NMAθ 2002
THETA State Bowl

Round # _____

A = _____

B = _____

C = _____

Final answer:

CODE: _____

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Final answer:

CODE: _____

Round 1

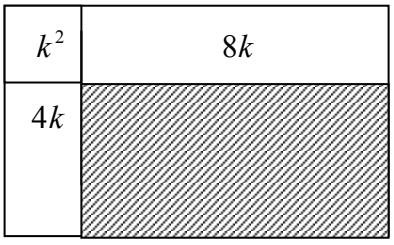
Part 1
Simplify into a fraction in lowest terms:
$$\frac{3^{-1}+2^{-1}}{3^{-2}+2^{-2}}$$

A = the numerator

Part 2
The measures of the angles of a triangle are in the ratio of 3:3:4. If the largest angle of the triangle is doubled and the triangle remains isosceles, what would be the measures of the angles of the new triangle?

B = largest angle of the new triangle

Part 3
In the figure, the large rectangle has been divided into three smaller rectangles and a square. The areas of each region are given.



C = the numerical area of the shaded region

Final answer = $C - A + \sqrt{B}$

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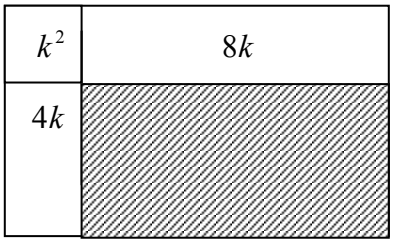

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Round 2

Part 1

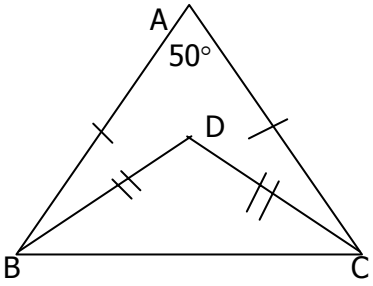
Solve the system: $\begin{cases} x+y=4 \\ 5x+2y=11 \end{cases}$

A = the average of the x-value and y-value of the solutions

Part 2

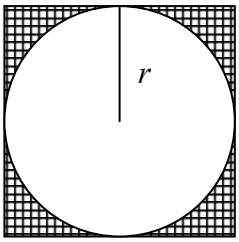
Given $\overline{BD}$ bisects $\angle ABC$.

B = $m\angle BDC$



Part 3

Consider the square and inscribed circle below. Write a formula for the area of the shaded region in terms of r (radius).



C = integral coefficient in the formula

Final: $A^C + B$

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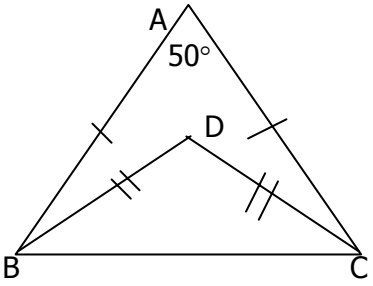

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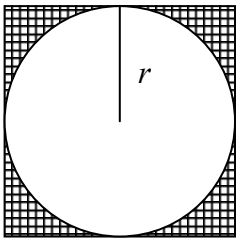

C = integral coefficient in the formula

Final: $A^C + B$

Round 3

Part 1
The sum of two numbers is 10 and their product is 24.

A = the sum of their reciprocals as a fraction in lowest terms

Part 2

x is 20% of y and 2z is 80% of y.
what percent of z is x ?

