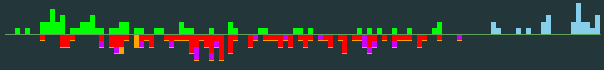
M: Manic Ceramic

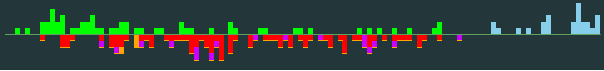
Problem author: Arnoud van der Leer, Maarten Sijm



Problem: Given two types of tiles with x and $\frac{1}{y}$ instances of a pattern, how many should you at least buy to get equally as many patterns as tiles?

M: Manic Ceramic

Problem author: Arnoud van der Leer, Maarten Sijm

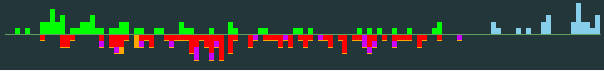


Problem: Given two types of tiles with x and $\frac{1}{y}$ instances of a pattern, how many should you at least buy to get equally as many patterns as tiles?

Equivalently: Minimize $N = A + B = Ax + \frac{B}{y}$.

M: Manic Ceramic

Problem author: Arnoud van der Leer, Maarten Sijm



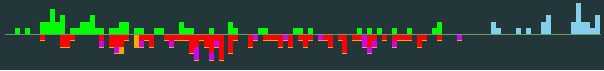
Problem: Given two types of tiles with x and $\frac{1}{y}$ instances of a pattern, how many should you at least buy to get equally as many patterns as tiles?

Equivalently: Minimize $N = A + B = Ax + \frac{B}{y}$.

Observation 1: We can get rid of B since we only really care about N: $N = Ax + \frac{N-A}{y}$.

M: Manic Ceramic

Problem author: Arnoud van der Leer, Maarten Sijm



Problem: Given two types of tiles with x and $\frac{1}{y}$ instances of a pattern, how many should you at least buy to get equally as many patterns as tiles?

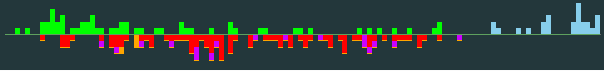
Equivalently: Minimize $N = A + B = Ax + \frac{B}{y}$.

Observation 1: We can get rid of B since we only really care about N: $N = Ax + \frac{N-A}{y}$.

Observation 2: We can rewrite this to $(y-1)N = (xy-1)A$, or $pN = qA$.

M: Manic Ceramic

Problem author: Arnoud van der Leer, Maarten Sijm



Problem: Given two types of tiles with x and $\frac{1}{y}$ instances of a pattern, how many should you at least buy to get equally as many patterns as tiles?

Equivalently: Minimize $N = A + B = Ax + \frac{B}{y}$.

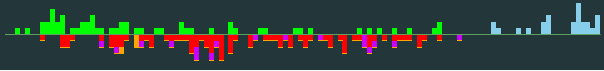
Observation 1: We can get rid of B since we only really care about N: $N = Ax + \frac{N-A}{y}$.

Observation 2: We can rewrite this to $(y-1)N = (xy-1)A$, or $pN = qA$.

Observation 3: We are now looking for the smallest N for which q divides pN. This is the case when $pN = lcm(p, q)$.

M: Manic Ceramic

Problem author: Arnoud van der Leer, Maarten Sijm



Problem: Given two types of tiles with x and $\frac{1}{y}$ instances of a pattern, how many should you at least buy to get equally as many patterns as tiles?

Equivalently: Minimize $N = A + B = Ax + \frac{B}{y}$.

Observation 1: We can get rid of B since we only really care about N: $N = Ax + \frac{N-A}{y}$.

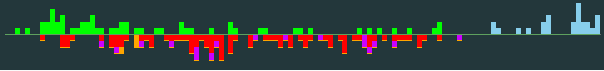
Observation 2: We can rewrite this to $(y-1)N = (xy-1)A$, or $pN = qA$.

Observation 3: We are now looking for the smallest N for which q divides pN. This is the case when $pN = lcm(p, q)$.

Solution: $N = \dfrac{\mathrm{lcm}(xy-1, y-1)}{y-1}$.

M: Manic Ceramic

Problem author: Arnoud van der Leer, Maarten Sijm



Problem: Given two types of tiles with x and $\frac{1}{y}$ instances of a pattern, how many should you at least buy to get equally as many patterns as tiles?

Equivalently: Minimize $N = A + B = Ax + \frac{B}{y}$.

Observation 1: We can get rid of B since we only really care about N: $N = Ax + \frac{N-A}{y}$.

Observation 2: We can rewrite this to $(y-1)N = (xy-1)A$, or $pN = qA$.

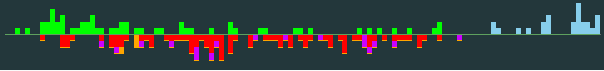
Observation 3: We are now looking for the smallest N for which q divides pN. This is the case when $pN = lcm(p, q)$.

Solution: $N = \dfrac{\mathrm{lcm}(xy-1, y-1)}{y-1}$.

Alternative: $N = \dfrac{xy-1}{\gcd(x-1, y-1)}$.

M: Manic Ceramic

Problem author: Arnoud van der Leer, Maarten Sijm



Problem: Given two types of tiles with x and $\frac{1}{y}$ instances of a pattern, how many should you at least buy to get equally as many patterns as tiles?

Equivalently: Minimize $N = A + B = Ax + \frac{B}{y}$.

Observation 1: We can get rid of B since we only really care about N: $N = Ax + \frac{N-A}{y}$.

Observation 2: We can rewrite this to $(y-1)N = (xy-1)A$, or $pN = qA$.

Observation 3: We are now looking for the smallest N for which q divides pN. This is the case when $pN = lcm(p, q)$.

Solution: $N = \dfrac{\mathrm{lcm}(xy-1, y-1)}{y-1}$.

Alternative: $N = \dfrac{xy-1}{\gcd(x-1, y-1)}$.

Statistics: 180 submissions, 57 accepted, 25 unknown