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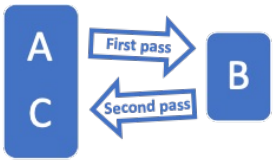
Practice Question C0



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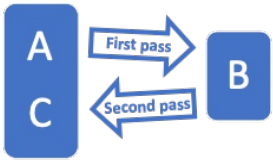
Practice Question C0



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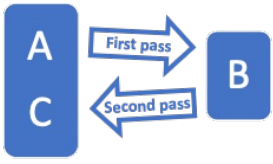

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C0.

Let *N* be the number you receive. Find $\lfloor \sqrt{N} \rfloor$. HINT: $\lfloor x \rfloor$ is a floor function, it means round x down to the nearest integer.

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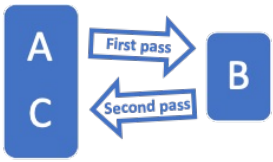
Question C1



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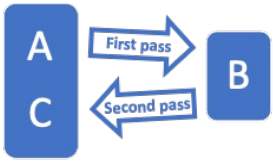

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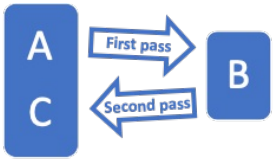

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C1.

Let k be the number you receive.

Real numbers x and y have the property that $x^2 + y^2 = k$. We also know that all square numbers are non-negative.

Find the maximum value of $2x + 2y$.

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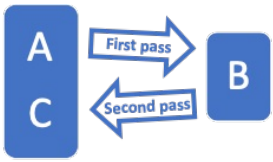
Question C2



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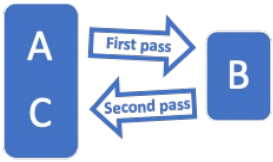

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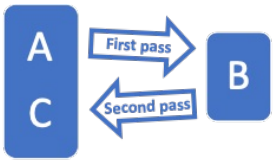

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C2.

Let k be the number you receive.

How many ordered triples (a, b, c) satisfy the equation:

$$abc - 2(ab + ac + bc) + 4(a + b + c) - k = 0?$$

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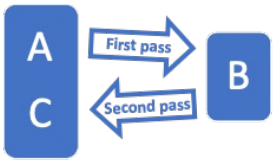
Question C3



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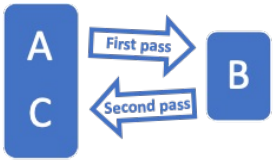

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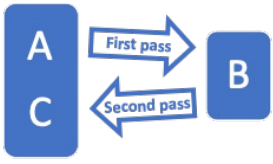

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C3.

Let k be the number you receive.

Sets $A, B,$ and C contain positive integers $\leq |k|$.

$A = \{x : x \text{ is a multiple of } 3\}$

$B = \{x : x \text{ is a multiple of } 4\}$

$C = \{x : x \text{ is one more than a prime}\}$.

How many elements are in $(A \cap B) \cup (C \cap B)$?

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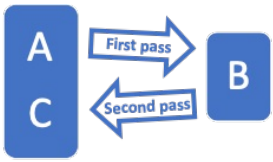
Question C4



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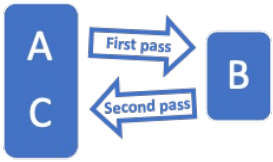

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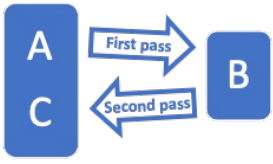

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C4.

Let k be the number you receive.

If $x + \dfrac{1}{x} = 2k$, find the value of $x^4 + \dfrac{1}{x^4}$.

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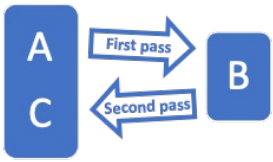
Question C5



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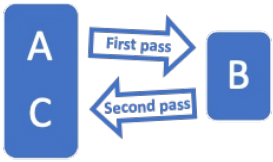

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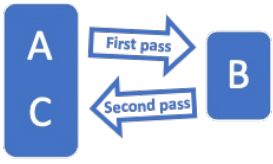
Question C5



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C5.

Let k be the number you receive.

Triangle ABC is equilateral with each side $4k$ long.

Points $D, E, \text{ and } F$ are on $\overline{BC}, \overline{AB}, \text{ and } \overline{CA}$ respectively.

Point G is the intersection of $\overline{AD}$ and $\overline{EF}$ and $\overline{AD} \perp \overline{BC}, \overline{DE} \perp \overline{AB}, \text{ and } \overline{EF} \perp \overline{AC}$.

Find the area of quadrilateral $GDBE$.

