SCHOOL WORK.

MATHEMATICS.

ARCHIBALD MACMURCHY, M.A., TORONTO, EDITOR.

SOLUTIONS

By WILBUR GRANT, Toronto Coll. Inst.

(SEE JANUARY NO.)

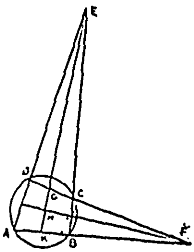
2. If i. $ax+by+c=0$, ii. $bx+cy+a=0$, iii. $cx+ay+b=0$, then $a+b+c=0$, or $a^2+b^2+c^2=ab+bc+ca$.

2. By adding i., ii. and iii., we get $(a+b+c)(x+y+1)=0$, where either $a+b+c=0$, or $x+y+1=0$, (iv.) Multiplying i. by a, ii. by b, iii. by c, i. by b, ii. by c, iii. by a, and adding products we get

$$(a^2+b^2+c^2)(x+y)+(ab+bc+ac)(x+y)+2(ab+bc+ca)=0,$$

putting $x+y=-1$ from iv.,

$\therefore\ a^2+b^2+c^2=ab+bc+ca.$



4. Let $ABCD$ be a quadrilateral inscribed in a circle. Let the sides AD BC be produced to meet in E and DC, AB to meet in F. Let $EGHK$ bisect angle AEB, meeting DC in G and AB in K. Let FH bisect angle DFA.

4. Angle EHF = angle HKF + $\frac{1}{2}$ angle DFA.

= angle BAE + $\frac{1}{2}$ angle AEB + $\frac{1}{2}$ angle DFA.

Angle KHF = angle HGF + $\frac{1}{2}$ angle DFA.

= angle DCE + $\frac{1}{2}$ angle AEB + $\frac{1}{2}$ angle DFA.

But angle DAB + angle DCB = angle DCB + angle DCE = 180°.

$\therefore$ angle DCE = angle BAE.

$\therefore$ angle EHF = angle KHF = 90°.

5. If through a given point within a circle are drawn two perpendicular chords, the sum of the squares on these lines has a constant value.

5. Let O be the point of intersection of the two chords AC, BD. Take E the centre, and drop perpendiculars on the chords. By applying Prop. IV., Book II., it may be shown that $AO^2+OC^2+BO^2+OD^2=4r^2$ where r is radius of circle.

QUESTIONS IN PHYSICS.

By W. J. LOUDON, B.A., Univ. Coll.

9. A candle whose specific gravity is A floats vertically in still water of specific gravity B. It is lighted and the flame descends towards the water with uniform velocity u. Show that the velocity with which the candle burns is $\dfrac{Au}{B-A}$.

(This question can easily be solved by remembering that the distance travelled in any time by a body moving uniformly is the product of the velocity and the time. In the present case the expression for the time disappears in the result.)

10. A body is weighed by means of an ordinary balance. When placed in one pan its weight appears to be P; when placed in the other pan, Q. Show that its true weight is $\sqrt{PQ}$. (This is solved by using the principle of the lever.)

11. Show also in the preceding question that the lengths of the arms of the balance will be very nearly in the ratio 1 to $1+\dfrac{P-Q}{2Q}$.

12. A piece of iron weighing 48.3 grammes at a temperature of 96°.7 centigrade is immersed in a quantity of water whose weigh is 76.4 grammes at a temperature of 11°.05. The common temperature to which both finally come is 16°.74. Determine the specific heat of iron.

(Specific heat is defined as the quantity of heat which would be required to raise a given weight of a substance through one degree centigrade, as compared with that required to raise the same weight of water through the same distance. With this definition, to solve the problem it is sufficient to equate the quantity of heat given out by the iron to the quantity of heat absorbed by the water, the specific heat of water of course being 1.)