ARTS DEPARTMENT.

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SOLUTIONS.

Solutions by Prof. Edgar Frisby, M.A., Naval Observatory, Washington.

107. If
$$x+y-axy=0$$
$$y+z-byz=0$$
$$z+x-cxy=0,$$
and if $azy+bxz+cyx=0$, then
$$\frac{a}{b^2-(a-c)^2}+\frac{b}{c^2-(b-a)^2}+\frac{c}{a^2-(c-b)^2}=0.$$

From first and third equations we have
$$y=\frac{x}{ax-1}\ ;\ z=\frac{x}{cz-1}.$$

Substituting in (2) gives $(a+\ )x^2-2x=bx^2$,

whence $x=0$ or $x=\frac{2}{a+c-b}$,

similarly $y=0$ $y=\frac{2}{a+b-c}$

and $z=0$ $z=\frac{2}{b+c-a}$,

and substituting the last values in

$azy+bxz+cyz=$ gives the relation.

111. Divide without expansion
$$(x^2-\frac{1}{2}yz)^3+\frac{27}{8}y^3z^3 \text{ by } x^2+yz.$$
$$\left(x^2-\frac{yz}{2}\right)^3+\left(\frac{3yz}{2}\right)^3=\left(x^2-\frac{yz}{2}+\frac{3yz}{2}\right)$$
$$\left(x^4-x^2yz+\frac{y^2z^2}{4}+\frac{9y^2z^2}{4}-\frac{3x^2yz}{2}+\frac{3y^2z^2}{4}\right)$$
$$=(x^2+yz)\ (x^4-\frac{5}{2}x^2yz+\frac{13}{4}y^2z^2),$$

whence dividing by the first factor we have
$$x^4-\frac{5}{2}x^2yz+\frac{13}{4}y^2z^2.$$

Solutions by F. Boultbee, Univ. Coll.

110. Factor $l(m+nx)^2-(l+nx)(m+nx)$
$$-ln(l+nx)\ (m+nx)+n(l+nx)^2.$$
$$=(m+nx)\left\{l(m+nx)-(l+nx)\right\}$$
$$-n(l+nx)\ \left\{l(m+nx)-(l-nx)\right\}$$
$$=\left\{(m+nx)-n(l+nx)\right\}$$
$$\left\{l(m+nx)-(l+nx)\right\}.$$

108. (See January number, 1880).
$$(1-x)^{-2n}=1+2nx+\ldots\ldots$$
$$+\frac{2n-(2n+r-2)}{\underline{|r-1}}x^{r-1}+\frac{2n-(2n+r+1)}{\underline{|r}}x^r$$
$$(1-x)^{-n}=1+nx+\ldots\ldots$$
$$+\frac{n-(n+r-2)}{\underline{|r-1}}x^{r-1}+\frac{n(n+1)-(n+r-1)}{\underline{|r}}x^r.$$

Multiplying together we see that given expression equals coefficient of x^r in
$$(1-x)^{-2n}\times(1-x)^{-n}$$
equals coefficient x^r in $(1-x)^{-3n}$
$$\frac{3n(3n+1)-(3n+r-1)}{\underline{|r}}.$$

112. Two equal circles intersect in A and B through D any point in the line AB; DEC is drawn at right angles to AB, meeting the circles in E and C respectively; join BE and AE and produce them to meet AC