Maximal Assessment Formations

(i) Question pools and assessment banks.

(ii) Appropriate size of a question bank.

Learning Goals Matches the Number of Questions

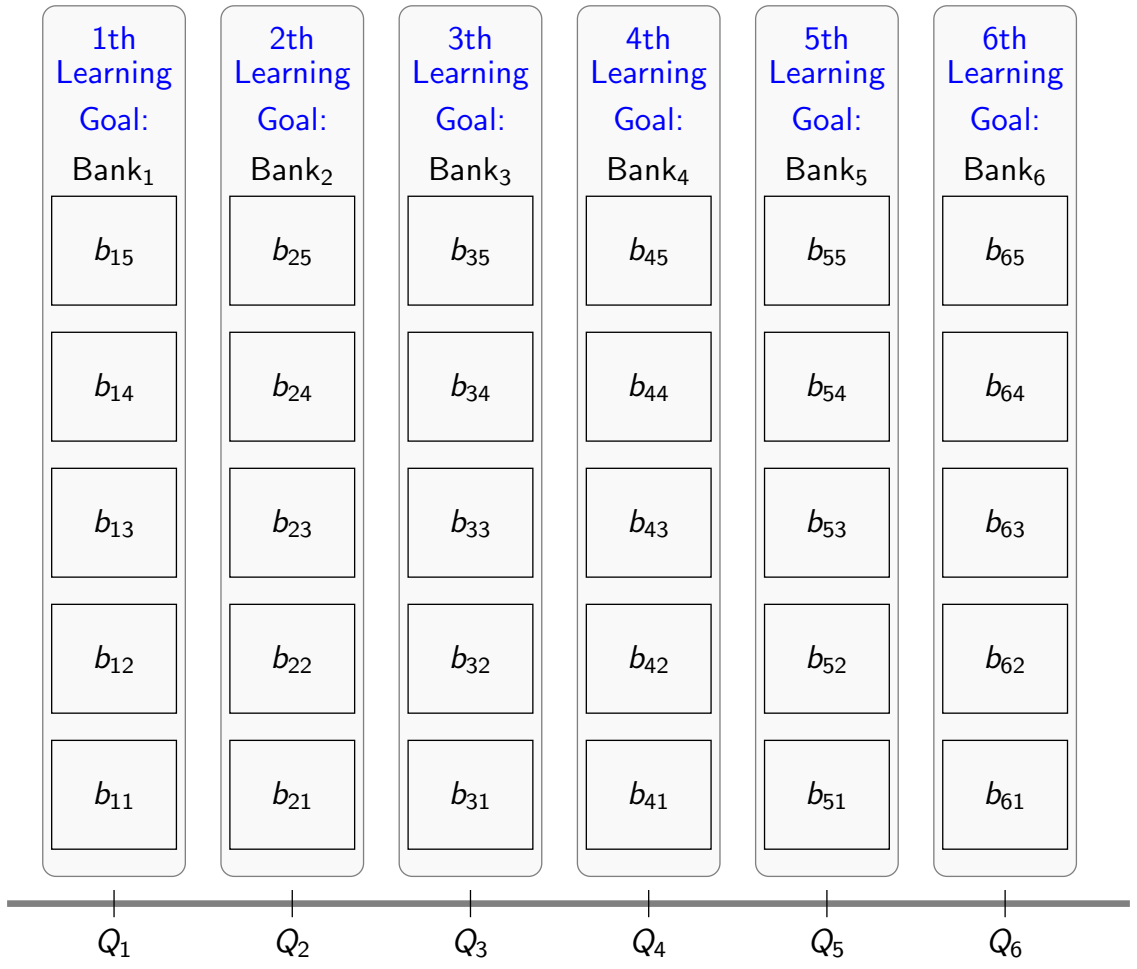

Figure: First step is writing n question related to each learning goal. That is making Question pools (banks).

