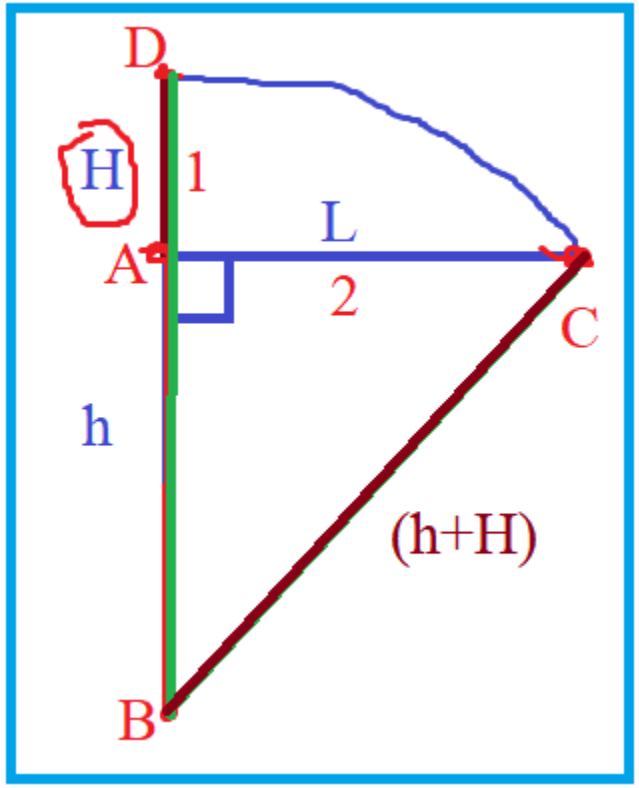
2) Water- Proof

https://www.youtube.com/watch?v=CAkMUdeB06o&feature=related

https://www.geogebra.org/m/jZbpk3JY

3) Water Lily

https://codeforces.com/problemset/problem/1199/B



$AB^2 + AC^2 = BC^2$

$h^2 + L^2 = (h + H)^2$

$h^2 + L^2 = h^2 + H^2 + 2hH$

$L^2 = H^2 + 2hH$

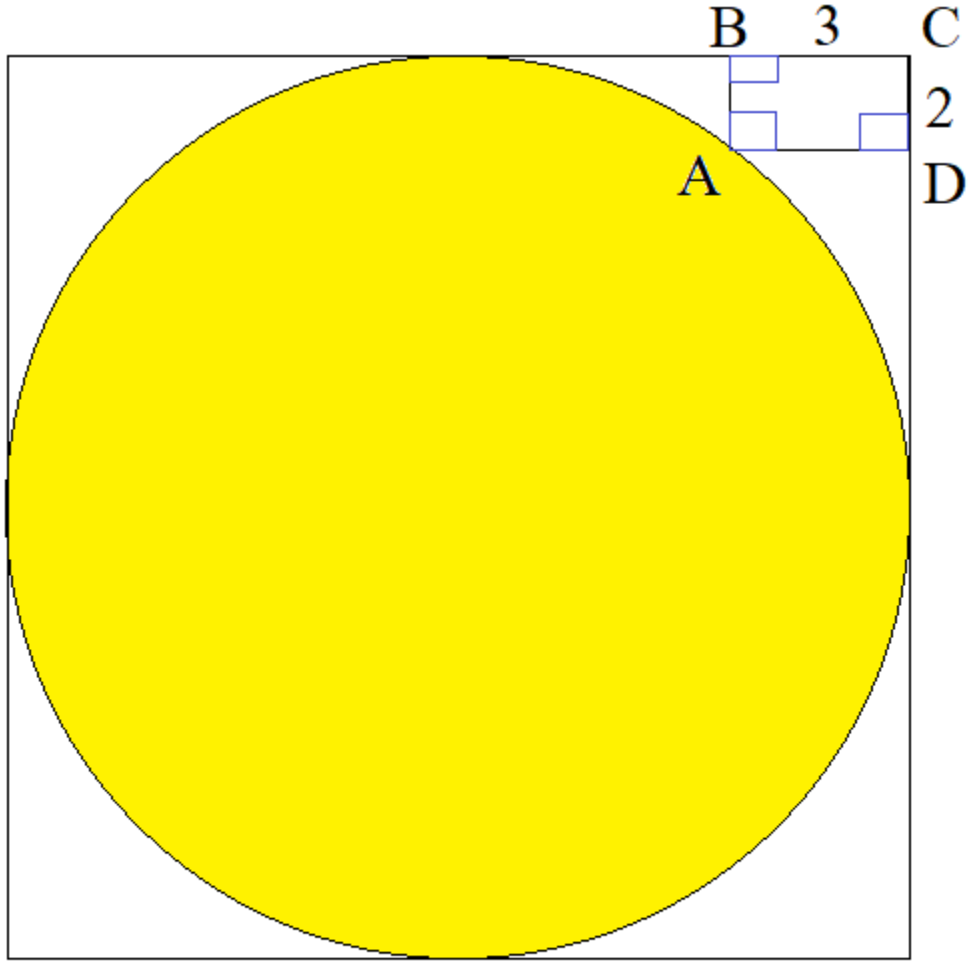
$2hH = L^2 - H^2$

$h = (L^2 - H^2)/(2H)$

$h = (L^2 - H^2)/(2H)$ when , L>H

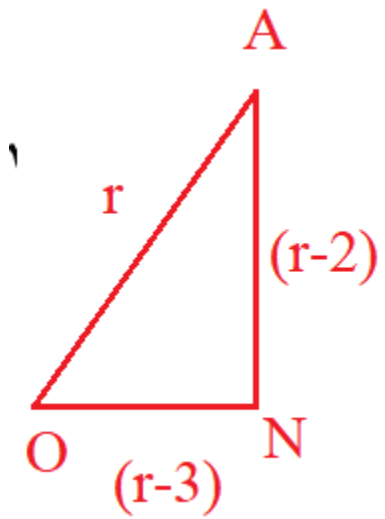
If L<H then no solution because h<0.

4) Circle Inside Square



হলুদ বৃত্তের ক্ষেত্রফল কত?
What is the area of the yellow circle?

Solution:



$$OA^2 = ON^2 + AN^2$$

$$r^2 = (r-3)^2 + (r-2)^2$$

$$r^2 = r^2 - 6r + 3^2 + r^2 - 4r + 2^2$$

$$0 = -10r + 9 + r^2 + 4$$

$$r^2 - 10r + 13 = 0$$

$$r^2 - 2.r.5 = -13$$ [(a-b)^2= a^2 -2ab+b^2]

