University Computer Science Name: _____ Score: _____

1. A formula uses the variables p, q, r and s. How many rows does its truth table have?

   _____

2. $\{1\} \subseteq \{1, 2\}$, and also $\{1\} \in \{1, 2\}$.

   ☐ True ☐ False

3. In the step for $\Sigma i = n(n+1)/2$, the sum up to $k + 1$ is rewritten as –

   ☐ $(k+1)(k+2)/2$

   ☐ $k(k+1)/2 + k$

   ☐ $k(k+1)/2 + (k+1)$

   ☐ $(k+1)(k+2)/2 + k$

4. How many 4-digit PINs use no digit twice?

   _____

5. A road map has a million junctions, each joined to about four others. The best storage is –

   ☐ an adjacency list

   ☐ a list of all vertex pairs

   ☐ an adjacency matrix

   ☐ either; the cost is the same

6. Two fair dice: what is P(sum = 7 or sum = 11)?

   ☐ $8/36 = 2/9$

   ☐ $7/36$

   ☐ $2/11$

   ☐ $1/6$

7. The claim ”if the list is sorted, the search returns the right index” is shown false by an unsorted list that gets a wrong index.

   ☐ True ☐ False

8. How many subsets does a set with 5 elements have?

   _____

9. Use the formula to find $1 + 2 + \ldots + 100$.

   _____

10. How many committees of 3 can be chosen from 10 people?

    _____

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1. **16**

   Each variable is T or F, so there are $2^4 = 16$ combinations.

2. **False**

   {1} is a subset of {1, 2}, but it is not a member: the members are the numbers 1 and 2.

3. **k(k+1)/2 + (k+1)**

   Split off the last term: the hypothesis covers 1 to k, then add k + 1. Only after simplifying do you reach (k+1)(k+2)/2.

4. **5040**

   Order matters and digits do not repeat, so $P(10, 4) = 10 \times 9 \times 8 \times 7 = 5040$.

5. **an adjacency list**

   A matrix needs 10^{12} cells, almost all 0; a list stores only the 4 million or so edges that exist.

6. **8/36 = 2/9**

   6 pairs sum to 7 and 2 pairs sum to 11; the events do not overlap, so 8 of the 36 pairs.

7. **False**

   With p false, p → q is true whatever happens. Only a sorted list with a wrong index would break the claim.

8. **32**

   Each element is in or out, one bit each, so $2^5 = 32$, counting the empty set and the whole set.

9. **5050**

   $100 \times 101 \div 2 = 5050$.

10. **120**

    $\binom{10}{3} = \frac{10 \times 9 \times 8}{3!} = \frac{720}{6} = 120$.