251. a. The translation of “two times the number of hours” is 2x. Four hours more than 2x becomes 2x + 4.

252. c. When the key words less than appear in a sentence, it means that you will subtract from the next part of the sentence, so it will appear at the end of the expression. “Four times a number” is equal to 4x in this problem. Three less than 4x is 4x − 3.

253. b.Each one of the answer choices would translate to 9y − 5 except for choice b. The word sum is a key word for addition, and 9y means “9 times y.”

254. b.Since Susan started 1 hour before Dee, Dee has been working for one less hour than Susan had been working. Thus, x − 1.

255. c. Frederick would multiply the number of books, 6, by how much each one costs, d. For example, if each one of the books cost $10, he would multiply 6 times $10 and get $60. Therefore, the answer is 64.

256. a. In this problem, multiply d and w to get the total days in one month and then multiply that result by m, to get the total days in the year. This can be expressed as mwd, which means m times w times d.

257. a. To calculate the total she received, multiply xdollars per hour times h, the number of hours she worked. This becomes xh. Divide this amount by 2 since she gave half to her friend. Thus, x 2 h is how much money she has left.

258. d.The cost of the call is x cents plus y times the additional minutes. Since the call is 5 minutes long, she will pay x cents for 1 minute and y cents for the other four. Therefore the expression is 1x + 4y, or x + 4y, since it is not necessary to write a 1 in front of a variable.

259. a. Start with Jim’s age, y, since he appears to be the youngest. Melissa is four times as old as he is, so her age is 4y. Pat is 5 years older than Melissa, so Pat’s age would be Melissa’s age, 4y, plus another 5 years. Thus, 4y + 5.

260. c. Since she worked 48 hours, Sally will get paid her regular amount, x dollars, for 40 hours and a different amount, y, for the additional 8 hours. This becomes 40 times x plus 8 times y, which translates to 40x + 8y.

261. b.This problem translates to the expression 6 × 2 + 4. Using order of operations, do the multiplication ﬁrst; 6 × 2 = 12 and then add 12 + 4 = 16 inches.

262. c. This translates to the expression 2 + 3 × 4 − 2. Using order of operations, multiply 3 × 4 ﬁrst; 2 + 12 − 2. Add and subtract the numbers in order from left to right; 2 + 12 = 14; 14 − 2 = 12.

263. b.This problem translates to the expression 10 − 4 (8 −3) + 1. Using order of operations, do the operation inside the parentheses ﬁrst; 10 − 4 (5) + 1. Since multiplication is next, multiply 4 × 5; 10 − 20 + 1. Add and subtract in order from left to right; 10 − 20 = −10; −10 + 1 = −9.

264. d.This problem translates to the expression 42 + (11 − 9) ÷ 2. Using order of operations, do the operation inside the parentheses ﬁrst; 42 + (2) ÷ 2. Evaluate the exponent; 16 + (2) ÷ 2. Divide 2 ÷ 2; 16 + 1. Add; 16 + 1 = 17.

265. c. This problem translates to the expression 3 {[2 − (−7 + 6)] + 4}. When dealing with multiple grouping symbols, start from the innermost set and work your way out. Add and subtract in order from left to right inside the brackets. Remember that subtraction is the same as adding the opposite so 2 − (−1) becomes 2 + (+1) = 3; 3 {[2 − (−1)] + 4]}; 3 [3 + 4]. Multiply 3 × 7 to ﬁnish the problem; 3 [7] = 21.

266. c. If the total amount for both is 80, then the amount for one person is 80 minus the amount of the other person. Since John has x dollars, Charlie’s amount is 80 − x.

267. c. Use the formula F = 9 5 C + 32. Substitute the Celsius temperature of 20° for C in the formula. This results in the equation F = 9 5 (20) + 32. Following the order of operations, multiply 9 5 and 20 to get 36. The ﬁnal step is to add 36 + 32 for an answer of 68°.

268. d.Use the formula C = 5 9 (F − 32). Substitute the Fahrenheit temperature of 23° for F in the formula. This results in the equation C = 5 9 (23 − 32). Following the order of operations, begin calculations inside the parentheses ﬁrst and subtract 23 − 32 to get −9. Multiply 5 9 times −9 to get an answer of −5°.

269. d.Using the simple interest formula Interest = principal × rate × time, or I = prt, substitute p = $505, r = .05 (the interest rate as a decimal) and t = 4; I = (505)(.05)(4). Multiply to get a result of I = $101.

270. d.Using the simple interest formula Interest = principal × rate × time, or I = prt, substitute p = $1,250, r = 0.034 (the interest rate as a decimal), and t = 1.5 (18 months is equal to 1.5 years); I = (1,250)(.034)(1.5). Multiply to get a result of I = $63.75. To ﬁnd the total amount in the account after 18 months, add the interest to the initial principal. $63.75 + $1,250 = $1313.75.

271. a. Using the simple interest formula Interest = principal × rate × time, or I = prt, substitute I = $4,800, p = $12,000, and r = .08 (the interest rate as a decimal); 4,800 = (12,000)(.08)(t). Multiply 12,000 and .08 to get 960, so 4,800 = 960t. Divide both sides by 960 to get 5 = t. Therefore, the time is 5 years.

272. b.Using the simple interest formula Interest = principal × rate × time, or I = prt, substitute I = $948, p = $7,900, and t= 3 (36 months is equal to 3 years); 948 = (7,900)(r)(3). Multiply 7,900 and 3 on the right side to get a result of 948 = 23,700r. Divide both sides by 23,700 to get r = .04, which is a decimal equal to 4%.

273. d.In the statement, the order of the numbers does not change; however, the grouping of the numbers in parentheses does. Each side, if simpliﬁed, results in an answer of 300, even though both sides look different. Changing the grouping in a problem like this is an example of the associative property of multiplication.

274. c. Choice a is an example of the associative property of addition, where changing the grouping of the numbers will still result in the same answer. Choice b is an example of the distributive property of multiplication over addition. Choice d is an example of the additive identity, where any number added to zero equals itself. Choice c is an example of the commutative property of addition, where we can change the order of the numbers that are being added and the result is always the same.

275. b.In the statement, 3 is being multiplied by the quantity in the parentheses, x + 4. The distributive property allows you to multiply 3 × x and add it to 3 × 4, simplifying to 3x + 12.

276. c. Let y = the number. The word product is a key word for multiplication. Therefore the equation is −5y = 30. To solve this, divide each side of the equation by −5; − − 5 5 y = − 30 5 . The variable is now alone: y = −6.

277. b.Let x = the number. The opposite of this number is −x. The words subtraction and difference both tell you to subtract, so the equation becomes −x − 10 = 5. To solve this, add 10 to both sides of the equation; −x − 10 + 10 = 5 + 10. Simplify to x 15. Divide both sides of the equation by −1. Remember that −x = −1x; − − 1 x = − 15 1 . The variable is now alone: x = −15.

278. b.Let x = the number. Since sum is a key word for addition, the equation is −4 + x = −48. Add 4 to both sides of the equation; −4 + 4 + x = −48 + 4. The variable is now alone: x = −44.

279. c. Let x = the number. Now translate each part of the sentence. Twice a number increased by 11 is 2x + 11; 32 less than 3 times a number is 3x − 32. Set the expressions equal to each other: 2x + 11 = 3x − 32. Subtract 2x from both sides of the equation: 2x - 2x + 11 = 3x - 2x − 32. Simplify: 11 = x − 32. Add 32 to both sides of the equation: 11 + 32 = x − 32 + 32. The variable is now alone: x = 43.

280. a. The statement, “If one is added to the difference when 10x subtracted from −18x, the result is 57,” translates to the equation −18x − 10x + 1 = 57. Combine like terms on the left side of the equation: −28x + 1 = 57. Subtract 1 from both sides of the equation: −28x + 1 −1 = 57 − 1. Divide each side of the equation by −28: − − 2 2 8 8 x = − 5 2 6 8 . The variable is now alone: x = −2.

281. c. The statement, “If 0.3 is added to 0.2 times the quantity x − 3, the result is 2.5,” translates to the equation 0.2(x − 3) + 0.3 = 2.5. Remember to use parentheses for the expression when the words the quantity are used. Use the distributive property on the left side of the equation: 0.2x − 0.6 + 0.3 = 2.5. Combine like terms on the left side of the equation: 0.2x + −0.3 = 2.5. Add 0.3 to both sides of the equation: 0.2x + −0.3 + 0.3 = 2.5 + 0.3. Simplify: 0.2x 2.8. Divide both sides by 0.2: 0 0 . . 2 2 x = 2 0 . . 8 2 . The variable is now alone: x = 14.