$$r^2 - 2.r.5 + 5^2 = -13 + 5^2$$

$$(r-5)^2 = -13 + 25 = 12$$

$$(r-5)^2 = 12$$

$r - 5 = +\sqrt{12}$ অথবা, $r - 5 = -\sqrt{12}$

$r = 5 + \sqrt{12}$ অথবা, $r = 5 - \sqrt{12}$

r = 8.46410161514 (correct)

অথবা,r= 1.53589838486 (wrong)

r> 2 and r>3

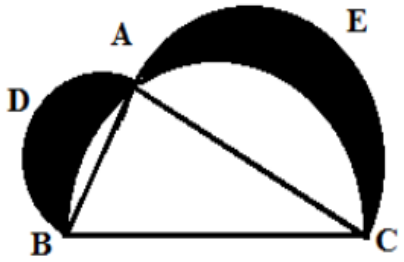
help:

$$(x-3)^2 = 4$$

$$x^2 - 2.3.x + 3^2 = 4$$

$$x^2 - 6x + 5 = 0$$

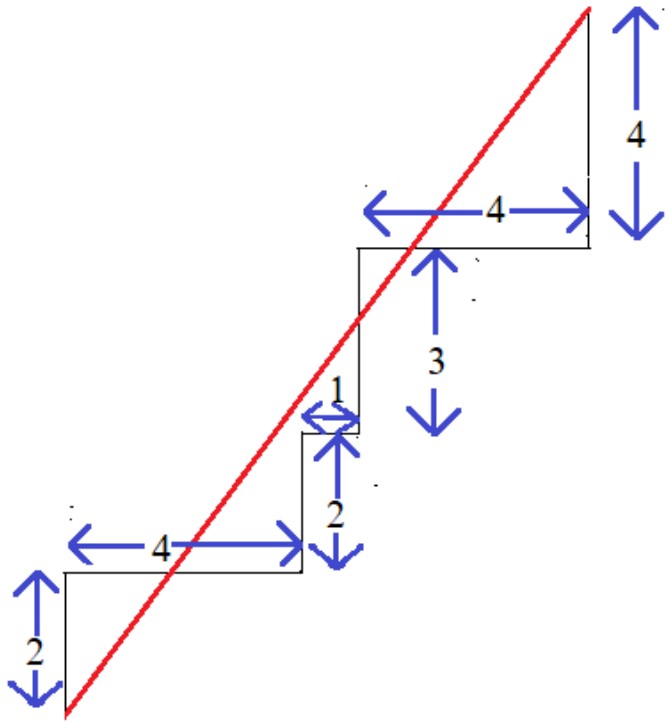
5) BdMO problem

8		চিত্রে ∠BAC সমকোণ। ADB, AEC, ABC অর্ধবৃত্তের ব্যাস যথাক্রমে AB, AC, BC। ADB, AEC অর্ধবৃত্তে কালো অংশের ক্ষেত্রফল যথাক্রমে 14, 18 । ABC ত্রিভুজের ক্ষেত্রফল কত হবে? ∠BAC is a right angle, ADB, AEC, ABC are semicircles with diameters AB, AC and BC. The areas of the black portions in semicircles ADB and AEC are 14 and 18 respectively. Find the area of triangle ABC.

