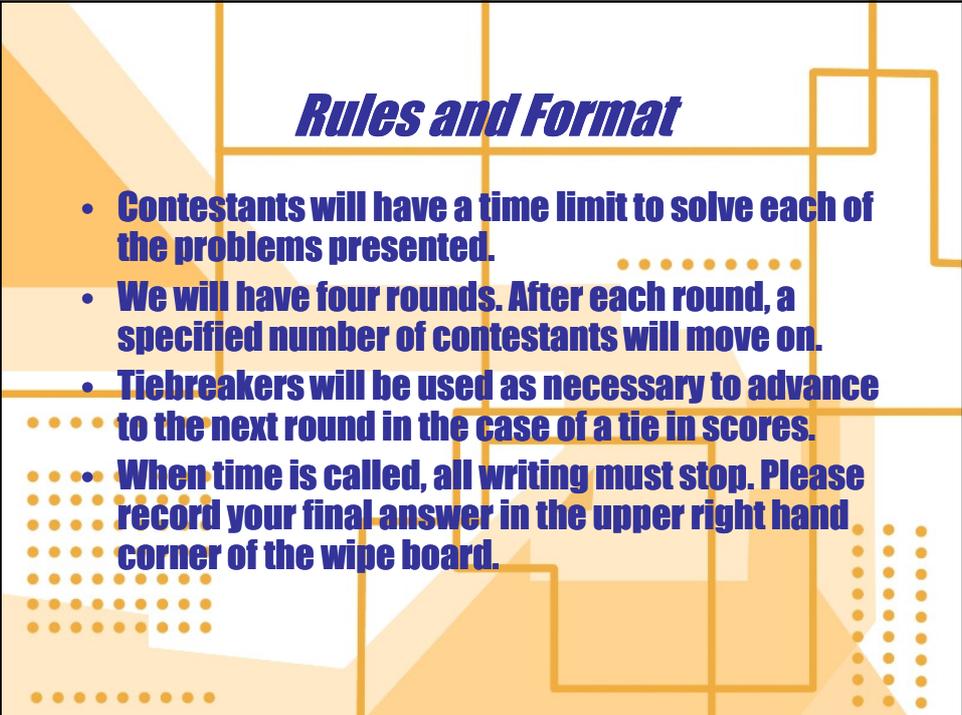
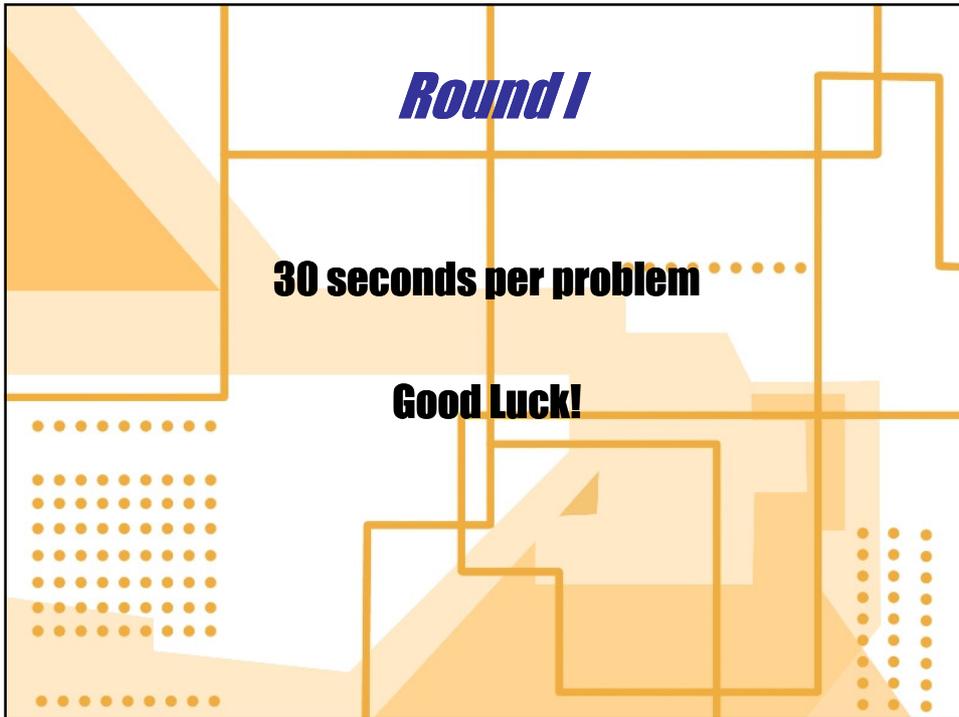


