Advanced Drills

Use these drills to push yourself with the toughest types of problems you are likely to encounter on SAT test day. Each drill has ten questions, with solutions that follow.

- Algebra Drill 1
- Algebra Drill 2
- Advanced Math Drill 1
- Advanced Math Drill 2
- Problem Solving and Data Analysis
- Geometry and Trigonometry
- Mixed Problems

If you are doing a drill under timed conditions, allow about 15 minutes to complete (longer than the chapter drills because of the increased average difficulty of the problems). Good luck!

Algebra Drill 1

1. Solve for x:

$$1\frac{7}{8}x + \frac{5}{32} = 3\frac{3}{4}x - 1\frac{1}{4}$$

(A) $\frac{3}{4}$

(B) $2\frac{17}{32}$

(C) $\frac{15}{16}$

(D) $-\frac{45}{76}$

2. When 2 times a number is subtracted from 14, the result is 2 greater than the number. What is the number in question?

(A) $\frac{16}{3}$

(B) 4

(C) 12

(D) 16

3. In 2015, Andre had 210 coins in his collection. If Andre adds 5 new coins a year starting in 2015 through the end of 2022 and then adds 8 coins a year starting in 2023, how many coins will he have in his collection at the end of 2045?

(A) 224

(B) 421

(C) 429

(D) 434

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4. How many pairs (x, y) satisfy both $x - y > 3$ and $y - 5 > x$?

(A) 0
(B) 1
(C) 2
(D) Infinitely many

5. What is the solution (x, y) to the following set of equations?

$$4x - 3y = \frac{11}{3} \text{ and } -\frac{2}{3}x + \frac{1}{4}y = -\frac{13}{18}$$

(A) $\left(\frac{4}{3}, \frac{5}{4}\right)$
(B) $\left(\frac{5}{4}, \frac{4}{9}\right)$
(C) $\left(-\frac{37}{12}, -\frac{16}{3}\right)$
(D) $\left(\frac{7}{4}, 10\right)$

6. How many ordered pairs (x, y) satisfy the following system of equations?

$$(x - 2)(y + 5) = 0 \text{ and } 3x + y = 1$$

(A) 0
(B) 1
(C) 2
(D) Infinitely many

7. What are the solutions to the following series of equations?

$$\frac{3}{8}a + \frac{2}{3}b = 4.3 \text{ and } -12.9 + 1.125a = -2b$$

(A) $a = 0.8$ and $b = 6$
(B) $a = 16.8$ and $b = -3$
(C) No solutions
(D) Infinitely many solutions

8. Candidate M and Candidate N are the only candidates running for city mayor. If the total number of votes the two candidates receive is 50,000 and if Candidate M receives 3 times as many votes as Candidate N, what is the total number of votes Candidate N receives?

(A) 12,500
(B) 16,667
(C) 21,500
(D) 37,500

9. Jennifer's yearly salary, S, is modeled using the equation $S = 2{,}500Y + 40{,}000$, where Y represents how many years she has been working at the company. What does the number 2,500 represent in this equation?

(A) The amount Jennifer's salary increases for each year she has been working
(B) Jennifer's starting salary
(C) The amount of money Jennifer has made in year Y
(D) The number of hours Jennifer has worked in year Y

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10. If Avinash reads 2 fiction articles per day and 14 nonfiction articles per week, which expression models the total number of articles he would read in w weeks?

(A) $2w + 14$
(B) $16w$
(C) $28w$
(D) $112w$

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Algebra Drill 2

1. If $-(2x-4)+3(x-5)=-4$, what is the value of x?

   (A) -3
   (B) 5
   (C) 7
   (D) 15

2. If $g(x+2)=5x-4$, what is the value of $g(7)$?

   (A) 21
   (B) 29
   (C) 31
   (D) 41

3. John is having an undetermined number of people over for dinner. He needs to have 6 serving utensils (used by everyone collectively), plus a knife, fork, and spoon for each diner. Which of the following equations correctly models the total number of utensils, U, John will need for x number of diners, himself included?

   (A) $U=3x$
   (B) $U=9x$
   (C) $U=3x+6$
   (D) $U=6x+3$

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4. If $f(x) = 4x + 7$ and if $g(x) = -3x + 2$, what is the value of $f(g(3))$?

   (A) -27
   (B) -21
   (C) -7
   (D) 19

5. Under a new state law, a massage therapist will be required to charge sales tax on her services. If the sales tax rate is 7%, by what ratio would she need to multiply the current price of her services to determine the new total amount customers will pay under the new law?

   (A) $\frac{7}{100}$
   (B) $\frac{7}{10}$
   (C) $\frac{107}{100}$
   (D) $\frac{170}{100}$

6. If $6(2a - b) = 4b$, what is the ratio of b to a?

   (A) $\frac{2}{3}$
   (B) $\frac{5}{6}$
   (C) $\frac{6}{5}$
   (D) $\frac{12}{5}$

7. The total operational costs C for a restaurant are modeled by the equation $C = 2M + 50{,}000$, where M represents the number of meals served. What does the 50,000 represent in the equation?