282. b.Let x = the number. The sentence, “If twice the quantity x + 6 is divided by negative four, the result is 5,” translates to 2(x − + 4 6) = 5. Remember to use parentheses for the expression when the words the quantity are used. There are different ways to approach solving this problem. Method I: Multiply both sides of the equation by −4: −4 × 2(x − + 4 6) = 5 ×−4 This simpliﬁes to: 2 (x + 6) = −20 Divide each side of the equation by 2: 2(x 2 + 6) = − 2 20 This simpliﬁes to: x + 6 = −10 Subtract 6 from both sides of the equation: x + 6 − 6 = −10 − 6 The variable is now alone: x = −16 Method II: Another way to look at the problem is to multiply each side by −4 in the ﬁrst step to get: 2(x + 6) = −20 Then use distributive property on the left side: 2x + 12 = −20 Subtract 12 from both sides of the equation: 2x + 12 −12 = −20 − 12 Simplify: 2x = −32 Divide each side by 2: 2 2 x = − 2 32 The variable is now alone: x = −16

283. d.Translating the sentence, “The difference between six times the quantity 6x + 1 minus three times the quantity x − 1 is 108,” into symbolic form results in the equation: 6(6x + 1) − 3(x − 1) = 108. Remember to use parentheses for the expression when the words the quantity are used. Perform the distributive property twice on the left side of the equation: 36x + 6 − 3x + 3 = 108. Combine like terms on the left side of the equation: 33x + 9 = 108. Subtract 9 from both sides of the equation: 33x + 9 − 9 = 108 − 9. Simplify: 33x = 99. Divide both sides of the equation by 33: 3 3 3 3 x = 9 3 9 3 . The variable is now alone: x = 3.

284. a. This problem translates to the equation −4 (x + 8) + 6x = 2x + 32. Remember to use parentheses for the expression when the words the quantity are used. Use distributive property on the left side of the equation: −4x − 32 + 6x = 2x + 32. Combine like terms on the left side of the equation: 2x − 32 = 2x + 32. Subtract 2x from both sides of the equation: 2x − 2x − 32 = 2x − 2x + 32. The two sides are not equal. There is no solution: −32 ≠ 32.

285. c. Let x = the amount of hours worked so far this week. Therefore, the equation is x + 4 = 10. To solve this equation, subtract 4 from both sides of the equation; x + 4 − 4 = 10 − 4. The variable is now alone: x = 6.

286. b.Let x = the number of CDs Kathleen has. Four more than twice the number can be written as 2x + 4. Set this amount equal to 16, which is the number of CDs Michael has. To solve this, subtract 4 from both sides of the equation: 2x + 4 − 4 = 16 − 4. Divide each side of the equation by 2: 2 2 x = 1 2 2 . The variable is now alone: x = 6.

287. d.Since the perimeter of the square is x + 4, and a square has four equal sides, we can use the perimeter formula for a square to ﬁnd the answer to the question: P 4s where P perimeter and s side length of the square. Substituting the information given in the problem, P x 4 and s 24, gives the equation: x 4 4(24). Simplifying yields x 4 96. Subtract 4 from both sides of the equation: x 4 – 4 96 – 4. Simplify: x 92.

288. b.Let x = the width of the rectangle. Let x + 3 = the length of the rectangle, since the length is “3 more than” the width. Perimeter is the distance around the rectangle. The formula is length + width + length + width, P = l + w + l + w, or P = 2l + 2w. Substitute the let statements for l and w and the perimeter (P) equal to 21 into the formula: 21 = 2(x + 3) + 2(x). Use the distributive property on the right side of the equation: 21 = 2x + 6 + 2x. Combine like terms of the right side of the equation: 21 = 4x + 6. Subtract 6 from both sides of the equation: 21 − 6 = 4x + 6 − 6. Simplify: 15 = 4x. Divide both sides of the equation by 4: 1 4 5 = 4 4 x . The variable is now alone: 3.75 = x.

289. a. Two consecutive integers are numbers in order like 4 and 5 or −30 and −29, which are each 1 number apart. Let x= the ﬁrst consecutive integer. Let x+ 1 = the second consecutive integer. Sum is a key word for addition so the equation becomes: (x)+ (x+ 1) = 41. Combine like terms on the left side of the equation: 2x+ 1 = 41. Subtract 1 from both sides of the equation: 2x+ 1 −1 = 41 −1. Simplify: 2x= 40. Divide each side of the equation by 2: 2 2 x = 4 2 0 . The variable is now alone: x= 20. Therefore the larger integer is: x+ 1 = 21. The two integers are 20 and 21.

290. a. Two consecutive even integers are numbers in order, such as 4 and 6 or −30 and −32, which are each 2 numbers apart. Let x = the ﬁrst consecutive even integer. Let x + 2 = the second (and larger) consecutive even integer. Sum is a key word for addition so the equation becomes (x) + (x + 2) = 126. Combine like terms on the left side of the equation: 2x + 2 = 126. Subtract 2 from both sides of the equation: 2x + 2 − 2 = 126 − 2; simplify: 2x = 124. Divide each side of the equation by 2: 2 2 x = 12 2 4 . The variable is now alone: x = 62. Therefore the larger integer is: x + 2 = 64.

291. a. Two consecutive odd integers are numbers in order like 3 and 5 or −31 and −29, which are each 2 numbers apart. In this problem you are looking for 2 consecutive odd integers. Let x = the ﬁrst and smallest consecutive odd integer. Let x + 2 = the second (and larger) consecutive negative odd integer. Sum is a key word for addition so the equation becomes (x)+ (x + 2) = −112. Combine like terms on the left side of the equation: 2x + 2 = −112. Subtract 2 from both sides of the equation: 2x + 2 − 2 = −112 − 2; simplify: 2x = −114. Divide each side of the equation by 2: 2 2 x = −1 2 14 . The variable is now alone: x = −57. Therefore the larger value is: x + 2 = −55.

292. c. Three consecutive even integers are numbers in order like 4, 6, and 8 or −30, −28 and −26, which are each 2 numbers apart. Let x = the ﬁrst and smallest consecutive even integer. Let x + 2 = the second consecutive even integer. Let x + 4 = the third and largest consecutive even integer. Sum is a key word for addition so the equation becomes (x)+ (x + 2) + (x + 4) = 102. Combine like terms on the left side of the equation: 3x + 6 = 102. Subtract 6 from both sides of the equation: 3x + 6 − 6 = 102 − 6; simplify: 3x = 96. Divide each side of the equation by 3: 3 3 x = 9 3 6 . The variable is now alone: x = 32; therefore the next larger integer is: x + 2 = 34. The largest even integer would be: x + 4 = 36.

293. d.Let t= the amount of time traveled. Using the formula distance = rate× time, substitute the rates of each car and multiply by tto ﬁnd the distance traveled by each car. Therefore, 63t distance traveled by one car and 59t distance traveled by the other car. Since the cars are traveling in opposite directions, the total distance traveled by both cars is the sum of these distances: 63t + 59t. Set this equal to the total distance of 610 miles: 63t+ 59t= 610. Combine like terms on the left side of the equation: 122t= 610. Divide each side of the equation by 122: 1 1 2 2 2 2 t = 6 1 1 2 0 2 ; the variable is now alone: t= 5. In 5 hours, the cars will be 610 miles apart.

294. d.Use the formula distance = rate × time for each train and add these values together so that the distance equals 822 miles. For the ﬁrst train, d = 65t and for the second train d = 72t, where d is the distance and t is the time in hours. Add the distances and set them equal to 822: 65t + 72t = 822. Combine like terms on the left side of the equation: 137t = 822; divide both sides of the equation by 137: 1 1 3 3 7 7 t = 8 1 2 3 2 7 . The variable is now alone: t = 6. In 6 hours, they will be 822 miles apart.

295. d.Use the formula distance = rate × time for each train and add these values together so that the distance equals 1,029 miles. For the ﬁrst train, d = 45t and for the second train d = 53t, where d is the distance and t is the time in hours. Add the distances and set them equal to 1,029: 45t + 53t = 1,029. Combine like terms on the left side of the equation: 98t = 1,029; divide both sides of the equation by 98: 9 9 8 8 t = 1, 9 0 8 29 . The variable is now alone: t = 10.5 hours. The two trains will pass in 10.5 hours.

