United States Patent [19]

Evans

[11] **3,788,644**

[45] **Jan. 29, 1974**

[54] **MATHEMATICAL BOARD GAME APPARATUS**

[76] Inventor: **Brent R. Evans,** 1660 Calado Ct., Campbell, Calif. 95008

[22] Filed: **Nov. 10, 1971**

[21] Appl. No.: **197,216**

[52] **U.S. Cl.** ..... **273/134 AD,** 35/32, 273/1 R, 273/134 D, 273/134 GM, 273/134 GP, 273/136 C, 273/137 AD

[51] **Int. Cl.** **A63f 3/00**

[58] **Field of Search** ... 273/130, 131, 133, 134, 135, 273/136; 35/32

[56] **References Cited**

UNITED STATES PATENTS

3,211,459	10/1965	Kropinski	273/136 C X
486,308	11/1892	Watt	273/133
705,873	7/1902	Schinkel	273/136 K UX

FOREIGN PATENTS OR APPLICATIONS

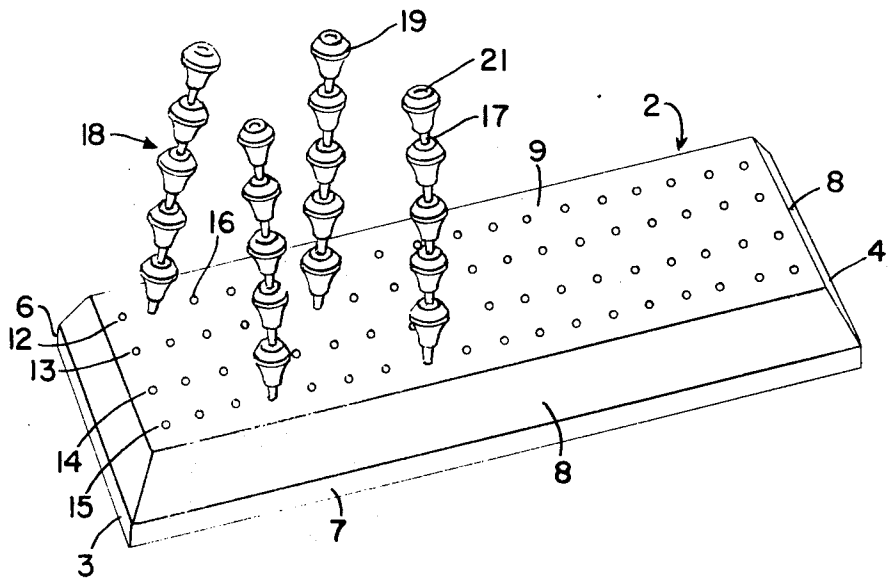
841,727	7/1960	Great Britain	273/134 GM

Primary Examiner—Delbert B. Lowe
Attorney, Agent, or Firm—John J. Leavitt

[57] **ABSTRACT**

Apparatus for playing a mathematical game including an elongated block having at least four rows of 18 apertures each adapted to receive the stem of a mover, of which there are 20, and a plurality of dice adapted to be manipulated by each player in turn to determine the number of apertures encompassed within each move. Each mover is provided with a bore correlated in depth and diameter to the shank of another mover so that when the shank of a mover extends fully thereinto the mover lies somewhat tilted within the supporting bore. The game is designed to provide an adequate experiential base (involving choices, physical actions, and consequences) to promote, over a period of time, success in developing mathematical abilities.

