

- 3.** There are 9 choices for the first digit and ten choices for each of the other three digits. By the Multiplication Principle
- $$9 \cdot 10 \cdot 10 \cdot 10 = 9000$$
- different four digit numbers can be formed.
- 6.** By the Multiplication Principle the building contractor will need to show 24 different models.
- $$3 \cdot 2 \cdot 4 = 24$$
- 15.** Since there are 26 different letters and 10 different digits, by the Multiplication Principle, a user name formed by choosing 4 letters followed by four digits can be done
- $$26 \cdot 26 \cdot 26 \cdot 26 \cdot 10 \cdot 10 \cdot 10 \cdot 10 = 26^4 \cdot 10^4 = 4,569,760,000$$
- ways. So theoretically there are 4,569,760,000 different user names possible.
- 16.** A user name consists of four letters followed by four digits, but no letter or digit can be repeated. By the Multiplication Principle reveals there are
- $$26 \cdot 25 \cdot 24 \cdot 23 \cdot 10 \cdot 9 \cdot 8 \cdot 7 = 1,808,352,000$$
- different user names possible.
- 17.** In this problem letters and digits can be repeated, but no two adjacent symbols can be the same. In the first spot we can choose any one of 26 letters, but in the second position there are only 25 letters available. (We cannot repeat the letter to its left.) In the third position there are again 25 possible letters because the letter in the first position can be used, but the one in the second position cannot. The fourth position also has 25 available letters.
- Similar reasoning is used for choosing the digits. Any one of 10 digits can be chosen for the fifth position, but only 9 that can be used in the sixth position. The seventh and eighth positions each have 9 possible digits that can be used.
- Using this reasoning and the Multiplication Principle, we find that there are
- $$26 \cdot 25 \cdot 25 \cdot 25 \cdot 10 \cdot 9 \cdot 9 \cdot 9 = 2,961,562,500$$
- user names for the system.
- 18.** If the name must start with A, there is only one choice for the first position. Similarly, if it must end with 9, there is only one choice for the eighth position. Then by the Multiplication Principle, there are
- $$1 \cdot 26 \cdot 26 \cdot 26 \cdot 10 \cdot 10 \cdot 10 \cdot 1 = 26^3 \cdot 10^3 = 17,576,000$$
- different user names that begin with A and end with 9.
- 21.** By the Multiplication Principle, we see that Adam has
- $$9 \cdot 9 \cdot 3 \cdot 2 = 486$$
- different insurance options to choose from.