$\angle C B A$ (I. 16), and $\therefore > \angle B G E$ — an absurdity. $\therefore \angle A B C$ not $< \angle A C B$, and can be proved not greater. $\therefore \angle A B C = \angle A C B$, and $\therefore A B = A C$ (I. A). Q. E. D.

EXERCISE.—Shew that $D C$ produced must divide angle $G C E$.

SUBSCRIBER, L'Orignal.—The expression $\underline{6}$ is read "factorial 6," and means $1 \times 2 \times 3 \times 4 \times 5 \times 6$.

D. M. CHISHOLM has sent in a correct solution of the problem, "Three Gambles, &c.," which appeared in the JOURNAL of November last.

Practical Department.

LAWS OF ACQUIRING AND RETAINING KNOWLEDGE.

BY JAMES L. HUGHES.

1. The *sources* of acquired knowledge are books, men, and things.

2. The *methods* of acquiring knowledge are, in the reverse order of their teaching power: reading, hearing, seeing, and experimenting or doing.

3. *General Rule.*—Independent of differences in brain power, the *readiness* with which knowledge is acquired depends on *the attitude of the mind towards our sensations.*

4. The *rate* of learning depends in each individual on the *intensity of attention* paid to the subject.

5. The *clearness* of our conceptions depends on:

(*a.*) Attending to only *one thing at a time.*

(*b.*) The *source* from which we receive knowledge; books, men, or things.

(*c.*) The *method* of learning: reading, hearing, seeing, experimenting or doing.

6. The *depth* of an impression is influenced by the *time* we devote to a subject. Dwell. Give a thought time to be photographed.

7. The *permanence* of conceptions depends on:

(*a.*) The condition of health of body and brain.

(*b.*) The *clearness* of our conceptions.

(*c.*) Intensity of attention; modified by interest, pleasure, or pain.

(*d.*) *Repetition*, to ourselves and others, in concert or individually.

(*e.*) *Association of Ideas.*—One idea suggesting another. This may be regarded as the foundation of memory. It depends on

1. *Similarity* in part or in whole, in appearance, shape, color, sound, etc. A single feature, or tone, or movement serves to recall a friend residing in New York, and immediately a thousand ideas connected with the friend or the city he lives in flash in succession through the mind.

2. *Contrast.*—Youth—old age; cradle—grave; palace—cottage, etc.

3. *Contiguity*, (*a.*) of *time*; (*b.*) of *Place. Time.*—We say a thing occurred about the time of the famine, the great heat, the severe frost; when James was born, or Emma married; during Lord Elgin's time, or Lord Dufferin's, etc. *Place.*—Start from the home of your childhood. How one object will suggest another as you sweep along in any direction in imagination! The store, the blacksmith's shop, the school house, the church, the hill, the creek, etc., follow each other in their proper order, the one being suggested by the other.

ELEMENTARY ARITHMETIC.

READ BEFORE THE LANARK TEACHERS' ASSOCIATION; BY I. J. BIRCHARD, B.A., PRINCIPAL PERTH COLL. INSTITUTE.

I conceive education, in the true sense of the word, to be, the development of the natural powers of the mind; whoever aids that development is an educator. I thus make a careful distinction between communicating facts and educating—between a mind possessed of knowledge and an educated mind. In the former case the pupils are mentally paupers, and the teacher a dispenser of charity; in the latter the pupils are labourers sowing the seeds of a future harvest, while the teacher watches over and directs their efforts, and takes care that wheat—not tares—is sown. The former *mind is a storehouse which contains nothing except what is placed* in it; the latter is fertile soil ever producing fresh harvests.

In this brief essay on teaching Elementary Arithmetic, I propose to show how to carry on this educating process simultaneously with the acquirement of knowledge. In educating a child, the teacher and nature are co-workers; nature furnishes the programme which the teacher must faithfully carry out, if he would secure a symmetrical and not a distorted result. The young mind rapidly gains both knowledge and power from observation and drawing conclusions therefrom; it is the part of a judicious teacher to direct his pupils to the making of profitable observations and to the drawing of correct conclusions. In teaching arithmetic, *i. e.*, increasing a pupil's knowledge of number and his power to reason about number, two principles should be kept constantly in view:

(1) A knowledge of number in the abstract must be preceded by a knowledge of number in the concrete.

(2) Each new principle must be clearly connected with, or rather grow out of, what is already quite familiar.

A child first learns to distinguish a single object from more than one; then to distinguish a group of two, then three, &c., to ten; which requires nearer observation, and is a greater amount of knowledge than most persons imagine. With this amount of knowledge at five years of age he enters a public school, and if his knowledge of arithmetic is to be increased, whether by formal teaching or otherwise, the increment must be added to 'ten'; any attempt to build from 'eleven' will certainly be a failure.

In most cases, however, the pupil will obtain sufficient exercise in counting from play and other casual sources, leaving to the teacher the task of translating his knowledge into a new language, that of symbols. At this stage it is quite sufficient to familiarize the pupil with the forms, in figures, of the numbers with which he is already familiar. The *theory* of notation is as much above his comprehension as the moon is beyond his reach.

Just as the idea of number is first obtained from 'things', and then represented by symbols; so must the operations of addition, &c., be first performed on visible, tangible objects, and then the same operation performed with symbols.

Such is education in the full sense of the word; a slow process for acquiring the ability to pass examinations, perhaps, but the only way to promote brain growth, or to increase the mental powers.

I proceed now to some practical examples of the preceding theory.

The multiplication table is the first grand difficulty which the young mathematician has to encounter. Its difficulties may be greatly lessened, and valuable mathematical training may be given,