Ex 1

1)

$$P(A|B) = \frac{P(A)P(B|A)}{P(B)} \Rightarrow P(swine\ flu|positive) = \frac{P(swine\ flu)P(positive\ given\ swine\ flu)}{P(positive)} = \frac{\frac{1}{9000}*1}{\frac{1011}{100000}} = \frac{100}{9099}$$

*swine flu affects 1 in 9000 people in my city, so the probability of having swine flu is $P(swine\ flu) = \frac{1}{9000}$

* the probability of a positive test given that you are sick is 1 because the probability of a false negative is zero

* so $P(positive\ given\ swin\ flu) = 1$

* $P(not\ swine\ flue) = 1 - P(swine\ flu)$ but we also have a chance of getting a positive test even if we are not sick,

$P(positive\ given\ not\ swine\ flu) = 0.01$

* $P(Positive) = \big(P(swine\ flu) * P(positive\ given\ swin\ flu)\big) + \big(P(not\ swine\ flu) * P(positive\ given\ not\ swine\ flu)\big) = \left(\frac{1}{9000} * 1\right) + \left(\frac{8999}{9000} * \frac{1}{100}\right) = \frac{1011}{100000}$

2)

$$P(A|B) = \frac{P(A)P(B|A)}{P(B)} \Rightarrow P(swine\ flu|positive) = \frac{P(swine\ flu)P(positive\ given\ swine\ flu)}{P(positive)} = \frac{\frac{1}{350}*1}{\frac{449}{35000}} = \frac{100}{449}$$

*swine flu affects 1 in 9000 people in my city, so the probability of having swine flu is $P(swine\ flu) = \frac{1}{350}$

* the probability of a positive test given that you are sick is 1 because the probability of a false negative is zero

* so $P(positive\ given\ swin\ flu) = 1$

* $P(not\ swine\ flue) = 1 - P(swine\ flu)$ but we also have a chance of getting a positive test even if we are not sick,

$P(positive\ given\ not\ swine\ flu) = 0.01$

* $P(Positive) = \big(P(swine\ flu) * P(positive\ given\ swin\ flu)\big) + \big(P(not\ swine\ flu) * P(positive\ given\ not\ swine\ flu)\big) = \left(\frac{1}{350} * 1\right) + \left(\frac{349}{350} * \frac{1}{100}\right) = \frac{449}{35000}$

3)

$$P(A|B) = \frac{P(A)P(B|A)}{P(B)} \Rightarrow P(swine\ flu|positive) = \frac{P(swine\ flu)P(positive\ given\ swine\ flu)}{P(positive)} = \frac{\frac{1}{350}*1}{\frac{57}{2500}} = \frac{50}{399}$$

*swine flu affects 1 in 9000 people in my city, so the probability of having swine flu is $P(swine\ flu) = \frac{1}{350}$

* the probability of a positive test given that you are sick is 1 because the probability of a false negative is zero

* so $P(positive\ given\ swin\ flu) = 1$

* $P(not\ swine\ flue) = 1 - P(swine\ flu)$ but we also have a chance of getting a positive test even if we are not sick,

$P(positive\ given\ not\ swine\ flu) = 0.02$

* $P(Positive) = \big(P(swine\ flu) * P(positive\ given\ swin\ flu)\big) + \big(P(not\ swine\ flu) * P(positive\ given\ not\ swine\ flu)\big) = \left(\frac{1}{350} * 1\right) + \left(\frac{349}{350} * \frac{2}{100}\right) = \frac{57}{2500}$

Ex2

$$P(rain|cloud) = \frac{P(rain)P(cloud|rain)}{P(cloud)} = \frac{0.1 * 0.5}{0.4} = 0{,}125\ \%(12.5\%)$$

*$P(rain) = 0.1, because$ only 3 of 30 days tend to be rainy(10%)
*$P(cloud) = 0.4, because$ about 40% of days start cloudy
*$P(cloud|rain) = 0.5, beacuse$ 50% of all rainy days start off cloudy