296. c. Translate the sentence, “Nine minus ﬁve times a number is no less than 39,” into symbols: 9 − 5x ≥ 39. Subtract 9 from both sides of the inequality: 9 − 9 − 5x ≥ 39 − 9. Simplify: −5x ≥ 30; divide both sides of the inequality by −5. Remember that when dividing or multiplying each side of an inequality by a negative number, the inequality symbol changes direction: − − 5 5 x ≤ − 30 5 . The variable is now alone: x ≤−6.

297. a. This problem is an example of a compound inequality, where there is more than one inequality in the question. In order to solve it, let x = the total amount of gumdrops Will has. Set up the compound inequality, and then solve it as two separate inequalities. Therefore, the second sentence in the problem can be written as: 2 < x − 2 < 6. The two inequalities are: 2 < x − 2 and x − 2 < 6. Add 2 to both sides of both inequalities: 2 + 2 < x − 2 + 2 and x − 2 + 2 < 6 + 2; simplify: 4 < x and x < 8. If x is greater than four and less than eight, it means that the solution is between 4 and 8. This can be shortened to: 4 < x < 8.

298. a. This inequality shows a solution set where y is greater than or equal to 3 and less than or equal to eight. Both −3 and 8 are in the solution set because of the word inclusive, which includes them. The only choice that shows values between −3 and 8 and also includes them is choice a.

299. b.Let x = the number. Remember that quotient is a key word for division, and at least means greater than or equal to. From the question, the sentence would translate to: 2 x + 5 ≥ x. Subtract 5 from both sides of the inequality: 2 x + 5 − 5 ≥ x − 5; simplify: 2 x ≥ x − 5. Multiply both sides of the inequality by 2: 2 x × 2 ≥ (x − 5) × 2; simplify: x ≥ (x − 5)2. Use the distributive property on the right side of the inequality: x ≥ 2x − 10. Add 10 to both sides of the inequality: x + 10 ≥ 2x − 10 + 10; simplify: x + 10 ≥ 2x. Subtract x from both sides of the inequality: x − x + 10 ≥ 2x − x. The variable is now alone: 10 ≥ x. The number is at most 10.

300. d.Let x = the amount of hours Cindy worked. Let 2x + 3 = the amount of hours Carl worked. Since the total hours added together was at most 48, the inequality would be (x) + (2x + 3) ≤ 48. Combine like terms on the left side of the inequality: 3x + 3 ≤ 48. Subtract 3 from both sides of the inequality: 3x + 3 − 3 ≤ 48 − 3; simplify: 3x ≤ 45. Divide both sides of the inequality by 3: 3 3 x ≤ 4 3 5 ; the variable is now alone: x ≤ 15. The maximum amount of hours Cindy worked was 15.

301. b.Choices a and d should be omitted because the negative values should not make sense for this problem using time and cost. Choice b substituted would be 6 = 2(2) + 2 which simpliﬁes to 6 = 4 + 2. Thus, 6 = 6. The coordinates in choice c are reversed from choice b and will not work if substituted for x and y.

302. a. Let x = the total minutes of the call. Therefore, x − 1 = the additional minutes of the call. This choice is correct because in order to calculate the cost, the charge is 35 cents plus 15 cents times the number of additional minutes. If y represents the total cost, then y equals 0.35 plus 0.15 times the quantity x − 1. This translates to y = 0.35 + 0.15(x − 1) or y = 0.15(x − 1) + 0.35.

303. d.Let x = the total miles of the ride. Therefore, x − 1 = the additional miles of the ride. The correct equation takes $1.25 and adds it to $1.15 times the number of additional miles, x − 1. Translating, this becomes y (the total cost) = 1.25 + 1.15(x − 1), which is the same equation as y = 1.15(x − 1) + 1.25.

304. c. The total amount will be $4.85 plus two times the number of ounces, x. This translates to 4.85 + 2x, which is the same as 2x + 4.85. This value needs to be less than or equal to $10, which can be written as 2x + 4.85 ≤ 10.

305. b.Let x = the number of checks written that month. Green Bank’s fees would therefore be represented by .10x + 3 and Savings-R-Us would be represented by .05x + 4.50. To ﬁnd the value for which the banks charge the same amount, set the two expressions equal to each other: .10x + 3 = .05x + 4.50. Subtract 3 from both sides: .10x + 3 − 3 = .05x + 4.50 − 3. This now becomes: .10x = .05x + 1.50. Subtract .05x from both sides of the equation: .10x − .05x = .05x − .05x + 1.50; this simpliﬁes to: .05x = 1.50. Divide both sides of the equation by .05: . . 0 0 5 5 x = 1 .0 5 5 0 . The variable is now alone: x = 30. Costs would be the same if 30 checks were written.

306. d.Let x = the number of miles traveled in the taxi. The expression for the cost of a ride with Easy Rider would be 1.25x + 2. The expression for the cost of a ride with Luxury Limo is 1x + 3.25. To solve, set the two expressions equal to each other: 1.25x + 2 = 1x + 3.25. Subtract 2 from both sides: 1.25x + 2 − 2 = 1x + 3.25 − 2. This simpliﬁes to: 1.25x = 1x + 1.25; subtract 1x from both sides: 1.25x − 1x = 1x − 1x + 1.25. Divide both sides of the equation by .25: . . 2 2 5 5 x = 1 .2 .2 5 5 . The variable is now alone: x = 5; the cost would be the same if the trip were 5 miles long.

307. b.Let x = the ﬁrst integer and let y = the second integer. The equation for the sum of the two integers is x + y = 36, and the equation for the difference between the two integers is x − y = 6. To solve these by the elimination method, combine like terms vertically and the variable of y cancels out. x + y = 36 x − y = 6 This results in: 2x = 42, so x = 21 Substitute the value of x into the ﬁrst equation to get 21 + y = 36. Subtract 21 from both sides of this equation to get an answer of y = 15.

308. c. Let x = the greater integer and y = the lesser integer. From the ﬁrst sentence in the question we get the equation x = y + 2. From the second sentence in the question we get y + 2x = 7. Substitute x = y + 2 into the second equation: y + 2(y + 2) = 7; use the distributive property to simplify to: y + 2y + 4 = 7. Combine like terms to get: 3y + 4 = 7; subtract 4 from both sides of the equation: 3y + 4 − 4 = 7 − 4. Simplify to 3y 3.Divide both sides of the equation by 3: 3 3 y = 3 3 ; therefore y = 1. Since the greater is two more than the lesser, the greater is 1 + 2 = 3.

309. d.Let x = the lesser integer and let y = the greater integer. The ﬁrst sentence in the question gives the equation y = 4x. The second sentence gives the equation x + y = 5. Substitute y = 4x into the second equation: x + 4x = 5. Combine like terms on the left side of the equation: 5x = 5; divide both sides of the equation by 5: 5 5 x = 5 5 . This gives a solution of x = 1, which is the lesser integer.

310. a. Let x = the lesser integer and let y = the greater integer. The ﬁrst sentence in the question gives the equation 3y + 5x = 9. The second sentence gives the equation y − 3 = x. Substitute y − 3 for x in the second equation: 3y + 5(y − 3) = 9. Use the distributive property on the left side of the equation: 3y + 5y − 15 = 9. Combine like terms on the left side: 8y − 15 = 9; add 15 to both sides of the equation: 8y − 15 + 15 = 9 + 15. Simplify to: 8y = 24. Divide both sides of the equation by 8: 8 8 y = 2 8 4 . This gives a solution of y = 3. Therefore the lesser, x, is three less than y, so x = 0.

311. b.Let l = the length of the rectangle and let w = the width of the rectangle. Since the width is 6 inches less than 3 times the length, one equation is w = 3l − 6. The formula for the perimeter of a rectangle is 2l + 2w = 104. Substituting the ﬁrst equation into the perimeter equation for w results in 2l + 2(3l − 6) = 104. Use the distributive property on the left side of the equation: 2l + 6l − 12 = 104. Combine like terms on the left side of the equation: 8l − 12 = 104; add 12 to both sides of the equation: 8l − 12 + 12 = 104 + 12. Simplify to: 8l 116. Divide both sides of the equation by 8: 8 8 l = 11 8 6 . Therefore, the length is l = 14.5 inches and the width is w = 3(14.5) − 6 = 37.5 inches.