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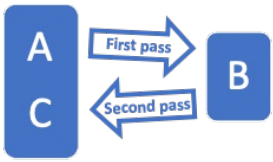
Question C6



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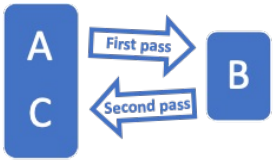
Question C6



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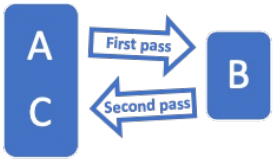

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C6.

Let k be the number you receive.

If $\left(1-\frac{1}{2^2}\right)\left(1-\frac{1}{3^2}\right)\left(1-\frac{1}{4^2}\right)\cdot\ldots\cdot\left(1-\frac{1}{k^2}\right)=\frac{x}{2k}$, find the value of x.

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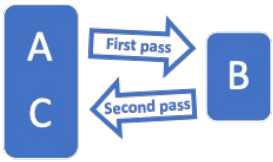
Question C7



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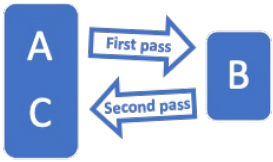

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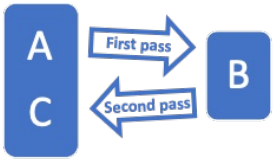

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C7.

Let k be the number you receive.

If $f(x) + 2 \cdot f\left(\frac{k}{3} - x\right) = x^2$ for all x, find the value of $f(2)$.

Write your answer as an improper fraction.

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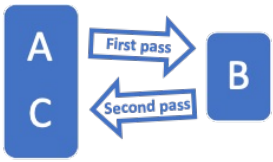
Question C8



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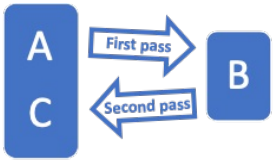

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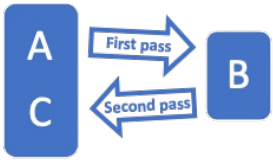

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C8.

Let k be the number you receive.

The notation $[x]$ means the greatest integer less than or equal to x.

Evaluate $[\log_2 1] + [\log_2 2] + [\log_2 3] + [\log_2 4] + ... + [\log_2 k]$.

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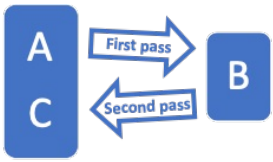
Question C9



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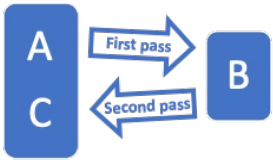
Question C9



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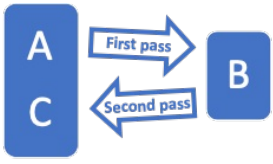
Question C9



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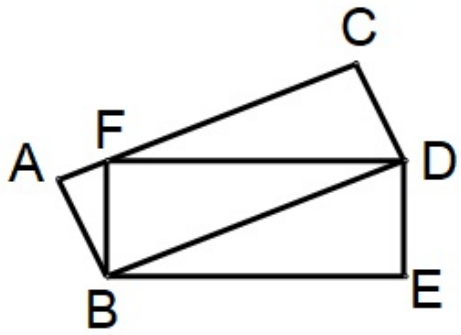
C9.

Let k be the number you receive.

Rectangles $ACDB$ and $BFDE$ are drawn as shown, with Point F on $\overline{AC}$.

Given that $BE = k - 1$ and $DE = 3.5$, give the length of $\overline{AB}$ as an improper fraction.



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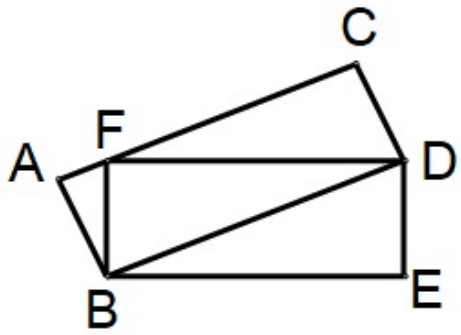
Rectangles $ACDB$ and $BFDE$ are drawn as shown, with Point F on $\overline{AC}$.

Given that $BE = k - 1$ and $DE = 3.5$, give the length of $\overline{AB}$ as an improper fraction.



C9.

Let k be the number you receive.

Rectangles $ACDB$ and $BFDE$ are drawn as shown, with Point F on $\overline{AC}$.

Given that $BE = k - 1$ and $DE = 3.5$, give the length of $\overline{AB}$ as an improper fraction.