   (A) The total operational costs
   (B) The fixed operational costs
   (C) The cost per meal
   (D) The minimum number of meals served

8. The total costs C to operate a factory are represented by the function $C(n) = an + b$, where n is the number of days the factory is operational. If the daily operations costs were to increase beyond the given rate and if the initial startup costs were to decrease beyond the given rate, how would this affect the constants a and b?

   (A) a would increase, and b would increase.
   (B) a would increase, and b would decrease.
   (C) a would decrease, and b would increase.
   (D) a and b would remain the same.

9. How will the function $f(x) = 4x - 5$ be affected by the translation

$$g(x) = f(x - 1) + 2?$$

   (A) It will be shifted up 2 units and 1 unit to the left.
   (B) It will be shifted down 1 unit and 2 units to the left.
   (C) It will be shifted up 2 units and 1 unit to the right.
   (D) It will be shifted down 1 unit and 2 units to the right.

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10. A company is conducting an online campaign to increase its social media followers. The number of social media followers, N, is estimated by the equation $N = 30W + 250$, where W represents the number of weeks of the campaign (and $W > 0$). What does the number 250 represent in the equation?

(A) The number of weeks of the campaign
(B) The number of new social media followers each week
(C) The number of social media followers at the start of the campaign
(D) The number of social media followers at the end of W weeks

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Advanced Math Drill 1

1. An element's half-life is the amount of time that it takes for the element to decay by half. If there is x amount of element Z initially, which of the following represents the amount A of Z that would remain after n whole half-lives of Z had passed?

   (A) $A = \frac{x}{2n}$

   (B) $A = \frac{x}{2^n}$

   (C) $A = \frac{n}{2x}$

   (D) $A = \frac{x}{2^{n-1}}$

2. $\sqrt[5]{32x^8y^{11}}$ is equivalent to which of the following?

   (A) $2xy^2\sqrt[5]{x^3y}$

   (B) $2x^5y^{10}\sqrt[5]{x^3y}$

   (C) $2x^3y^6\sqrt[5]{xy}$

   (D) $2xy^2\sqrt[5]{2x^3y^2}$

3. If $x > 0$, then $\frac{1}{2x} + \frac{1}{3x}$ is equivalent to which of the following?

   (A) $\left(\frac{25}{6x^2}\right)^{\frac{1}{2}}$

   (B) $\left(\frac{4}{25x^2}\right)^{\frac{1}{2}}$

   (C) $\left(\frac{5}{6x}\right)^2$

   (D) $\left(\frac{25}{36x^2}\right)^{\frac{1}{2}}$

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4. If $x^2 + ax = b$, where a and b are constants, what are the solutions for x?

   (A) $x = -\frac{a}{2} \pm \sqrt{2b + \frac{a^2}{2}}$

   (B) $x = -\frac{a}{2} \pm \sqrt{b + \frac{a^2}{4}}$

   (C) $x = -\frac{b}{2} \pm \sqrt{\frac{a^2}{2} - 2b}$

   (D) $x = -\frac{a}{2} \pm \sqrt{b^2 + \frac{a^2}{4}}$

5. $6x^2 + 15xy + 6y^2 = ?$

   (A) $3(2x + y)^2$

   (B) $(3x + y)(x + 3y)$

   (C) $(3x + 3y)(2x + 2y)$

   (D) $3(x + 2y)(2x + y)$

6. What are the solution(s) for x in the equation below?

$$x - 6 = \sqrt{75 - 2x}$$

   (A) 13

   (B) 13 and -3

   (C) -3 and 3

   (D) No solution

7. At what points will $f(x) = 8x^2 - 22x + 15$ intersect the x-axis?

   (A) 15

   (B) $\frac{3}{2}$ and $\frac{5}{4}$

   (C) $-\frac{5}{4}$ and $-\frac{3}{2}$

   (D) $\frac{5}{4}$ and $\frac{15}{2}$

8. Which value of n will cause the value of $f(x) = xn$ to be consistently positive and increase the most rapidly, given that x is greater than 1 and that n is an even integer?

   (A) -2

   (B) -1

   (C) 1

   (D) 2

9. To see if two sets of data are correlated, one can calculate the correlation coefficient between two populations, r_{xy}, using the formula $r_{xy} = \frac{s_{xy}}{s_x s_y}$, where s_{xy} is the covariance of the population, s_x is the standard deviation of population x, and s_y is the standard deviation of population y. If the dispersion of population x and the dispersion of population y both increase while the covariance between the populations remains the same, what would happen to the correlation coefficient of the two populations?

   (A) It would decrease.

   (B) It would increase.

   (C) It would stay the same.

   (D) It cannot be determined.

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