312. a. Let w = the width of the parallelogram and let l = the length of the parallelogram. Since the length is 5 more than the width, then l = w + 5. The formula for the perimeter of a parallelogram 2l + 2w = 50. Substituting the ﬁrst equation into the second for l results in 2(w + 5) + 2w = 50. Use the distributive property on the left side of the equation: 2w + 10 + 2w = 50; combine like terms on the left side of the equation: 4w + 10 = 50. Subtract 10 on both sides of the equation: 4w + 10 − 10 = 50 − 10. Simply to: 4w 40. Divide both sides of the equation by 4: 4 4 w = 4 4 0 ; w = 10. Therefore, the width is 10 cm and the length is 10 + 5 = 15 cm.

313. c. Let x = the amount invested at 12% interest. Let y = the amount invested at 15% interest. Since the amount invested at 15% is 100 more then twice the amount at 12%, then y = 2x + 100. Since the total interest was $855, use the equation 0.12x + 0.15y = 855. You have two equations with two variables. Use the second equation 0.12x + 0.15y = 855 and substitute (2x + 100) for y: 0.12x + 0.15(2x + 100) = 855. Use the distributive property: 0.12x + 0.3x + 15 = 855. Combine like terms: 0.42x + 15 = 855. Subtract 15 from both sides: 0.42x + 15 − 15 = 855 − 15; simplify: 0.42x = 840. Divide both sides by 0.42: 0 0 . . 4 4 2 2 x = 0 8 . 4 4 0 2 . Therefore, x = $2,000, which is the amount invested at 12% interest.

314. c. Let x = the amount invested at 8% interest. Since the total interest is $405.50, use the equation 0.06(4,000) + 0.08x = 405.50. Simplify the multiplication: 240 + 0.08x = 405.50. Subtract 240 from both sides: 240 − 240 + 0.8x = 405.50 − 240; simplify: 0.08x = 165.50. Divide both sides by 0.08: 0 0 . . 0 0 8 8 x = 16 0 5 .0 .5 8 0 . Therefore, x = $2,068.75, which is the amount invested at 8% interest.

315. d.Let x = the amount of coffee at $3 per pound. Let y = the total amount of coffee purchased. If there are 18 pounds of coffee at $2.50 per pound, then the total amount of coffee can be expressed as y = x + 18. Use the equation 3x + 2.50(18) = 2.85y since the average cost of the y pounds of coffe is $2.85 per pound. To solve, substitute y = x + 18 into 3x + 2.50(18) = 2.85y. 3x + 2.50(18) = 2.85(x + 18). Multiply on the left side and use the distributive property on the right side: 3x + 45 = 2.85x + 51.30. Subtract 2.85x on both sides: 3x − 2.85x + 45 = 2.85x − 2.85x + 51.30. Simplify: 0.15x 45 51.30. Subtract 45 from both sides: 0.15x + 45 − 45 = 51.30 − 45. Simplify: 0.15x 6.30. Divide both sides by 0.15: 0 0 . . 1 1 5 5 x = 6 0 . . 3 1 0 5 ; so, x = 42 pounds, which is the amount of coffee that costs $3 per pound. Therefore, the total amount of coffee is 42 + 18, which is 60 pounds.

316. c. Let x= the amount of candy at $1.90 per pound. Let y= the total number of pounds of candy purchased. If it is known that there are 40 pounds of candy at $2.15 per pound, then the total amount of candy can be expressed as y= x+ 40. Use the equation 1.90x+ 2.15(40) = $158.20 since the total amount of money spent was $158.20. Multiply on the left side: 1.90x+ 86 = 158.20. Subtract 86 from both sides: 1.90x+ 86 −86 = 158.20 −86. Simplify: 1.90x 72.20. Divide both sides by 1.90: 1 1 . . 9 9 0 0 x = 7 1 2 .9 .2 0 0 ; so, x= 38 pounds, which is the amount of candy that costs $1.90 per pound. Therefore, the total amount of candy is 38 + 40, which is 78 pounds.

317. a. Let x = the amount of marigolds at $1 per packet. Let y = the amount of marigolds at $1.26 per packet. Since there are 50 more packets of the $1.26 seeds than the $1 seeds, y = x + 50. Use the equation 1x + 1.26y = 420 to ﬁnd the total number of packets of each. By substituting into the second equation, you get 1x + 1.26(x + 50) = 402. Multiply on the left side using the distributive property: 1x + 1.26x + 63 = 402. Combine like terms on the left side: 2.26x + 63 = 402. Subtract 63 from both sides: 2.26x + 63 − 63 = 402 − 63. Simplify: 2.26x 339. Divide both sides by 2.26: 2 2 . . 2 2 6 6 x = 2 3 . 3 2 9 6 ; so, x = 150 packets, which is the number of packets that costs $1 each.

318. a. Let x = the amount of 3% iodine solution. Let y = the amount of 20% iodine solution. Since the total amount of solution was 85 oz., then x + y = 85. The amount of each type of solution added together and set equal to the amount of 19% solution can be expressed in the equation 0.03x + 0.20y = 0.19(85); Use both equations to solve for x. Multiply the second equation by 100 to eliminate the decimal point: 3x + 20y = 19(85). Simplify that equation: 3x + 20y = 1805. Multiply the ﬁrst equation by −20: −20x + −20y = −1700. Add the two equations to eliminate y: −17x + 0y = −85. Divide both sides of the equation by −17: − − 1 1 7 7 x = 8 1 5 7 ; x = 5. The amount of 3% iodine solution is 5 ounces. 501

319. c. Let x = the amount of 34% acid solution. Let y = the amount of 18% iodine solution. Since the total amount of solution was 30 oz., then x + y = 30. The amount of each type of solution added together and set equal to the amount of 28% solution can be expressed in the equation 0.34x + 0.18y = 0.28(30). Use both equations to solve for x. Multiply the second equation by 100 to eliminate the decimal point: 34x + 18y = 28(30); simplify that equation: 34x + 22y = 840. Multiply the ﬁrst equation by 18: 18x 18y 540. Add the two equations to eliminate y: 16x 0y 300. Divide both sides of the equation by 16: 1 1 6 6 x 3 1 0 6 0 , x 18.75. The amount of 34% acid solution is 18.75 ounces.

320. b.Let x = Ellen’s age and let y = Bob’s age. Since Bob is 2 years from being twice as old as Ellen, than y = 2x − 2. The sum of twice Bob’s age and three times Ellen’s age is 66 and gives a second equation of 2y + 3x = 66. Substituting the ﬁrst equation for y into the second equation results in 2(2x − 2) + 3x = 66. Use the distributive property on the left side of the equation: 4x − 4 + 3x = 66; combine like terms on the left side of the equation: 7x − 4 = 66. Add 4 to both sides of the equation: 7x − 4 + 4 = 66 + 4. Simplify: 7x 70. Divide both sides of the equation by 7: 7 7 x = 7 7 0 . The variable, x, is now alone: x= 10. Therefore, Ellen is 10 years old.

321. d.Let x = Shari’s age and let y = Sam’s age. Since Sam’s age is 1 less than twice Shari’s age this gives the equation y = 2x − 1. Since the sum of their ages is 104, this gives a second equation of x + y = 104. By substituting the ﬁrst equation into the second for y, this results in the equation x + 2x − 1 = 104. Combine like terms on the left side of the equation: 3x − 1 = 104. Add 1 to both sides of the equation: 3x − 1 + 1 = 104 + 1. Simplify: 3x 105. Divide both sides of the equation by 3: 3 3 x = 10 3 5 . The variable, x, is now alone: x = 35. Therefore, Shari’s age is 35.

322. d.Let x = the cost of one binder and let y = the cost of one pen. The ﬁrst statement, “two binders and three pens cost $12.50,” translates to the equation 2x + 3y = 12.50. The second statement, “three binders and ﬁve pens cost $19.50,” translates to the equation: 3x + 5y = 19.50 Multiply the ﬁrst equation by 3: 6x + 9y = 37.50 Multiply the second equation by −2: −6x + −10y = −39.00 Combine the two equations to eliminate x: −1y = −1.50 Divide by 1: y = 1.50 Therefore, the cost of one pen is $1.50. Since the cost of 2 binders and 3 pens is 12.50, substitute y 1.50 into the ﬁrst equation: 3 × $1.50 = $4.50; $12.50 − 4.50 = $8.00; $8.00 ÷ 2= $4.00, so each binder is $4.00. The total cost of 1 binder and 1 pen is $4.00 + $1.50 = $5.50.

