Solution to Pascal's Identity Problem

All of the 3-element subsets of $\{1,2,3,4,5\}$ that contain 5.

$\{1,2,5\}$	$\{2,3,5\}$
$\{1,3,5\}$	$\{2,4,5\}$
$\{1,4,5\}$	$\{3,4,5\}$

Extra Explanation:

Because removing 5 gives you a 2-element subset of $\{1,2,3,4\}$, and those are counted by $C(4,2)$.

ex: $\{1,2,5\} \longleftrightarrow \{1,2\}$

$\vdots$

$\{3,4,5\} \longleftrightarrow \{3,4\}$

Solution to Routes Through a City

1. $C(5,2) = 10$ Routes From a to c.

- Each route from a to c corresponds to a word of length 5, with letters S and E, with exactly 2 S's.

- Eg: Route: SSEEE ← length 5 word w/ 2 S's.

- Each row of these words corresponds to a 2-element subset of $\{1,2,3,4,5\}$

Eg: SSEEE ⟶ $\{1,2\}$

(look at the positions of your S's).

2. Solution (this is similar to some of the first multiplication-counting problems)

$$\underbrace{C(5,2)}_{\text{\# of way to get from a to c}} \times \underbrace{C(3,1)}_{\text{\# of ways to get from c to d}} = 10 \times 3 = \boxed{30}$$