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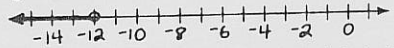
Solving Inequalities in One Variable; Combined Inequalities

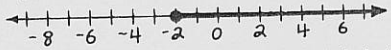
Solve each inequality and graph each solution set that is not empty.

1. $3a \leq 9$ $\{a : a \leq 3\}$

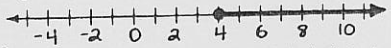
2. $-\frac{2}{3}c > 8$ $\{c : c < -12\}$



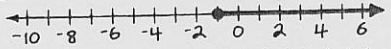
3. $d + 7 \geq 5$ $\{d : d \geq -2\}$



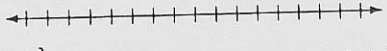
4. $5 - 3e \leq -7$ $\{e : e \geq 4\}$



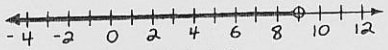
5. $2x + 2 \geq -3x - 3$ $\{x : x \geq -1\}$



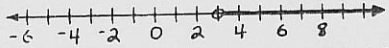
6. $2 + 3x < 3(x - 1)$ $\varnothing$



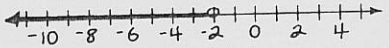
7. $2z + 3(z - 1) < 4(z + 1) + 2$ $\{z : z < 9\}$



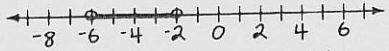
8. $\frac{3s + 1}{5} > \frac{s + 1}{2}$ $\{s : s > 3\}$



9. $3(t + 1) - 4 > 2(2t + 1) - 1$ $\{t : t < -2\}$

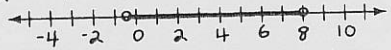


10. $-1 < g + 5 < 3$ $\{g : -6 < g < -2\}$

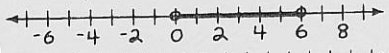


11. $1 \leq 6n < 18$ $\{n : \frac{1}{6} \leq n < 3\}$

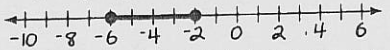
12. $18 > 2(j + 1) > 1$ $\{j : 8 > j > -\frac{1}{2}\}$



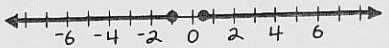
13. $4 < \frac{k + 8}{2} < 7$ $\{k : 0 < k < 6\}$



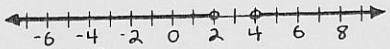
14. $6 \leq 5 - \frac{q}{2} \leq 8$ $\{q : -6 \leq q \leq -2\}$



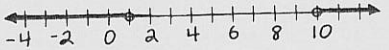
15. $2 - n \leq 3n$ or $2 - n \leq -3n$ $\{n : n \leq -1 \text{ or } n \geq \frac{1}{2}\}$



16. $2 - 3m < -10$ or $2m + 4 < 10 - m$ $\{m : m < 2 \text{ or } m > 4\}$



17. $2(c + 1) - 3 < 1$ or $2(c + 1) - 3 > 19$ $\{c : c < 1 \text{ or } c > 10\}$



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Problem Solving with Inequalities

Solve the following.

1. Find all sets of four consecutive odd integers that are positive and whose sum is at most 25. — $\{1,3,5,7\}$ or $\{3,5,7,9\}$

2. Find all sets of three consecutive even integers whose sum is greater than 102 and less than 116. — $\{34,36,38\}$ or $\{36,38,40\}$

3. Find all pairs of consecutive even integers whose sum is greater than 73 but less than 79. — 36,38 or 38,40

4. Paul bowled games of 155, 148, and 160. What must he bowl in the next game to keep at least an average of 150? — 137

5. The Coin Shop will purchase at most \$20.00 per person per day in silver coins, provided that they are packaged in sets of 6 nickels, 4 dimes, and 1 quarter. What is the greatest number of sets that Steve could bring to the shop to sell? — 21 sets

6. Heather's age is 3 years more than one half her cousin Rachel's age. If the difference in their ages is less than 4 years, what is the oldest that Rachel can be in years? — 13 years

7. At Cheryl's Canine Resort, there are reservations for twice as many retrievers as collies, and for two more shepherds than collies. If there are 21 cages in all, what is the greatest number of collies that can be boarded? — 4 collies

8. Nancy's golf score on Friday was 86. Her score on Tuesday was 8 points more than her score on Thursday. If Nancy's average score is between 80 and 84, what are the lowest and highest possible scores she could have had on Thursday? — lowest score 74, highest score 78

9. The A-One Shoe Store has in its inventory three times more pairs of sneakers than it has pairs of boots, and at least ten more pairs of sandals than it has pairs of boots. If there are 28 pairs of sandals in the inventory, what is the greatest possible number of pairs of sneakers in the inventory? — 54 pairs

10. Mr. Scrooge and Mr. Marner believed in saving money. At the end of 3 years, Mr. Scrooge had saved no less than two thirds what Mr. Marner had saved. If Mr. Marner had saved \$15.00 per week, what is the least amount of money that Mr. Scrooge saved? — \$1560

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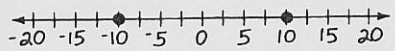
Absolute Value in Open Sentences; Solving Graphically

Solve and graph the solution set.