323. a. Let x = the number of degrees in the smaller angle and let y = the number of degrees in the larger angle. Since the angles are complementary, x + y = 90. In addition, since the larger angle is 15 more than twice the smaller, y = 2x + 15. Substitute the second equation into the ﬁrst equation for y: x + 2x + 15 = 90. Combine like terms on the left side of the equation: 3x + 15 = 90. Subtract 15 from both sides of the equation: 3x + 15 − 15 = 90 − 15; simplify: 3x = 75. Divide both sides by 3: 3 3 x = 7 3 5 . The variable, x, is now alone: x = 25. The number of degrees in the smaller angle is 25.

324. b.Let x = the cost of a student ticket. Let y = the cost of an adult ticket. The ﬁrst sentence, “The cost of a student ticket is $1 more than half of an adult ticket,” gives the equation x = 1 2 y + 1; the second sentence, “six adults and four student tickets cost $28,” gives the equation 6y + 4x = 28. Substitute the ﬁrst equation into the second for x: 6y + 4(1 2 y + 1) = 28. Use the distributive property on the left side of the equation: 6y + 2y + 4 = 28. Combine like terms: 8y + 4 = 28. Subtract 4 on both sides of the equation: 8y + 4 − 4 = 28 − 4; simplify: 8y = 24. Divide both sides by 8: 8 8 y = 2 8 4 . The variable is now alone: y = 3. The cost of one adult ticket is $3.

325. a. Let x = the cost of one shirt. Let y = the cost of one tie. The ﬁrst part of the question, “three shirts and 5 ties cost $23,” gives the equation 3x + 5y = 23; the second part of the question, “5 shirts and one tie cost $20,” gives the equation 5x + 1y= 20. Multiply the second equation by −5: −25x − 5y = −100. Add the ﬁrst equation to that result to eliminate y. The combined equation is: −22x = − 77. Divide both sides of the equation by −22: − − 2 2 2 2 x = − − 7 2 7 2 . The variable is now alone: x = 3.50; the cost of one shirt is $3.50.

326. c. The terms 3x and 5x are like terms because they have exactly the same variable with the same exponent. Therefore, you just add the coefﬁcients and keep the variable. 3x + 5x = 8x.

327. c. Because the question asks for the difference between the areas, you need to subtract the expressions: 6a + 2 − 5a. Subtract like terms: 6a − 5a + 2 = 1a + 2; 1a = a, so the simpliﬁed answer is a + 2.

328. b.Since the area of a rectangle is A = length times width, multiply (x3)(x4). When multiplying like bases, add the exponents: x3+4 = x7.

329. c. Since the area of the soccer ﬁeld would be found by the formula A = length × width, multiply the dimensions together: 7y2 × 3xy. Use the commutative property to arrange like variables and the coefﬁcients next to each other: 7 × 3 × x × y2 × y. Multiply: remember that y2 × y = y2 × y1 = y2+1 = y3. The answer is 21xy3.

330. a. Since the area of a parallelogram is A = base times height, then the area divided by the base would give you the height; x x 8 4 ; when dividing like bases, subtract the exponents; x8−4 = x4.

331. d.The key word quotient means division so the problem becomes 3 9 d d 3 5 . Divide the coefﬁcients: 1 3 d d 3 5 . When dividing like bases, subtract the exponents: 1d 3 3−5 ; simplify: 1d 3 −2 . A variable in the numerator with a negative exponent is equal to the same variable in the denominator with the opposite sign—in this case, a positive sign on the exponent: 3 1 d2 .

332. a. The translation of the question is 6x2 3 · x3 4 y xy2 . The key word product tells you to multiply 6x2 and 4xy2. The result is then divided by 3x3y. Use the commutative property in the numerator to arrange like variables and the coefﬁcients together: 6 × 3 4 x x 3y 2xy2 . Multiply in the numerator. Remember that x2 · x = x2 · x1 = x2+1 = x3: 2 3 4 x x 3 3 y y2 . Divide the coefﬁcients; 24 ÷ 3 = 8: 8 x x 3 3 y y2 . Divide the variables by subtracting the exponents: 8x3−3y2−1; simplify. Recall that anything to the zero power is equal to 1: 8x0y1 = 8y.

333. b.Since the formula for the area of a square is A = s2, then by substituting A = (a2b3)2. Multiply the outer exponent by each exponent inside the parentheses: a2×2b3×2. Simplify; a4b6.

334. a. The statement in the question would translate to 3x2(2x3y)4. The word quantity reminds you to put that part of the expression in parentheses. Evaluate the exponent by multiplying each number or variable inside the parentheses by the exponent outside the parentheses: 3x2(24x3×4y4); simplify: 3x2(16x12y4). Multiply the coefﬁcients and add the exponents of like variables: 3(16x2+12y4); simplify: 48x14y4.

335. d.Since the area of a rectangle is A = length times width, multiply the dimensions to ﬁnd the area: 2x(4x + 5). Use the distributive property to multiply each term inside the parentheses by 2x: 2x × 4x + 2x × 5. Simplify by multiplying the coefﬁcients of each term and adding the exponents of the like variables: 8x2 + 10x.

336. b.The translated expression would be −9p3r(2p − 3r). Remember that the key word product means multiply. Use the distributive property to multiply each term inside the parentheses by −9p3r: −9p3r × 2p − (−9p3r) × 3r. Simplify by multiplying the coefﬁcients of each term and adding the exponents of the like variables: −9 × 2p3+1r − (−9 × 3p3r1+1). Simplify: −18p4r − (−27p3r2). Change subtraction to addition and change the sign of the following term to its opposite: −18p4r + (+27p3r2); this simpliﬁes to: −18p4r + 27p3r2.

337. c. The two numbers in terms of x would be x + 3 and x + 4 since increased by would tell you to add. Product tells you to multiply these two quantities: (x + 3)(x + 4). Use FOIL (First terms of each binomial multiplied, Outer terms in each multiplied, Inner terms of each multiplied, and Last term of each binomial multiplied) to multiply the binomials: (x · x) + (4 · x) + (3 · x) + (3 · 4); simplify each term: x2 + 4x + 3x + 12. Combine like terms: x2 + 7x + 12.

338. d.Since the area of a rectangle is A = length times width, multiply the two expressions together: (2x − 1)(x + 6). Use FOIL (First terms of each binomial multiplied, Outer terms in each multiplied, Inner terms of each multiplied, and Last term of each binomial multiplied) to multiply the binomials: (2x · x) + (2x · 6) − (1 · x) − (1 · 6). Simplify: 2x2 + 12x − x − 6; combine like terms: 2x2 + 11x − 6.

339. a. Use the formula distance = rate × time. By substitution, distance = (4x2 − 2) × (3x − 8). Use FOIL (First terms of each binomial multiplied, Outer terms in each multiplied, Inner terms of each multiplied, and Last term of each binomial multiplied) to multiply the binomials: (4x2 · 3x) − (8 · 4x2) − (2 · 3x) − (2 · −8). Simplify each term: 12x3 − 32x2 − 6x + 16.

340. d.Since the formula for the volume of a prism is V = Bh, where B is the area of the base and h is the height of the prism, V = (x − 3)(x2 + 4x + 1). Use the distributive property to multiply the ﬁrst term of the binomial, x, by each term of the trinomial, and then the second term of the binomial, −3, by each term of the trinomial: x(x2 4x 1) 3(x2 4x 1). Then distribute: (x · x2) + (x · 4x) + (x · 1) − (3 · x2) − (3 · 4x) − (3 · 1). Simplify by multiplying within each term: x3 + 4x2 + x − 3x2 − 12x − 3. Use the commutative property to arrange like terms next to each other. Remember that 1x = x: x3 + 4x2 − 3x2 + x −12x − 3; combine like terms: x3 + x2 − 11x − 3.

