QUESTION BUREAU

(1) For what value of x will the expression $x^3-3cx^2+2c^2x+5c^3$ be a perfect cube?

(Question 22, page 225, Algebra)

Let (a) represent . . . . $x^3+3cx^2+2c^2x+5c^3$

Now $(x+c)^3=x^3+3cx^2+3c^2x+c^3$

Let (b) represent . . . $x^3+3cx^2+3c^2x+c^3$

Now (b) is a perfect cube obtained by cubing, $x+c$. If (a) were a perfect cube obtained in the same way the results (a) and (b) would be the same. That is the difference of (a) and (b) would be zero. Substract (b) from (a). Result: $-c^2x+4c^3$. That is: $-c^2x+4c^3=0$

$$\text{or } c^2x=4c^3$$

$$x=\frac{4c^3}{c^2}=4c$$

(2) Find the value of y for which $x^2-2(a-y)x-y^2$ is a perfect square.

(Question 14, page 226, Algebra).

If $x^2-2(a-y)x+y^2$ were a perfect square, then extracting the square root there would be no remainder, or the remainder would be zero.

Expand and extract square root.

$$x^2-2ax+2yx+y^2 \mid x-a+y$$

x^2

$2x-a$ | $-2ax+2yx+y^2$; $-2ax+a^2$

$2x-2a+y$ | $2yx+y^2-a^2$; $2xy+y^2-2ay$

$2ay-a^2$

If the expression is a perfect square

$$2ay-a^2=0$$

$$2ay=a^2$$

$$y=\frac{a^2}{2a}=\frac{a}{2}$$

To prove that if $y=\frac{a}{2}$ the expression is a perfect square.

Substitute $\frac{a}{2}$ for y, in $x^2-2ax+2yx+y^2$

Then expression becomes $x^2-2ax+ax+\frac{a^2}{4}$

$$=x^2-ax+\frac{a^2}{4}$$

$$=\left(x-\frac{a}{2}\right)\left(x-\frac{a}{2}\right)$$

But these factors are equal. Therefore one of them, $x-\frac{a}{2}$, is the square root.

Note.—By using the same reasoning, this method could be applied to Question (1), first extracting cube root, etc.

(3) What per cent. payable half yearly is equivalent to 10 % payable yearly.

(H. S. Arithematic, question 18, page 183)

Let $1 be the principal in each case.

Then amount of $1 for 1 yr. at 10 % is $1.10.

Let r be rate payable half yearly; then amount of $1 for 2 payments at r % is $\left(\$1+\frac{r}{100}\right)^2$

But by conditions the two amounts are equal.

Then $\left(\$1+\frac{r}{100}\right)^2=\$1.10$

Squaring: $1+\frac{r}{50}+\frac{r^2}{10000}=1.00$

Clearing: $10000+200r+r^2=11000$

Transposing: $r^2+200r=1000$

Solve this quadratic by completing the square and extracting sq. root of both sides.

Then $r+100=104.88$

Whence $r=4.88$.

Note.—In all the above no attempt is made to find the easiest or shortest solution, but to give the teacher help in teaching.

BOOKS RECEIVED

HUMAN GEOGRAPHIES, Books I., II. and III. Prices—1-6, 1-6, 1-9. Published by Messrs. George Phillip & Son, Ltd., 32 Fleet St., London, E. C. 4, England. These books are bound in stiff paper covers, printed in good type, on excellent paper and well illustrated.

THE ROUND TABLE, a quarterly review of the politics of the British Commonwealth. The March number contains articles on America and World Responsibility; Bolshevic Aims and Ideals—its Origin, Leaders, Aspirations, etc.; the Position of the Union Government in