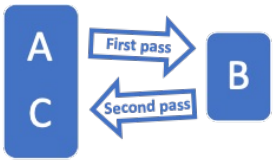
2024 SENIOR REGIONALS SHU
Shuttle Round

Practice Question A0



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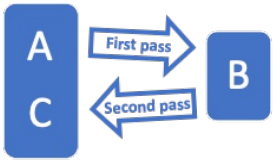
2024 SENIOR REGIONALS SHU
Shuttle Round

Practice Question A0



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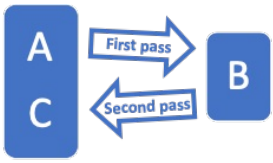
2024 SENIOR REGIONALS SHU
Shuttle Round

Practice Question A0



Do not turn over until instructed to do so

A0.

What is the 11^{th} prime number?

A0.

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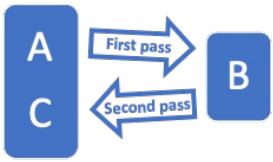
Question A1



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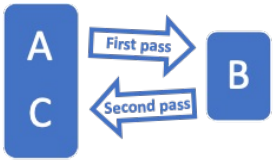
Question A1



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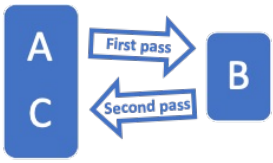
Question A1



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A1.

Find N if $\log_2 N$ is the real number solution to $4^x = 2^x + 6$.

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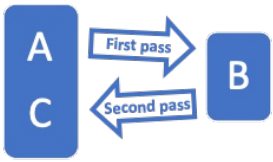
Question A2



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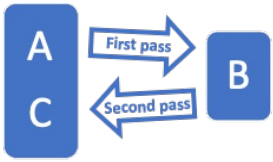
Question A2



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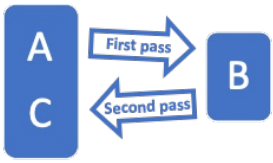
Question A2



Do not turn over until instructed to do so

A2.

In what base is the equation $(24)^2 = 642$ true?

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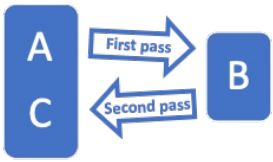
Question A3



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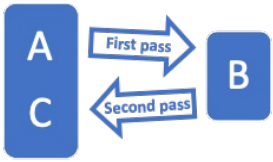
Question A3



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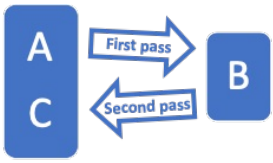
Question A3



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A3.

Evaluate $25^{\frac{1}{\log(25)}}$. (Note: Logarithm is base 10.)

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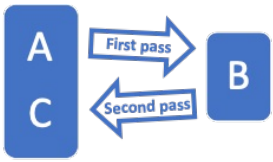
Question A4



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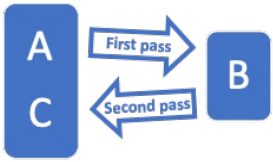
Question A4



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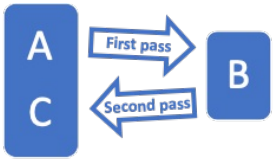
Question A4



Do not turn over until instructed to do so

A4.

The function $f(x) = x^2e^x$ has inflection points (a, y_1) and (b, y_2).

Find the value of $a \cdot b$.

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Find the value of $a \cdot b$.

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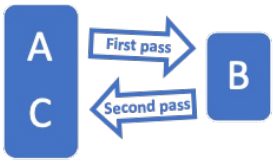
Question A5



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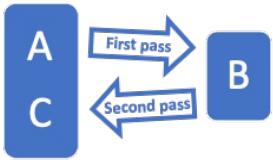
Question A5



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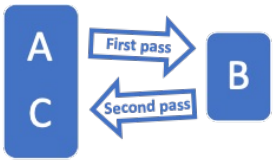
Question A5



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A5.

The product of the positive divisors of 100 is 10^N. What is the value of N?

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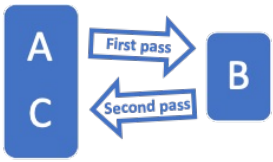
Question A6



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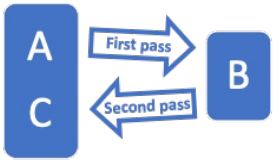
Question A6



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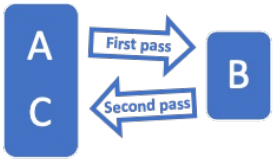
Question A6



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A6.