341. b.Since the formula for the volume of a rectangular prism is V = l × w × h, multiply the dimensions together: (x + 1)(x − 2)(x + 4). Use FOIL (First terms of each binomial multiplied, Outer terms in each multiplied, Inner terms of each multiplied, and Last term of each binomial multiplied) to multiply the ﬁrst two binomials: (x + 1 )(x − 2); (x · x) + x(−2) + (1 · x) + 1(−2). Simplify by multiplying within each term: x2 − 2x + 1x − 2; combine like terms: x2 − x − 2. Multiply the third factor by this result: (x + 4)(x2 − x − 2). To do this, use the distributive property to multiply the ﬁrst term of the binomial, x, by each term of the trinomial, and then the second term of the binomial, 4, by each term of the trinomial: x(x2 x 2) 4(x2 x 2). Distribute: (x · x2) + (x · −x) + (x · −2) + (4 · x2) + (4 · −x) + (4 · −2). Simplify by multiplying in each term: x3 − x2 − 2x + 4x2 − 4x − 8. Use the commutative property to arrange like terms next to each other: x3 − x2 + 4x2 − 2x − 4x − 8; combine like terms: x3 + 3x2 − 6x − 8.

342. c. Since area of a rectangle is found by multiplying length by width, we need to ﬁnd the factors that multiply out to yield x2 – 25. Because x2 and 25 are both perfect squares (x2 x · x and 25 = 5 · 5), the product, x2 – 25, is called a difference of two perfect squares, and its factors are the sum and difference of the square roots of its terms.Therefore, because the square root of x2 = x and the square root of 25 5, x2 – 25 (x 5)(x – 5).

343. b.To ﬁnd the base and the height of the parallelogram, ﬁnd the factors of this binomial. First look for factors that both terms have in common; 2x2 and 10x both have a factor of 2 and x. Factor out the greatest common factor, 2x, from each term. 2x2 − 10x; 2x(x − 5). To check an answer like this, multiply through using the distributive property. 2x(x −5); (2x · x) − (2x · 5); simplify and look for a result that is the same as the original question. This question checked: 2x2 − 10x.

344. d.Since the formula for the area of a rectangle is A = length times width, ﬁnd the two factors of x2 + 2x + 1 to get the dimensions. First check to see if there is a common factor in each of the terms or if it is the difference between two perfect squares, and it is neither of these. The next step would be to factor the trinomial into two binomials. To do this, you will be doing a method that resembles FOIL backwards (First terms of each binomial multiplied, Outer terms in each multiplied, Inner terms of each multiplied, and Last term of each binomial multiplied.) First results in x2, so the ﬁrst terms must be: (x )(x ); Outer added to the Inner combines to 2x, and the Last is 1, so you need to ﬁnd two numbers that add to +2 and multiply to +1. These two numbers would have to be +1 and +1: (x + 1)(x + 1). Since the factors of the trinomial are the same, this is an example of a perfect square trinomial, meaning that the farmer’s rectangular ﬁeld was, more speciﬁcally, a square ﬁeld. To check to make sure these are the factors, multiply them by using FOIL (First terms of each binomial multiplied, Outer terms in each multiplied, Inner terms of each multiplied, and Last term of each binomial multiplied; (x · x) + (1 · x) + (1 · x) + (1 · 1); multiply in each term: x2 + 1x + 1x + 1; combine like terms: x2 + 2x + 1.

345. a. Since area of a rectangle is length × width, look for the factors of the trinomial to ﬁnd the two dimensions. First check to see if there is a common factor in each of the terms or if it is the difference between two perfect squares, and it is neither of these. The next step would be to factor the trinomial into two binomials. To do this, you will be doing a method that resembles FOIL backwards. (First terms of each binomial multiplied, Outer terms in each multiplied, Inner terms of each multiplied, and Last term of each binomial multiplied.) First results in x2, so the ﬁrst terms must be (x )(x ); Outer added to the Inner combines to 6x, and the Last is 5, so you need to ﬁnd two numbers that add to produce +6 and multiply to produce +5. These two numbers are +1 and +5; (x + 1)(x + 5).

346. a. Since the formula for the area of a rectangle is length × width, ﬁnd the factors of the trinomial to get the dimensions. First check to see if there is a common factor in each of the terms or if it is the difference between two perfect squares, and it is neither of these. The next step would be to factor the trinomial into two binomials. To do this, you will be doing a method that resembles FOIL backwards (First terms of each binomial multiplied, Outer terms in each multiplied, Inner terms of each multiplied, and Last term of each binomial multiplied.) First results in x2, so the ﬁrst terms must be (x )(x ); Outer added to the Inner combines to 1x, and the Last is −12, so you need to ﬁnd two numbers that add to +1 and multiply to −12. These two numbers are −3 and +4; (x − 3)(x + 4). Thus, the dimensions are (x + 4) and (x − 3).

347. b.Since the trinomial does not have a coefﬁcient of one on its highest exponent term, the easiest way to ﬁnd the answer to this problem is to use the distributive property. First, using the original trinomial, identify the sum and product by looking at the terms when the trinomial is in descending order (highest exponent ﬁrst): 3x2 – 7x 2.The sum is the middle term, in this case, 7x.The product is the product of the ﬁrst and last terms, in this case, (3x2)(2) 6x2. Now, identify two quantities whose sum is –7x and product is 6x2, namely –6x and –x. Rewrite the original trinomial using these two terms to replace the middle term in any order: 3x2 –6x – x + 2. Now factor by grouping by taking a common factor out of each pair of terms.The common factor of 3x2 and –6x is 3x and the common factor of –x and 2 is –1.Therefore, 3x2 – 6x – x + 2 becomes 3x(x – 2) – 1(x – 2). (Notice that if this expression were multiplied back out and simpliﬁed, it would correctly yield the original polynomial.)Now, this two-term expression has a common factor of (x – 2) which can be factored out of each term using the distributive property: 3x(x – 2) – 1(x – 2) becomes (x – 2)(3x –1).The dimensions of the courtyard are (x – 2) and (3x – 1).

348. d.In order to convert this number to standard notation, multiply 9.3 by the factor of 107. Since 107 is equal to 10,000,000, 9.3 ×10,000,000 is equal to 93,000,000. As an equivalent solution, move the decimal point in 9.3 seven places to the right since the exponent on the 10 is positive 7.

349. c. To convert to scientiﬁc notation, place a decimal point after the ﬁrst non-zero digit to create a number between 1 and 10—in this case, between the 2 and the 4. Count the number of decimal places from that decimal to the place of the decimal in the original number. In this case, the number of places would be 5. This number, 5, becomes the exponent of 10 and is positive because the original number was greater than one. The answer then is 2.4 × 105.

350. d.In order to convert this number to standard notation, multiply 5.3 by the factor of 10−6. Since 10−6 is equal to 0.000001, 5.3 × 0.000001 is equal to 0.0000053. Equivalently, move the decimal point in 5.3 six places to the left since the exponent on the 10 is negative 6.

351. d.Let x = the number. The sentence, “The square of a positive number is 49,” translates to the equation x2 = 49. Take the square root of each side to get x2 = 49 so x = 7 or −7. Since you are looking for a positive number, the ﬁnal solution is 7.

352. d.Let x = the number. The statement, “The square of a number added to 25 equals 10 times the number,” translates to the equation x2 + 25 = 10x. Put the equation in standard form ax2 bx c 0, and set it equal to zero: x2 − 10x + 25 = 0. Factor the left side of the equation: (x − 5)(x − 5) = 0. Set each factor equal to zero and solve: x − 5 = 0 or x − 5 = 0; x = 5 or x = 5. The number is 5.

353. b.Let x = the number. The statement, “The sum of the square of a number and 12 times the number is −27,” translates to the equation x2 + 12x = −27. Put the equation in standard form and set it equal to zero: x2 + 12x + 27 = 0. Factor the left side of the equation: (x + 3)(x + 9) = 0. Set each factor equal to zero and solve: x + 3 = 0 or x + 9 = 0; x = −3 or x = −9. The possible values of this number are −3 or −9, the smaller of which is −9.

354. b. Let x= the number of inches in the width and let x+ 2 = the number of inches in the length. Since area of a rectangle is length times width, the equation for the area of the rectangle is x(x+ 2) = 24. Multiply the left side of the equation using the distributive property: x2 + 2x= 24. Put the equation in standard form and set it equal to zero: x2 + 2x−24 = 0. Factor the left side of the equation: (x+ 6)(x−4) = 0. Set each factor equal to zero and solve: x+ 6 = 0 or x−4 = 0; x= −6 or x= 4. Reject the solution of −6 because a distance will not be negative. The width is 4 inches.

