Applications

1. Use your algorithms to find each sum without using a calculator.

   a. $^{+}12 + {}^{+}4$

   b. $^{+}12 + {}^{-}4$

   c. $^{-}12 + {}^{+}4$

   d. $^{-}7 + {}^{-}8$

   e. $^{+}4.5 + {}^{-}3.8$

   f. $^{-}4.5 + {}^{+}3.8$

   g. $^{-}250 + {}^{-}750$

   h. $^{-}6{,}200 + {}^{+}1{,}200$

   i. $^{+}0.75 + {}^{-}0.25$

   j. $^{+}\frac{2}{3} + {}^{-}\frac{1}{6}$

   k. $^{-}\frac{5}{12} + {}^{+}\frac{2}{3}$

   l. $^{-}\frac{8}{5} + {}^{-}\frac{3}{5}$

2. Find each sum.

   a. $^{+}3.8 + {}^{+}2.7$

   b. $^{-}3.8 + {}^{-}2.7$

   c. $^{-}3.8 + {}^{+}2.7$

   d. $^{+}3.8 + {}^{-}2.7$

3. Write an addition number sentence that matches each diagram.

   a.

   b.

   c.

   d.
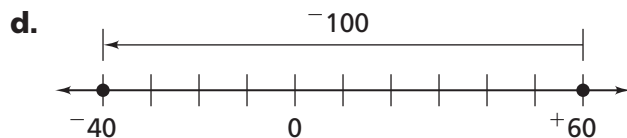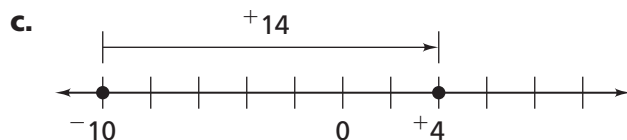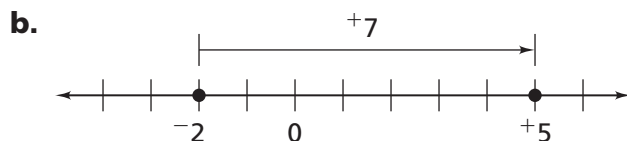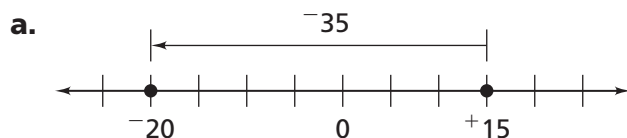
The chip board has 10 black and 13 red chips. Use the chip board for Exercises 4 and 5.
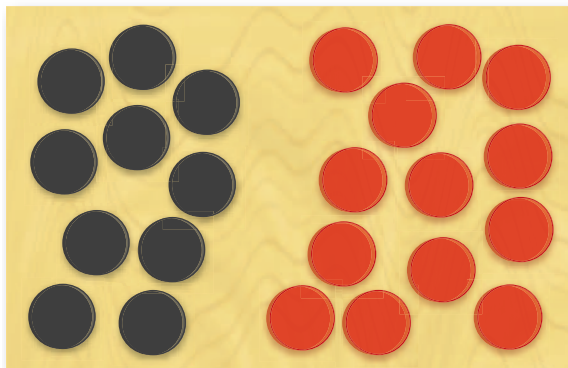
4. What is the value shown on the board?

5. Write a number sentence to represent each situation. Then find the new value of the chip board.

   a. Remove 5 red chips from the original board.

   b. Then add 5 black chips.

   c. Then add 4 black chips and 4 red chips.