8 Claims, 5 Drawing Figures



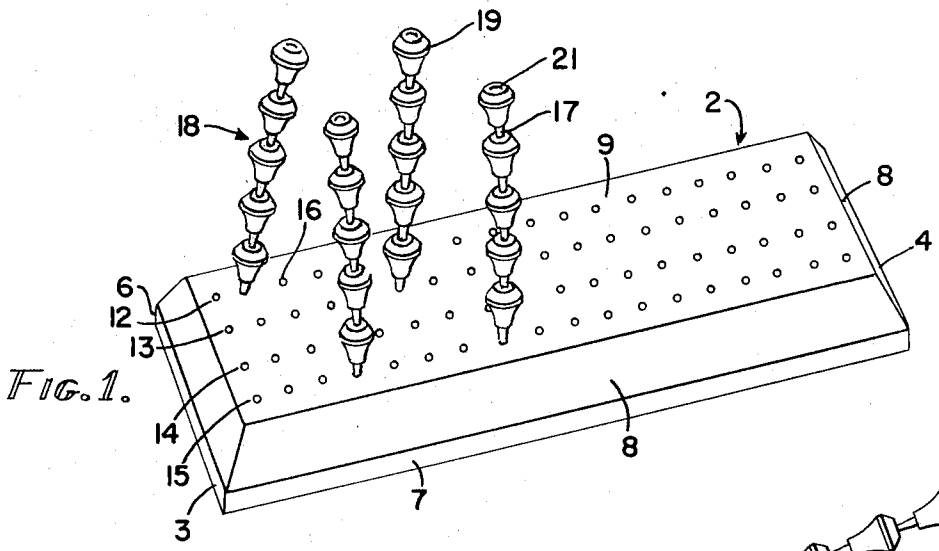


FIG. 1.

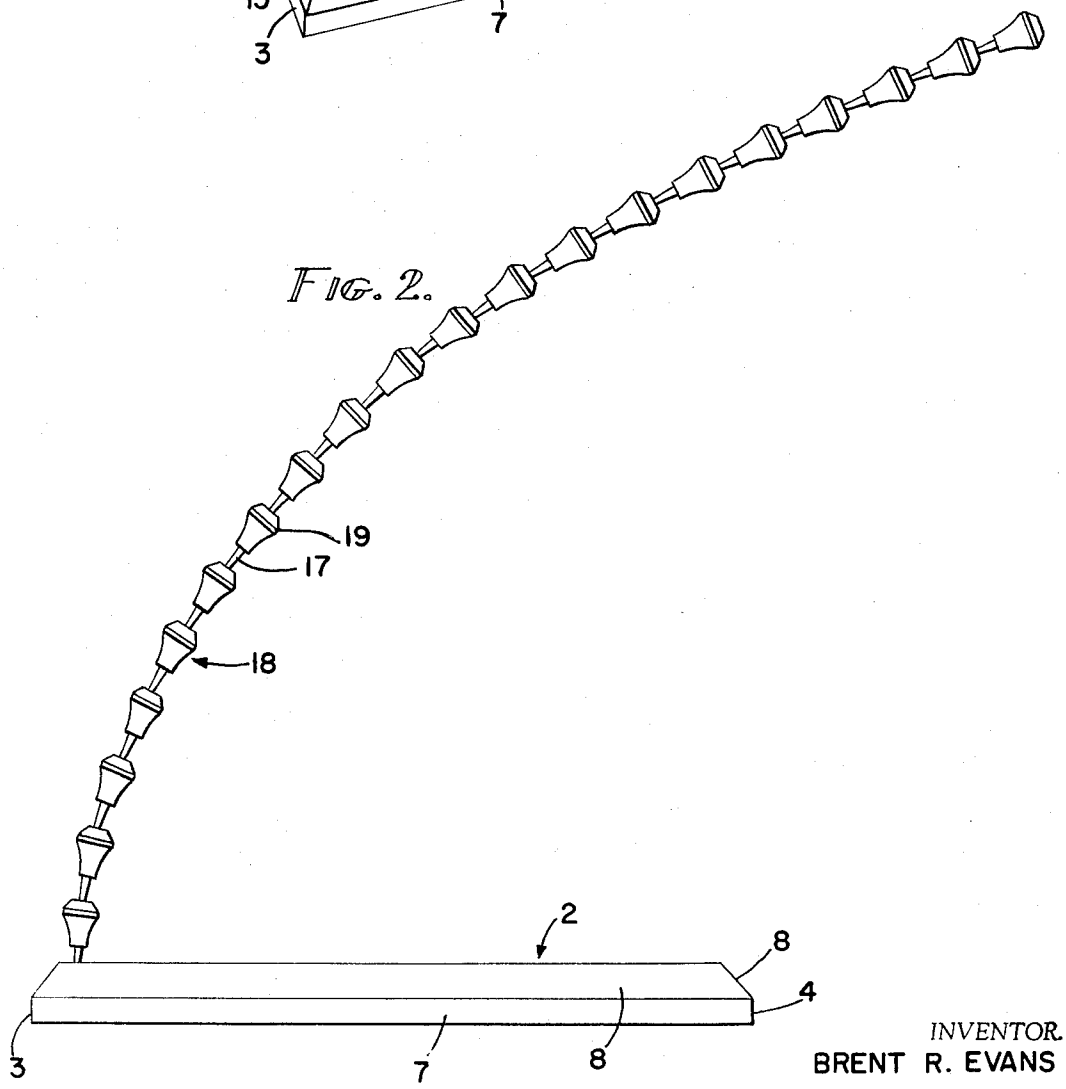


FIG. 2.