355. b.Let x = the measure of the base and let x + 5 = the measure of the height. Since the area of a parallelogram is base times height, then the equation for the area of the parallelogram is x(x + 5) = 36. Multiply the left side of the equation using the distributive property: x2 + 5x = 36; Put the equation in standard form and set it equal to zero: x2 + 5x − 36 = 0. Factor the left side of the equation: (x + 9)(x − 4) = 0. Set each factor equal to zero and solve: x + 9 = 0 or x − 4 = 0; x = −9 or x = 4. Reject the solution of −9 because a distance will not be negative. The height is 4 + 5 = 9 meters.

356. d.Let x = the length of the diagonal. Therefore, x − 5 = the length of the patio and x −7 = the width of the patio. Since the area is 195 m2, and area is length times the width, the equation is (x −5)(x − 7) = 195. Use the distributive property to multiply the binomials: x2 −5x − 7x + 35 = 195. Combine like terms: x2 − 12x + 35 = 195. Subtract 195 from both sides: x2 − 12x + 35 − 195= 195 − 195. Simplify: x2 − 12x − 160 = 0. Factor the result: (x − 20)(x + 8) = 0. Set each factor equal to 0 and solve: x − 20 = 0 or x + 8 = 0; x = 20 or x = −8. Reject the solution of −8 because a distance will not be negative. The length of the diagonal is 20 m.

357. a. Let w = the width of the ﬁeld and let 2w + 2 = the length of the ﬁeld (two more than twice the width). Since area is length times width, multiply the two expressions together and set them equal to 3,280: w(2w + 2) = 3,280. Multiply using the distributive property: 2w2 + 2w = 3,280. Subtract 3,280 from both sides: 2w2 + 2w − 3,280 = 3,280 − 3,280; simplify: 2w2 + 2w − 3,280 = 0. Factor the trinomial completely: 2(w2 + w − 1640) = 0; 2(w + 41)(w − 40) = 0. Set each factor equal to zero and solve: 2 ≠ 0 or w + 41 = 0 or w − 40 = 0; w = −41 or w = 40. Reject the negative solution because you will not have a negative width. The width is 40 feet.

358. b.Let x = the width of the walkway. Since the width of the garden only is 24, the width of the garden and the walkway together is x + x + 24 or 2x + 24. Since the length of the garden only is 35, the length of the garden and the walkway together is x + x + 35 or 2x + 35. Area of a rectangle is length times width, so multiply the expressions together and set the result equal to the total area of 1,530 square feet: (2x + 24)(2x + 35) = 1,530. Multiply the binomials using the distributive property: 4x2 + 70x + 48x + 840 = 1,530. Combine like terms: 4x2 + 118x + 840 = 1,530. Subtract 1,530 from both sides: 4x2 + 118x + 840 − 1,530 = 1,530 − 1,530; simplify: 4x2 + 118x − 690 = 0. Factor the trinomial completely: 2(2x2 + 59x − 345) = 0; 2(2x + 69)(x − 5) = 0. Set each factor equal to zero and solve: 2 ≠ 0 or 2x + 69 = 0 or x − 5 = 0; x = −34.5 or x = 5. Reject the negative solution because you will not have a negative width. The width is 5 feet.

359. a. Let x = the width of the deck. Since the width of the pool only is 18, the width of the pool and the deck is x + x + 18 or 2x + 18. Since the length of the pool only is 24, the length of the pool and the deck together is x + x + 24 or 2x + 24. The total area for the pool and the deck together is 832 square feet, 400 square feet added to 432 square feet for the pool. Area of a rectangle is length times width so multiply the expressions together and set them equal to the total area of 832 square feet: (2x + 18)(2x + 24) = 832. Multiply the binomials using the distributive property: 4x2 + 36x + 48x + 432 = 832. Combine like terms: 4x2 + 84x + 432 = 832. Subtract 832 from both sides: 4x2 + 84x + 432 − 832 = 832 − 832; simplify: 4x2 + 84x − 400 = 0. Factor the trinomial completely: 2(2x2 + 42x − 200) = 0; 2(2x − 8)(x + 25) = 0. Set each factor equal to zero and solve: 2 ≠ 0 or 2x − 8 = 0 or x + 25 = 0; x = 4 or x = −25. Reject the negative solution because you will not have a negative width. The width is 4 feet.

360. c. To solve this problem, ﬁnd the width of the frame ﬁrst. Let x = the width of the frame. Since the width of the picture only is 12, the width of the frame and the picture is x + x + 12 or 2x + 12. Since the length of the picture only is 14, the length of the frame and the picture together is x + x + 14 or 2x + 14. The total area for the frame and the picture together is 288 square inches. Area of a rectangle is length times width so multiply the expressions together and set them equal to the total area of 288 square inches: (2x + 12)(2x + 14) = 288. Multiply the binomials using the distributive property: 4x2 + 28x + 24x + 168 = 288. Combine like terms: 4x2 + 52x + 168 = 288. Subtract 288 from both sides: 4x2 + 52x + 168 − 288 = 288 − 288; simplify: 4x2 + 52x − 120 = 0. Factor the trinomial completely: 4(x2 + 13x − 30) = 0; 4(x − 2)(x + 15) = 0. Set each factor equal to zero and solve: 4 ≠ 0 or x − 2 = 0 or x + 15 = 0; x = 2 or x = −15. Reject the negative solution because you will not have a negative width. The width is 2 feet. Therefore, the larger dimension of the frame is 2(2) + 14 = 4 + 14 = 18 inches.

361. b.Let x = the lesser integer and let x + 1 = the greater integer. Since product is a key word for multiplication, the equation is x(x + 1) = 90. Multiply using the distributive property on the left side of the equation: x2 + x = 90. Put the equation in standard form and set it equal to zero: x2 + x − 90 = 0. Factor the trinomial: (x − 9)(x + 10) = 0. Set each factor equal to zero and solve: x − 9 = 0 or x + 10 = 0; x = 9 or x = −10. Since you are looking for a positive integer, reject the x-value of −10. Therefore, the lesser positive integer would be 9.

362. a. Let x = the lesser integer and let x + 1 = the greater integer. Since product is a key word for multiplication, the equation is x(x + 1) = 132. Multiply using the distributive property on the left side of the equation: x2 + x = 132. Put the equation in standard form and set it equal to zero: x2 + x − 132 = 0. Factor the trinomial: (x − 11)(x + 12) = 0. Set each factor equal to zero and solve: x − 11 = 0 or x + 12 = 0; x = 11 or x = −12. Since you are looking for a negative integer, reject the x-value of 11. Therefore, x = −12 and x + 1 = −11. The greater negative integer is −11.

363. a. Let x = the lesser even integer and let x + 2 = the greater even integer. Since product is a key word for multiplication, the equation is x(x + 2) = 168. Multiply using the distributive property on the left side of the equation: x2 + 2x = 168. Put the equation in standard form and set it equal to zero: x2 + 2x − 168 = 0. Factor the trinomial: (x − 12)(x + 14) = 0. Set each factor equal to zero and solve: x − 12 = 0 or x + 14 = 0; x = 12 or x = −14. Since you are looking for a positive integer, reject the x-value of −14. Therefore, the lesser positive integer would be 12.

364. d.Let x = the lesser odd integer and let x + 2 = the greater odd integer. Since product is a key word for multiplication, the equation is x(x + 2) = 143. Multiply using the distributive property on the left side of the equation: x2 + 2x = 143. Put the equation in standard form and set it equal to zero: x2 + 2x − 143 = 0. Factor the trinomial: (x − 11)(x + 13) = 0. Set each factor equal to zero and solve: x − 11 = 0 or x + 13 = 0; x = 11 or x = −13. Since you are looking for a positive integer, reject the xvalue of −13. Therefore, x = 11 and x + 2 = 13. The greater positive odd integer is 13.

365. c. Let x = the lesser odd integer and let x + 2 = the greater odd integer. The translation of the sentence, “The sum of the squares of two consecutive odd integers is 74,” is the equation x2 + (x + 2)2 = 74. Multiply (x + 2)2 out as (x + 2)(x + 2) using the distributive property: x2 + (x2 + 2x + 2x + 4) = 74. Combine like terms on the left side of the equation: 2x2 + 4x + 4 = 74. Put the equation in standard form by subtracting 74 from both sides, and set it equal to zero: 2x2 + 4x − 70 = 0; factor the trinomial completely: 2(x2 + 2x − 35) = 0; 2(x − 5)(x + 7) = 0. Set each factor equal to zero and solve: 2 ≠ 0 or x − 5 = 0 or x + 7 = 0; x = 5 or x = −7. Since you are looking for a positive integer, reject the solution of x = −7. Therefore, the smaller positive integer is 5.