Animation:

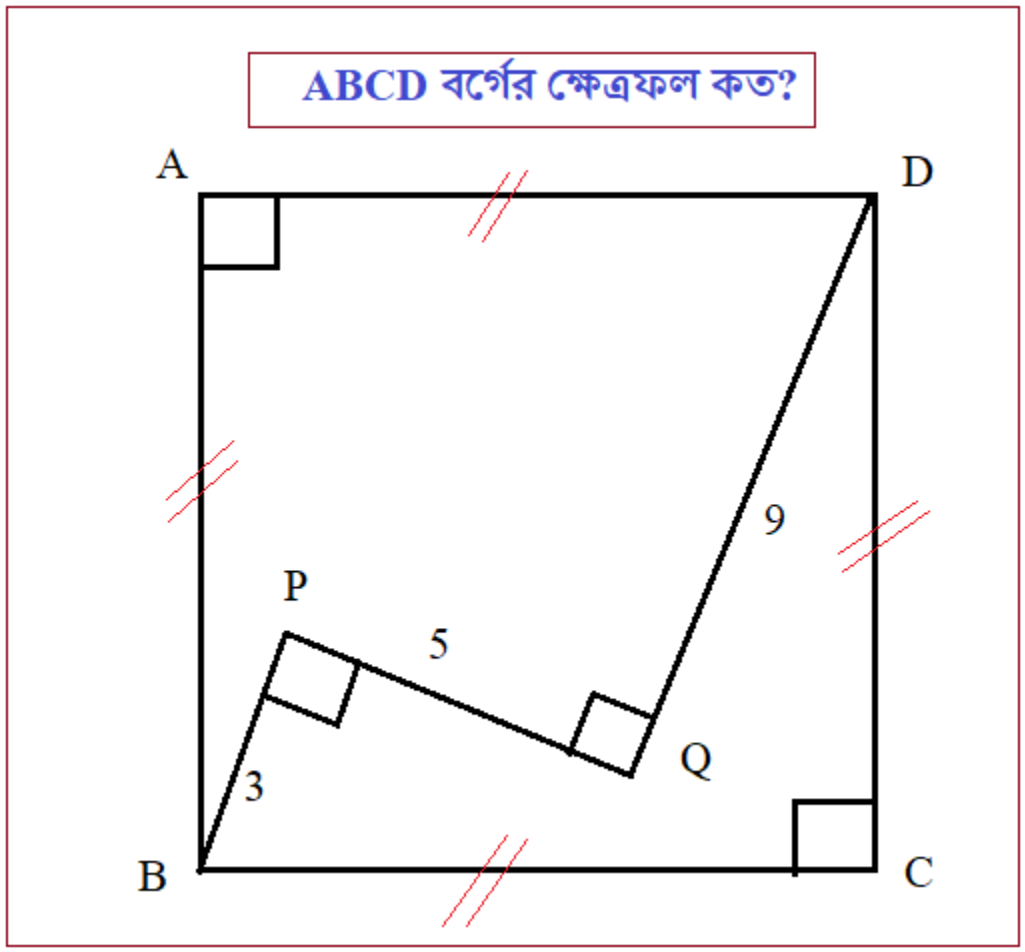
http://www.cut-the-knot.org/Curriculum/Geometry/PythagoreanLune.shtml

6) I like to Move it, Move it



লাল রেখার দৈর্ঘ্য কত?