INVENTOR.
BRENT R. EVANS

BY John J. Leavitt

FIG. 3.

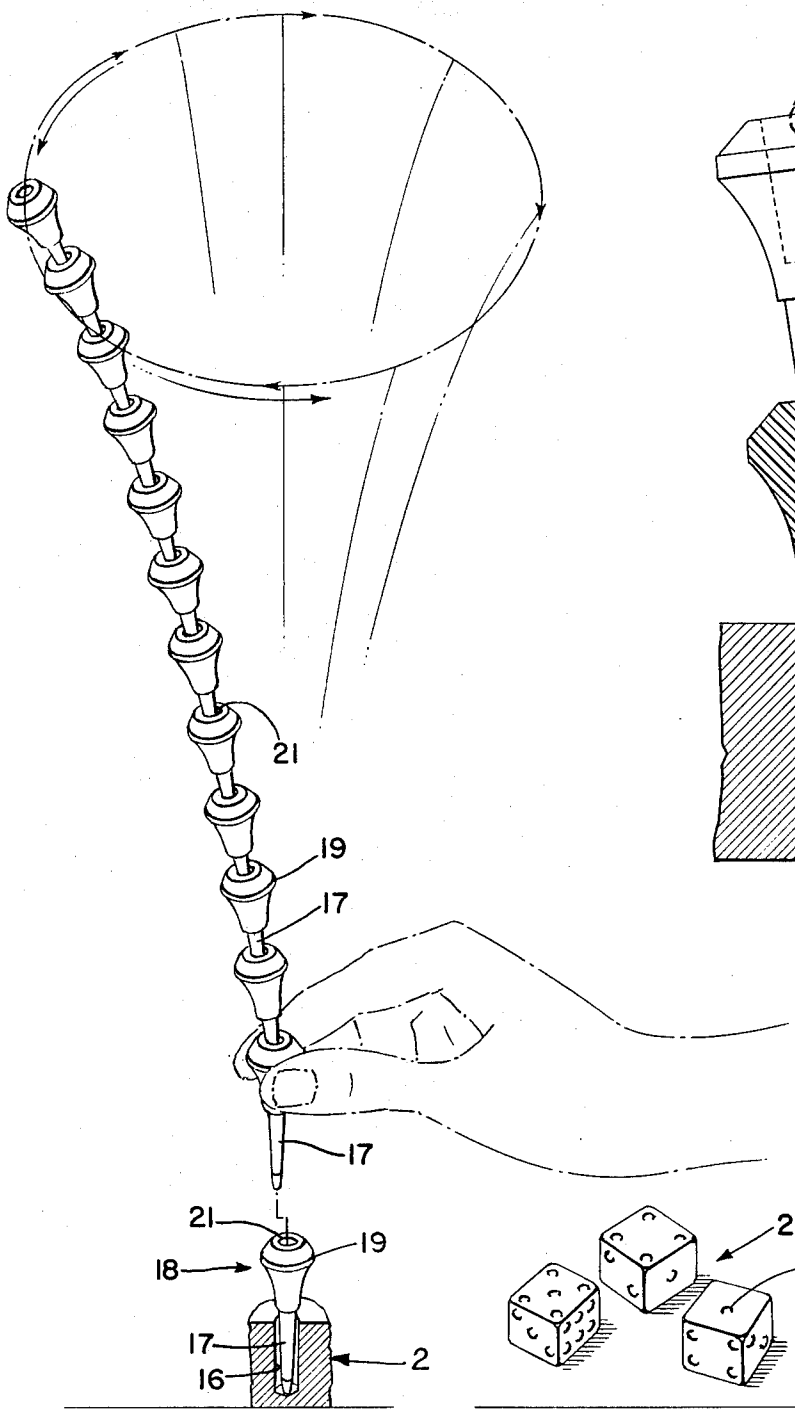


FIG. 4.