***Welcome to the
2nd Annual Amador Valley
Geometry Bee***



Rules and Format

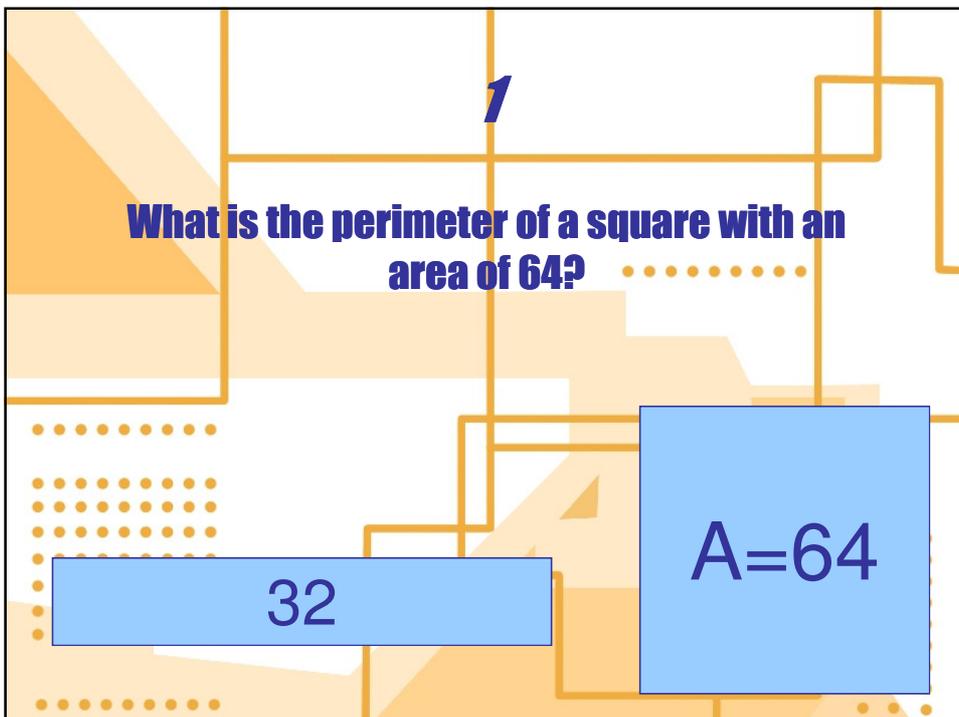
- **Contestants will have a time limit to solve each of the problems presented.**
- **We will have four rounds. After each round, a specified number of contestants will move on.**
- **Tiebreakers will be used as necessary to advance to the next round in the case of a tie in scores.**
- **When time is called, all writing must stop. Please record your final answer in the upper right hand corner of the wipe board.**



Round 1

30 seconds per problem

Good Luck!



1

What is the perimeter of a square with an area of 64?

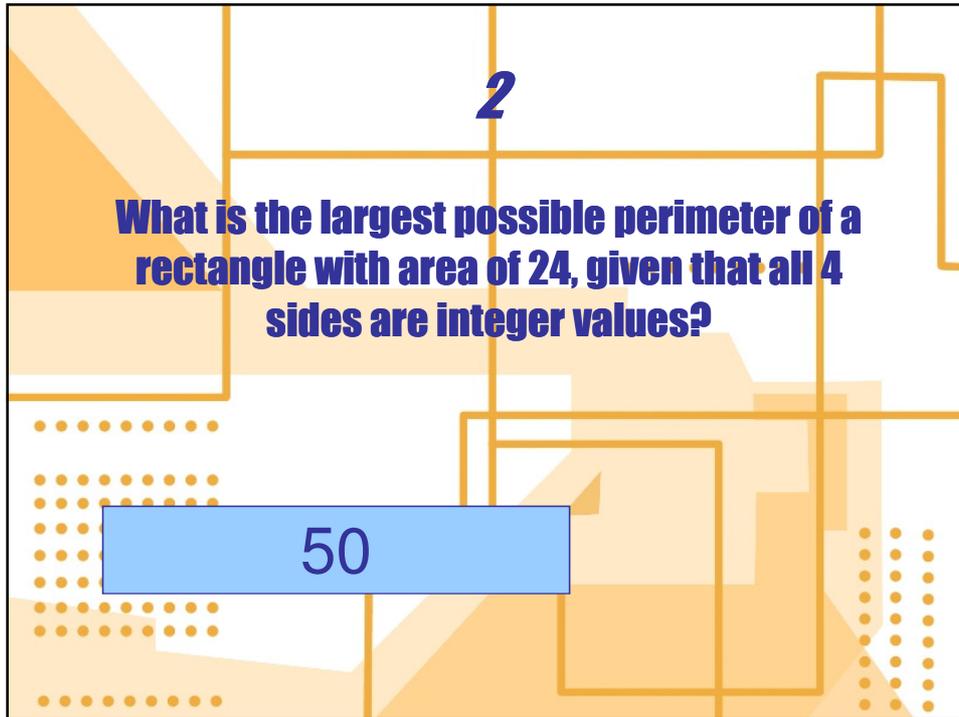
32

A=64

2

What is the largest possible perimeter of a rectangle with area of 24, given that all 4 sides are integer values?