Learning Goals Matches the Number of Questions

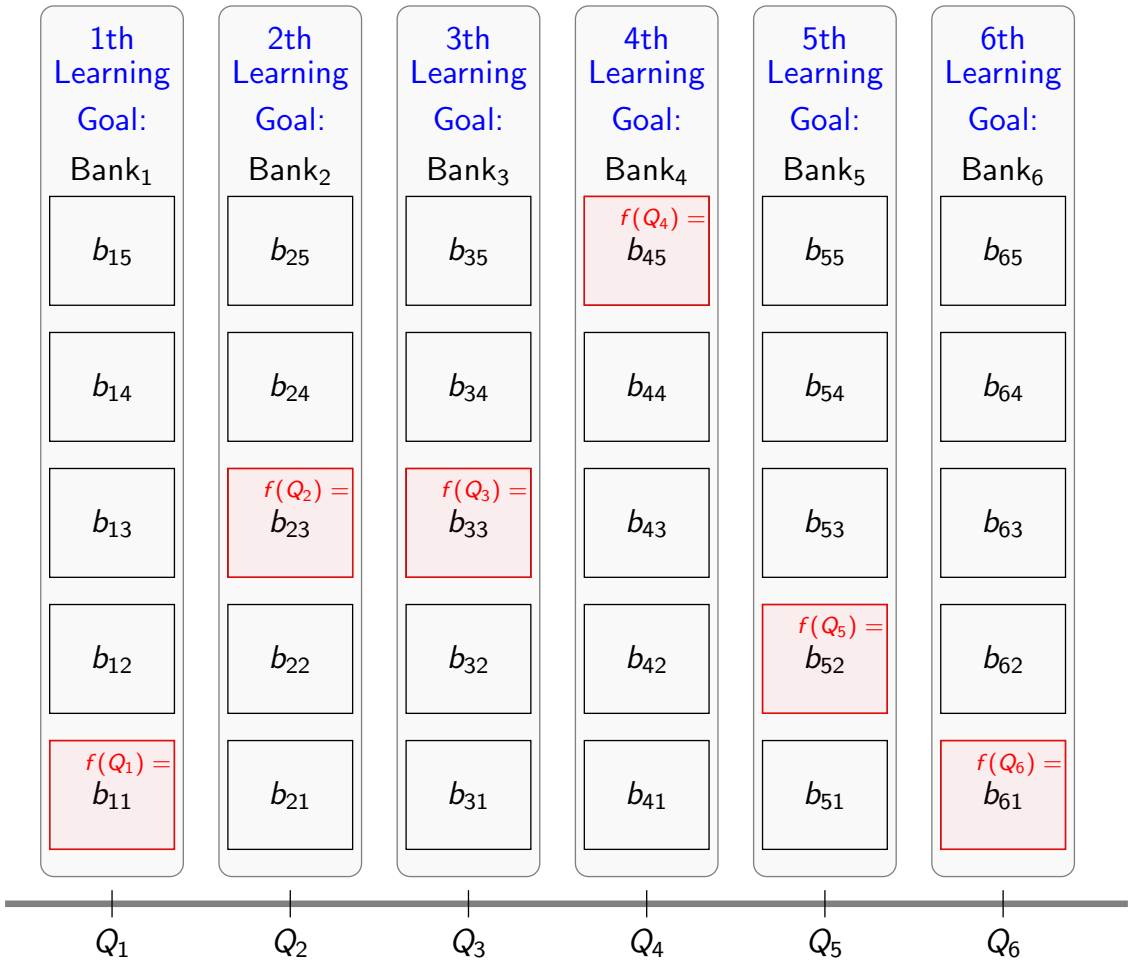

Figure: $\{b_{11}, b_{23}, b_{33}, b_{45}, b_{52}, b_{61}\}$ is an assessment variant with 6 questions created from the 6 pools of questions.

Example: Robbery 101, Quiz 1, 4 Learning Goals

Learning Goal 1: Knowing the Getaway Car Question Bank$_1$	Learning Goal 2: Knowing the Vault Question Bank$_2$
(b_{11}) What color is the car? (b_{12}) What is the model of the car? (b_{13}) Where is the car parked?	(b_{21}) Where is the vault located? (b_{21}) Who has the key to the vault? (b_{23}) When is vault unattended?
Learning Goal 3: Knowing the Guards Question Bank$_3$	**Learning Goal 4: Knowing the Schedule** Question Bank$_4$
(b_{31}) How many total guards are there? (b_{32}) Which guard is distracted a lot? (b_{33}) Which guard is nice?	(b_{41}) When are you entering the bank? (b_{41}) When is the time for stockings? (b_{43}) When is the driver going to floor it?

