1 General Strategies & Basic Equations

- 1. A piece of cloth is cut into 3 smaller pieces. The first piece has a length of x centimeters, the second piece has a length of 3x centimeters, and the third piece has a length of 5x centimeters. If the length of the original cloth is 171 centimeters, what is the difference in length, in centimeters, between the longest piece and the shortest piece?
- 2. If -4 < 4x 4 < 2, which of the following could be the value of x?

3. Erin began the day with p pencils. She gave $\frac{1}{3}$ of her pencils to her friend Joy during first period and $\frac{1}{4}$ of the remaining pencils to her friend Leslie during second period. In terms of p, how many pencils does Erin have left after second period?

(A) $\frac{15p}{48}$ (B) $\frac{3p}{8}$ (C) $\frac{5p}{12}$ (D) $\frac{p}{2}$

4. Which of the following expressions is equivalent to $(4x - 3)^2 + 4(4x - 3)^2$?

(A)
$$(4x-3)(4x-6)$$
 (B) $(8x+1)(2x-3)$ (C) $(4x-3)(4x+1)$ (D) $(16x-1)(x+3)$

- **5.** If $\frac{2y+2}{4} + \frac{y}{3} = \frac{y-3}{12}$, what is the value of *y*?
- 6. If 6(x+2) = 5(x+2) + 23, what is the value of (x+2)?
- 7. Jamie bought 27 notebooks to give to the students in her class. The notebooks were all the same price, and Jamie used a coupon that gave her \$55 dollars off her purchase. After Jamie used the coupon, the cost of the notebooks was \$107. How much would 4 notebooks cost, in dollars, with no coupon?
- **8.** If -7 < 5x 2 < 3, which of the following could be the value of x?

(A) -1 (B) 0 (C) 1 (D) 2

9. Hank is handing out flyers for an upcoming fundraiser. He begins the day with f flyers. After two hours, he has handed out $\frac{1}{3}$ of the flyers. After two more hours, he has handed out $\frac{2}{5}$ of the remaining flyers. He continues to hand out the flyers for one more hour, handing out $\frac{1}{4}$ of the remaining flyers. In terms of f, how many flyers did Hank hand out during this five-hour window?

A.
$$\frac{5f}{12}$$
 B. $\frac{9f}{20}$ C. $\frac{7f}{10}$ D. $\frac{11f}{15}$

10. If $\frac{y+4}{5} + \frac{2y-3}{10} = \frac{y}{15}$, what is the value of y?

11. If 3(5t-6) + 2t = 28 + 9t, what is the value of 8t?

12.

$$2(x-n) = 2x + 5$$

If the equation above has an infinite number of solutions for x, what is the value of the constant n?

- 13. A lumberjack earned \$300 on a day that he chopped down x number of Spruce trees and y number of Evergreen trees. The equation 5x + 7y = 300 represents this situation. What is the best interpretation of the number 7 in this equation?
 - (A) The lumberjack earned 7 dollars for each Evergreen tree he chopped down.
 - (B) The lumberjack chopped down 7 Evergreen trees that day.
 - (C) The lumberjack earned 7 dollars for each Spruce tree he chopped down.
 - (D) The lumberjack chopped down 7 Spruce trees that day.

- **14.** At the beginning of the week, the Sugar Shack had 2,000 goodies in inventory. Halfway through the week, 750 goodies were added to the inventory. At the end of the week, 490 goodies remained. On average, approximately how many goodies were sold each day?
- 15. The formula for the kinetic energy of an object is given as $KE = \frac{1}{2}mv^2$, where KE is its kinetic energy, m is its mass, and v is its velocity. Which of the following expressions gives the velocity of the object in terms of the other variables?

(A)
$$v = \sqrt{\frac{KEm}{2}}$$
 (B) $v = \sqrt{\frac{2m}{KE}}$ (C) $v = \sqrt{\frac{2KE}{m}}$ (D) $v = \sqrt{2KEm}$

16.

x - 27 = a

If a is a positive integer, what could be the value of x?