7) Keep Moving



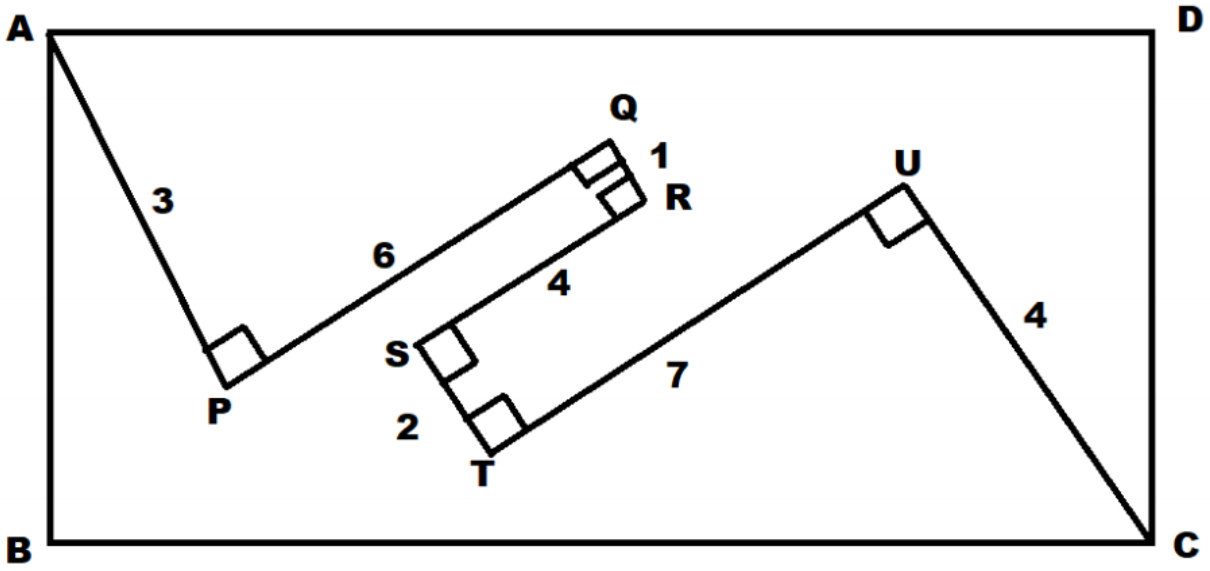
8) The Final Movement

A problem from ITMO -2019:

In the given figure, ABCD is a rectangle which has a perimeter of 30 cm.

P, Q, R, S, T, U are 6 points inside ABCD so that, AP ⊥ PQ, PQ ⊥ QR, QR ⊥ RS and RS ⊥ ST, ST ⊥ TU and TU ⊥ UC. The lengths of AP, PQ, QR, RS, ST, TU and CU are given in the figure (in cm).

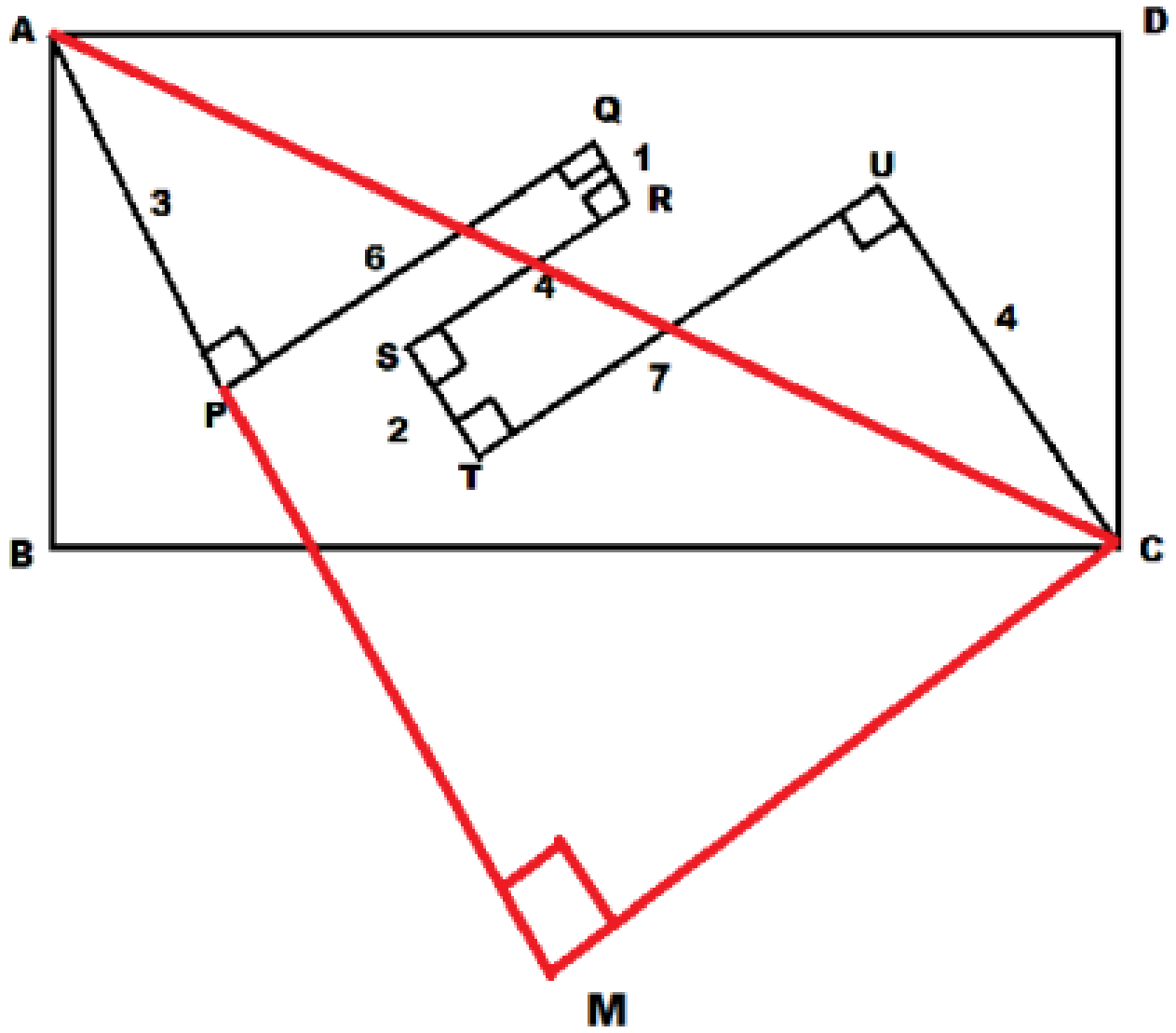
Find the area of the rectangle ABCD.



