11c.   How many bit strings of length 8 begin and end with a 1?

$$12222221 = 1 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 1 = 1^2 \cdot 2^6 = 2^6 = 64$$

14.   Suppose that in a certain state, all automobile license plates have 4-letters followed by three digits.

c. How many license plates could begin with TGIF?

e. How many license plates could begin with AB and have all letters and digits distinct?

c.   TGIF $\underset{10}{/}\ \underset{10}{/}\ \underset{10}{/}$ $= 10^3 = 1000$

e.   AB (L)(L) (N)(N)(N) $= 24 \cdot 23 \cdot 10 \cdot 9 \cdot 8 = 397,440$
     $\underbrace{\quad}_{24}\ \underset{23}{(}\ \underset{10}{(}\ \underset{9}{(}\ \underset{8}{(}$

17.   a. How many integers are there from 1000 through 9999?

b. How many odd integers are there from 1000 through 9999?

c. How many integers from 1000 through 9999 have distinct digits?

d. How many odd integers from 1000 through 9999 have distinct digits?

e. What is the probability that a randomly chosen four digit integer has distinct digits? has distinct digits and is odd?

a. 1000 $\rightarrow$ $9 \times 10 \times 10 \times 10 =$ 9000

b. 1000 $\rightarrow$ $9 \times 10 \times 10 \times 5 =$ 4500

c. 1000 $\rightarrow$ $9 \times 9 \times 8 \times 7 =$ 4536

d. 1000 $\rightarrow$ $8 \times 8 \times 7 \times 5 =$ 2240

1234567890
| | | | /

e. $\dfrac{4536}{9000} = 50.4\%$ $\dfrac{2240}{9600} = 24.9\%$

5. a. How many five-digit integers (integers from 10,000 through 99,999) are divisible by 5?

   b. What is the probability that a five-digit is chosen at random is divisible by 5?

   a. $9 \times 10 \times 10 \times 10 \times 2 = 18000$

   b. $18000/90000 = 20\%$

24. a. How many integers from 1 through 1000 are multiples of 2 or multiples of 9?

   b. Suppose an integer from 1 through 1000 is chosen at random. Use the result of part (a) to find the probability that the integer is a multiple of 2 or 9.

   c. How many integers from 1 through 1,000 are neither multiples of 2 nor multiples of 9?

   a. $1000/2 = 500$
      $1000/9 = 111$

      $500 + 111 = 611$

      $1000 / 2 \times 9 = 55$

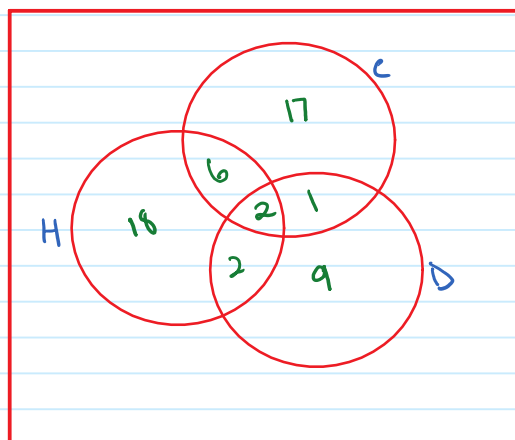 $611 - 55 = \boxed{556}$

   b. $556/1000 =$
      $\boxed{55.6\%} =$

   c. $1000 - 556 =$
      $\boxed{444} =$

33. e. How many students checked #2 and #3 but not #1?

   f. How many students checked #2 but neither of the other 2?

   H = 29
   C = 26
   D = 14
   H+C = 8
   H+D = 4
   C+D = 3
   H+C+D = 2

   Sample of Students
   100 total

   e. 1

   f. 17