On a recent test on basic knowledge, the average score for girls was 90, while the average score for boys was 84. The average score for the entire group was 88. If $\frac{1}{N}$ was the fraction of the group that were boys, find N.

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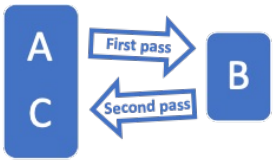
Question A7



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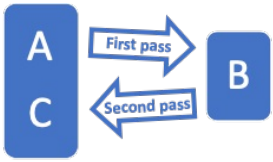
Question A7



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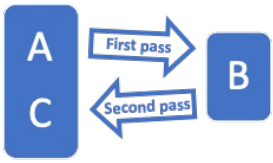
Question A7



Do not turn over until instructed to do so

A7.

Given that $\log(6!) = a\log(2) + b\log(3) + c\log(5)$, find $a + b + c$.

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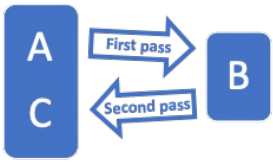
Question A8



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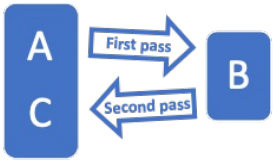
Question A8



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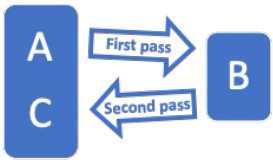
Question A8



Do not turn over until instructed to do so

A8.

Find the sum of the real roots to $x^2 + 1 = 5|x + 3|$.

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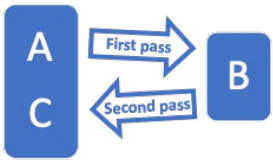
Question A9



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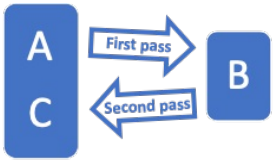
Question A9



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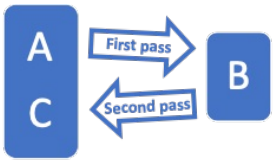
Question A9



Do not turn over until instructed to do so

A9.

Find the product of the roots of $(4^x - 8)^2 + (8^x - 4)^2 = (4^x + 8^x - 12)^2$.

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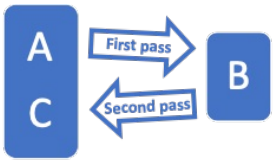
Question A10



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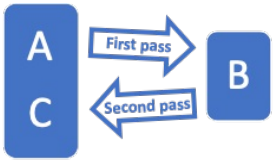
Question A10



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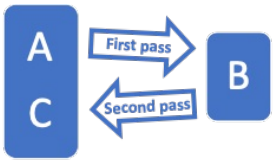
Question A10



Do not turn over until instructed to do so

A10.

The distance between the points of intersection of $f(x) = x^2 + x$ and $g(x) = 3x + 4$ can be written as $10\sqrt{a}$. Find the value of a.

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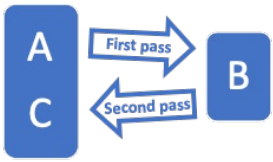
Question A11



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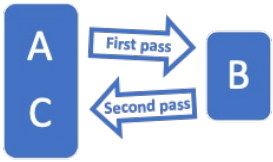
Question A11



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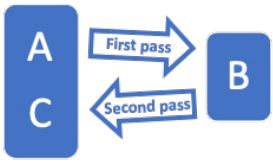
Question A11



Do not turn over until instructed to do so

A11.

Consider the sequence $a_1, a_2, a_3, \ldots$ such that
$a_1 = 3, a_2 = 7, a_3 = 4,$ and $a_{n+1} = a_n - a_{n-1}$, for all $n \geq 2$.

Find a_{2023}

A11.

Consider the sequence $a_1, a_2, a_3, \ldots$ such that
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Find a_{2023}

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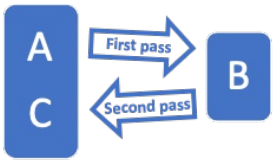
Question A12



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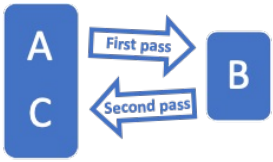
Question A12



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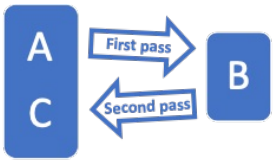
Question A12



Do not turn over until instructed to do so

A12.

Find the remainder when 2^{100} is divided by 13.

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