I. 26 II. 27

III. 28

(A) I only (B) I and II (C) II and III (D) III only

17.

$$8P + 14Q = 80$$

At an archery range, participants are awarded points based on how many times and where they hit the target. The equation above represents how one participant hit the outer part of the target P times and the inner part of the target Q times, for a total of 80 points. How many more points are awarded when you hit the inner part of the target than the outer part?

18. The sum of 6x and 9y is equal to the sum of 3z and 15. Which of the following expressions gives z in terms of other variables?

(A) 2x + 3y - 5 (B) 2x + 3y + 5 (C) 3x + 2y - 5 (D) 3x + 2y + 5

19.

$$2(7x+3) = 14x + 7$$

How many solutions does the given equation have?

- (A) Exactly one (B) Exactly two (C) Infinitely many (D) Zero
- **20.** Farmers Harry and Ron work together to milk 75 cows over the course of a day. Harry milks 15 more cows in the day than Ron does. If x is the number of cows that Ron milks, which equation represents the situation?

(A)
$$x(x+15) = 75$$
 (B) $x(x-15) = 75$ (C) $x + (x+15) = 75$ (D) $x + (x-15) = 75$

21. Waiter John can carry a tray of food if the weight of the tray plus the weight of the plates of food is no more than 50 pounds. He will drop everything if he is carrying more than 50 pounds. If each plate of food weighs 3 pounds, and the tray weighs 7 pounds, how many plates could John carry without dropping everything?

I. 13 II. 14

III. 15

(A) I only (B) I and II (C) III only (D) I, II, and III

22.

$$4a - a - a + 5 = 12 - 3a + a$$

In the equation above, what is the value of a?

23. 8x is six more than three times the value of 2x. What is the value of x?

24. Jenny can decorate cookies at an average rate of 14 cookies per hour. If Jenny continues at the same rate, which equation models the number of hours *h* it would take for her to decorate *c* cookies?

(A)
$$h = \frac{c}{14}$$
 (B) $h = 14c$ (C) $h = c + 14$ (D) $h = c - 14$

25. Alexandra begins the weekend with h homework problems to complete. On Friday, she completes $\frac{2}{5}$ of the problems. On Saturday morning, she completes $\frac{1}{4}$ of the remaining problems, and on Saturday night, she completes $\frac{2}{3}$ of the remaining problems. In terms of h, how many problems does Alexandra need to complete on Sunday to finish her homework?

(A)
$$\frac{h}{12}$$
 (B) $\frac{7h}{60}$ (C) $\frac{3h}{20}$ (D) $\frac{11h}{30}$

$$\frac{3(m+2)}{9} = \frac{5(m-4)}{10}$$

In the equation above, what is the value of m?

27. If $\frac{4}{b+2} = \frac{12}{c}$, where $b \neq -2$ and $c \neq 0$, what is c in terms of b?

(A)
$$c = 3b + \frac{1}{2}$$
 (B) $c = 3b + 3$ (C) $c = 3b + 4$ (D) $c = 3b + 6$

- **28.** How many solutions does the equation 4(16-6) = -8(3-8x) have?
 - (A) Exactly one (B) Exactly two (C) Infinitely many (D) Zero
- **29.** Stephanie owns a pet grooming business. The equation 2c + 3.5d = 98 describes the maximum number of cats, c, and the number of dogs, d, that she can groom in a week. If Stephanie is booked to groom 24 dogs this week, how many cats could she add to her schedule?
 - I. 7
 - II. 8 III. 9
 - (A) I only (B) I and II (C) II and III (D) I, II, and III
- **30.** An aquarium consists of a 10-gallon tank and a 260-gallon tank. The total number of fish in both tanks is 1,835. The equation 10x + 260y = 1,835 represents this situation. Which of the following is the best interpretation of x in this context?
 - (A) The average number of fish per gallon in the 10-gallon tank
 - (B) The average number of fish per gallon in the 260-gallon tank
 - (C) The total number of fish in the 10-gallon tank
 - (D) The total number of fish in the 260-gallon tank

31.

$$-3(42x - 7) = -15 + k(8 - 13x)$$

If the solution of the given equations if -4, what is the value of the constant k?