Solution:

Join A,C. Draw a right angle triangle ΔACM taking AC as hypotenuse and extending AP.

The figure will look like :



Since, AP|| QR ||ST||CU and PQ||SR||TU||CM

So, AM= AP+PM= AP+QR+ST+CU= 3+1+2+4=10 cm

and, CM= PQ – RS + TU = 6 – 4 +7 = 9

Now, from ΔACM we get, $AC^2 = AM^2 + CM^2 = 10^2 + 9^2 = 100+81 =181$

Let, AB=CD=x and BC=AD=y

So, from ΔABC we get, $AC^2 = AB^2 + BC^2 = x^2 + y^2$

or, $x^2 + y^2 = 181$ … (1)

Again, perimeter of ABCD = 2(AB+BC) =30

or, AB+BC =15

or, x+y =15

or, $(x+y)^2 = 15^2$

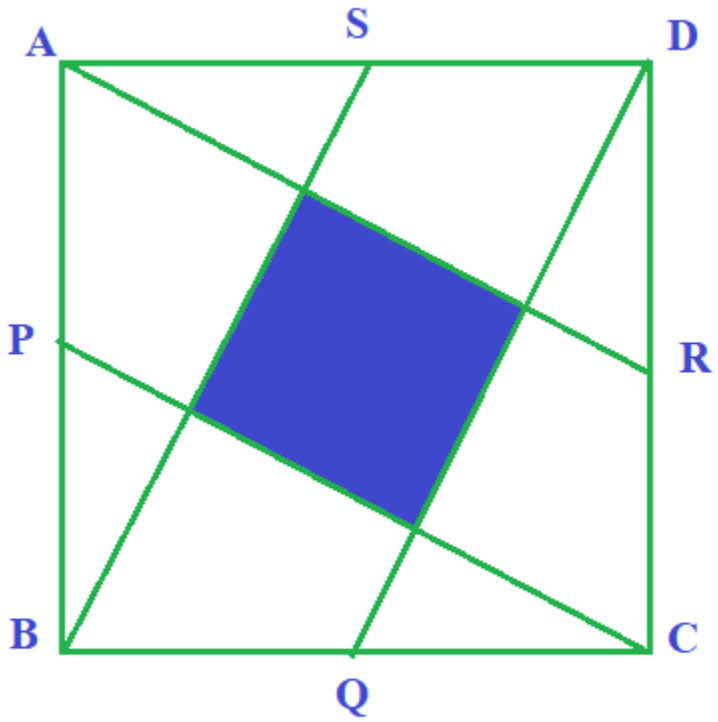
or, $x^2 + y^2 +2xy = 225$

or, 181 + 2xy =225 [from (1)]

or, xy= (225-181)/2 = 44/2 = 22

ANS: Area of ABCD= xy= 22 square cm.

9)



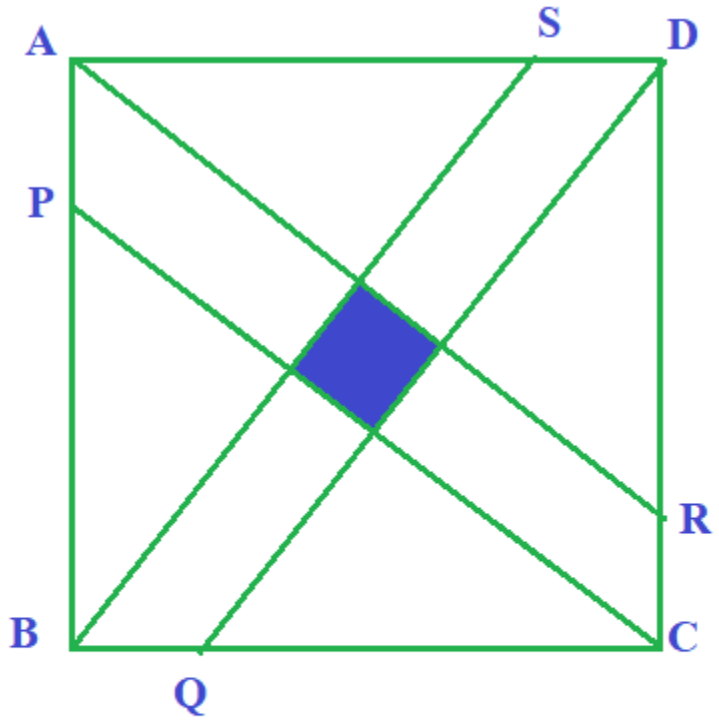
ABCD একটি বর্গক্ষেত্র যার ক্ষেত্রফল = ৩৬০০ বর্গমিটার

P,Q,R,S যথাক্রমে AB,BC,CD, DA বাহু চারটির মধ্যবিন্দু।

মাঝের নীল রঙ করা অংশের ক্ষেত্রফল কত?