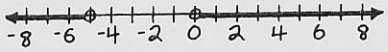
1. $|\frac{3}{5}a| = 6$ $\{-10, 10\}$



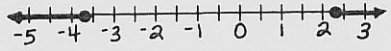
2. $|y - 0.3| = 0.1$ $\{0.2, 0.4\}$

3. $|5(n - 3)| = 10$ $\{1, 5\}$

4. $|2c + 5| > 5$ $\{c: c < -5 \text{ or } c > 0\}$



5. $|\frac{s}{3} + \frac{1}{5}| \geq 1$ $\{s: s \leq -\frac{18}{5} \text{ or } s \geq \frac{12}{5}\}$



Using absolute value and the variable x, translate each statement into an open sentence.

6. The numbers whose distance from 8 is less than 2 $|x - 8| < 2$
7. The numbers whose distance from 5 is equal to 3 $|x - 5| = 3$
8. The numbers whose distance from -3 is at least 4 $|x + 3| \geq 4$
9. The numbers whose distance from $\frac{1}{4}$ is more than $\frac{5}{4}$ $|x - \frac{1}{4}| > \frac{5}{4}$
10. The numbers whose distance from m is no less than z $|x - m| \geq z$

Solve each open sentence graphically.

11. $|t - 3| < \frac{2}{3}$ $\{t: \frac{7}{3} < t < \frac{11}{3}\}$
12. $|2 + 6x| = 4$ $\{-1, \frac{1}{3}\}$
13. $|m - 8| \geq 3$ $\{m: m \geq 11 \text{ or } m \leq 5\}$
14. $\frac{3}{5} < |n + 5|$ $\{n: n < -\frac{28}{5} \text{ or } n > -\frac{22}{5}\}$
15. $|-2s - 4| < 4$ $\{s: -4 < s < 0\}$
16. $10|4 - 0.5r| = 20$ $\{4, 12\}$

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Theorems and Proofs; Order and Absolute Value

State the axiom or definition that justifies each numbered step in each proof.

1. Prove that $(m + 2)(m + 3) = m^2 + 5m + 6$.

Proof:

1.	$(m + 2)(m + 3) = (m + 2)m + (m + 2) \cdot 3$	1. Distributive property
2.	$= m \cdot m + 2m + m \cdot 3 + 2 \cdot 3$	2. Distributive property
3.	$= m^2 + 2m + m \cdot 3 + 6$	
4.	$= m^2 + 2m + 3m + 6$	4. Commutative prop. for mult.
5.	$= m^2 + (2 + 3)m + 6$	5. Distributive property
6.	$\therefore (m + 2)(m + 3) = m^2 + 5m + 6$	

2. Prove that if $s < 0$ and $t > 0$, then $|st| = |s| \cdot |t|$.

Proof:

1.	$s < 0$ and $t > 0$	1. Given
2.	$st < 0$	2. Multiplicative prop. of order
3.	$\lvert st\rvert = -st, \lvert s\rvert = -s, \lvert t\rvert = t$	3. Definition of absolute value
4.	$\lvert s\rvert \cdot \lvert t\rvert = (-s)t$	4. Multiplicative prop. of equality
5.	$= [(-1)s]t$	5. Multiplicative prop. of -1
6.	$= (-1)st$	6. Associative prop. of mult.
7.	$= -st$	7. Multiplicative prop. of -1
8.	$\therefore \lvert s\rvert \cdot \lvert t\rvert = -st = \lvert st\rvert$	8. Transitive prop. of equality
9.	$\therefore \lvert st\rvert = \lvert s\rvert \cdot \lvert t\rvert$	9. Symmetric prop. of equality

3. Prove that if $a < 0$, $b < a$, and $c < b$, then $0 < bc - ac$.

Proof:

1.	$a < 0, b < a, c < b$	1. Given
2.	$c < 0$	2. Transitive property of order
3.	$bc > ac$	3. Multiplicative property of order
4.	$bc + (-ac) > ac + (-ac)$	4. Additive property of order
5.	$bc + (-ac) > 0$	5. Property of additive inverses
6.	$bc - ac > 0$	6. Definition of subtraction
7.	$\therefore 0 < bc - ac$	7. Definition of $>$