# Practice quiz on Problem Solving

**PUNTOS TOTALES DE 9**

1. I am given the following 3 joint probabilities:

   `1 / 1 puntos`

   $p$(I am leaving work early, there is a football game that I want to watch this afternoon) = $.1$

   $p$(I am leaving work early, there is not a football game that I want to watch this afternoon) = $.05$

   $p$(I am not leaving work early, there is not a football game that I want to watch this afternoon) = $.65$

   What is the probability that there is a football game that I want to watch this afternoon?

   ○ .2

   ◉ .3

   ○ .35

   ○ .1

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   ✓ **Correcto**

   Getting the answer is a two-step process. First, recall that the sum of probabilities for a probability distribution must sum to 1. So the "missing" joint distribution

   p(I am not leaving work early, there is a football game I want to watch this afternoon) must be $1-(0.1+0.05+0.65)=0.2$

   By the sum rule, the marginal probability p(there is a football game that I want to watch this afternoon) = the sum of the joint probabilities

   P(I am leaving work early, there is a football game that I want to watch this afternoon) + P(I am not leaving work early, there is a football game I want to watch this afternoon) = $.1 + .2 = .3$

**2.** The

Joint probability of my summiting Mt. Baker in the next two years AND publishing a best-selling book in the next two years is .05. If the probability of my publishing a best-selling book in the next two years is $10\%$, and the probability of my summiting Mt. Baker in the next two years is $30\%$, are these two events dependent or independent?

- ◉ Dependent
- ○ Independent

✓ **Correcto**

We know this because the joint distribution of $5\%$ does not equal the product distribution of $(0.1) \times (0.3) = 3\%$. If I summit Mt. Baker, I am more likely to publish a best-selling book, and vice versa.

**3.** The

Joint probability of my summiting Mt. Baker in the next two years AND my publishing a best-selling book in the next two years is .05.

If the probability of my publishing a best-selling book in the next two years is $10\%$, and the probability of my summiting Mt. Baker in the next two years is $30\%$, what is the probability that (sadly) in the next two years I will neither summit Mt. Baker nor publish a best-selling book?

1 / 1 puntos

- ○ .25
- ○ .95
- ◉ .65
- ○ .9

✓ **Correcto**

Set A = I will summit Mt. Baker in the next two years

Set B = I will publish a best-selling book in the next two years.

Since $p(A) = 0.3$ and $p(A, B) = 0.05$, by the SUM RULE we know that $p(A, \sim B) = (0.3 - 0.05) = 0.25$

Since $p(B) = 0.1, p(\sim B) = 0.9$

Since $p(\sim B) = 0.9$ and $p(A, \sim B) = 0.25$ and again by the SUM RULE, $p(\sim A, \sim B) = 0.9 - 0.25 = .65$

4. I have two coins. One is fair, and has a probability of coming up heads of .5. The second is bent, and has a probability of coming up heads of .75. If I toss each coin once, what is the probability that *at least* one of the coins will come up heads?

- ◉ .875
- ◯ .625
- ◯ .375
- ◯ 1.0

✓ **Correcto**

We apply the rule p(A or B or both)

= 1 - (p(~A)p(~B))

= 1 - ((1- .5)(1-.75))

= 1 - .125

=.875

5. What is $\dfrac{11!}{9!}$ ?

- ◯ 554, 400
- ◯ 110, 000
- ◉ 110
- ◯ 4, 435, 200

✓ **Correcto**

$$\frac{11!}{9!} = 11 \times 10 = 110$$

6. What is the probability that, in six throws of a die, there will be exactly one each of "1" "2" "3" "4" "5" and "6" ?

- ○ .01176210
- ○ .00187220
- ○ .01432110
- ◉ .01543210

✓ **Correcto**

There are $6! = 720$ permutations where each face occurs exactly once.

There are $6 \times 6 \times 6 \times 6 \times 6 \times 6 = 46656$ total permutations of 6 throws.

The probability is therefore $\dfrac{720}{46656} = 0.01543210$

7. On 1 day in 1000, there is a fire and the fire alarm rings.

On 1 day in 100, there is no fire and the fire alarm rings (false alarm)

On 1 day in 10,000, there is a fire and the fire alarm does not ring (defective alarm).

On 9,889 days out of 10,000, there is no fire and the fire alarm does not ring.

If the fire alarm rings, what is the (conditional) probability that there is a fire?

Written $p(\text{there is a fire} \mid \text{fire alarm rings})$

- ⦿ 9.09%
- ◯ 1.1%
- ◯ 1.12%
- ◯ 90.9%

✓ **Correcto**

10 days out of every 10,000 there is fire and the fire alarm rings.

100 days out of every 10,000 there is no fire and the fire alarm rings.

110 days out of every 10,000 the fire alarm rings.

The

probability that there is a fire, given that the fire alarm rings, is $\dfrac{10}{110} = 9.09\%$

8. On 1 day in 1000, there is a fire and the fire alarm rings.

On 1 day in 100, there is no fire and the fire alarm rings (false alarm)

On 1 day in 10,000, there is a fire and the fire alarm does not ring (defective alarm).

On 9,889 days out of 10,000, there is no fire and the fire alarm does not ring.

If the fire alarm does not ring, what is the (conditional) probability that there is a fire?

p(there is a fire | fire alarm does not ring)

- ○ .01000%
- ○ 1.0001%
- ○ .10011%
- ◉ 0.01011%

✓ **Correcto**
On $(1 + 9,889) = 9,890$ days out of every $10,000$ the fire alarm does not ring.

On 1 of those $10,000$ days there is a fire.

$$\frac{1}{9890} = 0.01011\%$$

9. A group of 45 civil servants at the State Department are newly qualified to serve as Ambassadors to foreign governments. There are 22 countries that currently need Ambassadors. How many distinct groups of 22 people can the President promote to fill these jobs?

- ○ =1.06*(10^35)
- ◉ 8.2334 \times (10^12)
- ○ =2.429*(10^-13)

- ○ $$4.1167 \times (10^12)

! **Incorrecto**

$$\binom{45}{22}$$

$$= 45!/(23!)(22!)$$

$$= \frac{45!}{23! \times 22!}$$