Connection

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er.

7 EXAMPLE Real-World Connection

Aeronautics Radar detected an unidentified plane 5000 mi away, approaching at 700 mi/h. Fifteen minutes later an interceptor plane was dispatched, traveling at 800 mi/h. How long did the interceptor take to reach the approaching plane?

Relate distance for interceptor + distance for approaching plane = 5000 mi

Define Let t = the time in hours for the interceptor.
Then $t + 0.25$ = the time in hours for the approaching plane.

Write $800t + 700(t + 0.25) = 5000$

$800t + 700t + 175 = 5000$ Distributive Property

$1500t = 4825$ Solve for t.

$t \approx 3.217$ or about 3 h 13 min

Check Is the answer reasonable? In $3\frac{1}{4}$ h, the interceptor flies 2600 mi. In $3\frac{1}{2}$ h, the approaching plane flies 2450 mi. $2600 + 2450 \approx 5000$, so the answer is reasonable.

Understanding 7 A space probe leaves Earth at the rate of 3 km/s. After 100 days, a radio signal is sent to the probe. Radio signals travel at the speed of light, about 3×10^5 km/s. About how long does the signal take to reach the probe? about 86.4 seconds, or 1 minute 26.4 seconds

RCISES

For more practice, see *Extra Practice*.

e and Problem Solving

tice by Example

Solve each equation. Check your answers.

Example 1 (page 18)

1. $7w + 2 = 3w + 94$ 23
2. $15 - g = 23 - 2g$ 8
3. $43 - 3d = d + 9$ $\frac{17}{2}$
4. $5y + 1.8 = 4y - 3.2$ -5
5. $6a - 5 = 4a + 2$ $\frac{7}{2}$
6. $7y + 4 = 3 - 2y$ $-\frac{1}{9}$
7. $5c - 9 = 8 - 2c$ $\frac{17}{7}$
8. $4y - 8 - 2y + 5 = 0$ $\frac{3}{2}$

Example 2 (page 19)

9. $6(n - 4) = 3n$ 8
10. $2 - 3(x + 4) = 8$ -6
11. $5(2 - g) = 0$ 2
12. $2(x + 4) = 8$ 0
13. $6(t - 2) = 2(9t - 2)$ $-\frac{2}{3}$
14. $4w - 2(1 - w) = -38$ -6
15. $4(k + 5) = 2(9k - 4)$ 2
16. $10(1 - 2y) = -5(2y - 1)$ $\frac{1}{2}$

Example 3 (page 19)

Solve each formula for the indicated variable.

17. $A = \frac{1}{2}bh$, for h $h = \frac{2A}{b}$
18. $s = \frac{1}{2}gt^2$, for g $g = \frac{2s}{t^2}$
19. $V = \ell wh$, for w $w = \frac{V}{\ell h}$
20. $I = prt$, for r $r = \frac{I}{pt}$
21. $S = 2\pi rh$, for r $r = \frac{S}{2\pi h}$
22. $V = \pi r^2 h$, for h $h = \frac{V}{\pi r^2}$

Example 4 (page 19)

Solve each equation for x. Find any restrictions. 23–28. See margin.

23. $ax + bx = c$
24. $bx - cx = -c$
25. $\frac{x}{a} + b = c$
26. $\frac{x}{a} - 5 = b$
27. $\frac{x - 2}{2} = m + n$
28. $\frac{2}{5}(x + 1) = g$

3. Practice

Assignment Guide

1 Objective

A B Core 1–28, 36–47, 55–64

C Extension 65

2 Objective

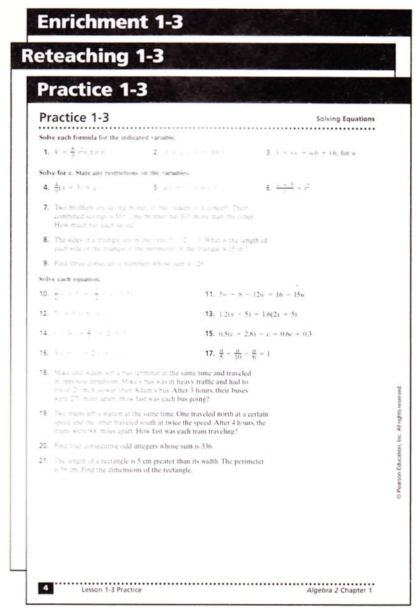
A B Core 29–35, 48–54

C Extension 66–68

Standardized Test Prep 69–72

Mixed Review 73–82

Exercises 18–21 Students may find it helpful to first rewrite the expression with the indicated variable as the rightmost factor. For example, in Exercise 20, rewrite $I = prt$ as $I = (pt)r$. This makes it easier to see what to multiply or divide each side by to isolate r.