6. Use your algorithms to find each difference without using a calculator. Show your work.

   a. $^{+}12 - {^{+}4}$

   b. $^{+}4 - {^{+}12}$

   c. $^{-}12 - {^{+}4}$

   d. $^{-}7 - {^{+}8}$

   e. $^{+}45 - {^{-}40}$

   f. $^{+}45 - {^{-}50}$

   g. $^{-}25 - {^{-}75}$

   h. $^{-}62 - {^{-}12}$

   i. $^{+}0.8 - {^{-}0.5}$

   j. $^{+}\frac{1}{2} - {^{+}\frac{3}{4}}$

   k. $^{-}\frac{2}{5} - {^{+}\frac{1}{5}}$

   l. $^{-}\frac{7}{10} - {^{+}\frac{4}{5}}$

7. Find each value without using a calculator.

   a. $^{+}12 + {^{-}12}$

   b. $^{+}12 - {^{+}12}$

   c. $^{-}12 - {^{+}12}$

   d. $^{-}12 - {^{-}12}$

   e. $^{-}12 + {^{-}12}$

   f. $^{-}12 + {^{+}12}$

8. Find each value.

   a. $^{+}50 + {^{-}35}$

   b. $^{+}50 - {^{-}20}$

   c. $^{-}19 - {^{+}11}$

   d. $^{-}30 - {^{+}50}$

   e. $^{-}35 + {^{-}15}$

   f. $^{+}12 + {^{-}18}$

9. Write a story about temperature, money, or game scores to represent each number sentence.

a. $^+7 - {^-4} = {^+11}$ b. $^-20 + {^+n} = {^+30}$ c. $^-n + {^-150} = {^-350}$

10. Without doing any calculations, decide which will give the greater result. Explain your reasoning.

a. $^+5,280 + {^-768}$ OR $^+5,280 - {^-768}$

b. $^+1,760 - {^-880}$ OR $^+1,760 - {^+880}$

c. $^+1,500 + {^+3,141}$ OR $^+1,500 - {^-3,141}$

11. Without doing any calculations, determine whether each result is positive or negative. Explain.

a. $^-23 + {^+19}$ b. $^+3.5 - {^-2.7}$

c. $^-3.5 - {^-2.04}$ d. $^+3.1 + {^-6.2}$

12. Find each missing part.

13. Find each sum or difference. Show your work.

a. $^+15 + {^-10}$ b. $^-20 - {^+14}$

c. $^+200 - {^-125}$ d. $^-20 - {^-14}$

e. $^-200 + {^+125}$ f. $^+7 - {^+12}$

14. Below is part of a time line with three years marked.

+————|————————|————————|————+
    1986   1996   2006

   a. How does 1996 relate to 1986? How does 1996 relate to 2006?

   b. Write two number sentences. One must relate 1996 to 1986. The other must relate 1996 to 2006.

   c. How are these two number sentences alike and different?

15. Compute each value.

   a. $^+3 + {}^-3 + {}^-7$ **b.** $^+3 - {}^+3 - {}^+7$

   c. $^-10 + {}^-7 + {}^-28$ **d.** $^-10 - {}^+7 - {}^+28$

   e. $7 - {}^+8 + {}^-5$ **f.** $^+7 + {}^-8 - {}^+5$

   g. $^-97 + {}^-35 - {}^+10$ **h.** $^-97 - {}^+35 + {}^-10$

   i. What can you conclude about the relationship between subtracting a positive number $(-\ ^+)$ and adding a negative number $(+\ ^-)$ with the same absolute value?

16. Compute each value.

   a. $^+3 - {}^-3 - {}^-7$ **b.** $^+3 + {}^+3 + {}^+7$

   c. $^-10 - {}^-7 - {}^-28$ **d.** $^-10 + {}^+7 + {}^+28$

   e. $^+7 + {}^+8 + {}^+5$ **f.** $^+7 - {}^-8 - {}^-5$

   g. $^-97 - {}^-35 - {}^+10$ **h.** $^-97 + {}^+35 + {}^-10$

   i. What can you conclude about the relationship between subtracting a negative number $(-\ ^-)$ and adding a positive number $(+\ ^+)$ with the same absolute value?

Multiple Choice In each set of calculations, one result is different from the others. Find the different result without doing any calculations.

