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## Practice quiz on Sets

PUNTOS TOTALES DE 3

1. Let  $A = \{1, 3, 5\}$ . Is the following statement:  $3 \in A$ . True or false?

1 / 1 punto

☐ False

☒ True

✓ Correcto

The symbol  $\in$  stands for "is an element of" and it is true that 3 is an element of  $A$ . The other two elements of  $A$  are 1 and 5.

2. Let  $E = \{-1, -2, -3\}$ . Compute the cardinality  $|E|$  of  $E$ :

1 / 1 punto

☐ -3

✓ Correcto

Recall that the cardinality of a set is the number of elements in it. Since  $E$  has three elements (which are  $-1, -2, -3$ ), the cardinality of  $E$  is  $|E| = 3$ .

3. Let  $A = \{1, 3, 5\}$  and  $B = \{3, 5, 10, 11, 14\}$ .

1 / 1 punto

Which of the following sets is equal to the intersection  $A \cap B$ ?

☒  $\{3, 5\}$

☐  $\{3, 5, 10\}$

☐  $\{3\}$

☐  $\{1, 3, 5\}$

✓ Correcto

The intersection of two sets consists precisely of the elements they share in common. The elements 3 and 5 are in both  $A$  and  $B$ .



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## Practice quiz on the Number Line, including Inequalities

PUNTOS TOTALES DE 8

1. Which of the following real numbers is not an integer?

1 / 1 punto

- ☐ 7
- ☐ 0
- ☒ 4.3
- ☐ -3



Correcto

4.3 is a decimal that is between two consecutive integers (4 and 5).



Prueba de práctica sobre la recta numérica, incluidas las desigualdades

Cuestionario Práctico • 25 min

2. Which of the following is the absolute value  $|-7|$  of the number  $-7$ ?

1 / 1 punto

- ☐ 0
- ☐ 1
- ☐ -7
- ☒ 7



Correcto

The absolute value of a number  $x$  is the distance along the number line from  $x$  to 0. In this case,  $-7$  is 7 units away from 0, and so  $|-7| = 7$ .

3. Suppose I tell you that  $x$  and  $y$  are two real numbers which make the statement  $x < y$  true. Which pair of numbers cannot be values for  $x$  and  $y$ ?

1 / 1 punto

- ☐  $x = -1$  and  $y = 0$
- ☐  $x = -17.3$  and  $y = -17.1$
- ☐  $x = 1$  and  $y = 7.3$
- ☒  $x = 5$  and  $y = 3.3$



## Prueba de práctica sobre la recta numérica, incluidas las desigualdades

Cuestionario Práctico • 25 min

4. Suppose I tell you that  $w$  is a real number which makes both of the following statements true:  $w > 1$  and  $w < 1.2$ . Which of the following numbers could be  $w$ ?

1 / 1 punto

- ☒  $w = 1.05$
- ☐  $w = 11$
- ☐  $w = 1.2$
- ☐  $w = 0$

✓ Correcto

$1.05 > 1$  is true since  $1.05$  is to the right of  $1$  on the real number line, and  $1.05 < 1.2$  is also true, since  $1.05$  is to the left of  $1.2$  on the real number line.

5. Suppose that  $x$  and  $y$  are two real numbers which satisfy  $x + 3 = 4y + 1$ . Which of the following statements are false?

1 / 1 punto

- ☐  $2x + 6 = 8y + 2$
- ☐  $x + 2 = 4y$
- ☒  $x = 4y$



## Prueba de práctica sobre la recta numérica, incluidas las desigualdades

Cuestionario Práctico • 25 min

5. Suppose that  $x$  and  $y$  are two real numbers which satisfy  $x + 3 = 4y + 1$ . Which of the following statements are false?

1 / 1 punto

- ☐  $2x + 6 = 8y + 2$
- ☐  $x + 2 = 4y$
- ☒  $x = 4y$
- ☐  $x = 4y - 2$

✓ Correcto

The equation  $x = 4y$  cannot be derived from the given equation.

6. Which of the following real numbers is in the open interval  $(2, 3)$ ?

1 / 1 punto

- ☐  $2$
- ☒  $2.1$
- ☐  $1$
- ☐  $3$

7. Which of the following real numbers are in the open ray  $(3.1, \infty)$ ?

1 / 1 punto

- ☐ 0
- ☐ 3.1
- ☒ 4.75
- ☐ -5

✓ **Correcto**

Recall that  $(3.1, \infty) = \{x \in \mathbb{R} \mid x > 3.1\}$ . Since  $4.75 > 3.1$  is true,  $4.75 \in (3.1, \infty)$ .

8. Which of the following values for  $x$  solves the equation  $-3x + 2 = -4$

1 / 1 punto

- ☒  $x = 2$
- ☐  $x = \frac{2}{3}$
- ☐  $x = -2$
- ☐ All values of  $x$  such that  $x \leq 2$



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## Practice quiz on Simplification Rules and Sigma Notation

PUNTOS TOTALES DE 6

1. Which of the numbers below is equal to the following summation:  $\sum_{i=1}^3 i^2$  ?

1 / 1 punto

- ☐ 30
- ☒ 14
- ☐ 1
- ☐ 9

✓ **Correcto**

We compute  $\sum_{i=1}^3 i^2 = 1^2 + 2^2 + 3^2 = 14$



2. Suppose that  $A = \sum_{k=1}^{100} k^4$  and  $B = \sum_{j=1}^{100} j^4$

1 / 1 punto

Which of the following statements is true?