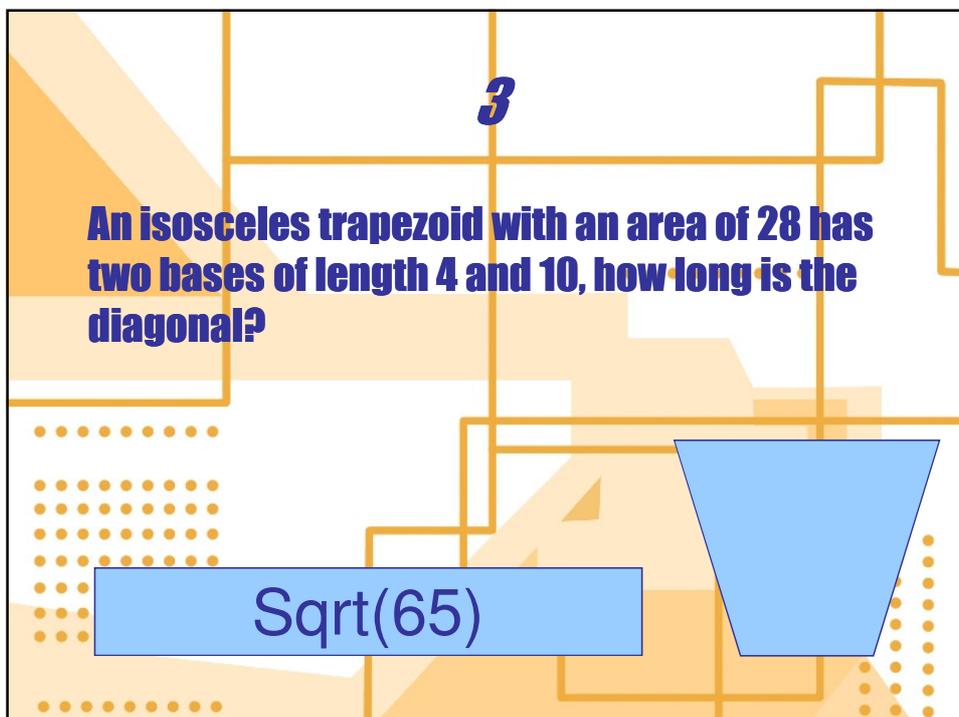
50



3

An isosceles trapezoid with an area of 28 has two bases of length 4 and 10, how long is the diagonal?

Sqrt(65)



4

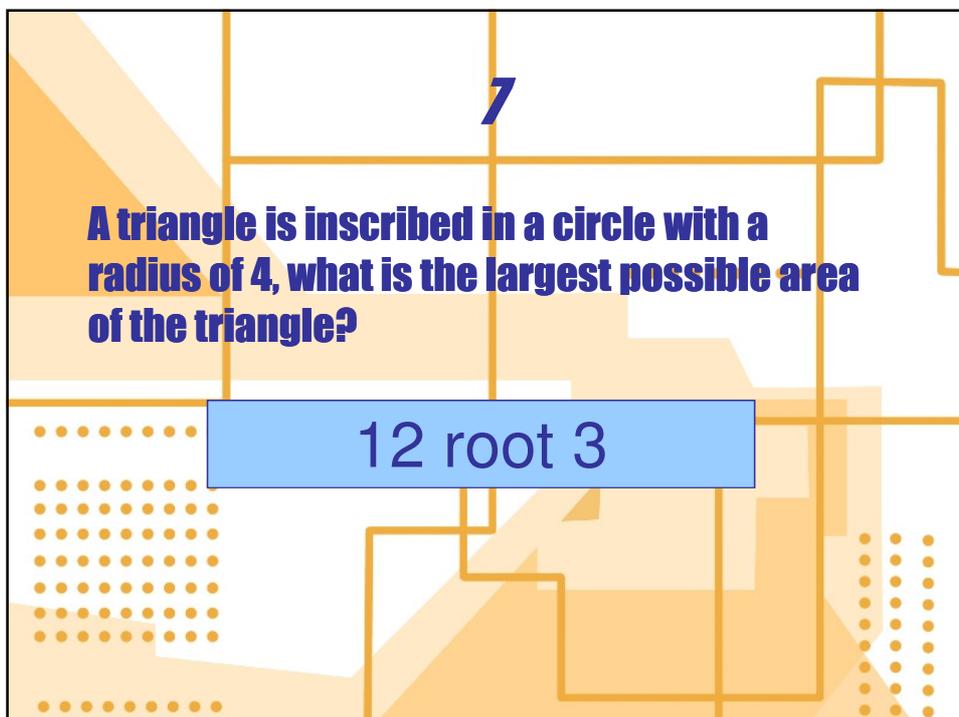
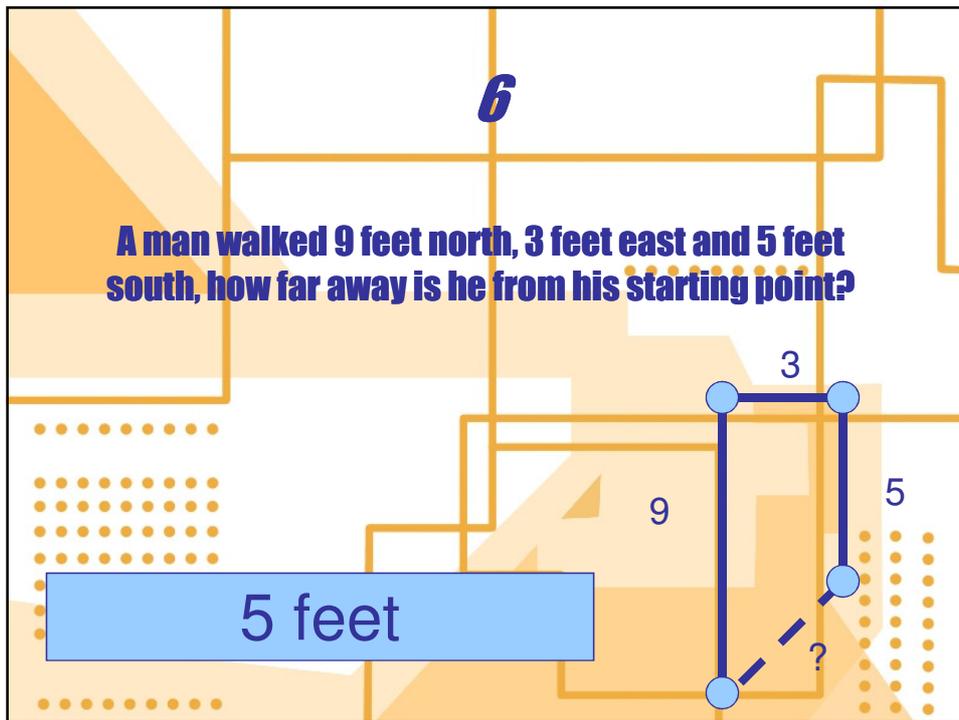
How many diagonals does a dodecagon (12 sides) have?