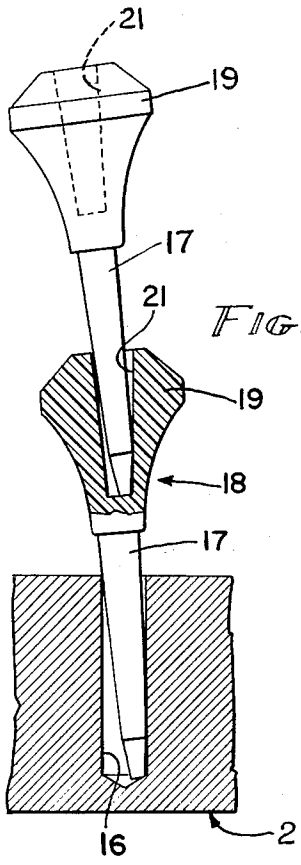


FIG. 5.

INVENTOR.
BRENT R. EVANS
BY John J. Leavitt

MATHEMATICAL BOARD GAME APPARATUS

BACKGROUND OF THE INVENTION

Persons of all ages may have more or less difficulty with mathematical development. One of the most common problems exhibited by people having trouble dealing in mathematical concepts and operations is the abstract nature of mathematics. If a person has memorized methematical "facts" or sequences of operation without an adequate and concrete base of experience as to what the mathematical symbols actually stand for, he must rely too heavily on rote memory. This is clearly illustrated in the concept of how much a number is and how different numbers and quantities compare in magnitude with other numbers and quantities. Without such an understanding, a person may memorize that $7 + 3 = 10$, but he has little understanding or feeling as to what this actually means. He therefore is sometimes correct in his answers or calculations, but can be wrong (example $7 + 3 = 15$) and not be aware that he is wrong. It is as if the person had memorized that $G + C = U$. Not only do frequent errors result, but the person experiences stress and difficulty when he tries to think in mathematical terms and do more than merely calculate. It has been found that if mathematical skills can be learned in the form of activity classified as amusement by the players themselves or as a game, the players develop the mathematical skills without even knowing that such development is the object of the game. Accordingly, it is one of the objects of the present invention to provide apparatus for playing a mathematical game which is suitable for play simultaneously by players of different levels of mathematical development.

One of the difficulties encountered by teachers is the inability to determine what area of mathematical development is creating the impediment to further development. Accordingly, it is one of the objects of the present invention to provide apparatus for playing a mathematical game in which the mere participation in the game by a player will quickly illustrate the area of difficulty for the specific payer, and create the conditions whereby the difficiency can be overcome.

The intellectual development of a child is dependent upon many factors. With respect to intellectual growth and development in relation to mathematics, the child must learn for instance the concept of one-to-one correspondence and the vital concept of how much a number really is. It has been found that these concepts may best be taught to a person if the person is "activized" or becomes involved in making decisions in such a way that he continually goes back and forth from abstract concepts to concrete examples to motorical or physical movements resulting in varying consequences from decisions of his will to achieve the concrete example or goal. Accordingly, it is another object of the invention to provide a game apparatus which may be utilized by from two to four players of all ages from 18 months to adulthood so as to achieve the learning goals indicated.

It is generally accepted as a truism that most of what a child learns from date of birth through the first several years he learns by observation of others and by imitation. Thus, it is important that a child be permitted to observe others playing a game at their own respective levels, whether it be at the same age level as the child observer, or at an older age level in which proficiencies are greater than those of the child observer. Accordingly, it is an object of this invention to provide game apparatus that will permit a child, even 1 of 18 months, to imitate others playing the game, and provide the child with an opportunity to develop basic counting and coordination skills through such imitation and his own instinct for exploration.

It is another object of the invention to provide a game board apparatus which is easily manufactured, economical in cost to the consumer, and durable so as to provide years of use without injury.

The invention possesses other objects and features of advantage, some of which with the foregoing will be apparent from the following description and the drawings. It is to be understood, however, that the invention is not limited to the embodiment illustrated and described, as it may be embodied in other forms within the scope of the appended claims.

BRIEF SUMMARY OF INVENTION

In terms of broad inclusion, the game board apparatus comprises a generally elongated rectilinear block one surface of which has been bored to provide a plurality of rows of apertures extending parallel to the longitudinal dimension of the block. Each of the rows contains a multiplicity of apertures, the preferred number in one embodiment being eighteen. In the embodiment illustrated, there are four such rows of apertures. Adapted to fit snugly into each of the apertures, is a mover formed so that a multiplicity of movers may be superimposed one above the other in interengaging relationship. The movers may also be inserted in the various apertures. Another part of the game apparatus is a plurality of dice, preferably three, each die having indicia thereon from one to six as is usual with such dice.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view illustrating the game board apparatus with four groups of movers supported on the game board.