A

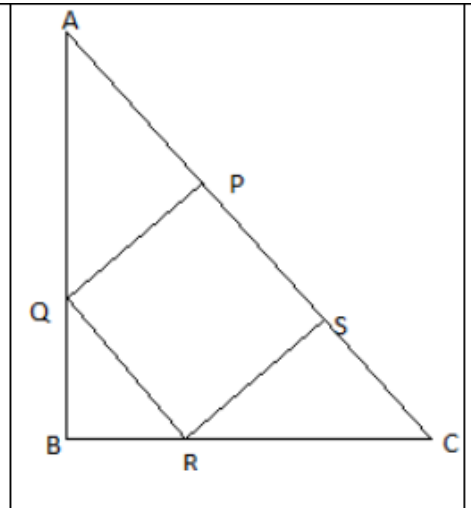
10) Assignment



ABCD একটি বর্গক্ষেত্র যার ক্ষেত্রফল = ৩৬০০ বর্গমিটার

P,Q,R,S যথাক্রমে AB,BC,CD, DA বাহু চারটিকে
1:4 অনুপাতে বিভক্ত করে।
মাঝের নীল রঙ করা অংশের ক্ষেত্রফল কত?

11) Assignment:

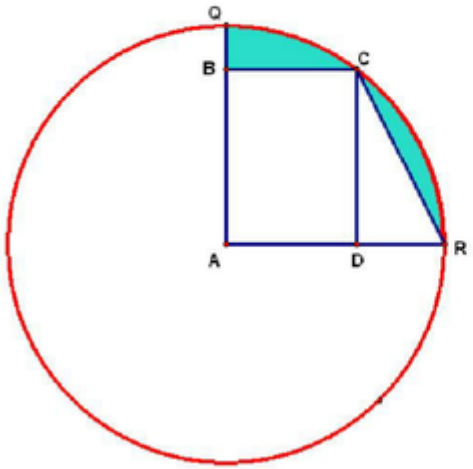
১০		চিত্রে **ABC** একটি সমকোণী ত্রিভুজ এবং **PQRS** একটি বর্গ। **AB=3** এবং **BC=4** হলে **PQ=60/x. x =?** In the diagram below, **ABC** is a right angle triangle. **PQRS** is a square. **AB=3** and **BC=4. PQ=60/x. x =?**

12) Assignment:

Area and Perimeter of 2D shapes

Length AQ is 5cm

Length CD is 4cm



1. What is the area of the circle?
2. What is the length of the minor arc QR?
3. What is the area of the rectangle ABCD?
4. What is the area of the triangle CDR?
5. What is the total area of the shaded parts?

Hint: Pythagoras might help here.

Geometry with Sherlock Holmes: thinking like a detective

সম্পাদ্য সমাচারঃ **Deductive Reasoning**

http://www.csun.edu/~kme52026/Chapter4.pdf

How to solve real life geo problem

https://www.universalclass.com/articles/math/geometry/how-to-solve-practical-geometry-problems.htm

How to understand complex figures

https://www.universalclass.com/articles/math/geometry/understanding-composite-figures-in-geometry.htm

IMO, ISL GEOMETRY

1)

https://artofproblemsolving.com/wiki/index.php/1960_IMO_Problems/Problem_4

2)

https://artofproblemsolving.com/community/c6h16217p113340

3) assignment:

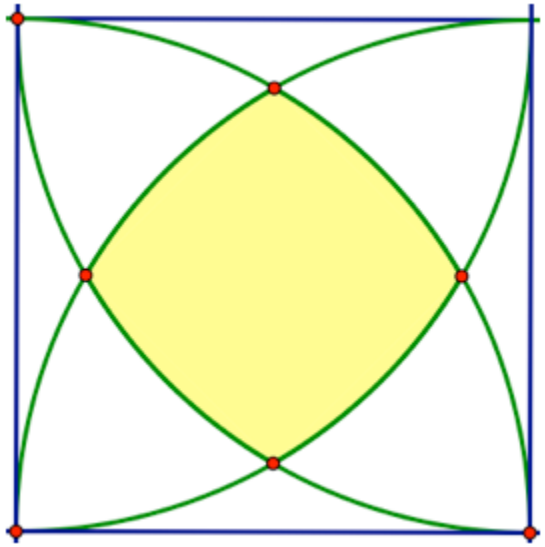
https://artofproblemsolving.com/community/c6h21178p137410