B = percent number

Part 3
Find the circumference of a circle with area $169\ \pi\ sq.in.$

C = coefficient of π

Final: $A\left(\frac{C}{B}\right)$

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Round 3

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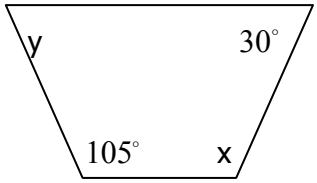
Round 4

Part 1
Find values for x and y:

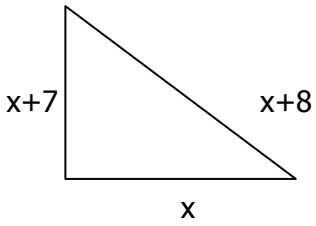


A = x - y

Part 2
Find the exact roots: $x^2 - 2x = 5$

B = 4 times the product of the roots

Part 3
Calculate the length for x:



C = area of the triangle

Final: $A(B + C)$

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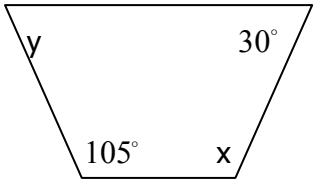

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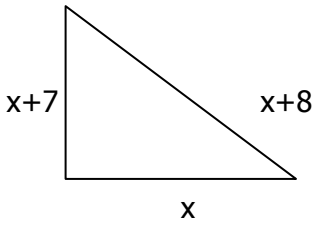

C = area of the triangle

Final: $A(B + C)$

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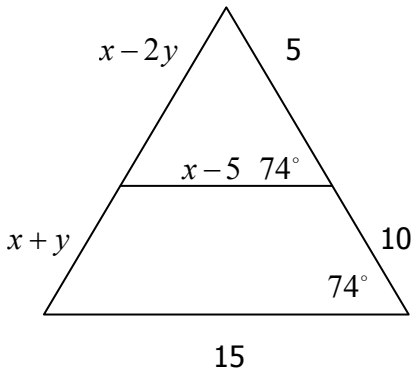
Round 5

Part 1
Find the values for x and y given:



$A = \frac{x}{y}$

Part 2
A square is inscribed in a circle with a radius of 6 in.

B = the area of the square

Part 3
If the radius of a circle is increased 100%, by what percent is the area of the circle increased ?

C = percent number

Final: $\frac{C}{A} - B$

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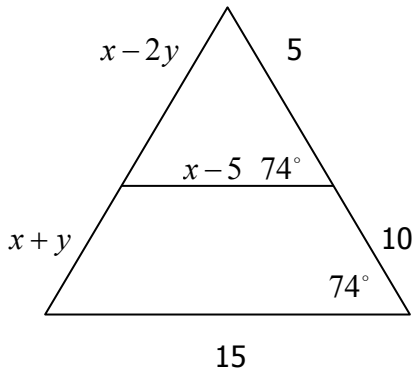
Round 5

Part 1
Find the values for x and y given:



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Final: $\frac{C}{A} - B$

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Round 6

Part 1

$f(x)$ is a linear function and
$f(1)=3,\ f(2)=7,\ f(3)=11$ then
$f(x)$ = ?

A = the slope of the linear function

Part 2

If $C=2A-B$, and

$$A=\begin{bmatrix}3 & -3 & 2\\ -1 & 4 & 0\end{bmatrix},\ B=\begin{bmatrix}-3 & 3 & 0\\ -1 & -4 & 2\end{bmatrix},$$

$$C=\begin{bmatrix}9 & -9 & x\\ -1 & 12 & y\end{bmatrix}$$

B = x + y

Part 3

Evaluate each expression if a = -1 and b = -3

$$x=\frac{\left(3a^2b\right)\left(-2ab\right)}{12ab^2} \qquad y=\frac{\left(4ab^2\right)\left(-3a^3b^3\right)}{6a^2b^5}$$

C = $\frac{y}{x}$

Final: $B\left(C-A\right)$

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C = $\frac{y}{x}$

Final: $B\left(C-A\right)$

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Round 7

Part 1

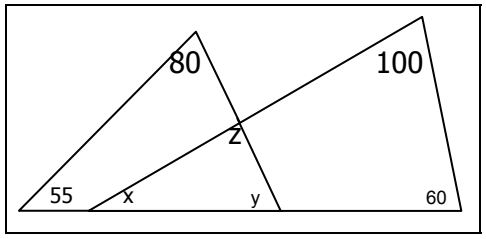
Simplify completely: $5^{\log_5 8} - 3^{(\log_3 8 - \log_3 2)}$
A = answer