54

5

The lengths of two sides of an isosceles triangle are 14 and 29. What is its perimeter?

72



8

There is a 3x3 square array, what is the sum of areas of all the squares present (there are 1x1 squares, 2x2 squares, and 3x3 squares)?

34

9

Point X (13,21) is translated to X' (-9,2). If the same translation rule is applied to point Y (7, 4), what are the coordinates of Y'?

Y'(-15, -15)

10

If the perimeter of a quadrilateral is 20, what is its largest possible area?

25**11**

In a quadrilateral, angle B is 3 times as big as angle A, angle C is 4 times as big as angle B, and angle D is equal to the difference between angle A and B. Find the largest angle measure.

240°

12

Point P (8,9) is reflected across the y-axis to point P', and then reflected across the x-axis to point P''. What are the coordinates of point P''?

P''(-8,-9)

13

There exists a triangle ABC with INTEGER side lengths 3, n, and 10. Let a be the the largest integer value of n, and b be the smallest integer value. What is a-b?

4

14

A regular n-gon has interior angles 160 degrees. Find n.

18

15

A 6x10 rectangle. has been divided into 4 smaller squares, find the area of the smallest square?

4

16

There is a 4x6 rectangle, a rhombus is formed with the midpoints of each of the sides of the rectangle, find the area of this rhombus

6

4

12

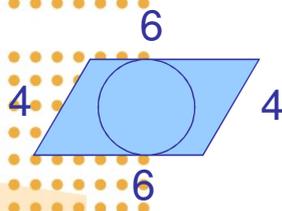
17

**•G is the centroid of Triangle ABC,
•If the area of ABC = 6, find the area of Triangle ABG.**

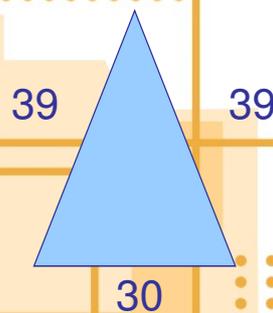
2

18

A circle is inscribed in a parallelogram with sides measuring 4, 4, 6, and 6. What is the largest possible area of the circle? (In terms of pi)

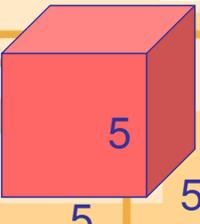
 **4π** **19**

A triangle has sides measuring 39, 39, 30. Find its area.

**540**

20

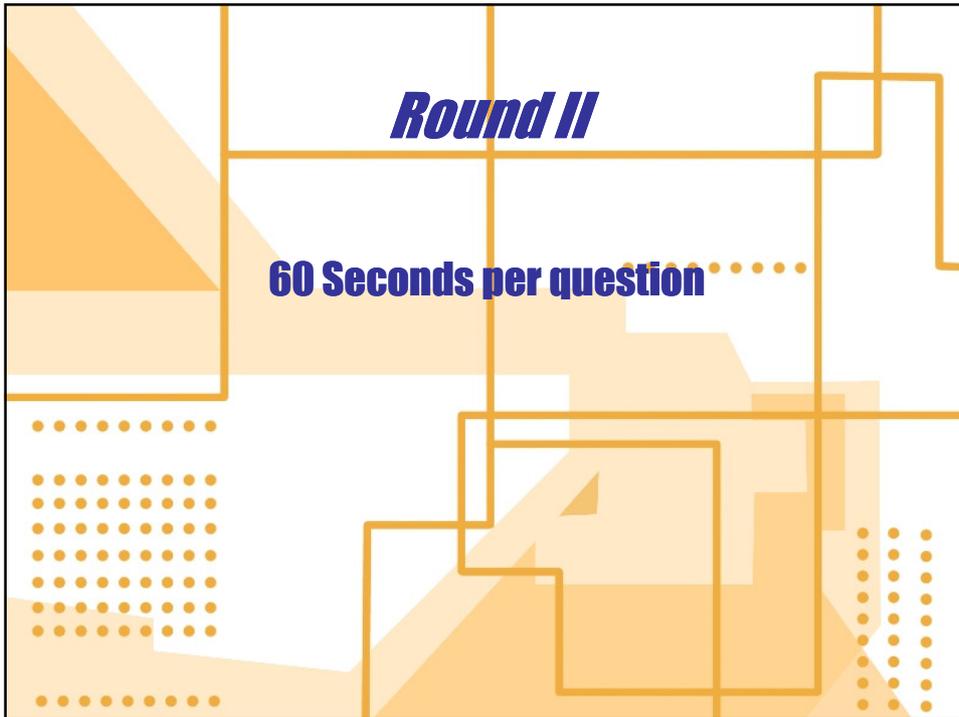
We color the surface of a 5x5x5 cube. The cube is now split up into 125 smaller cubes. How many of these smaller cubes are not colored at all?