17. A. $54 + {}^-25$ **B.** $54 - 25$

     C. $25 - 54$ **D.** $^-25 + 54$

18. F. $^-6.28 - {}^-3.14$ **G.** $^-6.28 + 3.14$

     H. $3.14 + {}^-6.28$ **J.** $^-3.14 - {}^-6.28$

19. A. $534 - 275$ **B.** $275 - 534$

     C. $^-534 + 275$ **D.** $275 + {}^-534$

20. F. $175 + {}^-225$ **G.** $225 - 175$

     H. $175 - 225$ **J.** $^-225 + 175$

21. Fill in the missing information for each problem.

a. $^{+}5 + \dfrac{^{-}3}{4} = \blacksquare$ b. $^{+}\dfrac{4}{8} + {^{-}6} = \blacksquare$ c. $^{-}3\dfrac{3}{4} - \dfrac{^{-}3}{4} = \blacksquare$

d. $^{+}2\dfrac{2}{3} - ^{+}\dfrac{1}{3} = \blacksquare$ e. $^{-}2 + \blacksquare = {^{-}2\dfrac{1}{2}}$ f. $^{-}4.5 + \blacksquare = {^{-}5}$

22. **Multiple Choice** Which is the correct addition and subtraction fact family for $^{-}2 + {^{+}3} = {^{+}1}$?

A. $^{-}2 + 3 = 1$
　　$^{-}2 + 1 = 3$
　　$3 - 1 = 2$

B. $^{-}2 + {^{+}3} = {^{+}1}$
　　$^{-}2 + 3 = 1$
　　$3 - 1 = 2$

C. $^{-}2 + 3 = 1$
　　$1 - 3 = {^{-}2}$
　　$1 - {^{-}2} = 3$

D. 　$1 - 3 = {^{-}2}$
　　$1 - {^{-}2} = 3$
　　$3 - 1 = 2$

23. Write a related fact for each number sentence to find n. What is the value of n?

a. $n - {^{+}7} = {^{+}10}$ b. $\dfrac{^{-}1}{2} + n = \dfrac{^{-}5}{8}$ c. $^{+}\dfrac{2}{3} - n = \dfrac{^{-}7}{9}$

24. Are $^{+}8 - {^{+}8}$ and $8 - 8$ equivalent? Explain.

25. Are $^{+}100 - {^{+}99}$ and $100 - 99$ equivalent? Explain.

26. Are the expressions in each group below equivalent? If so, which form makes the computation easiest?

a. $^{+}8 + {^{-}10}$
　$8 - {^{+}10}$
　$8 - 10$

b. $3 + {^{-}8}$
　$3 - {^{+}8}$
　$3 - 8$

27. Locate each pair of points on a coordinate grid. Describe the direction from the first point to the second point. Use these descriptions: to the left, to the right, downward, and upward.

a. $(^{+}3, {^{+}2}); (^{-}5, {^{+}2})$ b. $(^{-}7, {^{+}7}); (^{+}3, {^{+}7})$ c. $(^{-}8, {^{-}2}); (^{+}4, {^{-}2})$

d. $(^{+}4, {^{+}4}); (^{+}4, {^{+}20})$ e. $(^{+}18, {^{+}8}); (^{+}18, {^{-}8})$ f. $(^{-}20, {^{-}4}); (^{-}20, {^{+}9})$

g. Movement to the right or upward is in a positive direction. Movement to the left or downward is in a negative direction. Explain why this makes sense.

h. Now, describe the direction and the distance between the first point and the second point. For example, an answer of $^{-}15$ means you move in a negative direction a distance of 15. Whether the change is in the x-coordinate or the y-coordinate will tell whether $^{-}15$ means down 15 or to the left 15.

28. a. Locate three points on a coordinate grid that could be the vertices of a right triangle.

b. Find two different points that make a right triangle with coordinates ($^-2$, $^+2$) and ($^+3$, $^+1$).