4)

https://artofproblemsolving.com/community/c6h369284p2033917

Problems for PSET

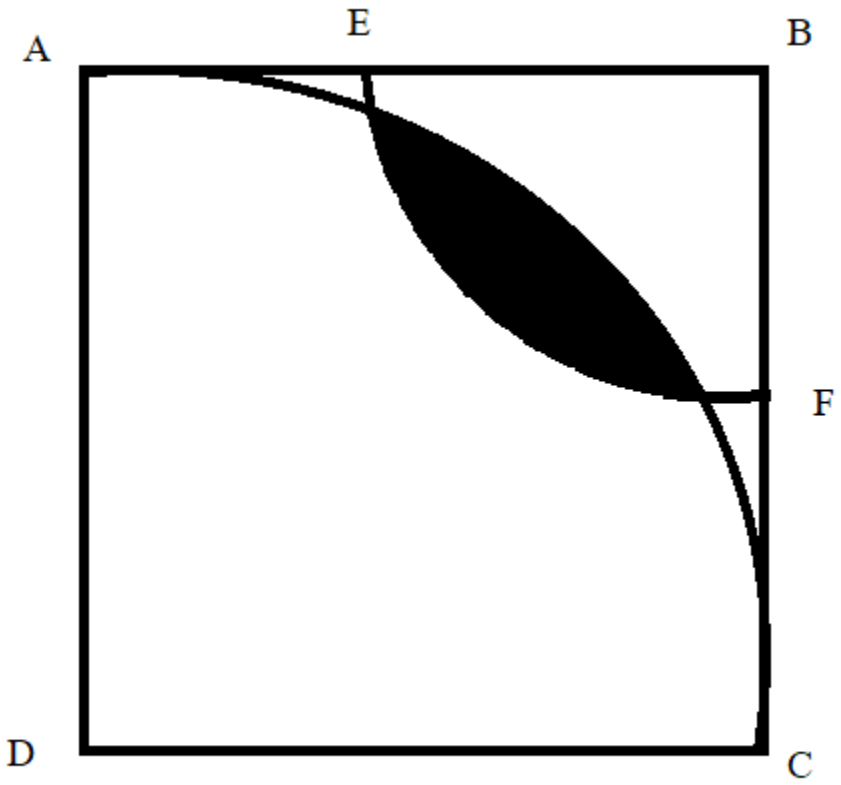
1)



http://jwilson.coe.uga.edu/EMAT6680Fa10/Hacker/A13%3AFinal/Finalwriteup.html

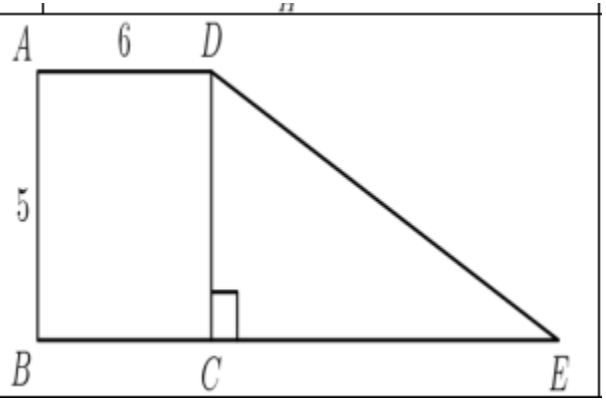
2)

ABCD বর্গক্ষেত্র। E ও F যথাক্রমে AB ও BC এর মধ্যবিন্দু।



কালো অংশের ক্ষেত্রফল কত?

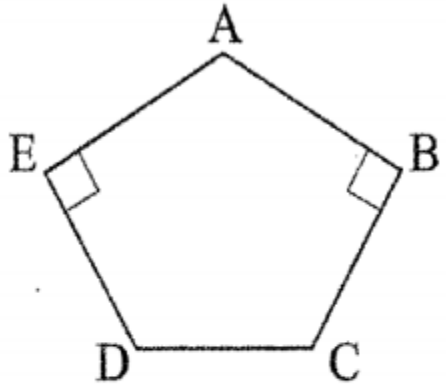
3)

ABCD আয়তক্ষেত্র এবং **DCE** সমকোণী ত্রিভুজের ক্ষেত্রফল সমান। **AD=6, AB=5** হলে **BE** এর মান কত? Rectangle **ABCD** and right triangle **DCE** have the same area. **AD=6, AB=5** They are joined to form a trapezoid, as shown. **BE**=?	

