(ten-thousand's place or hundred-thousand's place). We could do this in our base-twelve system and call the next place the dozen-gross' place.

As you can see, this exploration with the base-twelve system could go on and on. Most classes will probably only want to explore the dozen's place and gross' place. But remember, whenever you are teaching bases...Don't Forget Base-Twelve.

REFERENCES

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Adler, Ruth and Irving. Numerals: New Dresses for Old Numbers. New York: John Day and Company, 1964.

THE UPS AND DOWNS OF PROBABILITY

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As probability becomes a part of more and more high school curricula across the country, we need to look about for honest examples of probability usage in everyday life. Dealing bridge hands, rolling dice and flipping coins are all right for an introduction, but it seems contrived, artificial, and of little practical use. To see how probability theory is used every day, let's take a look at a modern convenience that everyone takes for granted--the automatic elevator. How are these designed for efficiency in modern buildings?

In designing a high-rise office building the number of elevators, their capacity and how fast they travel must be determined. This problem is different from converting manual elevators to automatic ones. With existing manual elevators all the factors are known before conversion begins. What about a building where the foundation is not laid and no leases have been signed? How does a designer plan for efficient elevator operation? Questions such as how many elevators are needed, what capacity and how fast should they travel must be answered. Over design is out of the question. Bids are competitive so economy of installation and operation is an overriding consideration.

Years of experience have led elevator engineers to develop the following probability formulas. If little is known about the distribution of future workers, then it must be assumed that the elevator has an equal probability of stopping at any floor. Naturally, if it is known that floor five is being planned for one hundred workers and floor six is going to be a computer center with only ten staff members, then the calculations will be refined. Given an equal distribution of workers per floor let UP represent the probable number of stops an elevator will make after leaving the lobby.

$$UP = S - S\left(\frac{S-1}{S}\right)^P$$

, where S = number of possible stops above the lobby and P = number of passengers on the elevator. Thus, in an eleven story building (ten floors above the lobby), an elevator with four passengers can be expected to make $10-10\left(\frac{9}{10}\right)^4$, or 3.439 stops.

Three interesting facts are worth inserting here. Engineers figure the average passenger weight at 150 pounds. Going up to work in the morning passengers will generally occupy an elevator to 80% of capacity. Going down to exit the building at quitting time, passengers will fill the elevator to 100% of capacity.

Here are two more important formulas. To calculate the probable number of stops an elevator will make going down to the lobby, multiply the UP by .75. At lunch time when there is considerable up and down traffic, the probable number of stops an elevator will make in a round trip equals UP times 1.75. One set of possible classroom exercises follows:

1) Fill in the table.

PROBABLE NO. OF STOPS ON A ROUND TRIP AT 12:30 P.M.

PASSENGERS PER TRIP

NUMBER OF FLOORS SERVICED

After completing the chart, go to an appropriate building and observe how close your predictions were. Try to learn something about the populations of each floor. Does this account for any errors in prediction?

2) How fast does the elevator travel, measured in feet per second?
3) How many passengers must enter a car, or is it a definite time interval, before the car leaves the lobby?
4) What kind of electronic brain is needed to control the operations of a bank of elevators?

Suggested further reading:

Strakosch, George R., Vertical Transportation: Elevators and Escalators. John Wiley & Sons, 1967.

An absent-minded professor cashed a check and was inadvertently paid in dollars what the check called for in cents, and in cents what was called for in dollars. He did not notice this until later on, when he found he had exactly twice as much money in his pocket as he should have had. By that time he had spent 41¢. How much did he have left ?