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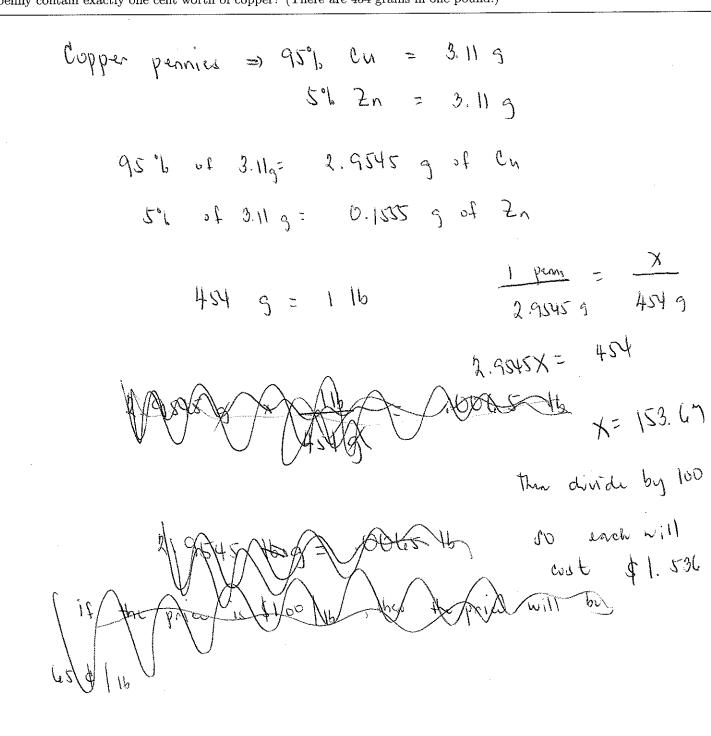
N-Q.1 How much is a penny worth? The price of copper fluctuates. Between 2002 and 2011, there were times when it was lower than $1.00 per pound and other times when it was higher than $4.00 per pound. Copper pennies minted between 1962 and 1982 are 95% copper and 5% zinc, and each weighs 3.11 grams. At what price per pound of copper does such a penny contain exactly one cent worth of copper? (There are 454 grams in one pound.)

Let x = number of pennies in one pound of copper

Between 2002 & 2011
price of copper is lower than $1.00 per pound
                     higher than $4.00 per pound

Between
1962 and 1982 → pennies ⟨ 95% copper
                          5% zinc

1 penny = 3.11 grams   454 grams = 1 lb.

SO: 3.11 × 95% = 2.95 grams of copper in each penny

$$\frac{1 \ penny}{2.95 \ grams} = \frac{x \ \cancel{\$}}{454 \ grams}$$

$$\frac{454}{2.95} = \frac{2.95 \, X}{2.95}$$

X = 153.9
     or 153 pennies made out of 1 pound of copper

$$\frac{153 \ pennies}{100 \ pennies \ each \ dollar} = \$1.53 \ for \ the \ price \ of \ copper.$$

which could happen if
100 pennies made @ $1.00 price of copper
53 pennies @ $0.53 price of copper

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$$\frac{2.95}{3.11} = \frac{X}{454}$$

$$\frac{1339.3}{3.11} = \frac{3.11x}{3.11}$$

$$\frac{430.64}{454.00} = .95$$

@ 10 @ pound cost 45 us

$$\frac{146 \text{ pennies}}{1 \text{ pound}} \qquad —$$

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First we need to find the amount of copper in a penny between 1962 and 1982.

$$0.95 \cdot 3.11 = \boxed{2.9545 \text{ grams of copper}}$$

Then we can find the amount of copper there is in one pound.

$$\frac{1 \text{ lb}}{\# \text{ grams}} = \frac{454 \text{ grams}}{2.9545 \text{ grams}} = 153.7 \text{ grams}$$

Then we need to find the price per pound.

$$(153.7) \frac{x \text{ price}}{153.7 \text{ gram}} = 0.01 (153.7)$$

$$x = \$1.54$$

The price of copper per pound is \$1.54.