- ☐  $B > A$
- ☐  $A > B$
- ☒  $A = B$
- ☐ There is not enough information to do the problem

✓ **Correcto**

$A = B$ . Both summations evaluate to the same number, since  $k$  and  $j$  are just dummy indices.

3. Which of the numbers below is equal to the summation  $\sum_{i=1}^{10} 7$ ?

1 / 1 punto

- ☒ 70
- ☐ 7
- ☐ 55
- ☐ 0



## Prueba de práctica sobre reglas de simplificación y notación Sigma

Cuestionario Práctico • 20 min

✓ **Correcto**

According to one of our Sigma notation simplification rules, this summation is just equal to 10 copies of the number 7 all added together, and so we get  $10 \times 7 = 70$ .

4. Suppose that  $X = \sum_{i=1}^5 i^3$  and  $Y = \sum_{i=1}^5 i^4$ .

1 / 1 punto

Which of the following expressions is equal to the summation  $\sum_{i=1}^5 (2i^3 + 5i^4)$ ?

- ☐ 3375
- ☒  $2X + 5Y$
- ☐  $X + Y$
- ☐ 7

✓ **Correcto**

To get here, you apply two of our Sigma notation simplification rules  $\sum_{i=1}^5 2i^3 + 5i^4 = 2(\sum_{i=1}^5 i^3) + 5(\sum_{i=1}^5 i^4) = 2X + 5Y$ .



## Prueba de práctica sobre reglas de simplificación y notación Sigma

Cuestionario Práctico • 20 min

5. Which of the following numbers is the mean  $\mu_Z$  of the set  $Z = \{-2, 4, 7\}$ ?

1 / 1 punto

- ☐ 9
- ☒ 3
- ☐  $\frac{13}{3}$
- ☐ 4

✓ **Correcto**

To get the mean of a set of numbers, you need to perform two steps: first add them all up (in this case getting  $-2 + 4 + 7 = 9$ ), and then divide by the number of elements in the set (in this case that number is 3).

So you should obtain  $\mu_Z = \frac{9}{3} = 3$ , which you did!



## Prueba de práctica sobre reglas de simplificación y notación Sigma

Cuestionario Práctico • 20 min

So you should obtain  $\mu_Z = \frac{9}{3} = 3$ , which you did!

6. Suppose the set  $X$  has five numbers in it:  $X = \{x_1, x_2, x_3, x_4, x_5\}$ . Which of the following expression represents the mean of the set  $X$ ?

1 / 1 punto

- ☐  $\sum_{i=1}^5 x_i$
- ☐  $\frac{1}{5} [\sum_{i=1}^5 (x_i - \mu_X)^2]$
- ☐  $\frac{1}{N} [\sum_{i=1}^N x_i]$
- ☒  $\frac{1}{5} [\sum_{i=1}^5 x_i]$

✓ **Correcto**

To obtain the mean of a set of numbers, you first add them all up (which is expressed here by the sigma operation inside the square brackets) and then you divide by the number of numbers in the set (which is expressed here by the  $\frac{1}{5}$  outside the square brackets).



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## Graded quiz on Sets, Number Line, Inequalities, Simplification, and Sigma Notation

CALIFICACIÓN DEL ÚLTIMO ENVÍO

92.3%

1. Let  $B = \{3, 5, 10, 11, 14\}$ . Is the following statement true or false:  $3 \notin B$

1 / 1 punto

- ☒ False  
☐ True

✓ Correcto

The symbol  $\notin$  stands for "is not an element of." Since 3 is in an element of the set  $B$ , the given statement is not true.



2. Let  $A = \{1, 3, 5\}$  and  $B = \{3, 5, 10, 11, 14\}$ . Which of the following sets is equal to the union  $A \cup B$ ?

1 / 1 punto

- ☐  $\{1, 10, 18\}$   
☐  $\{3, 5, 10, 11, 14\}$   
☒  $\{1, 3, 5, 10, 11, 14\}$   
☐  $\{1, 3, 5, 3, 5, 10, 11, 14\}$

✓ Correcto

The union of two sets consists precisely of the elements that are in at least one of the two sets. That is precisely what is listed here.

3. How many real numbers are there between the integers 1 and 4?

1 / 1 punto

- ☐ None  
☐ 4  
☐ 2



4. Suppose I tell you that  $x$  and  $y$  are two real numbers which make the statement  $x \geq y$  true. Which pair of numbers cannot be values for  $x$  and  $y$ ?