4)

ABCDE একটি পঞ্চভুজ যার **AE=AB=1, BC=CD=DE. ∠AED=∠ABC=90, ∠EDC=∠DCB=∠EAB. ABCDE ABCDE** এর ক্ষেত্রফলকে যদি $\frac{a\sqrt{b}}{c}$ আকারে লেখা যায় , এখানে **b** এবং **c** পরস্পর সহমৌলিক সংখ্যা. **a** এবং **b** মৌলিক সংখ্যা. তাহলে **a+b+c?**

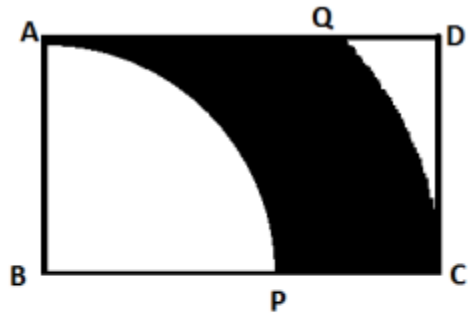
ABCDE is a pentagon where **AE=AB=1** unit and **BC=CD=DE. ∠AED=∠ABC=90 and ∠EDC=∠DCB=∠EAB.** Area of **ABCDE=**$\frac{a\sqrt{b}}{c}$ where **a** and **b** are prime numbers, **b** and **c** are coprime to each other. Find **a+b+c?**



5)

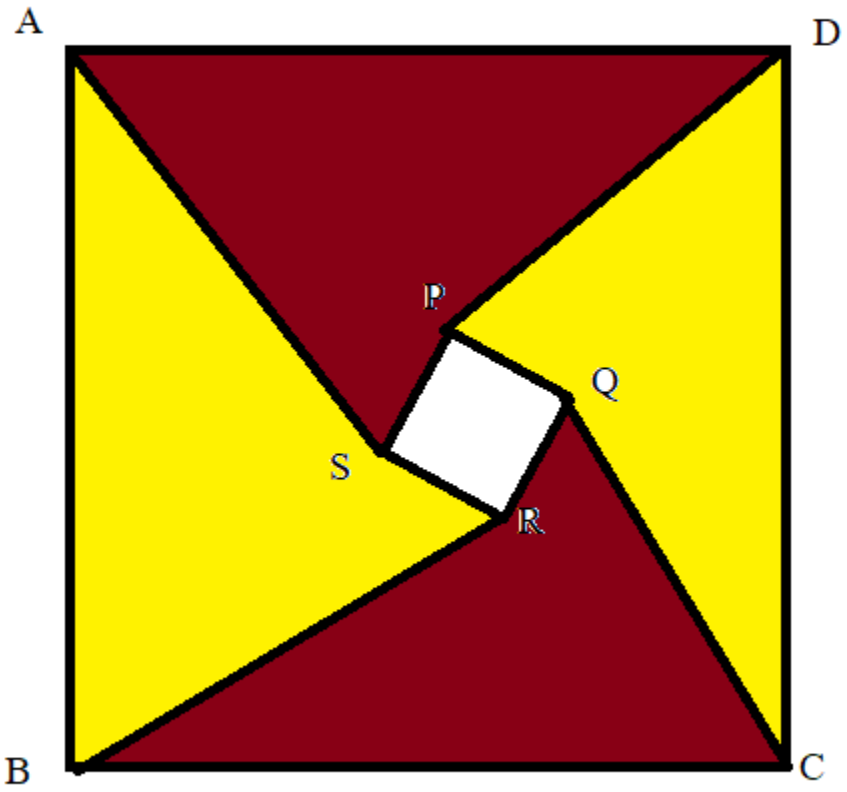
চিত্রে, ***ABCD*** একটি আয়তক্ষেত্র।**AB = 4** এবং, BC = 8. B বিন্দুকে কেন্দ্র করে BA এবং BC এর সমান ব্যাসার্ধ নিয়ে আঁকা দুটি বৃত্তচাপ যথাক্রমে BC কে P বিন্দুতে এবং AD কে Q বিন্দুতে ছেদ করে।চিত্রে দেখানো কালো অংশের ক্ষেত্রফল যদি $a\pi+b\sqrt{3}$ হয় তাহলে, $\frac{b}{a}$= ?

In figure, **ABCD** is a rectangle. **AB=4** and **BC=8** . The two arcs obtained by taking centre at **B** and radius equals to **BA** and **BC** intersects **BC** at **P** and **AD** at **Q** respectively. If black portion of the figure has an area of $a\pi+b\sqrt{3}$, $\frac{b}{a}$= ?



6)

ABCD এবং PQRS উভয়েই বর্গ।



প্রমাণ করো , লাল অংশের ক্ষেত্রফল = হলুদ অংশের ক্ষেত্রফল

Recommendation

1)

https://www.mathemania.com/lesson/polygons/

2)

https://www.khanacademy.org/math/geometry-home/geometry-miscellaneous/geometry-worked-examples/v/challenging-perimeter-problem

3)

https://www.geogebra.org/geometry