27

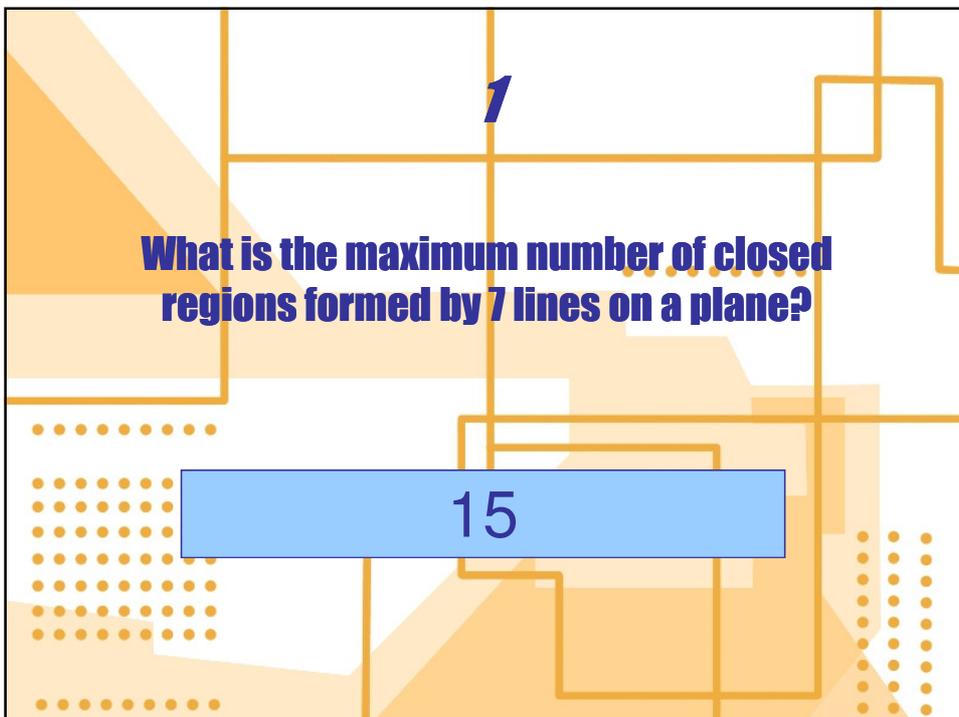
Round 1 Complete

Round 1 Tiebreakers



Round II

60 Seconds per question



1

What is the maximum number of closed regions formed by 7 lines on a plane?

15

2

What is the volume in cubic feet of a solid rectangular prism of marble that is 2 feet long, 9 feet wide, and 2 inches deep?

3 cubic feet

3

What is the largest possible area of a right triangle with one side of length 12 and another side of length 20?

120

12?

20?

4

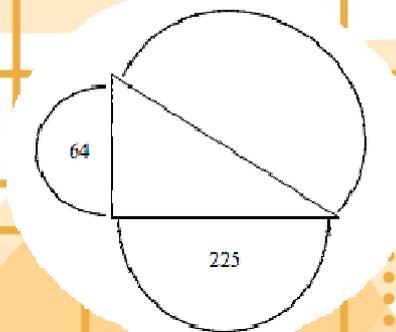
A quadrilateral has vertices at $(-2,-2)$, $(0,2)$, $(6,3)$, and $(4,-1)$. What is its area?

22

5

How many square units are in the area of the semicircle of a right triangle if the area of the semicircles on the legs of the triangle are 64 and 225?

289



6

A certain number of 1-unit square tiles can form a rectangle of perimeter 30. All these tiles are rearranged to form a square region. What is the perimeter of this square region?

P=30

24

P=?

7

Triangle X and Triangle Y are similar. A side of triangle X is two times longer than a side of triangle Y. What is the ratio between the area of triangle X and the area of triangle Y?