366. a. Let x = the lesser integer and let x + 1 = the greater integer. The sentence, “the difference between the squares of two consecutive integers is 15,” can translate to the equation (x + 1)2 − x2 = 15. Multiply the binomial (x + 1)2 as (x + 1)(x + 1) using the distributive property: x2 + 1x + 1x + 1 − x2 = 15. Combine like terms: 2x + 1 = 15; subtract 1 from both sides of the equation: 2x + 1 − 1 = 15 − 1. Divide both sides by 2: 2 2 x = 1 2 4 . The variable is now alone: x = 7. Therefore, the larger consecutive integer is x + 1 = 8.

367. c. Let x = the lesser integer and let x + 1 = the greater integer. The sentence, “The square of one integer is 55 less than the square of the next consecutive integer,” can translate to the equation x2 = (x + 1)2 −55. Multiply the binomial (x + 1)2 as (x + 1)(x + 1) using the distributive property: x2 = x2 + 1x + 1x + 1 − 55. Combine like terms: x2 = x2 + 2x − 54. Subtract x2 from both sides of the equation: x2 − x2 = x2 − x2 + 2x − 54. Add 54 to both sides of the equation: 0 + 54 = 2x − 54 + 54. Divide both sides by 2: 5 2 4 = 2 2 x . The variable is now alone: 27 = x. The lesser integer is 27.

368. c. Let x = the amount each side is increased. Then, x + 4 = the new width and x + 6 = the new length. Since area is length times width, the formula using the new area is (x + 4)(x + 6) = 168. Multiply using the distributive property on the left side of the equation: x2 + 6x + 4x + 24 = 168; combine like terms: x2 + 10x + 24 = 168. Subtract 168 from both sides: x2 + 10x + 24 − 168 = 168 − 168. Simplify: x2 + 10x − 144 = 0. Factor the trinomial: (x − 8)(x + 18) = 0. Set each factor equal to zero and solve: x − 8 = 0 or x + 18 = 0; x = 8 or x = −18. Reject the negative solution because you won’t have a negative dimension. The correct solution is 8 inches.

369. a. Let x = the amount of reduction. Then 4 − x = the width of the reduced picture and 6 − x = the length of the reduced picture. Since area is length times width, and one-third of the old area of 24 is 8, the equation for the area of the reduced picture would be (4 − x)(6 − x) = 8. Multiply the binomials using the distributive property: 24 − 4x − 6x + x2 = 8; combine like terms: 24 − 10x + x2 = 8. Subtract 8 from both sides: 24 − 8 − 10x + x2 = 8 − 8. Simplify and place in standard form: x2 − 10x + 16 = 0. Factor the trinomial into 2 binomials: (x − 2)(x − 8) = 0. Set each factor equal to zero and solve: x − 2 = 0 or x − 8 = 0; x = 2 or x = 8. The solution of 8 is not reasonable because it is greater than the original dimensions of the picture. Accept the solution of x = 2 and the smaller dimension of the reduced picture would be 4 − 2 = 2 inches.

370. d.Let x = the amount that each side of the garden is increased. Then, x + 20 = the new width and x + 24 = the new length. Since the area of a rectangle is length times width, then the area of the old garden is 20 × 24 = 480 and the new area is 480 + 141 = 621. The equation using the new area becomes (x + 20)(x + 24) = 621. Multiply using the distributive property on the left side of the equation: x2 + 24x + 20x + 480 = 621; combine like terms: x2 + 44x + 480 = 621. Subtract 621 from both sides: x2 + 44x + 480 − 621 = 621 − 621; simplify: x2 + 44x − 141 = 0. Factor the trinomial: (x − 3)(x + 47) = 0. Set each factor equal to zero and solve: x − 3 = 0 or x + 47 = 0; x = 3 or x = − 47. Reject the negative solution because you won’t have a negative increase. Thus, each side will be increased by 3 and the new length would be 24 + 3 = 27 feet.

371. b.Let x the number of hours it takes Ian and Jack to remodel the kitchen if they are working together. Since it takes Ian 20 hours if working alone, he will complete 2 1 0 of the job in one hour, even when he’s working with Jack. Similarly, since it takes Jack 15 hours to remodel a kitchen, he will complete 1 1 5 of the job in one hour, even when he’s working with Ian. Since it takes xhours for Ian and Jack to complete the job together, it stands to reason that at the end of one hour, their combined effort will have completed 1 x of the job. Therefore, Ian’s work + Jack’s work combined work and we have the equation: 2 1 0 1 1 5 1 x . Multiply through by the least common denominator of 20, 15 and xwhich is 60x: (60x)( 2 1 0 ) (60x)( 1 1 5 ) (60x)( 1 x ). Simplify: 3x 4x 60. Simplify: 7x 60. Divide by 7: 7 7 x 6 7 0 . x 6 7 0 which is about 8.6 hours.

372. a. Let x = the number of hours it takes Peter and Joe to paint a room if they are working together.Since it takes Peter 1.5 hours if working alone, he will complete 1 1 .5 of the job in one hour, even when he’s working with Joe. Similarly, since it takes Joe 2 hours to paint a room working alone, he will complete 1 2 of the job in one hour, even when working with Peter. Since it takes x hours for Peter and Joe to complete the job together, it stands to reason that at the end of one hour, their combined effort will have completed 1 x of the job.Therefore, Peter’s work Joe’s work combined work and we have the equation: 1 1 .5 1 2 1 x . Multiply through by the least common denominator of 1.5, 2 and x which is 6x: (6x)( 1 1 .5 ) + (6x)(1 2 ) = (6x)(1 x ). Simplify: 4x 3x 6. Simplify: 7x 6. Divide by 7: 7 7 x 6 7 ; x 6 7 hours. Change hours into minutes by multiplying by 60 since there are 60 minutes in one hour. (60)(6 7 ) 36 7 0 divided by 7 equals 51.42 minutes which rounds to 51 minutes.

373. c. Let x = the number of hours it takes Carla and Charles to plant a garden if they are working together. Since it takes Carla 3 hours if working alone, she will complete 1 3 of the job in one hour, even when she’s working with Charles. Similarly, since it takes Charles 4.5 hours to plant a garden working alone, he will complete 4 1 .5 of the job in one hour, even when working with Carla. Since it takes x hours for Carla and Charles to complete the job together, it stands to reason that at the end of one hour, their combined effort will have completed 1 x of the job.Therefore, Carla’s work + Charles’s work combined work and we have the equation: 1 3 4 1 .5 1 x . Multiply through by the least common denominator of 3, 4.5 and x which is 9x: (9x)(1 3 ) (9x)( 4 1 .5 ) (9x)(1 x ). Simplify: 3x 2x 9. Simplify: 5x 9. Divide by 5: 5 5 x 9 5 ; x 9 5 hours which is equal to 1.8 hours.

374. c. Let x = the number of hours it will take Jerry to do the job alone. In 1 hour Jim can do 1 1 0 of the work, and Jerry can do 1 x of the work. As an equation this looks like 1 1 0 + 1 x = 1 4 , where 1 4 represents what part of the job they can complete in one hour together. Multiplying both sides of the equation by the least common denominator, 40x, results in the equation 4x + 40 = 10x. Subtract 4x from both sides of the equation. 4x − 4x + 40 = 10x − 4x. This simpliﬁes to 40 = 6x. Divide each side of the equation by 6; 4 6 0 = 6 6 x . Therefore, 6.666 = x, and it would take Jerry about 6.7 hours to complete the job alone.

375. d.Let x = the number of hours Ben takes to clean the garage by himself. In 1 hour Ben can do 1 x of the work and Bill can do 1 1 0 of the work. As an equation this looks like 1 x + 1 1 0 = 1 6 , where 1 6 represents what part they can clean in one hour together. Multiply both sides of the equation by the least common denominator, 30x, to get an equation of 30 + 3x = 5x. Subtract 3x from both sides of the equation; 30 + 3x − 3x = 5x − 3x. This simpliﬁes to 30 = 2x, and dividing both sides by 2 results in a solution of 15 hours.