- **32.** The total cost of renting a boat for 14 days is given by the equation t = 14f + 300, where f is the daily fee, in dollars. What is the total cost to rent a boat for 14 days when the daily fee is \$125?
- **33.** Jane rides her bike at a constant speed along a trail. The equation d = 12t gives the distance d, in miles from her house, that Jane will be t hours after leaving her house. How many miles away will she be 1.5 hours after leaving her house?
- **34.** In astrophysics, the formula used to determine the luminosity of a spherical object is given as $F = \frac{L}{4\pi r^2}$ where F is the flux density of the illuminated surface area of the sphere, L is the luminosity of the sphere and r is the radius of the sphere. Which of the following equations gives the radius of the sphere in terms of the other variables?

(A)
$$r = \sqrt{\frac{4\pi L}{F}}$$
 (B) $r = \sqrt{\frac{FL}{4\pi}}$ (C) $r = \sqrt{\frac{F}{4\pi L}}$ (D) $r = \sqrt{\frac{L}{4\pi F}}$

35. If $\frac{2z-2}{6} = \frac{x}{3}$, which of the following correctly expresses x in terms of z?

(A)
$$z-1$$
 (B) $\frac{z-1}{2}$ (C) $\frac{6z-1}{3}$ (D) $6z-6$

- **36.** If $\frac{a}{9} + \frac{b}{3} = 30$, what is the value of 2a + 6b?
- **37.** An amusement park charges its attendees \$32 per hour for the first 4 hours, then \$18 per hour for each additional hour. Which expression reflects the total cost that an attendee is charged for h hours in the amusement park, where $h \ge 4$?

(A)
$$18h + 56$$
 (B) $32h - 128$ (C) $32h + 72$ (D) $18h + 128$

- **38.** During a city council meeting, members voted on whether they wanted to have a pool built near the community center. It was reported afterwards that four times as many people voted in favor of the pool as people who voted against it. The city council released data that 828 more members voted for the pool than voted against it. Based on this situation, how many people voted for having the pool built?
- **39.** Which of the following is equivalent to $(a + 2b) \left(\frac{b}{2a}\right)$?

(A)
$$\frac{b+b^2}{2}$$
 (B) $\frac{b}{2} + \frac{b^2}{a}$ (C) $b+b^2$ (D) $b+\frac{b^2}{a}$

- **40.** If $\frac{2}{3}(x-2) + \frac{3}{5}(x-1) = x \frac{3}{5}$, what is $\frac{x}{3}$?
- **41.** In economics marginal revenue can be defined as $R' = P\left(1 + \frac{1}{Ed}\right)$, where R' is the marginal revenue, P is the price of the item and Ed is the price elasticity of demand for that item. Given this equation, which of the following identifies the price elasticity of demand in terms of the other variables?

(A)
$$Ed = \frac{R'}{P-1}$$
 (B) $Ed = \frac{P+1}{R'}$ (C) $Ed = \frac{P}{R'-P}$ (D) $Ed = \frac{R'}{P-R'}$

42. One gallon of gas is enough for a certain car to drive 26 miles. The car needs to drive n miles to reach its destination. Which equation represents the amount of gas G, in gallons, which allows the car to drive halfway to the destination?

(A) G = 26n (B) $G = \frac{n}{26}$ (C) G = 13n (D) $G = \frac{n}{52}$

Solutions

- **1.** 76
- **2.** B
- 3. D
- **4.** C
- **5.** -1
- **6.** 23
- **7.** 24
- **8.** B
- 9. C
- 10. $-\frac{3}{2}$
- **11.** 46
- 12. $-\frac{5}{2}$
- --- :
- **13.** A
- 14. 32315. C

4

- **17.** 6
- 18. A
- **19.** D
- **20.** C
- **21.** B
- **22.** 7/4
- **23.** 3
- **24.** A
- **25.** C
- **26.** 16
- 27. D
- **28.** C
- **29.** A
- **30.** A
- **31.** 9
- **32.** 2050
- **33.** 18
- **34.** D
- **35.** A
- **36.** 540
- **37.** A
- **38.** 276
- **39.** B
- **40.** $\frac{5}{3}$
- **41.** C
- **42.** D