Part 2

$x^2 + y^2 = 25$ and $xy = -8$

B = the positive value of $x + y$

Part 3



C = z

Final: $\frac{C - B}{A}$

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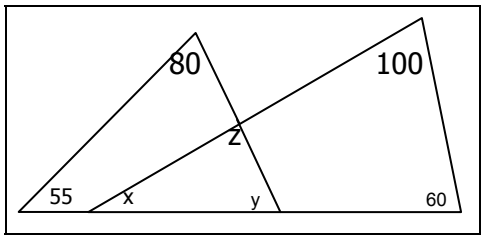


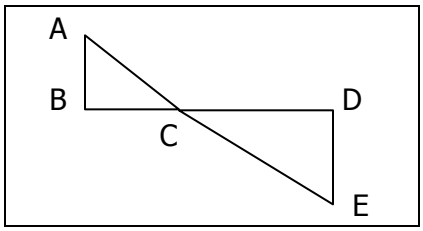
C = z

Final: $\frac{C - B}{A}$

Round 8

Part 1

Given $\overline{BD} \perp \overline{AB};\ \overline{BD} \perp \overline{DE};$
$BD = 6; AB = 3; DE = 5$



A = length of AE

Part 2

$2^{-1} + 2^{-2} + 2^{-3} + \ldots + 2^{-10}$

B = numerator - denominator (of the sum)

Part 3

Mignon is driving a sports utility vehicle along a highway at a constant speed of 55mph. A sports car one-half mile behind her that is moving at a constant speed passes her in 60 seconds.

C = speed of the sports car in mph

Final: $A^B \bullet C$

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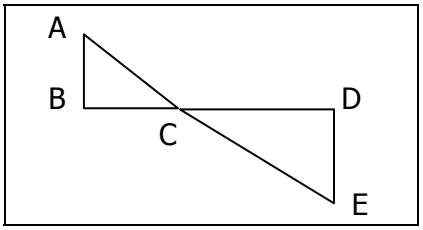

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Round 9

Part 1
A dealer bought a truckload of goods. If the dealer sold two-thirds of the truckload for three-fourths of the amount she paid for the truckload and if she could sell the entire truckload at this rate, what percent profit did she make?

A = percent number

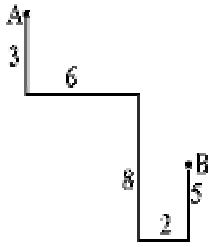
Part 2
In triangle ABC, the bisectors of angles B and C meet at a point D. $m\angle BDC = 140^\circ$.

B = $m\angle A$

Part 3

Suppose that a pirate starting at point A
walks 3 miles South, then 6 miles East,
then 8 miles South, then 2 miles East, and
finally 5 miles North. Thereby reaching point B.

What is the straightline distance from A to B?



C = distance AB

Final: $6A - B + 3C$

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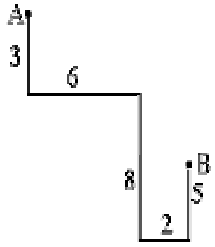

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Round 10

Part 1

Given that $P = (1,0)$, $Q = (0,2)$, $R = (-1,1)$, and T are the vertices of a parallelogram, which one of the following is possible?

(a) $T = (0,0)$ (b) $T = (-1,-1)$ (c) $T = (2,2)$
(d) $T = (2,0)$ (e) $T = (-2,3)$

A = sum of the coordinates of the answer

Part 2

Jim is chasing his pet frog, Tyrone. Tyrone takes 3 jumps for every 2 steps that Jim runs, but each of Jim's steps is twice as long as a jump of Tyrone's. Tyrone had made 10 jumps when Jim started. Jim caught Tyrone just as Tyrone finished his what number jump?

B = total number of Tyrone's jumps

Part 3

The hypotenuse of a right triangle has length $\sqrt{16s+1}$ (with $s > 0$).
The lengths of the other two sides are s and s+1.

What is the value of s?

C = s

Final: $B - 2C + A$

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