Some propositions

A: any particular day is a weekday (Mon-Fri)
B: any particular day is a weekend day (Sat and Sun)
C: any particular day is a Thursday
D: any particular day has a full moon
E: any particular day is in March

	A	B	C
Mon	1	0	0
Tue	1	0	0
Wed	1	0	0
Thur	1	0	1
Fri	1	0	0
Sat	0	1	0
Sun	0	1	0

$P(A) = 5/7 \approx 0.714$
$P(B) = 2/7 \approx 0.286$
$P(C) = 1/7 \approx 0.143$

The length of the Lunar cycle is 27.321661 days

$P(D) = 1/27.321661 \approx 0.037$

In every 400 year cycle:

There are 303 normal 365 day years
There are 97 leap 366 day years
$303 \times 365 + 97 \times 365 = 146097$ days

Every year has one 31 day March

$400 \times 31 = 12400$

$P(E) = 12400/146097 \approx 0.085$

Column G: correct answer
Column F: calculated by normal formula:

$$P(X \wedge Y) = P(X) \times P(Y)$$
$$P(X \vee Y) = P(X) + P(Y) - P(X) \times P(Y)$$

	G		F		
$P(A \wedge B)$	0	= 0.000	10/49	≈ 0.204	(weekday and weekend)
$P(A \vee B)$	1	= 1.000	39/49	≈ 0.796	(weekday or weekend)
$P(A \wedge C)$	1/7	≈ 0.143	5/49	≈ 0.102	(weekday and Thursday)
$P(A \vee C)$	5/7	≈ 0.714	42/49	≈ 0.755	(weekday or Thursday)
$P(B \wedge C)$	0	= 0.000	2/49	≈ 0.041	(weekend and Thursday)
$P(B \vee C)$	3/7	≈ 0.429	19/49	≈ 0.388	(weekend or Thursday)

	G	F	
$P(A \wedge D)$	≈ 0.026	≈ 0.026	(weekday and full moon)
$P(A \vee D)$	≈ 0.725	≈ 0.725	(weekday or full moon)
$P(B \wedge D)$	≈ 0.010	≈ 0.010	(weekend and full moon)
$P(B \vee D)$	≈ 0.312	≈ 0.312	(weekend or full moon)
$P(A \wedge E)$	≈ 0.061	≈ 0.061	(weekday and March)
$P(A \vee E)$	≈ 0.738	≈ 0.738	(weekday or March)
$P(D \wedge E)$	≈ 0.003	≈ 0.003	(full moon and March)
$P(D \vee E)$	≈ 0.118	≈ 0.118	(full moon or March)
$P(B \wedge E)$	≈ 0.024	≈ 0.024	(weekend and March)
$P(B \vee E)$	≈ 0.347	≈ 0.347	(weekend or March)

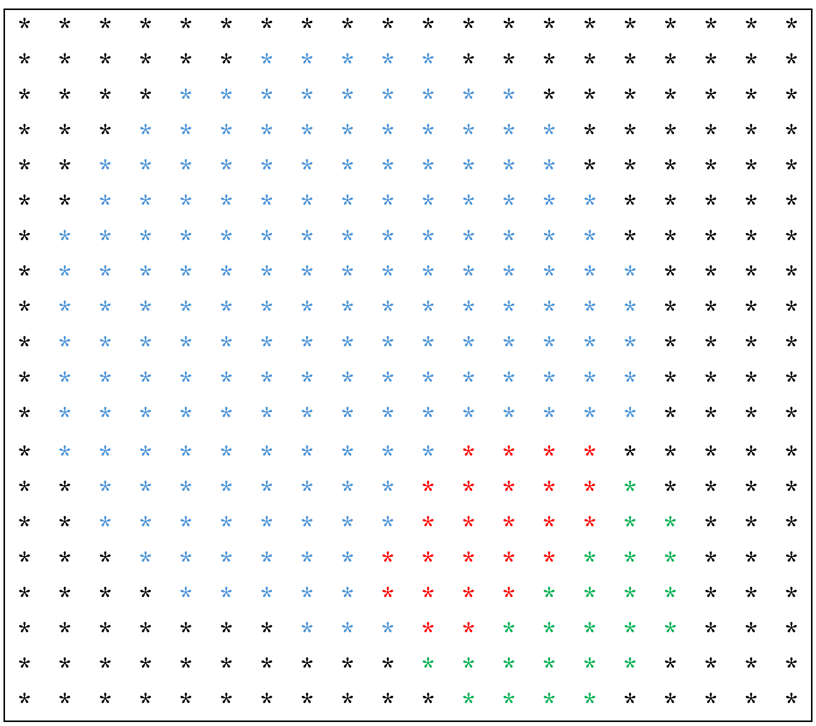
For conditional probabilities P(X | Y) = P(X ∧ Y) / P(Y)
Column FB: P(X ∧ Y) calculated by formula
Column FG: the correct value for P(X ∧ Y) is used

	G	FB	FG
P(B | A)	(what are the chances that it's a weekend once we know that it's a weekday)		
	0	0.204/0.714 ≈ 0.286	0/.714 = 0
P(B | E)	(what are the chances that it's a weekend once we know that it's in March)		
	2/7 ≈ 0.286	0.024/0.085 ≈ 0.286	0.024/0.085 ≈ 0.286

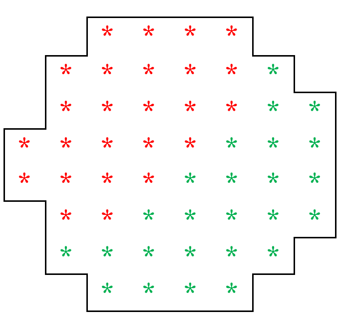
In the universe of numbers between 1 and 400:

P(A: it's even) = 0.5 of the universe, 200 numbers
P(B: it's between 100 and 149) = 0.125 of the universe, 50 numbers
25 numbers are both, 0.0625 of the universe

175 items black: not even and not between 100 and 149
25 items are red: both even and between 100 and 149
175 items are blue: even but not between 100 and 149
25 items are green: between 100 and 149 but not even



In P(A | B), the probability that A is true given that B is known to be true, we are given that B is true, so the world is reduced to those 50 items



And we are interested in the 25 red ones in which A is true (i.e. both A and B are true) They were 0.0625 of the original universe of 400 numbers, and so were the green ones. But both cover 0.5 of the universe we care about now.

So $P(A \mid B)$ and $P(\neg A \mid B)$ are both 0.5.

When our universe was reduced to the $P(\ldots \mid B)$ area its size was multiplied by $P(B)$, 0.125, so to re-scale $P(A \wedge B)$ we must undo the original scaling down, divide by $P(B)$.