Example: Robbery 101, Quiz 1, 4 Learning Goals

Learning Goal 1: Knowing the Getaway Car Question Bank$_1$	Learning Goal 2: Knowing the Vault Question Bank$_2$
(b_{11}) What color is the car?	(b_{21}) Where is the vault located?
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(b_{13}) Where is the car parked?	(b_{23}) When is vault unattended?
Learning Goal 3: Knowing the Guards Question Bank$_3$	**Learning Goal 4: Knowing the Schedule** Question Bank$_4$
(b_{31}) How many total guards are there?	(b_{41}) When are you entering the bank?
(b_{32}) Which guard is distracted a lot?	(b_{41}) When is the time for stockings?
(b_{33}) Which guard is nice?	(b_{43}) When is the driver going to floor it?

A student quiz may look like this:

Quiz 1, Robbery 101

Please follow all codes of academic integrity. Name: Date:

1. Where is the car parked?
2. Where is the vault located?
3. Which guard is distracted a lot?
4. When is the driver going to floor it?

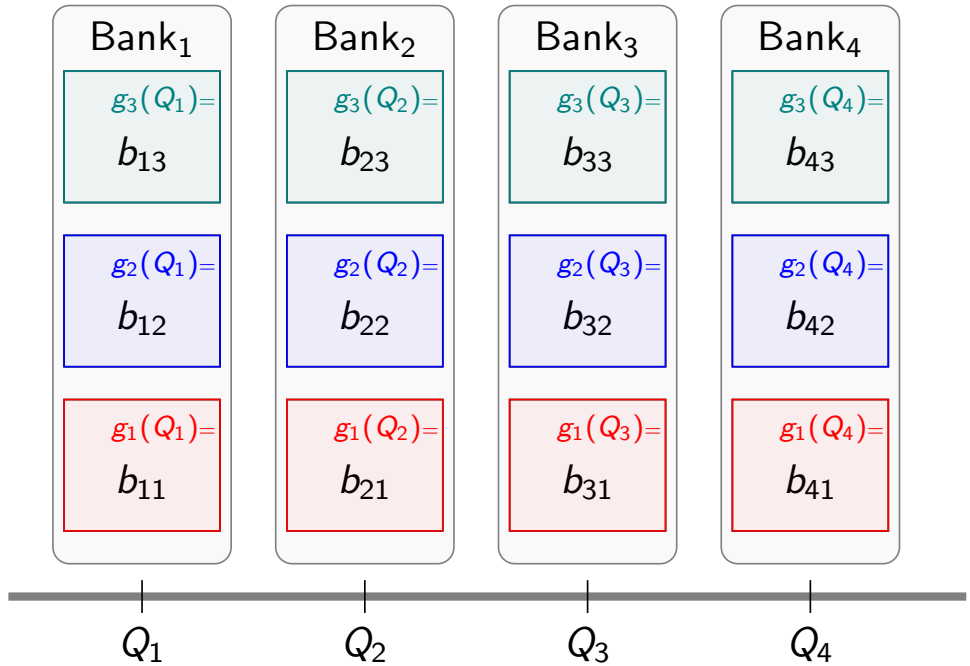
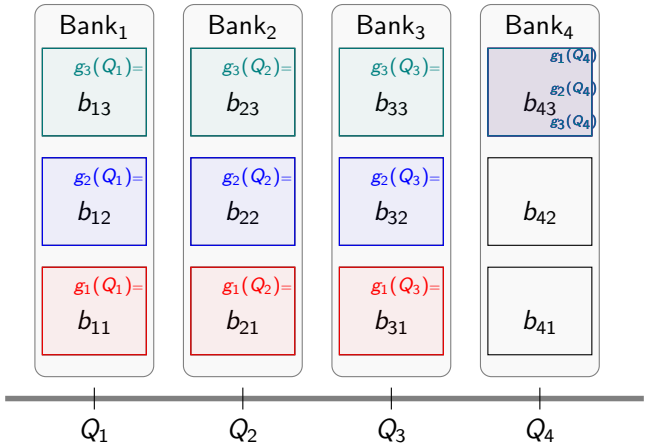
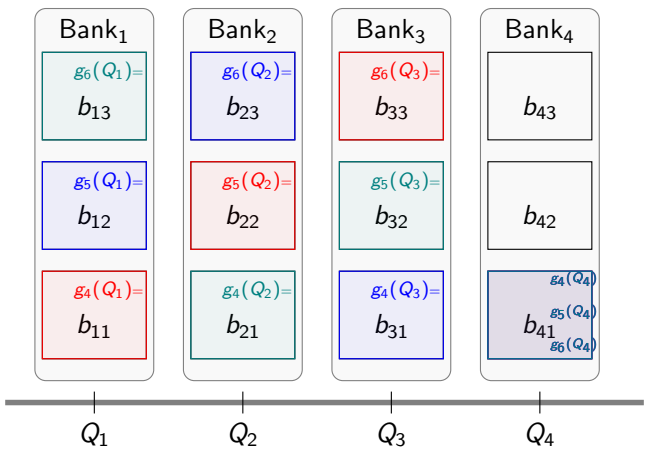
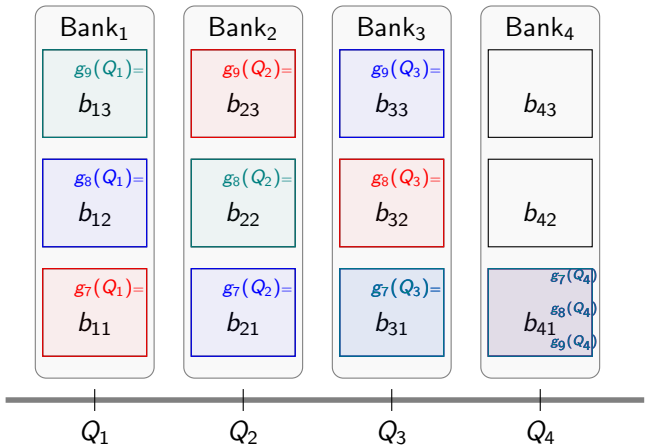