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Copper $< \$1/$pound   or $> \$4/$pound   Background info 2002 – 2011

95% copper and 5% zinc = 1 penny

3.11 grams = 1 penny

$\$$ price/pound of copper

Determine grams in penny.

$.95(3.11) = 2.9545$ grams of copper in a classic penny

Determine lbs in penny

$2.9545 g \times \dfrac{1 \text{ lb}}{454 g} = 0.0065071$ lbs of copper in a classic penny

Determine $\$$price for 1 lb. in penny which is valued at $\$.01$.

$$\dfrac{0.0065071 \text{ lbs}}{1 \text{ lbs}} = \dfrac{1 \text{ cent}}{X \text{ cent}}$$

$$X = \dfrac{1}{0.0065071} = 153.66 \text{ cents} = \$1.53/\text{lb}$$

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Copper pennies $\Rightarrow$ 95% Cu = 3.11 g

5% Zn = 3.11 g

95% of 3.11g = 2.9545 g of Cu

5% of 3.11 g = 0.1555 g of Zn

454 g = 1 lb

$$\frac{1 \text{ penny}}{2.9545 \text{ g}} = \frac{x}{454 \text{ g}}$$

$2.9545x = 454$

$x = 153.67$

Then divide by 100

so each will cost $1.536

if the price is $1.00/lb then the price will be

65¢/lb

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Pounds $\times$ (cost per pound) = total cost

- If a penny weighs 3.11 g and is 95% copper, then each penny has $(3.11)(.95) = 2.9545$ g of copper.
- Given that 1 pound = 454 g, then

$$\frac{1 \ LB}{454 \ g} = \frac{X \ LB}{2.9545 \ g}$$

$$X \cdot 454 = 2.9545$$

$$X = .0065 \ LB's \ of \ copper \ in \ one \ penny$$

Pounds $\times$ (cost per pound) = total cost $\left(\text{one cent} = \$0.01\right)$

$(.0065) \cdot P = 0.01$

$$P = \frac{0.01}{0.0065} = 1.54 \ dollars \ per \ pound \ makes \ there$$

be one cent of copper in every penny.

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First:

1 lb of copper = 454 gms.

1 penny = 95% of copper and 5% of zinc

and also: 1 penny = 3.11 gms

Thus: To get the amount of copper in a penny.

Say

1 penny = 3.11 × 95% (copper)

= 2.9545 grams (pure copper)

So: To determine how many pennies can be made out of one pound of copper, say.

1 lb = 454 gms. of copper

1 penny = 2.9545 gms (copper)

So:

$$\frac{454 \text{ gms}}{2.9545 \text{ gms}} = \# \text{ of penny}$$

= 153.67 pennies.

Then the price of copper per pound to worth exactly a penny of copper should be $1.5367.

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1962 - 1982 (95% Cu + 5% Zn) - weighs 3.11 grams

454 grams = 1 pound

100 cents = 1 dollar

3.11 grams × .95 = 2.9545 grams of copper
in one   (95%)   per penny
penny   ① Figured out how much Cu is in a penny
                    by multiplying by 95%.

$\frac{1}{100}$ dollar = 1 cent

② 2.9545 grams
   converted to pounds

$\frac{1}{454}$ lb = 1 gram

454 grams = 1 pound

454 p = g

$\frac{454p}{454} = \frac{2.9545}{454}$

$\frac{1}{100}$ lb   value of Cu
$\frac{0.01 \times}{0.01} = \frac{0.0065}{0.01}$

0.65   65 cents per pound   0.0065 pounds
                                        of Cu in a
                                        penny

Cu would be

$\frac{0.01}{0.0065} = \frac{0.0065 x}{0.0065}$ $1.53 per pound.

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$.95 (3.11) = 2.9545 g$ copper in a penny.

$.95 (.01) = \$.0095$ is the value of the copper "portion" of a penny that we're aiming for.