Enrichment 1-3
Reteaching 1-3
Practice 1-3
Practice 1-3 Solving Equations

-24 Exercises

$\frac{c}{+b}$, $a \neq -b$

$\frac{c}{-b}$, $b \neq c$

$(c - b)$ or ab, $a \neq 0$

26. $x = a(b + 5)$ or $ab + 5a$, $a \neq 0$

27. $x = 2(m + n) + 2$ or $2m + 2n + 2$

28. $x = \frac{5g}{2} - 1$

ercises 42–47 You may wish to ve students state any strictions on the variables.

ror Prevention

ercise 55 Students should alerted to the fact that strictions on variables may stem om the original equation or om expressions in the solution.

ror Prevention

ercise 67b Students may arrive the equation $x = \pm\sqrt{\frac{c-b}{a}}$ d say that $c - b$ and a must be rfect squares in order for the o solutions to be rational. Urge em to reassess the possibilities. e quantity $\frac{c-b}{a}$ can be a rfect square even though $- b$ and a are not. Consider, example, the case in which $= 4$, $b = 1$, and $a = 3$.

ges 21–24 Exercises

$R = \frac{r_1 r_2}{r_1 + r_2}$

$r_2 = \frac{Rr_1}{r_1 - R}$

$h = \frac{S - 2\pi r^2}{2\pi r}$

$v = \frac{h + 5t^2}{t}$

$h = \frac{2(v - s^2)}{s}$

$b_2 = \frac{2A}{h} - b_1$

$x = ab - b^2 - a, b \neq 0$

$x = \frac{c-a}{b-d}, b \neq d$

$x = \frac{b+d}{c-a}, a \neq c$

$x = \frac{3a - b - 8}{a - b}, a \neq b$

$x = \frac{3b + 2c - 5}{b - c}, b \neq c$

$x = \frac{2ab - 2c}{3at - cd}, 3at \neq cd$

$x = \frac{4a - 3bc}{aq - 5bp}, 5bp \neq aq$

$x = \frac{cb}{2da} + 6, a, b, d \neq 0$

$x = \frac{10c}{a}, a \neq 0$

$x = \frac{a-c}{m} + a, m \neq 0,$ $x \neq a$

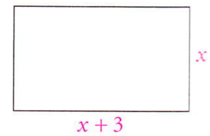
Examples 5–7 (pages 20, 21)

Write an equation to solve each problem.

29. Two buses leave Houston at the same time and travel in opposite directions. One bus averages 55 mi/h and the other bus averages 45 mi/h. When will they be 400 mi apart? **4 h**

30. Two planes left an airport at noon. One flew east at a certain speed and the other flew west at twice the speed. The planes were 2700 mi apart in 3 h. How fast was each plane flying? **300 mi/h; 600 mi/h**

31. Geometry The length of a rectangle is 3 cm greater than its width. The perimeter is 24 cm. Find the dimensions of the rectangle. **width = 4.5 cm; length = 7.5 cm**



32. Geometry One side of a triangle is 1 in. longer than the shortest side and is 1 in. shorter than the longest side. The perimeter is 17 in. Find the dimensions of the triangle. **$4\frac{2}{3}$ in.; $5\frac{2}{3}$ in.; $6\frac{2}{3}$ in.**

33. Geometry The sides of a rectangle are in the ratio 3 : 2. What is the length of each side if the perimeter of the rectangle is 55 cm? **11 cm; 11 cm; 16.5 cm; 16.5 cm**

34. Geometry The sides of a triangle are in the ratio 3 : 4 : 5. What is the length of each side if the perimeter of the triangle is 30 cm? **7.5 cm; 10 cm; 12.5 cm**

35. The sum of three consecutive integers is 90. **a–b. See left.**
a. Find the three numbers by letting x represent the first integer.
b. Find the three numbers by letting x represent the second integer.

