

Our readers will find that by working a few examples such as the above they acquire much additional power in the questions usually given relating to the roots of quadratics. The farther the student advances in mathematics, the more distinctly he sees not only the regions he reaches, but those also that he left behind.

PROBLEMS CONTRIBUTED BY SUBSCRIBERS.

14. A municipality borrows \$10,000, interest at 7 per cent., coupons payable semi-annually. What tax must be levied to pay the interest, and create such a sinking fund as will absorb the debt in 10 equal annual payments?

"A SUBSCRIBER."

15. Solve the simultaneous equations

$$\begin{cases} y^2 + x = 11 \\ x^2 + y = 7 \end{cases}$$

16. Given the distance of a point in an equilateral triangle from each of the angular points of the triangle, to construct the triangle.

A. B., Montreal.

17. Given the base of a cone 24 inches, the slant side 20 inches, required the perpendicular distance from the base of the highest point in the side of the cone through which a plane must pass, that the section may be the greatest parabola possible.

J. W. PLACE, Augusta.

G. H. B., of the Sheffield Academy, has sent in three different correct solutions of Prob. 6 of the March number.

J. W. P.—Your solution of Prob. 4, March number, was not correct. The difficulty you attempted to get over in your second communication is still the weak point.

G. S.—Your solution was not correct. In your first solution of the windmill problem you did not sufficiently appreciate the experimental basis on which a correct solution must rest. See Prof. Galbraith's solution in a back number.

J. P.—Your propositions were correct, but your attempts at the deductions were all failures. The lateness of the arrival of your first communication prevented us from noticing it in the April number.

Practical Department.

ATTENTION; HOW TO SECURE AND RETAIN IT.

BY JAMES HUGHES.

1. KINDS OF ATTENTION.

Attention may be of two kinds, *Negative* and *Positive*.

Negative Attention.—A pupil may look without seeing, listen without being conscious of hearing, and hear without comprehending. He may sit and dream. The mind has inner as well as outer gates. The outer gates admit merely to the courtyard of the mind. A great many pupils keep the inner doors closed to much of the teaching done by their teachers. We may perceive without receiving distinct conceptions. Thousands look at a store window in passing it without being able to name or even give the color of a single article in it.

We may hear also without taking in the thoughts of the person speaking. How often men sit in church and hear a preacher's voice without hearing his words. The sounds he makes get through the gates of the castle wall, but the castle itself is shut and filled with other tenants. The telephonic key has not been adjusted, and direct communication has not been established. We hear various sounds—the bell of the factory or the school, the whistle of the steam engine, the song of the birds, &c.—without

always being consciously impressed by them. Sometimes they influence or arrest our lines of thought, but more frequently, unless they convey a special message to us, we allow them to pass unheeded. Negative attention consists in the outward marks of attention merely. It is a form without reality; a seed without an active germ, from which nothing of life and beauty can ever spring.

Positive Attention.—A pupil who gives positive or active attention, is attentive not merely with his body but with his mind. He has the inner as well as the outer gates of his mind open. His mind must be *willing* to receive the thoughts his teacher has to communicate, and it must not be preoccupied, or *actively engaged with other thoughts*. He must for a time forget his personality, and turn from thoughts of his own plays and work and all that directly interests him. He must get out of his own current of thought and into that of his teacher.

Positive attention is the kind of attention which a teacher must have from his pupils if he wishes to impress them. If he secures only *negative* the minds of his scholars may be a thousand miles away whilst their bodies may occupy positions of most reverent attention. Careful attention is therefore directed to the following considerations:

1. **Positive attention is very difficult to obtain.**—This should not discourage the teacher, however. It is one of his highest duties to his pupils to train them to be able to fix their undivided attention on one subject. The extent to which a man can rivet his attention, and control the working of his own mind, decides the standard of his intellectual power. The force of a stream becomes resistless as its channel becomes restricted. The genial rays of the sun when brought to a focus have intense burning power. The mind which admits various subjects at the same time, and as a result becomes confused and full of but indistinct ideas, might, if all its energies were directed to the investigation of only one subject, mount with majestic tread from height to height in original investigation.

It is a difficult matter, however, even for adults to concentrate their attention on the one subject in hand. How often the thoughts which we hear uttered, or which we read, make no deeper impressions on our minds than the "shadows of the passing clouds do upon a landscape." A teacher should be patient when he finds that some active-brained boy or girl is in "wonder-land," when he is supposed to be revelling in the delights of complex fractions. It is often injurious to a very young child to startle it from its reveries. Mental links may thus be broken which will never be re-united. This remark should, however, be noted by parents and teachers of individuals, rather than by teachers of classes.

2. **Positive attention is a "result of good teaching rather than a condition on which the power to teach well depends."**—Those effeminate, or fossilized teachers, who weakly say, "Oh, dear! if my pupils would only give me their attention, I could teach them so well," should honestly say, "If I taught better, my class would attend to my teaching." It is of course true that the minds of the pupils may influence that of the teacher, but the extent to which this is true depends almost entirely on the teacher himself. Four things settle the question of mental control between the teacher and the taught.

1. The natural strength of the teacher's mind.
2. His force of character.
3. The interest he takes in his work.
4. The clearness of his conceptions of the subjects he desires to teach.

The weak, careless, indolent teacher, who has not thoroughly prepared the special lesson he has to teach, will not be a controlling power to a very large extent.