(4/1, 4, 4:1)

X

Y

8

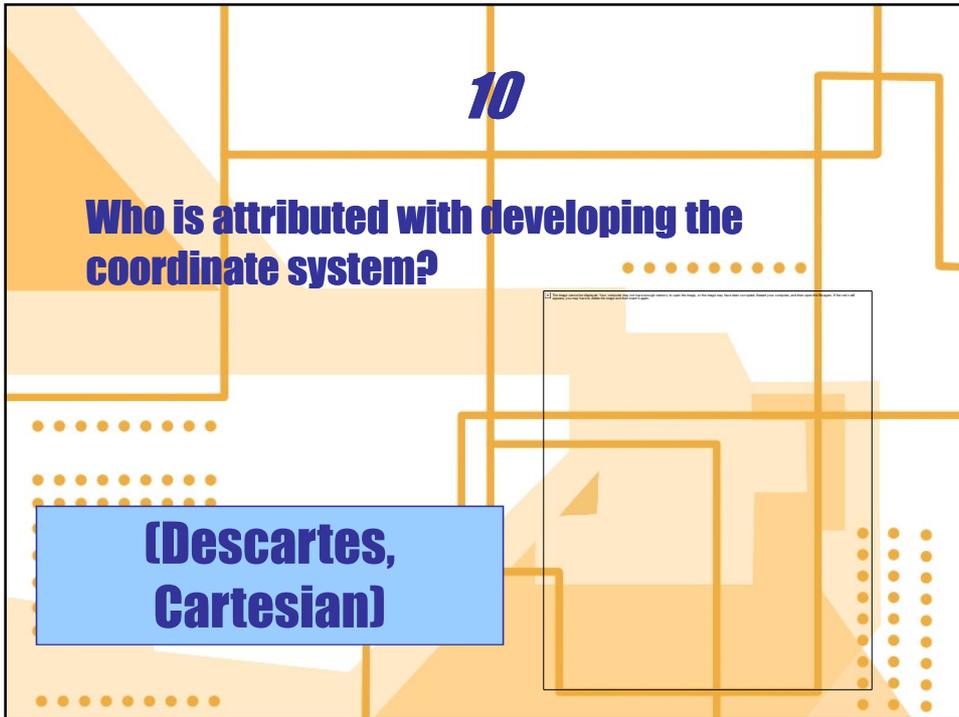
The midpoints of the sides of a triangle with area X are the vertices of a triangle with area Y . Find X/Y .

4

9

What is the area of an ellipse with major and minor axes of 7 and 6?

42π



10

Who is attributed with developing the coordinate system?

(Descartes, Cartesian)



Round 2 Complete

Round 2 Tiebreakers

Round III

90 seconds per problem

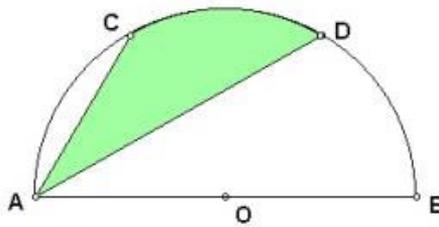
1

As shown, AB is parallel to CD, and AB is tangent to the smaller semi-circle. Given $AB=4$, and the radius of the larger semicircle is 5, Find the radius of the smaller semi-circle in exact terms.

$(\sqrt{21})$

2

Arc $CD=2\pi$, and the radius of the semicircle is 6, Find the shaded area in exact terms.



6π

3

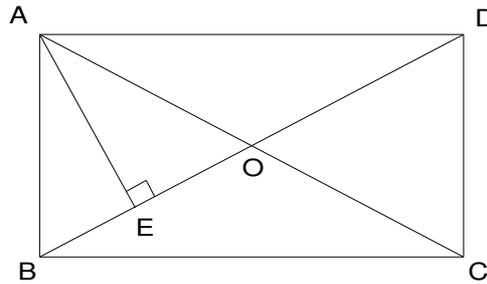
A rhombus has perimeter of 16, and two adjacent angles have a ratio 1:2. Find its area in exact terms.



$[8\sqrt{3}]$

4

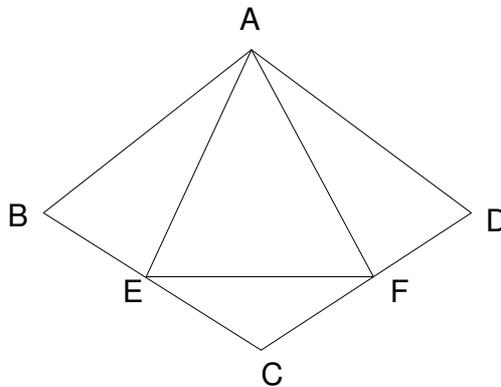
Given $AB=2$ $BD=4$ in rectangle $ABCD$, find AE in exact terms.



$(\sqrt{3})$

5

$ABCD$ is a rhombus, $\angle B = \angle EAF = 60^\circ$, $\angle BAE = 18^\circ$, find $\angle AFC = ?$



102

6

In a square ABCD, M is the midpoint of AB, N is the midpoint of BC. MC and NA intersect on point O. If AB=1, find the area of AOCD.

$\frac{2}{3}$

7

The points A, B, and C lie on a circle that has a radius of length 4. If the length of arc ABC is 2π , what is the length of line segment AC in exact terms?