1 / 1 punto

- ☐  $x = 2$  and  $y = 1$   
☐  $x = 10$  and  $y = 10$   
☒  $x = -1$  and  $y = 0$   
☐  $x = 5$  and  $y = 3.3$

✓ Correcto

Recall that the statement  $x \geq y$  means that  $x$  is either equal to  $y$  or  $x$  is to the right of  $y$  on the real number line. Since  $-1$  is actually to the left of  $0$ , these cannot be values for  $x$  and  $y$ .

5. Suppose that  $z$  and  $w$  are two positive numbers with  $z < w$ . Which of the following inequalities is false?

1 / 1 punto

- ☐  $w - 7 > z - 7$   
☐  $z + 3 < w + 3$   
☒  $-5z < -5w$



5. Suppose that  $z$  and  $w$  are two positive numbers with  $z < w$ . Which of the following inequalities is false?

1 / 1 punto

- ☐  $w - 7 > z - 7$
- ☐  $z + 3 < w + 3$
- ☒  $-5z < -5w$
- ☐  $-z > -w$

✓ **Correcto**

If we start with  $z < w$  and multiply both sides by  $-5$ , we need to flip the less-than sign, which would give  $-5z > -5w$ . For an example, try  $z = 1$  and  $y = 2$  and see what happens!

6. Find the set of all  $x$  which solve the inequality  $-2x + 5 \leq 7$

1 / 1 punto

- ☒  $x \geq -1$
- ☐  $x = -1$
- ☐  $x \geq -6$



6. Find the set of all  $x$  which solve the inequality  $-2x + 5 \leq 7$

1 / 1 punto

- ☒  $x \geq -1$
- ☐  $x = -1$
- ☐  $x \geq -6$
- ☐  $x \leq -1$

✓ **Correcto**

Subtracting 5 from both sides of the given inequality gives  $-2x \leq 2$ . Then we divide both sides by  $-2$ , remembering to flip the inequality sign, and we obtain this answer



7. Which of the following real numbers is not in the closed interval  $[2, 3]$

1 / 1 punto

- ☒ 1
- ☐ 2.1
- ☐ 2
- ☐ 3

✓ **Correcto**

Recall that the closed interval  $[2, 3]$  consists of all real numbers  $x$  which satisfy  $2 \leq x \leq 3$ . Since  $2 \leq 1$  is false,  $1 \notin [2, 3]$

8. Which of the following intervals represents the set of all solutions to:

0 / 1 punto

$$-5 \leq x + 2 < 10?$$

- ☒  $[-7, 8]$
- ☐  $[-5, 10)$
- ☐  $[-7, 8)$





9. Which of the numbers below is equal to the following summation:  $\sum_{k=2}^5 2k$ ?

1 / 1 punto

- ☐ 14
- ☐ 10
- ☐ 4
- ☒ 28

✓ Correcto

We compute  $\sum_{k=2}^5 2k = 4 + 6 + 8 + 10 = 28$ .

10. Suppose we already know that  $\sum_{k=1}^{20} k = 210$ . Which of the numbers below is equal to  $\sum_{k=1}^{20} 2k$ ?

1 / 1 punto

- ☒ 420
- ☐ 210
- ☐ 2
- ☐ 40



10. Suppose we already know that  $\sum_{k=1}^{20} k = 210$ . Which of the numbers below is equal to  $\sum_{k=1}^{20} 2k$ ?

1 / 1 punto

- ☒ 420
- ☐ 210
- ☐ 2
- ☐ 40

✓ Correcto

By applying one of our Sigma notation simplification rules, we can rewrite the summation in question as  $2 (\sum_{k=1}^{20} k) = 2 \times 210 = 420$ .

11. Which of the numbers below is equal to the summation  $\sum_{i=2}^{10} 7$ ?

1 / 1 punto

- ☐ 7
- ☐ 70
- ☒ 63
- ☐ 48



12. Which of the following numbers is the variance of the set  $Z = \{-2, 4, 7\}$ ?

1 / 1 punto

- ☐ 69
- ☐ 42
- ☐  $\sqrt{14}$
- ☒ 14

✓ Correcto

To get the variance of a set of numbers, you need to perform four steps:

First compute the mean (which is 3)

Then calculate all the squared differences between the numbers in the set and this mean (here you get 25, 1, 16)

Then add all these up (here you get 42)

Then divide by the number of elements in the set (which is 3).

Therefore, the variance of  $Z$



Then divide by the number of elements in the set (which is 3).

Therefore, the variance of  $Z$

$$= \frac{1}{3} [(-2-3)^2 + (4-3)^2 + (7-3)^2]$$

$$= \frac{1}{3} [25 + 1 + 16] = \frac{42}{3} = 14$$

13. Which of the following sets does *not* have zero variance? (hint: don't do any calculation here, just think!)

1 / 1 punto

- ☐  $\{5, 5, 5, 5, 5, 5, 5, 5, 5, 5, 5, 5, 5, 5\}$
- ☐  $\{1, 1, 1, 1\}$
- ☐  $\{0, 0, 0, 0, 0, 0, 0\}$
- ☒  $\{2, 5, 9, 13\}$



Correcto

Intuitively, the numbers in this set are spread out.