FIG. 2 is a side elevational view of the game board, with all of the movers interengaged and supported in a single column.

FIG. 3 is a perspective view, partly in vertical section, illustrating the manner of engagement of one of the movers with an aperture in the board, and illustrating also the freedom of movement that exists between interengaged movers arranged in a column when it is attempted by a player to superimpose such a column of movers on the lowermost mover engaged on the board.

FIG. 4 is a cross-sectional view, partly in elevation, illustrating the relatively loose interengagement between the lowermost mover of a column and the aperture within which it is inserted, and between the stem of a superposed mover and the aperture in the next lower mover into which it is inserted so as to permit freedom of movement of a column such as illustrated in FIG. 3, while enabling the entire complement of movers to be interengaged as illustrated in FIG. 2.

FIG. 5 is a perspective view of three dice forming a part of the game apparatus.

DESCRIPTION OF PREFERRED EMBODIMENT

In terms of greater detail, the game board apparatus

of the invention comprises an elongated block designated generally by the numeral 2, fabricated from either wood, plastic or other suitable material, and having end edges 3 and 4, and side edges 6 and 7. Preferably, but not necessarily, the end and side edges are beveled as indicated at 8. The block 2 is provided with a top surface 9 having four rows 12, 13, 14 and 15 of blind bores 16 extending almost through the thickness of the block 2. As illustrated in FIG. 1, each of the rows 12–15 of blind bores contains at least 18 such bores so that there are a total of 72 bores formed through the surface 9 of the block. As illustrated in FIG. 4, each of the bores 16 is proportioned in diameter to loosely receive the shank or stem 17 of a mover designated generally by the numeral 18. The mover is provided with a bulbous head 19 integral with the shank 17, and the head 19 is provided with an axially disposed longitudinally extending blind bore 21 as shown.

Referring to FIG. 4, it will be seen that when the shank 17 of the mover 18 is inserted into the blind bore 16 on the game board, the diametric proportions of the shank 17 and bore 16 are such that the mover lies in the bore somewhat tilted so that the axis of the mover and the axis of the bore 16 lie angularly disposed one with the other. In like manner, and as shown in FIG. 4, the bore 21 formed in the head 19 of each of the movers is proportioned in depth and diameter so that when the shank 17 of a superposed mover is inserted into the bore 21, the superposed mover lies slightly tilted with respect to the underlying mover, the axis of the superposed mover being somewhat angularly disposed to the axis of the bore 21.

It is important in teaching children digital manipulation of physical things that they develop dexterity in connection with such manipulation. Accordingly, if the movers fit tightly into the bore 16, or if interengaged movers fit tightly with respect to each other, there would be little opportunity for relative movement between the movers and the game board or between the movers themselves. There would thus be less opportunity for a child to develop his dexterity. It is for this reason that it is an advantage and is beneficial to the learning processes of a child or player regardless of age that the dimensions or proportions of the bores 16 and 21 and the shanks 17 of the movers be such that the movement illustrated schematically in FIG. 3 will be permitted. It will thus be seen that manipulation of a column of movers as indicated in FIG. 3 lends excitement to the game in that it requires a considerable amount of dexterity and physical control of the column to prevent the column from falling over.

As illustrated in FIG. 5, another part of the apparatus comprises a plurality of dice designated generally by the numeral 22, each being provided with indicia 23 on the various facets of the die, the indicia ranging from the numerical value "1" to "6" as is usual with conventional dice.

To secure the benefits of the game apparatus, at least four different games may be played by from two to four players of all ages from 18 months through adulthood. In one game, which may be called "Imitation," the player, which may be a child of approximately 18 months, is permitted to play freely with the board, movers and dice to form whatever patterns occur to him, stack the movers in whatever numbers occur to him, and even try some elementary counting of the bores or apertures between adjacent movers. In this game, it is important that the child observe others playing the game at their own levels of intelligence so that he can imitate their actions. Such imitation affords the child the opportunity to develop basic counting and coordination skills through his imitation of the actions and activities of others and his inherent tendency toward exploration.