$(4\sqrt{2})$

8

The maximum distance from point P to (the edge of) a circle is 11. The minimum distance is 5. Find a possible radius of the circle.

8 or 3

9

There is a $\triangle ABC$, $\angle C = 90^\circ$, O is a point on the side BC. We draw a circle with center O and radius OB. This circle intersects AB at D, $\angle A = 30^\circ$, $BD = 6$. What is the radius of Circle O?

6

10

AB is a diameter of Circle O with length 4. F is the midpoint of OB. Point C and D are on the circle so that, CD is perpendicular to AB at F. What is the length of CD?

(2sqrt(3))***Round 3 Complete*****Round 3 Tiebreakers**

Championship Round

120 seconds per problem

Championship Round Question 1

The median from the right angle to the hypotenuse of a right triangle is length 1. Its perimeter is $2 + \sqrt{6}$. Find its area.

1/2

Championship Round Question 2

As shown, E, G and F are the midpoints of AB, AC and BD, given $EF+AD=12\text{cm}$, AD is perpendicular to BC, and $EG=(3EF)/2$. Find the area of ABC.

48

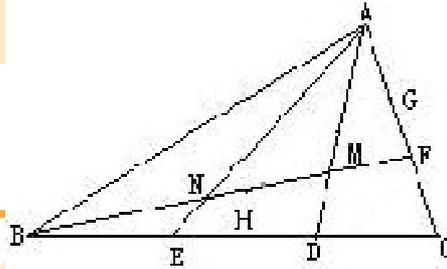
Championship Round Question 3

In a trapezoid ABCD, angle C=90 degrees, AD and BC are the two bases of the trapezoid, and point E is the midpoint of leg DC, given $AD=2$, $BC=8$, $AB=10$, find the area of triangle ABE.

20

Championship Round Question 4

As shown, $AF=2FC$, $BE=ED=DC$, given $BF=12$ cm.
Find the length of MF .



3

Championship Round Question 5

The top and bottom lines of this diagram are parallel. Angle $A = 40$, angle $B = 60$, angle $C = 50$, angle $D = 70$, and angle $E = 50$.
Find angle F

10°

F



Championship Round Complete

Final Tiebreakers

The graphic features a grid of orange lines on a white background. A yellow rectangular box is centered in the lower half, containing the text 'Final Tiebreakers'. Above the grid, the text 'Championship Round Complete' is written in a bold, italicized blue font. The background is decorated with orange geometric shapes and a pattern of small orange dots.



Round 1 Tiebreaker #1

⊕ Find the next three terms in this sequence:

⊕ 1, 3, 6, 10...

(15,21,28)

Round 2 **Tiebreaker #2**

The graphic has a green background with a grid pattern. The text is in a dark blue font. The sequence '1, 3, 6, 10...' is followed by the answer '(15,21,28)' in a white box. At the bottom, there are two white boxes labeled 'Round 2' and 'Tiebreaker #2'.

Round 1 Tiebreaker #2

What is the angle measure between the hour and minute hand at 4:15

37.5°

Round 2

Tiebreaker #3

Round 1 Tiebreaker #3

An isosceles triangle has 2 sides of length 2 and an area of 1, find the vertex angle.

30

Round 2

Round 2 Tiebreaker #1

What is the probability that a point selected on a circle will be closer to the circumference rather than the center?

(.75, $\frac{3}{4}$, 75%)

Round 3

Tiebreaker #2

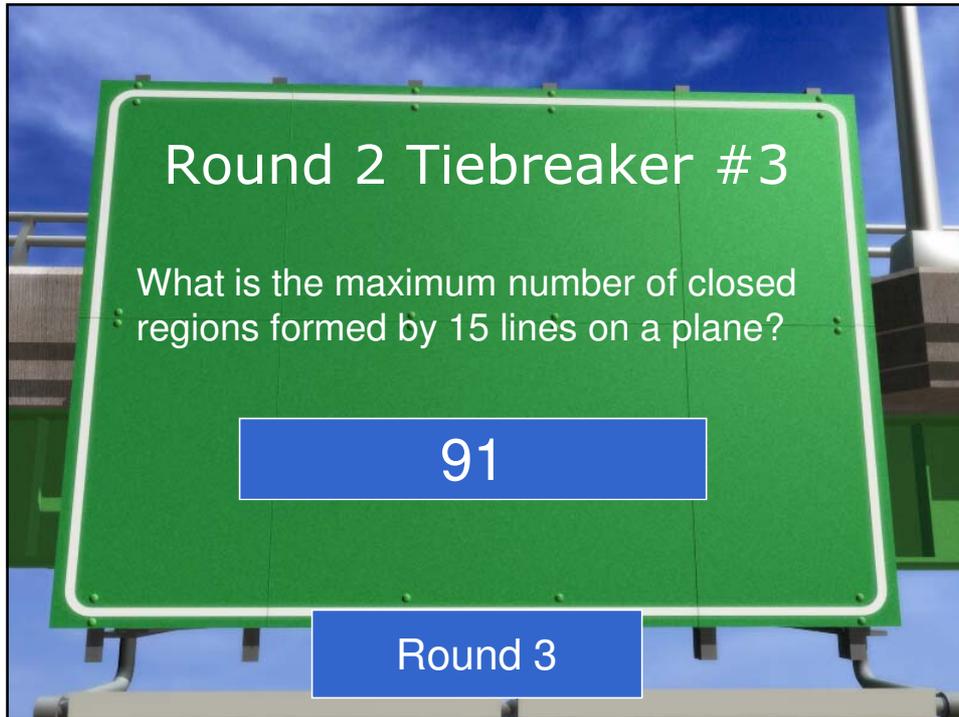
Round 2 Tiebreaker #2

What is the maximum number of right angles a convex hexagon can have?

