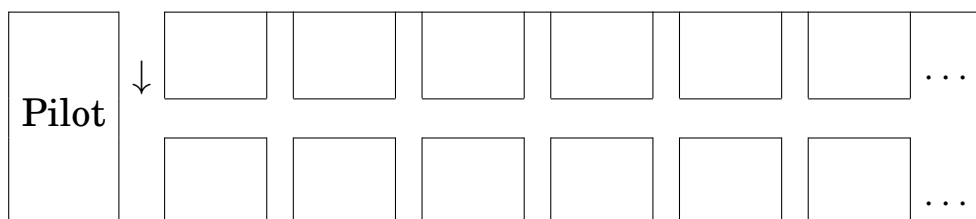


HOTEL INFINITY II

JUNIOR CIRCLE 10/18/2015

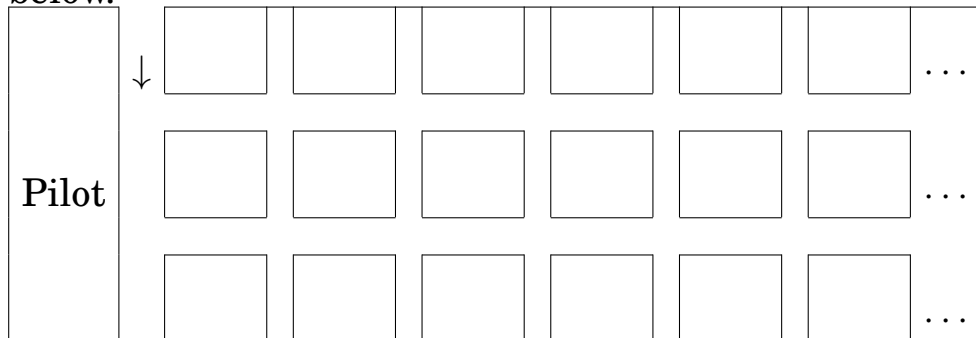
(1) In the galaxy tourists travel on *Infinity Rockets* operated by *Infinite Space*. Each *Infinity Rocket* has an infinite number of seats. In the seating charts below, each square represents a seat for a single passenger. The arrow \downarrow indicates the entry door.

(a) Passengers have been issued boarding passes numbered 1, 2, 3 and so on. Your task is to assign the seats so that all seats are full. First, write in each of the seats below the boarding pass number.



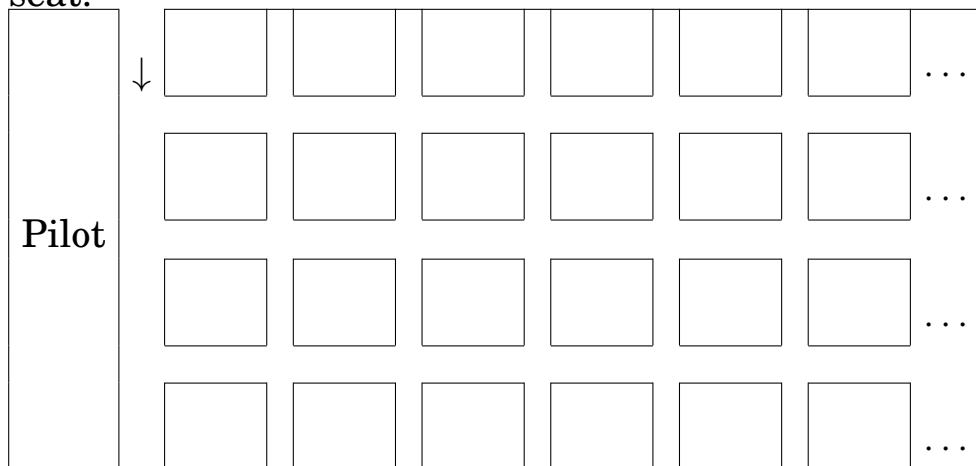
List the boarding pass numbers in row 1, row 2, row 3, ect. What numbers do you have in row n ? (Hint: It might be easier to figure out the bigger number of the two first.)

- (b) Another type of a rocket is presented below; it seats 3 passengers per row. Once again, assign seats so that all seats are taken. Write the boarding pass number on each of the seats below.



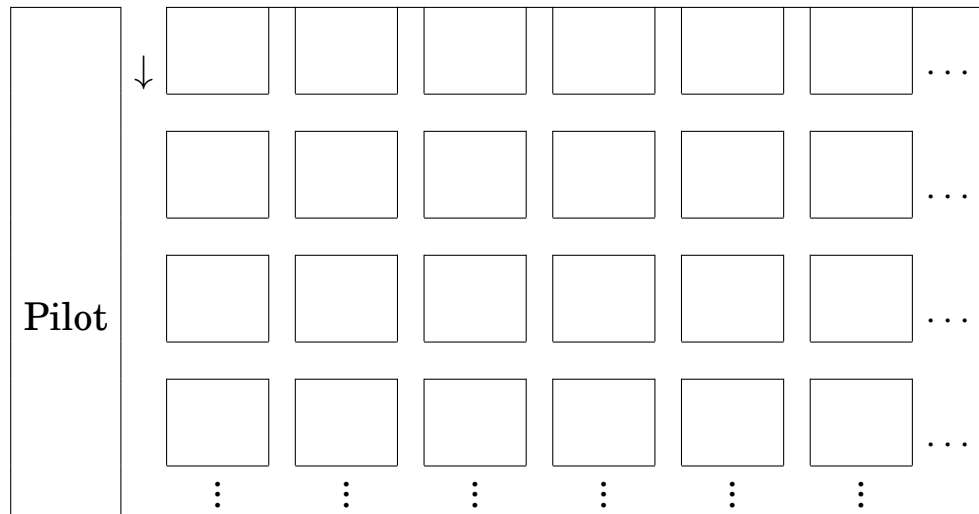
List the boarding pass numbers in row 1, row 2, row 3, ect. What numbers do you have in row n ? (Hint: It might be easier to figure out the bigger number of the two first.)