29. Find the opposite of each point in the graph. [Remember, the opposite of ($^+2$, $^-1$) is ($^-2$, $^+1$).]

a.

b.
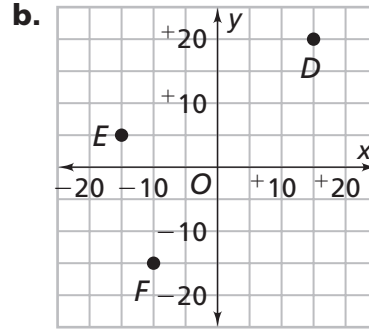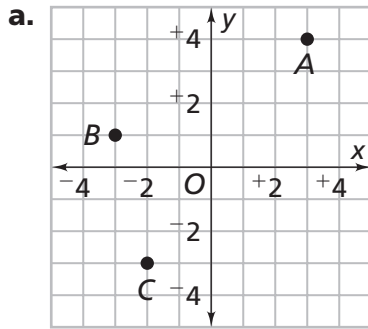
Connections

30. The Spartan Bike Shop keeps a record of their business transactions. They start their account at zero dollars. Payments represent negative transactions. Sales represent positive transactions. Write a number sentence to represent each transaction. Then find the new balance.

a. rent payment for shop: $1,800

b. payment for 20 new bicycles: $2,150

c. payment on office equipment: $675

d. business insurance for 6 months: $2,300

e. sale of 3 bicycles: $665

f. sale of two helmets and one baby seat: $95

g. Web site advertising down payment: $250

h. sale of 6 bicycles: $1,150

i. refund to an unhappy customer: $225

j. sale of 2 bicycles, two helmets, and two air pumps: $750

**k.** check from manufacturer for 5 bicycles returned: $530

Write a number sentence for each situation in Exercises 31 and 32.

31. The air temperature drops from 94° to 72° in 15 minutes. What is the change in temperature?

32. The Teacher's Pets team has 50 points in MathMania. They miss a 200-point question. What is their new score?

33. Find four different numbers, in order from least to greatest, that lie between the two given numbers.

   a. $^-4.5$ and $^-3.5$ **b.** $^-0.5$ and $^+0.5$

34. The diagram below shows Mug Wump drawn at the center of a coordinate grid and in four other positions.

   a. Find a sequence of coordinates to draw Mug's body at the center of the grid. Make a table to keep track of the points.

   b. You can write a coordinate rule to describe the movement of points from one location to another. For example, the coordinate rule $(x, y) \rightarrow (x - {}^+2, y + {}^+3)$ moves a point (x, y) to the left 2 units and up 3 units from its original location. The coordinate rule $(x, y) \rightarrow (x + {}^+6, y - {}^+7)$ moves points of the original Mug to produce which of the other drawings?

   c. Find coordinate rules for moving the original Mug to the other positions on the grid.
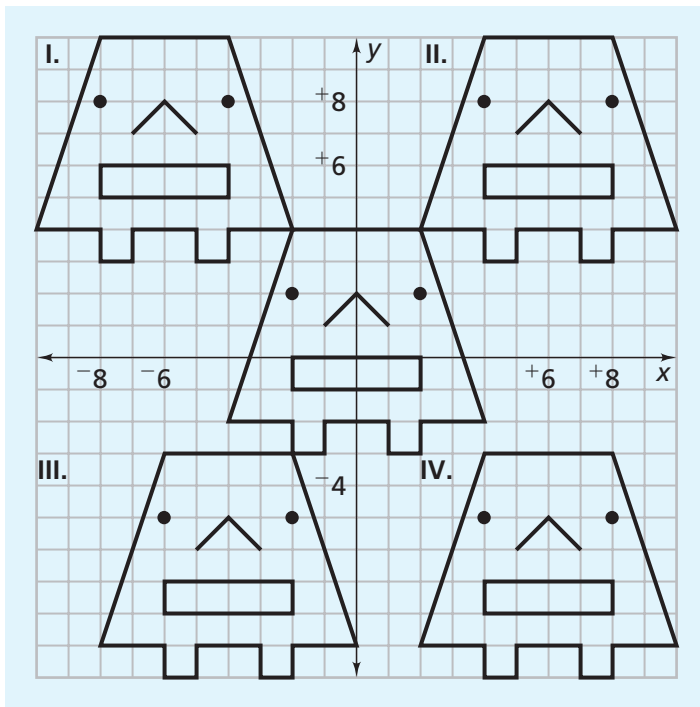
Use the points in each coordinate grid to determine what scale interval was used on each axis.