It will thus be seen that it constitutes an almost effortless way for a child to acquire a tremendous foundation of skills. For instance, by rolling one or more dice, the child learns to correlate the number of indicia indicated on each die with the number of blind bores formed in the board, and as his proficiency and dexterity increase through participating in the game, he is enabled to move the movers the requisite number of places indicated by the indicia on the dice. He thus almost effortlessly is being taught to count and to correlate one form of information with the motorial impulses required to achieve a certain goal. By motorial impulses is meant the activation of motor nerve centers in the body to effect movement of the body in accordance with the exercise of the will.

In a second game that may be played with the apparatus, the object is for the different players, up to four, to race from a point of commencement on the board, which may be either one or the other of the ends of the board, to the last hole or bore in the row in which the player has chosen to play. Each player chooses a mover of a particular color and, as indicated in FIG. 1, there are preferably a total of 20 movers, groups of five of the movers being of distinctive colors. Each player places one mover in the first hole in the row of holes that he has chosen to play on. Each player in turn may choose whether to roll one, two or three dice to determine the number of holes he is required to move his mover. Thus, on each move, or with each roll of the dice or die the player must place his mover into each hole as he counts. The player moves his mover the number of holes indicated on the dice he has thrown. If the player rolls a number which is greater than that required to reach the last hole in the row, constituting a numerical difference or overage, the player must retreat along that row the same number of holes that corresponds to the numerical overage. In other words, he must move back toward the starting point the number of holes corresponding to the average. On the next turn, he may again move toward the goal, being the last hole in the row he is playing on, but again any overage will cause him to bounce back along the same row. The game ends when one player moves into the last hole in the row without having to bounce back along the row because of an overage.

In this game, it will be seen that each of the players consciously or unconsciously is being exposed to the mathematical concepts of one-to-one correspondence, the magnitude of different numbers, and an elementary concept of probability (how many dice to roll). By having to place the mover in each hole as he counts, the player develops the basis for the concept of one-to-one correspondence needed in building later mathematical abilities. A young child, or even an older one, who has difficulty in mathematics, is likely to count in a disconnected manner. He will show this by skipping holes or numbers as he counts. Since the objective of the game is to land in the last hole and the consequence of rolling too high a number is to bounce back

away from the last hole in the row, the child will begin to develop a feeling for the magnitude of different numbers and their probability depending on the number of dice thrown. He will then begin to make more efficient decisions concerning how many dice he should roll depending on the distance he is from the last hole or goal. It is advisable to let the child discover these concepts on his own. Children who have difficulty in mathematics need to understand more and memorize less. The game itself on each turn will provide immediate feedback on how much a number is. It is vital that the child become an active learner who develops real understanding of concepts from actual experience rather than becoming a recipe follower.

A third game which may be played utilizing the game board apparatus is intended to develop the concepts of the magnitude of numbers and estimating. The object of this game is to capture your opponent by landing on top of him. This game may be categorized as a "chase" type game in which each player chooses a mover of a different color and places it anywhere in a single designated row common to all players. Each player in turn chooses one, two or three dice to roll. The indicia shown on the dice, whether it be one die or three dice, indicates the number of holes the player is required to move his mover.

Movement of the mover can be in either direction on each turn, but must be confined to the row within which the play is commenced. Once the move is started by the player, he cannot change direction except by bouncing back (overage) from the last hole in the row if the number of moves he must make is sufficiently large to require such a retreat. If the number of moves indicated by the die or dice results in the mover landing in the exact hole occupied by the mover of an opponent, the player places his mover on top of the opponent's mover and the opponent is considered to be out of the game. The player whose mover is superimposed over the opponent's underlying mover is said to have "captured" the mover of his opponent. The game ends when all the movers are in one stack with the player whose mover is on top, determined by the color of that mover, being designated the winner of the chase.

From the above it will be apparent that a player who does not really understand how much a number is, will show this lack of understanding by reacting only after counting out his moves. For example, his mover may be ten holes away from his opponent when he rolls a five. A player deficient in an understanding of the magnitude of numbers and estimating will not realize that moving his mover five holes will not place him on top of his opponent. He achieves this realization only after he counts out his moves. So far as the estimating concept is concerned, this skill is being developed in the player each time the player chooses one, two or three dice to roll in order to obtain the greatest chance of getting the number he needs to land exactly on top of his opponent and thus capture the mover of his opponent.

The concepts discussed heretofore, and the skills that they develop through playing of the games described, may be enhanced by creating additional freedom and complexity of movements in a fourth game which may be designated "Top Man." The object of this game is to capture the movers of your opponents by landing on top of them and literally becoming "Top Man." This game is played by utilizing the entire board, including all four of the rows of bores and all of the 20 movers. Each player chooses a different color mover and places all five of his movers at random anywhere on the board. Then, each player in turn chooses one, two or three dice to roll.