- (c) A wide-body rocket seats 4 passengers in a row. Assign seats to all passengers by writing the boarding pass number on each seat.



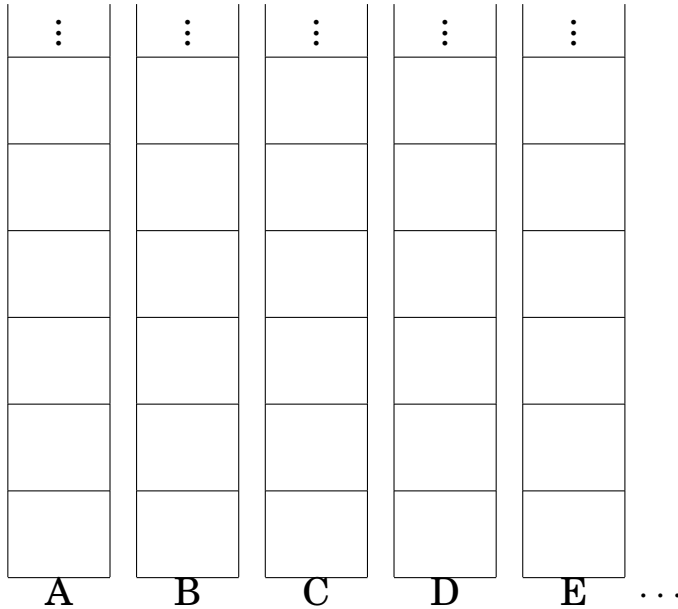
List the boarding pass numbers in row 1, row 2, row 3, ect. What numbers do you have in row n ? (Hint: It might be easier to figure out the bigger number of the two first.)

- (d) A super-wide-body rocket has an infinite number of seats in each row. Can you assign seats to an infinite number of passengers so that each seat is taken? Again, you must come up with a way to write the boarding pass number in each seat. Connect passengers 1 to 2 to 3 to ect. by straight segments. Show how this path continues as the numbers increase. *Hint:* There is only one door into the rocket and every tourist has a lot of baggage, meaning they want to walk as little as possible.



Use the grid paper at the back of the handout to come up with more than one way to seat the passengers.

- (2) Hotel *Infinity*² consists of an infinite number of towers, each with an infinite number of floors. All towers in the hotel are completely full:



Unfortunately, due to an earthquake the towers are damaged, and all guests are evacuated on a single rocket. To do this, you must give them boarding passes numbered 1, 2, 3 and so on. Can you do this? Write the boarding pass number you will be assigning into each room.

- (3) Each Infinity Rocket looks wonderful at night. Next to each row there is a round window. Some passengers have their lights on, and some off. When you look at the rocket from the outside, you see a pretty pattern of lit and unlit windows, like this:



The Leonardo d'Infinici Studios want to make a picture book with an infinite number of pages numbered 1, 2, 3, They want to put a photo of a rocket on each page, so that different pages show different patterns.

- (a) Can you help them design the picture book? For each page, describe the pattern to be drawn on that page (shade in the unlit windows). Make sure that different pages contain different patterns:

page 1	○ ○ ○ ○ ○ ○ ○ ...
page 2	○ ○ ○ ○ ○ ○ ○ ...
page 3	○ ○ ○ ○ ○ ○ ○ ...
page 4	○ ○ ○ ○ ○ ○ ○ ...
page 5	○ ○ ○ ○ ○ ○ ○ ...
page 6	○ ○ ○ ○ ○ ○ ○ ...
page 7	○ ○ ○ ○ ○ ○ ○ ...

⋮

- (b) Do you think you could make a book that lists *all possible such patterns*? Try to come up with a way. Then try to see if you could invent a pattern that is *not* on your list (if you can't, ask your instructor). Try doing more than just one below, if you would like to.

page 1

page 2

page 3

page 4

page 5

page 6

page 7

⋮

page 1

page 2

page 3

page 4

page 5

page 6

page 7

⋮

page 1	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> ...
page 2	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> ...
page 3	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> ...
page 4	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> ...
page 5	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> ...
page 6	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> ...
page 7	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> ...
⋮	

To test if your book actually has all the patterns, try to create a new pattern as follows: Window 1 should be different from window 1, page 1 of your book, window 2 should be different from window 2, page 2 of your book, window 3...Try this for your three books from 3b. Is this pattern on your list?