35.

36.
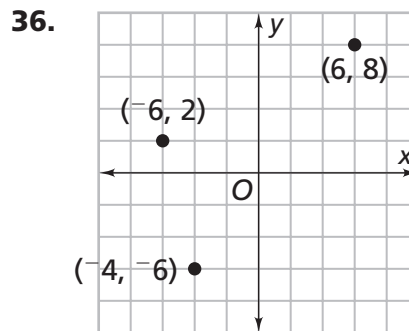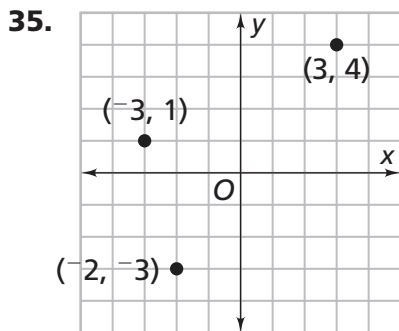
Extensions

37. Which numbers, when added to $^-15$, give a sum

    a. greater than 0   **b.** less than 0   **c.** equal to 0

38. Find the distance between each pair of numbers on a number line.

    a. $^+8, ^+4$ **b.** $^-8, ^+4$ **c.** $^+8, ^-4$

    d. $^-8, ^-4$ **e.** $^-3\frac{1}{2}, ^+\frac{3}{4}$ **f.** $^+5.4, ^-1.6$

39. Find each absolute value.

    a. $|^+8 - {}^+4|$ **b.** $|^-8 - {}^+4|$ **c.** $|^+8 - {}^-4|$

    d. $|^-8 - {}^-4|$ **e.** $|^-3\frac{1}{2} + {}^+\frac{3}{4}|$ **f.** $|^+5.4 - {}^-1.6|$

    g. Compare the results of parts (a)–(f) with the distances found in Exercise 38. What do you notice? Why do you think this is so?

40. Replace n with a number to make each statement true.

    a. $n + {}^-18 = {}^+6$ **b.** $^-24 - n = {}^+12$

    c. $^+43 + n = {}^-12$ **d.** $^-20 - n = {}^-50$

41. The table shows the profits or losses (in millions of dollars) earned by three companies from 1997 to 2006. Find the range of the annual results and the overall profit (or loss) for each company over that time period.

	Company	'97	'98	'99	'00	'01	'02	'03	'04	'05	'06
a.	Sands Motor	⁻5.3	⁻4.8	⁻7.2	⁻2.1	1.4	6.5	3.2	⁻3.5	10.2	2.4
b.	Daily Trans	6.0	3.4	⁻5.8	⁻12.3	⁻20.3	⁻1.5	2.5	9.8	19.4	32.1
c.	Sell to You	120	98	⁻20	⁻40	⁻5	85	130	76	5	⁻30

42. Julia thinks a bit more about how to use red and black chips to model operations with integers. She draws the following chip board. She decides it represents $8 \times {}^-5 = {}^-40$ and $^-40 \div 8 = {}^-5$.

a. Explain why Julia's reasoning makes sense.

b. Use Julia's reasoning to find each value.

   i. $10 \times {}^-5$ **ii.** $4 \times {}^-15$ **iii.** $3 \times {}^-5$

   iv. $^-14 \div 2$ **v.** $^-14 \div 7$ **vi.** $^-35 \div 7$

43. Starting from 0, write an addition sentence for diagram below.

a.

b.