35a. $x + (x + 1) + (x + 2) = 90$; 29, 30, 31
b. $(x - 1) + x + (x + 1) = 90$; 29, 30, 31

B Apply Your Skills

Solve each equation. **36. $\frac{46}{39}$, or $1\frac{7}{39}$**

36. $0.2(x + 3) - 4(2x - 3) = 3.4$

37. $12 - 3(2w + 1) = 7w - 3(7 + w)$ **3**

38. $3(m - 2) - 5 = 8 - 2(m - 4)$ **38. $\frac{27}{5}$, or $5\frac{2}{5}$**

39. $7(a + 1) - 3a = 5 + 4(2a - 1)$ **$\frac{3}{2}$**

40. $\frac{x}{2} + \frac{x}{5} + \frac{x}{3} = 31$ **30**

41. $0.5\left(2x + \frac{3}{4}\right) - \frac{1}{3}(0.1 + x) = 1$ **$\frac{79}{80}$, or 0.9875**

Solve each formula for the indicated variable. **42–47. See margin.**

42. $R(r_1 + r_2) = r_1 r_2$, for R

43. $R(r_1 + r_2) = r_1 r_2$, for r_2

44. $S = 2\pi r^2 + 2\pi rh$, for h

45. $h = vt - 5t^2$, for v

46. $v = s^2 + \frac{1}{2}sh$, for h

47. $A = \frac{1}{2}h(b_1 + b_2)$, for b_2

48. Geometry The measure of the supplement of an angle is 20° more than three times the measure of the original angle. Find the measures of the angles. **40°, 140°**

49. Geometry The measures of an angle and its complement differ by 22°. Find the measures of the angles. **34°, 56°**

50. Michael drove to a friend's house at a rate of 40 mi/h. He returned by the same route at a rate of 45 mi/h. The driving time for the round trip was 4 h. What is the distance Michael traveled? **about 169.4 mi**

Real-World Connection

In the 2000 Olympics, Marion Jones won three gold and two bronze medals.

51. Sports In the 2000 Olympics, Marion Jones of the United States won the gold medal in the 100-meter race with a time of 10.75 seconds. In the 1968 Olympics, Wyomia Tyus, also of the United States, won the gold medal in the 100-meter race in 11.08 seconds. If they ran in the same race repeating their respective times, by how many meters would Jones beat Tyus? **≈2.98 m**

52. Investments Suppose you have $5000 to invest. A certificate of deposit (CD) earns 6% annual interest, while bonds, which are more risky, earn 8% annual interest. You decide to invest $2000 in a CD and the rest in bonds. How much interest will you have earned at the end of one year? Of two years? **$360; $746.40**

66a. 10 cows; 30 chickens. Sample equation: $4c + 2(40 - c) = 100$, where c is the number of cows

c. Answers may vary. Sample: In all, a repair shop has 11 bicycles and tricycles to repair. These have a total of 26 wheels. How many bicycles and how many tricycles are there? 7 bicycles, 4 tricycles

53. Find 4 consecutive odd integers with a sum of 184. **43, 45, 47, 49**

54. Find 4 consecutive even integers such that the sum of the second and fourth is 76. **34, 36, 38, 40**

Solve for x. State any restrictions on the variables. **55–64. See margin p. 22.**

55. $\frac{x+a}{b} + b = a$

56. $bx + a = dx + c$

57. $cx - b = ax + d$

58. $a(x - 3) + 8 = b(x - 1)$

59. $c(x + 2) - 5 = b(x - 3)$

60. $a(3tx - 2b) = c(dx - 2)$

61. $b(5px - 3c) = a(qx - 4)$

62. $\frac{a}{b}(2x - 12) = \frac{c}{d}$

63. $\frac{3ax}{5} - 4c = \frac{ax}{5}$

64. $\frac{a - c}{x - a} = m$

Challenge

65. a. The speed of sound in air s, in ft/s, is given by the formula $s = 1055 + 1.1t$, where t is the temperature in degrees Fahrenheit. Solve the formula for t.
   b. Find the Fahrenheit temperature at which the speed of sound is 1100 ft/s.
   c. The relationship between the temperature in degrees Fahrenheit F and degrees Celsius C is given by the formula $F = \frac{9}{5}C + 32$. Solve the formula for C.
   d. Find the Celsius temperature at which the speed of sound is 1100 ft/s.