3

Round 3

Tiebreaker #3

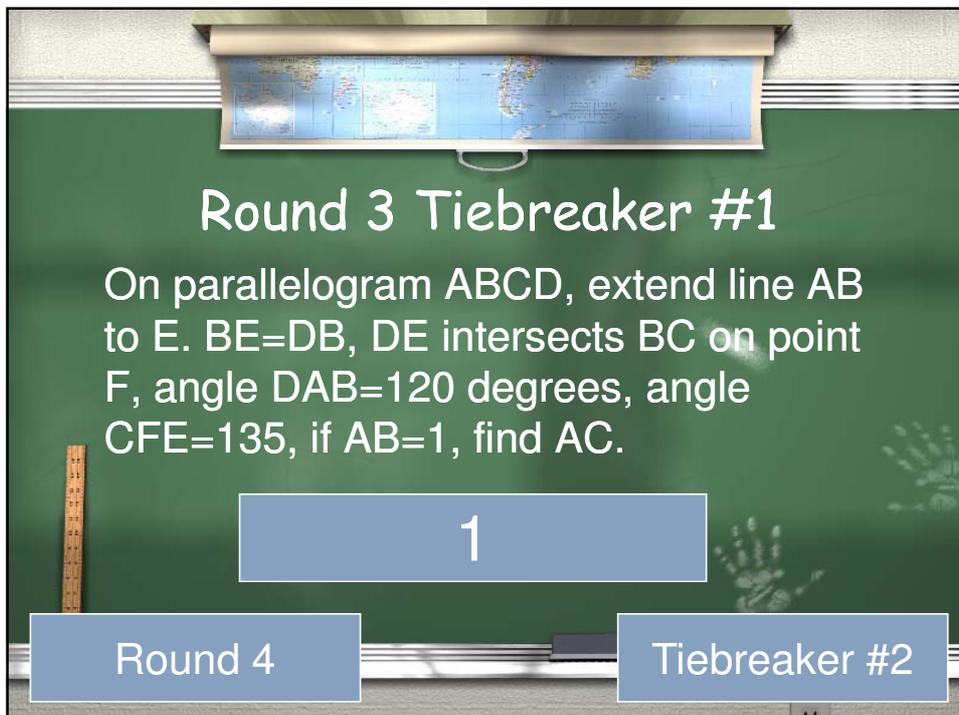


Round 2 Tiebreaker #3

What is the maximum number of closed regions formed by 15 lines on a plane?

91

Round 3



Round 3 Tiebreaker #1

On parallelogram ABCD, extend line AB to E. $BE = DB$, DE intersects BC on point F, angle $DAB = 120$ degrees, angle $CFE = 135$, if $AB = 1$, find AC.

1

Round 4

Tiebreaker #2

Round 3 Tiebreaker #2

As shown, a square is divided into 6 smaller squares; given the smallest square in the center has area of 1, find the area of ABCD?

143

Round 4

Tiebreaker #3

Round 3 Tiebreaker #3

Triangle $\triangle ABC$ inscribed in a circle, $AB = AC$, the distance from the center of the circle to BC is 3, the radius of the circle is 7. What is the length of AB (express your answer in exact terms)?

($2\sqrt{35}$ or $\sqrt{140}$)

Round 4

($2\sqrt{35}$ or $\sqrt{140}$)

Championship Tiebreaker #1

In a quadrilateral ABCD, the areas of $\triangle ABC$, $\triangle ACD$, $\triangle ABD$ are 5, 10, 6, respectively. find the area of triangle ABO.

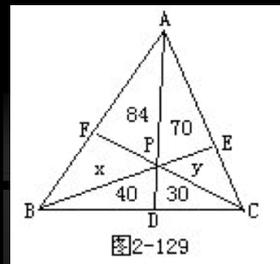
2

End

Tiebreaker #2

Championship Tiebreaker #2

Three lines divide triangle ABC into 6 smaller triangles. Area measures are as follows: $AFP=84$, $APE=70$, $BPD=40$ and $PDC=30$. Find $x+y$.



$$56+35=91$$

End

Tiebreaker #3

Championship Tiebreaker #3

In a trapezoid the two diagonals are perpendicular to each other and the median line is 8, find the area.

64

End

Tiebreaker #4

Championship Tiebreaker #4

A isosceles trapezoid has the median line of 15, and one diagonal is also the angle bisector of a 60-degree angle, find the perimeter of the trapezoid.

50

End

Tiebreaker #5

Championship Tiebreaker #5

none

$$(4\sqrt{4}) - 4$$

End

Geometry Bee 2009

Prove Yourself!