ARTS DEPARTMENT.

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Our correspondents will please bear in mind, that the arranging of the matter for the printer is greatly facilitated when they kindly write out their contributions, intended for insertion, on one side of the paper ONLY, or so that each distinct answer or subject may admit of an easy separation from other matter without the necessity of having it re-written.

SOLUTIONS

By the Proposer, W. G. ELLIS, B.A., Math'l Master, Collegiate Institute, Cobourg.

145. In 1870 a Frenchman in New York proposed to invest $5000 U. S. currency in the French 6 % loan, then being sold in London at 85. Gold being at 110, London exchange 4.87, brokerage in New York ¼ %, commission for buying in London ⅛ %, and London exchange on Paris being 25.43; what per cent. will the investor secure per annum, the *rentes* being payable in gold, exchange on Paris at 5.15, and gold at 115?

$$(5000-\tfrac{1}{4}\% \text{ of } 5000)\times\frac{100}{110}\times\frac{100}{4.87}=£931.025$$

$$=\text{amount of bill on London};$$

$$(931.025-\tfrac{1}{2}\% \text{ of } 931.025)\times 25.43=.23567.59$$

$$=\text{amount of bill on Paris};$$

$$23567.59\times\frac{100}{85}\times\frac{6}{100}=\text{int. rec'd in France},$$

$$23567.59\times\frac{100}{85}\times\frac{6}{100}\times\frac{115}{100}=371.39$$

$$=7\tfrac{3}{8}\ \%\ \text{nearly.}$$

146. A Canadian cent is one inch in diameter, $\frac{1}{10}$ of an inch thick, and 100 of them weigh a pound. What is the weight of a mass of the metal from which these cents are made, in the form of a sphere, four inches in diameter?

Let R be the radius of the cent and R' the radius of the sphere; then weight $=$

$$\frac{\frac{4}{3}\pi R'^3}{\frac{1}{10}\pi R^2}=\frac{\frac{4}{3}\pi 2^3}{\frac{1}{10}\pi(\frac{1}{2})^2}=\frac{\frac{4}{3}\times 8}{\frac{1}{40}}=426\tfrac{2}{3}=\text{Number}$$

of cents that can be coined, or weight $=$ $4.26\frac{2}{3}$ lbs.

147. If $x = 4y$, shew that the arithmetic mean of x and y is to the geometric mean as 5 is to 4.

$x=4y \therefore x:y :: 4:1,$

or $(x-y)^2:(x+y)^2 :: 3^2:5^2,$

or $(x-y)^2:4xy :: 9:16,$

or $x-y:2\sqrt{xy} :: 3:5;$

but $x-y:x+y :: 3:5;$

$$\therefore \frac{2\sqrt{xy}}{x+y}=\frac{4}{5},\ \therefore \frac{x+y}{2}:\sqrt{xy} :: 5:4.$$

148. If $\frac{r}{2}a^4+x^{\frac{1}{2}}a^2b+2b^2$ is the perfect square of a binomial, find x in terms of r.

$x=4r$.

149. Reduce to lowest terms

$$(x^{\frac{1}{2}}+p^2)^2-(a^2-b^2+c^{\frac{3}{2}})^2$$

$$(x^{\frac{1}{2}}+p^2)(a^2-b^2+c^{\frac{3}{2}})+(a^{\frac{1}{2}}-b^2+c^{\frac{3}{2}})^2+(x^{\frac{1}{2}}+p^2)^2$$

$$x^{\frac{1}{2}}+p^2-a^2+b^2-c^{\frac{3}{2}}.$$

150. Why is it that if any *three* consecutive numbers be multiplied together the product is divisible by 6?

Because one factor at least is divisible by 2 and one by 3.

151. Resolve $m^4-4m^3+5m^2-2m$ into elementary factors, and shew that it is divisible by 12 for all values of m above 2.

$m(m-1)(m-1)(m-2)$. Now, there are three consecutive numbers here as factors; $\therefore$ 3 is a divisor, and whether m be odd or even *two* of the factors are divisible each by 2; $\therefore$ 4 is also a divisor.