a. $t = \frac{s - 1055}{1.1}$
b. about 40.9°F
c. $C = \frac{5}{9}(F - 32)$
d. about 4.9°C

66. There are 40 cows and chickens in the farmyard. One quiet afternoon, Jack counted and found that there were 100 legs in all. How many cows and how many chickens are there?
   a. Solve this problem by writing and solving an equation. **See margin p. 22.**
   b. **Critical Thinking** This problem can also be solved by reasoning. Suppose all 40 animals are chickens. How many legs would there be? How many too few legs is that? If one chicken is replaced by one cow, by how many would the number of legs be increased? How many cows would have to replace chickens to get the required 100 legs? **80 legs; 20 legs; 2 legs; 10 cows**
   c. **Open-Ended** Write a problem about the number of wheels in a group of bicycles and tricycles. Solve your problem. **See margin p. 22.**

67. Assume that a, b, and c are integers and $a \neq 0$.
   a. **Proof** Prove that the solution of the linear equation $ax - b = c$ must be a rational number. **See margin.**
   b. **Writing** Describe the values of a, b, and c for which the solutions of $ax^2 + b = c$ are rational. **See back of book.**

68. A tortoise crawling at the rate of 0.1 mi/h passes a resting hare. The hare wants to rest another 30 min before chasing the tortoise at the rate of 5 mi/h. How many feet must the hare run to catch the tortoise? **about 269.4 ft**

FCAT Practice

Gridded Response

69. What is the only value z for which $6z - 24 = 2z + 50$? Enter your answer as a decimal. **18.5**

70. If 16 less than four times a number is 64, what is the number? **20**

71. The measure of the supplement of an angle is 25° more than 7 times the measure of the angle. To the nearest hundredth, what is the measure of the angle? **19.38°**

72. The sides of a rectangle are in the ratio 5 : 7 and the perimeter of the rectangle is 96 cm. What is the area of the rectangle? **560 cm^2**

FCAT Online
FCAT Format quiz at
www.PHSchool.com
Web Code: aga-0103

f you solve $ax - b = c$ or x, you get $x = \frac{b + c}{a}$. Since b and c re integers, $b + c$ is n integer. But a is a onzero integer. So

$\frac{b+c}{a}$ is the quotient of two integers and hence, by the definition of a rational number, $\frac{b+c}{a}$ is a rational number.

4. Assess

Lesson Quiz 1-3

1. Solve $16x - 15 = -5x + 48$. **3**
2. Solve $5(1 - 3m) = 30 - 2(4m + 7)$. **$-\frac{11}{7}$**
3. Solve $s = \frac{a + b + c}{2}$ for b. **$b = 2s - a - c$**
4. Mrs. Chern drove at a rate of 45 mi/h from her home to her sister's house. She spent 1.5 hours having lunch with her sister. She then drove back home at a rate of 55 mi/h. The entire trip, including lunch, took 4 hours. How far does Mrs. Chern live from her sister? **$61\frac{7}{8}$ mi**
5. Find three consecutive odd integers whose sum is 111. **35, 37, 39**

Alternative Assessment

Have students work in groups. Each group creates a quiz containing five questions covering the content of the lesson. At least one question should be an application. Groups trade quizzes and solve each problem. Then, both groups discuss the results together and resolve any difficulties.

FCAT Practice

A sheet of blank grids is available with the FCAT Daily Practice and Strategies Transparencies booklet. Give this sheet to students for practice with filling in the grids.

Resources
For additional practice with a variety of test item formats:
- FCAT Practice, p. 51
- FCAT Strategies, p. 46
- FCAT Daily Practice and Strategies Transparencies