Figure: You can create 3 student quizzes with no questions in common.

- But what if you have 6 students in Robbery 101?
- How many student's quizzes can be created with the four question banks where no two students have more than one question in common?







Every pair in the set of quizzes have only one question in common.

$\{b_{11}, b_{21}, b_{31}, b_{43}\}\ \{b_{12}, b_{22}, b_{32}, b_{43}\}\ \{b_{13}, b_{23}, b_{33}, b_{43}\}$
$\{b_{11}, b_{22}, b_{33}, b_{41}\}\ \{b_{12}, b_{23}, b_{31}, b_{41}\}\ \{b_{13}, b_{21}, b_{32}, b_{41}\}$
$\{b_{11}, b_{23}, b_{32}, b_{42}\}\ \{b_{12}, b_{21}, b_{33}, b_{42}\}\ \{b_{13}, b_{22}, b_{31}, b_{42}\}$

Table for Number of Students Assessment if Maximum 1 Question in Common

# of Students in class	#of Questions in Assessment	# of Questions in Each Pool
$N \leq 9$	$s \leq 4$	3
$N \leq 16$	$s \leq 5$	4
$N \leq 25$	$s \leq 6$	5
$N \leq 49$	$s \leq 8$	7
$N \leq 64$	$s \leq 9$	8
$N \leq 91$	$s \leq 10$	9
$N \leq 121$	$s \leq 12$	11
$N \leq 169$	$s \leq 14$	13
$N \leq 256$	$s \leq 17$	16
$N \leq 289$	$s \leq 18$	17
$N \leq 361$	$s \leq 20$	19
$N \leq 529$	$s \leq 24$	23
$N \leq 625$	$s \leq 26$	25
$N \leq 729$	$s \leq 28$	27
$N \leq 841$	$s \leq 30$	29
$N \leq 961$	$s \leq 32$	31
$N \leq 1024$	$s \leq 33$	32
$N \leq 1369$	$s \leq 38$	37

Table for Number of Students Assessment if Maximum 2 Questions in Common

# of Students in class	#of Questions in Assessment	# of Questions in Each Pool
$N \leq 27$	$s \leq 4$	3
$N \leq 64$	$s \leq 5$	4
$N \leq 125$	$s \leq 6$	5
$N \leq 243$	$s \leq 8$	7
$N \leq 512$	$s \leq 9$	8
$N \leq 729$	$s \leq 10$	9
$N \leq 1331$	$s \leq 12$	11

THANK YOU!