

Math 301 Assignment 9

These problems are due in class on Tuesday. If your homework takes up multiple pages, they must be stapled together. Your work must be legible, and any frills from notebook paper must be removed.

Book Exercises

Section 6.2: # 4, 10, 34

Section 6.4: # 4, 6, 12

Section 9.2: # 2, 4, 6, 16

Additional Exercises

#1. Use induction and Pascal's Identity to show that for all $n \geq 2$

$$\binom{2}{2} + \binom{3}{2} + \dots + \binom{n}{2} = \binom{n+1}{3}$$

#2. Use induction (on n) and Pascal's Identity to show that for all $n \geq r$

$$\binom{r}{r} + \binom{r+1}{r} + \dots + \binom{n}{r} = \binom{n+1}{r+1}$$

#3. Let I be the set of math instructors at EWU, C the set of MATH course numbers, S the set of possible section numbers, T the set of possible starting times, and R the set of classrooms at EWU. Let M be the subset of $I \times C \times S \times T \times R$ containing the following 5-tuples:

Instructor	Course	Section	Time	Room
Dempsey	141	2	9:00	SNR 204
Dempsey	141	3	10:00	SNR 204
Dempsey	161	1	8:00	SNR 204
Graham	142	2	9:00	KGS 233
Graham	161	4	12:00	HAR 117
Noon	107	1	8:00	KGS 227
Noon	107	6	12:00	ISL 137
Noon	107	10	1:00	KGS 233
Riggs	161	2	9:00	PAT 144
Riggs	161	3	11:00	KGS 228
Riggs	301	2	12:00	SNR 201
Stuart	107	3	9:00	KGS 334
Stuart	107	4	10:00	KGS 334
Stuart	141	5	12:00	KGS 234
Wehr	142	3	10:00	KGS 333
Wehr	142	5	1:00	KGS 234
Wehr	141	6	2:00	KGS 234

Display the table produced by applying the following projections to M

- P_3
- $P_{1,2}$
- $P_{1,5}$
- $P_{2,3,4}$
- Find all composite keys of M consisting of only two fields.

#4. For each of the following 4-ary relations on the set of integers \mathbb{Z} , (i) list 3 different 4-tuples in the relation. (ii) Also, determine the minimum number of fields needed for a composite key (or a primary key), and (iii) determine which projections will produce such a key.

- $R_1 = \{(a, b, c, d) \in \mathbb{Z}^4 : a < b < c < d\}$
- $R_2 = \{(a, b, c, d) \in \mathbb{Z}^4 : a, b, c, d \text{ form an arithmetic sequence}\}$
- $R_3 = \{(a, b, c, d) \in \mathbb{Z}^4 : a, b, c, d \text{ form a geometric sequence with } a = 6\}$
- $R_4 = \{(a, b, c, d) \in \mathbb{Z}^4 : d = 3c - 2a\}$

Practice Problems

Section 6.2: # 3, 9, 31, 33, 35

Section 6.4: # 3, 7, 9, 13, 27

Section 9.2: # 1, 3, 5, 7, 9, 15, 17