$\therefore \quad 2.9545 g \cdot \dfrac{1 \, lb}{454 g} \cdot x = .0095$

allows us to solve for x, giving the price per pound of copper needed to produce a penny whose copper portion is worth 95% of 1¢.

Solving the above equation for x gives us a copper price of \$1.46 per pound. This would work except we need the penny to contain 1¢ of copper. To produce a penny containing 1¢ worth of copper, we should use the equation $2.9545 g \cdot \dfrac{1 \, lb}{454 g} \cdot x = .01$, giving a price per pound of \$1.54. This gives us the price needed to provide 1¢ worth of copper.

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$$\frac{454g}{1 \text{ lb.}} = \frac{2.9545g}{X \text{ lb}} \qquad X = .0065 \text{ lb}$$

95% of 3.11g = 2.9545g of copper
5% of 3.11g = .1555g of zinc

95% of 454g = 431.3g of copper in 1 lb. of pennies
5% of 454g = 22.7g of zinc in 1 lb of pennies

$$\frac{\$X}{454g} \times \frac{\$.01}{2.9545g} \qquad X = \$1.536 = \$1.54 \text{ per pound}$$

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$$.95(3.11) = 2.9545 \text{ grams}$$

2.9545 grams is the weight of the copper in a penny

$$454 g = 1 lb$$

$$2.9545 g \times \frac{1 lb}{454 g} = \frac{2.9545}{454} = .065$$

$$\frac{454}{1} = \frac{2.9545}{X lbs} \rightarrow 454X = \frac{2.9545}{454}$$

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Given: 1 pound for every 454 grams.

1 penny is made up of 95% copper and 5% zinc which weighs 3.11 grams.

So, convert grams to pounds: $3.11 g \times \dfrac{1 lb}{454 g} = .0069 \, lbs$ Star [A]

So, now 95% of .0069 lbs is: $.95 \times .0069 lb = .0065 lb$
This gives the weight of copper in a penny.

There are 100 pennies in a dollar: $\dfrac{100P}{\$1}$

for every dollar there are 100 pennies: $\dfrac{\$1}{100P}$

If looking for $/lb does a penny contain exactly 1¢ worth of copper we would

"1¢ worth of copper" is .0065 lbs of copper b/c there are .0065 lbs of copper in 1¢.

1P weighs .0069 lbs

$\dfrac{\$1}{100P} \times \dfrac{1P}{.0069 lb} = \dfrac{\$1}{.69 lb} \times .95 =$ ↙95%

$\dfrac{\$1}{100P} \times \dfrac{1P}{.0069 lb} \times .95$ $\boxed{\begin{array}{c} \$1.39 \\ \text{OR} \\ \$1.54 \end{array}}$ dollars for every pound

$\begin{array}{c} 1.54 \\ 1.39 \end{array} \rightarrow \dfrac{\$1}{100P} \times \dfrac{1P}{.0069 lb} \times .95$

Looking for: $/lb

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One cent of copper is $.01 = 1\%$ hint: $454\,g = 1$ pound

$3.11_g(.95)$ copper $+ 3.11_g(.05)$ zinc $= 1$ penny

$2.9545_g\,C + .1555\,Z = 1$ penny

history:

$\dfrac{\$1.00}{\text{pound}} < \dfrac{\$4.00}{\text{pound}}$

$2002 \to 2011 = 9$ years

$1962 \to 1982 = 20$ years

$.95C + .05Z = 1$ penny

$\dfrac{454}{\text{grams}} = \dfrac{1}{\text{pound}} \;\Rightarrow\; 454\,p = 1\,gram$

$\dfrac{454}{3.11} = \dfrac{1}{X} = \text{pound}$

$.95\,C + .05\,Z = 1$ penny

$= 1$ penny

$\dfrac{1\text{ penny}}{2.9545} = \dfrac{X}{454\text{ grams}}$

$\dfrac{454}{2.9545} = 153.66$

≈ 153 price per pound