The player is entitled to move any one of his movers the number of holes corresponding to the indicia indicated on the dice he rolls. Movement can be in any pattern or direction along the length or width of the board. A player, however, may not touch the same hole twice on any one turn, and moves in a diagonal direction between holes are not permitted. When the player chooses to cross over a man that lies in his path, the crossed-over hole counts the same as any other hole. It will thus be seen that as a player "captures" the movers of his opponents, the column of movers under his control may become quite high. This condition is indicated in FIG. 1 in which the columns are each made up of five movers, and is indicated also in FIG. 3 in which 12 movers interengaged as shown are superimposed over a 13th mover engaged in the board.

As indicated in FIG. 2, all of the movers can be placed end to end in a single stack without any of them falling if the player has the manual dexterity to control the movement of the movers as the stack is moved over the board. Should a player in the process of moving a column spill the column of movers, whatever remains of the stack is claimed by the player whose mover remains on top. For example, the column may belong to the red player, but after a spill, a yellow mover may be the top mover of the column. That column then belongs to the player who claims title to the yellow movers.

In this game, to increase the complexity and additional freedom of movement, each player may change his direction of movement any time during the course of his turn, but he may not move into the same hole twice during that turn. The game ends when all the men are in the control of one player. It is then said that the winner is "Top Man."

As will be apparent from above, the additional freedom of movement and complexity of movements increase the number of alternatives available to the player. The player thus develops the ability to visualize and execute a pattern of movement which will result in capturing his opponent. When a player learns to estimate the magnitude of a number in a straight line, the next step is to be able to estimate the magnitude of numbers in patterns of movements or when there are distracting elements. By this technique, it will be seen that the player really learns to know how much a number really is. As the columns build up, the game becomes hilarious in that, as indicated in FIG. 3, it requires a considerable amount of manual dexterity to move the column from one position to another. Additional interest may be introduced into the game, and the estimating concept may be enhanced by requiring each player to move immediately after each roll of the dice rather than spending time attempting to determine the best course to follow to reach his objective.

In the game board and apparatus illustrated, the game board may be fabricated from a suitable block of hard wood or plastic while the movers may be formed from a suitable resin material or wood as desired. As with most conventional dice, the dice 22 may conve-

niently be fabricated from a suitable synthetic resin material.

Having thus described my invention, what is claimed to be novel and sought to be protected by letters patent, is as follows:

1. Game apparatus adapted to enhance a player's knowledge of mathematical concepts, comprising:

a. a game board comprising a block having a plurality of rows of bores therein, each row including a multiplicity of such bores;

b. multiplicity of movers adapted to be digitally manipulated in turn by a plurality of players, each said mover having a bore in one end thereof and a stem at the other end, said stem being proportioned with respect to the bores in said movers and game board to enable insertion of said stems in the bores of said movers and game board; and

c. at least one die having numerical indicia on its various facets and manipulable to determine by chance a number indicating the number of bores a player may move a mover on said board.

2. The combination according to claim 1, in which said game board is elongated and provided with four rows of said bores.

3. The combination according to claim 1, in which said rows of bores in said game board are parallel to each other and each row is constituted of at least eighteen bores.

4. The combination according to claim 1, in which a total of at least 72 bores are provided in said game board arranged in at least four rows.

5. The combination according to claim 1, in which said multiplicity of movers are divided into a plurality of distinguishable sets correlated in number to the number of rows of bores.

6. The combination according to claim 1, in which said multiplicity of movers are divided into a plurality of sets, each set being of a different color than the other sets.

7. The combination according to claim 1, in which each said mover comprises a bulbous body portion arranged about a central axis, the stem extending along said axis from said body, and said bore extending into said body from the side thereof opposite said stem.

8. As an article of manufacture, a mover for use in conjunction with a game board having a multiplicity of bores therein; comprising:

a. an elongated body having a bulbous portion at one end thereof arranged about a central axis;

b. a stem extending from said body along said axis; and

c. a bore in said bulbous portion extending thereinto in the same direction as said stem and proportioned to form a socket to receive the stem of a superposed mover, the proportions of said stem and bore being such that when a stem of one mover is fully inserted into the bore of another mover the axes of the stem and bore lie angularly disposed one to the other.

* * * * *