

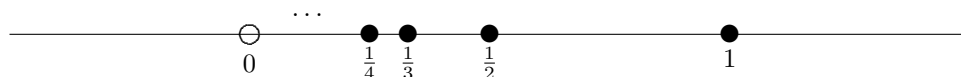
SOLUTIONS TO EXERCISES: I LIVE TWO BLOCKS WEST OF YOU

IN-SECTION EXERCISES:

1. x must lie to the left of z
2. Nothing can be said: z could lie to the right of x ; z could equal x ; or z could lie to the left of x .
3. $-x$ must lie to the right of $-y$
4. y is farther from zero; x is closer to zero
- 5a. 'one is less than three'; true
- 5b. 'two is less than or equal to two'; true
- 5c. 'negative one is greater than negative three'; true
- 5d. 'negative one is less than negative three'; false
- 5e. 'ex is less than or equal to one'; ST/SF
- 5f. 'ex is greater than or equal to negative one'; ST/SF
- 5g. 'negative one is greater than or equal to one'; false
- 5h. 'ex is greater than or equal to ex'; (always) true
6. Being 'bigger than' has to do with being *farther from zero*.
Being 'greater than' has to do with being *farther to the right on the number line*.
7. Greatest member: 4
Least member: 1
8. No greatest member: given any member, there is one that is farther to the right on the number line.
Least member: 1
9. Greatest member: -1
No least member: given any member, there is one that is farther to the left on the number line.
10. No greatest member; no least member. Zero is 'trying' to be the least member, but 0 isn't included in this set!



11. Greatest member: 1
No least member. Again, zero is 'trying' to be the least member, but 0 isn't in this set!



- 12a. 'For all ex greater than or equal to five ...' (Drop the word 'is'.)
- 12b. 'Let ex be greater than or equal to five.' (Drop the word 'is'; add the word 'be'.)
- 13a. $t \leq 2$
- 13b. $t \geq 2$
- 13c. $y \leq -2$
- 13d. $y \geq -2$
- 14a. t is at most 4
- 14b. t is at least 4
- 14c. y is at most -4
- 14d. y is at least -4

15. x is at most 5

x is at most $\frac{1}{3}$

x is at most -1 (There are infinitely many correct answers possible!)

16. $x = 5$

$x = \frac{1}{3}$

$x = -1$ (There are infinitely many correct answers possible!)

17. $2x + 3y = 5$

$\frac{1}{2}x + y = 4$

$x + 7y = \frac{1}{2}$ (There are infinitely many correct answers possible!)

18a. equation; always false



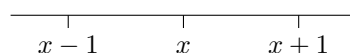
18b. inequality; always true



18c. inequality; always true



18d. inequality; always true



19a. equation in one variable (x)

19b. inequality in three variables (x , y , and z)

19c. inequality in one variable (x)

19d. equation in two variables (a and b)

20. The universal set for n is $\{1, 2, 3, \dots\}$. You can't have, say, 1.5 variables. It is conventional to use letters near the middle of the alphabet (like i , j , k , m or n) to denote variables with a universal set that is a subset of \mathbb{Z} .

21. The universal set for S is the set of *all possible sentences in one variable*. Here are some members of the universal set for S : $x = 1$, $x > 1$, $2x - 1 \leq 3x$, ...

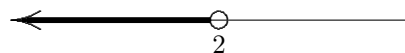
22. ' x is at least one' means ' $x \geq 1$ '. So, one number, or more than one number, must equal zero.

23. At least one of x , y , or z must equal 0. Here are some of the choices for x , y and z that make the sentence true:

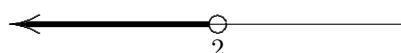
x	y	z	substitution into $xyz = 0$
0	1	2	$0 \cdot 1 \cdot 2 = 0$
0	0	2	$0 \cdot 0 \cdot 2 = 0$
1	0	$\frac{1}{2}$	$1 \cdot 0 \cdot \frac{1}{2} = 0$
0	0	0	$0 \cdot 0 \cdot 0 = 0$

24. Either $x + 1 = 0$ or $x + 2 = 0$ or $x - 1 = 0$ or $x = 0$. That is, either $x = -1$ or $x = -2$ or $x = 1$ or $x = 0$. These are the only four values of x that make the sentence true.

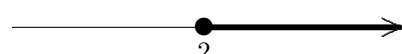
25a. ' x is less than two'; solution set $(-\infty, 2)$



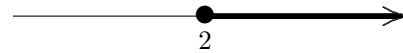
25b. ' 2 is greater than x '; solution set $(-\infty, 2)$



25c. ' x is greater than or equal to two'; solution set $[2, \infty)$



25d. 'two is less than or equal to ex'; solution set $[2, \infty)$



26.

x	substitution into ' $x \geq 2$ '	substitution into ' $2 \leq x$ '
4	$4 \geq 2$ (true)	$2 \leq 4$ (true)
2	$2 \geq 2$ (true)	$2 \leq 2$ (true)
1	$1 \geq 2$ (false)	$2 \leq 1$ (false)
2.3	$2.3 \geq 2$ (true)	$2 \leq 2.3$ (true)

END-OF-SECTION EXERCISES:

27. $x > 1$

28. $x \geq 1$

29. $x \leq 3$

30. $x < 3$

31. $(x + 1)(x - 2) = 0$

32. $x = 0$

33. $(x + 1)(x)(x - 2) = 0$

34. $x < 0$

35. $x \geq 0$

36. $x \leq 0$

37. $x \neq 0$

