

B

Must travel 4 Right & 4 Up

4 Right could be split as: (and by symmetry 4 Up as well)

A

$2 \times 2$

$1 \times 2 + 2 \times 1$

$4 \times 1$

2 step

3 step

4 step

Looking at each case individually

$\frac{2 \times 2}{1 \ 2}$   
 $2 \ 2$

$1 \times 2 + 2 \times 1$   
 $\frac{1 \ 2 \ 3}{2 \ 1 \ 1}$   
 $1 \ 2 \ 1$   
 $1 \ 1 \ 2$

$4 \times 1$   
 $\frac{1 \ 2 \ 3 \ 4}{1 \ 1 \ 1 \ 1}$

Combined with  $2 \times 2$  Up:

- Up First (UURRUUURR)
- Right First (RRUURRUU)

Combined with  $1 \times 2 + 2 \times 1$  Up:  
Up must go First (as one extra step)

- 3 options for Up with each option for Right

$$\therefore 2 + 3 = 5$$

total options

Combined with  $2 \times 2$  Up

Right must go First (as one extra step)

- 1 option for Up for each option for Right

Combined with  $4 \times 1$  Up

Up must go First (as one extra step)

- 1 option for Up for each option for Right

Combined with  $4 \times 1$  Up:

- Up First (URURUURUR)
- Right First (RURURURU)

Combined with  $1 \times 2 + 2 \times 1$  Up:  
Right must go First (as one extra step)

- 3 options for Up with each option for Right

$$\therefore 2 + 3 = 5$$

total options

Combined with  $1 \times 2 + 2 \times 1$  Up

Up First

- 3 options for Up for each option for Right

Right First

- 3 option for Up for each option for Right

$$\therefore 3 + 3 + 3 \times 3 + 3 \times 3 = 24$$

total options

So the total possible paths is

$$5 + 24 + 5 = 34$$

NB: You can pair up an n step process to the right with:

- n step process up, both with Right First and Up First
- n-1 step process up, with Right First
- n+1 step process up, with Up First

B

Must travel 4 Right & 4 Up

4 Right could be split as: (and by symmetry 4 Up as well)

A

$2 \times 2$

$1 \times 2 + 2 \times 1$

$4 \times 1$

2 step

3 step

4 step

Looking at each case individually

$\frac{2 \times 2}{1 \ 2}$   
 $\underline{2 \ 2}$

$\frac{1 \times 2 + 2 \times 1}{1 \ 2 \ 3}$   
 $\underline{\underline{2 \ 1 \ 1}}$   
 $1 \ 2 \ 1$

$\frac{4 \times 1}{1 \ 2 \ 3 \ 4}$   
 $\underline{\underline{1 \ 1 \ 1 \ 1}}$

Combined with  $2 \times 2$  Up:

- Up First (UURRUUURR)
- Right First (RRUURRUU)

Combined with  $1 \times 2 + 2 \times 1$  Up:  
Up must go First (as one extra step)

- 3 options for Up with each option for Right

$$\therefore 2 + 3 = \boxed{5}$$

total options

1 1 2

Combined with  $2 \times 2$  Up

- Right must go First (as one extra step)
- 1 option for Up for each option for Right

Combined with  $4 \times 1$  Up  
Up must go First (as one extra step)

- 1 option for Up for each option for Right

Combined with  $1 \times 2 + 2 \times 1$  Up

- Up First
- 3 options for Up for each option for Right

Right First

- 3 option for Up for each option for Right

$$\therefore 3 + 3 + 3 \times 3 + 3 \times 3 = \boxed{24}$$

total options

Combined with  $4 \times 1$  Up:

- Up First (URURURUR)
- Right First (RURURURU)

Combined with  $1 \times 2 + 2 \times 1$  Up:  
Right must go First (as one extra step)

- 3 options for Up with each option for Right

$$\therefore 2 + 3 = \boxed{5}$$

total options

So the total possible paths is  $5 + 24 + 5 = \boxed{34}$

NB: You can pair up an  $n$  step process to the right with:

- $n$  step process up, both with Right First and Up First
- $n-1$  step process up, with Right First
- $n+1$  step process up, with Up First

Must travel 6 Right & 6 Up. 6 Right could be split as: (by symmetry 6 Up as well)

$3 \times 2$	3 step
$2 \times 2 + 2 \times 1$	4 step
$1 \times 2 + 4 \times 1$	5 step
$6 \times 1$	6 step

- NB: You can pair an  $n$  step Right process with:
- $n$  step process Up, both with Right First and Up First
  - $n-1$  step process Up, with Right First
  - $n+1$  step process Up, with Up First.

Looking at each case individually:

$$\underline{3 \times 2}$$

$$\begin{array}{l} 1 \\ 2 \\ 3 \end{array}$$

$$\begin{array}{l} 2 \\ 2 \\ 2 \end{array}$$

Combined with  $3 \times 2$  Up

- Up First or Right First

$$\underline{2 \times 2 + 2 \times 1}$$

$$\begin{array}{l} 1 \\ 2 \\ 3 \\ 4 \end{array}$$

$$\begin{array}{l} 2 \\ 2 \\ 1 \\ 1 \end{array}$$

$$\begin{array}{l} 2 \\ 1 \\ 2 \\ 1 \end{array}$$

$$\begin{array}{l} 2 \\ 1 \\ 1 \\ 2 \end{array}$$

$$\begin{array}{l} 1 \\ 1 \\ 2 \\ 1 \end{array}$$

$$\begin{array}{l} 1 \\ 2 \\ 1 \\ 2 \end{array}$$

$$\begin{array}{l} 1 \\ 1 \\ 1 \\ 1 \\ 2 \end{array}$$

$$\begin{array}{l} 1 \\ 1 \\ 1 \\ 1 \\ 1 \\ 2 \end{array}$$

$$\begin{array}{l} 1 \\ 1 \\ 1 \\ 1 \\ 1 \\ 1 \end{array}$$

Combined with  $2 \times 2 + 2 \times 1$  Up

Up must go first

- 6 options for Up  
For each Right option

$$\therefore 2 + 6 = \boxed{8}$$

$$\underline{1 \times 2 + 4 \times 1}$$

$$\begin{array}{l} 1 \\ 2 \\ 3 \\ 4 \\ 5 \\ 6 \end{array}$$

$$\begin{array}{l} 2 \\ 1 \\ 1 \\ 1 \\ 1 \\ 1 \end{array}$$

$$\begin{array}{l} 1 \\ 1 \\ 2 \\ 1 \\ 1 \\ 1 \end{array}$$

$$\begin{array}{l} 1 \\ 1 \\ 1 \\ 2 \\ 1 \\ 1 \end{array}$$

$$\begin{array}{l} 1 \\ 1 \\ 1 \\ 1 \\ 2 \\ 1 \end{array}$$

$$\begin{array}{l} 1 \\ 1 \\ 1 \\ 1 \\ 1 \\ 2 \end{array}$$

$$\begin{array}{l} 1 \\ 1 \\ 1 \\ 1 \\ 1 \\ 1 \end{array}$$

Combined with  $3 \times 2$  Up

Right must go first

- 1 option for Up for each Right

Combined with  $6 \times 1$  Up

Up must go first

- 1 option for Up for each Right

Combined with  $1 \times 2 + 4 \times 1$  Up

Up must go first

- 5 options for Up for each Right

Combined with  $2 \times 2 + 2 \times 1$  Up

Right must go first

- 6 options for Up for each Right

Combined with  $2 \times 2 + 2 \times 1$  Up

Up First

- 6 options for Up for each Right

Combined with  $1 \times 2 + 4 \times 1$  Up

Up First

- 5 options for Up for each Right

Right First

Right First

- 5 options for Up for each Right

• 5 options for Up for each Right

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