A.CED.A.4: Transforming Formulas 1

1 Boyle's Law involves the pressure and volume of gas in a container. It can be represented by the formula $P_1V_1 = P_2V_2$. When the formula is solved for P_2, the result is

1) $P_1V_1V_2$
2) $\frac{V_2}{P_1V_1}$
3) $\frac{P_1V_1}{V_2}$
4) $\frac{P_1V_2}{V_1}$

2 Michael borrows money from his uncle, who is charging him simple interest using the formula $I = Prt$. To figure out what the interest rate, r, is, Michael rearranges the formula to find r. His new formula is r equals

1) $\frac{I-P}{t}$
2) $\frac{P-I}{t}$
3) $\frac{I}{Pt}$
4) $\frac{Pt}{I}$

3 The formula $Ax + By = C$ represents the equation of a line in standard form. Which expression represents y in terms of A, B, C, and x?

1) $\frac{C-Ax}{B}$
2) $\frac{C-A}{Bx}$
3) $\frac{C-A}{x+B}$
4) $\frac{C-B}{Ax}$

4 An equation used to find the velocity of an object is given as $v^2 = u^2 + 2as$, where u is the initial velocity, v is the final velocity, a is the acceleration of the object, and s is the distance traveled. When this equation is solved for a, the result is

1) $a = \frac{v^2u^2}{2s}$
2) $a = \frac{v^2-u^2}{2s}$
3) $a = v^2 - u^2 - 2s$
4) $a = 2s(v^2 - u^2)$

5 The formula for the area of a trapezoid is $A = \frac{1}{2}(b_1 + b_2)h$. The height, h, of the trapezoid may be expressed as

1) $2A - b_1 - b_2$
2) $\frac{2A-b_1}{b_2}$
3) $\frac{1}{2}A - b_1 - b_2$
4) $\frac{2A}{b_1+b_2}$

6 The volume of a trapezoidal prism can be found using the formula $V = \frac{1}{2}a(b+c)h$. Which equation is correctly solved for b?

1) $b = \frac{V}{2ah} + c$
2) $b = \frac{V}{2ah} - c$
3) $b = \frac{2V}{ah} + c$
4) $b = \frac{2V}{ah} - c$

7 The amount of energy, Q, in joules, needed to raise the temperature of m grams of a substance is given by the formula $Q = mC(T_f - T_i)$, where C is the specific heat capacity of the substance. If its initial temperature is T_i, an equation to find its final temperature, T_f, is

1) $T_f = \frac{Q}{mC} - T_i$
2) $T_f = \frac{Q}{mC} + T_i$
3) $T_f = \frac{T_i + Q}{mC}$
4) $T_f = \frac{Q - mC}{T_i}$

8 The equation for the volume of a cylinder is $V = \pi r^2 h$. The positive value of r, in terms of h and V, is

1) $r = \sqrt{\frac{V}{\pi h}}$
2) $r = \sqrt{V\pi h}$
3) $r = 2V\pi h$
4) $r = \frac{V}{2\pi}$

9 The formula for electrical power, P, is $P = I^2R$, where I is current and R is resistance. The formula for I in terms of P and R is

1) $I = \left(\frac{P}{R}\right)^2$
2) $I = \sqrt{\frac{P}{R}}$
3) $I = (P - R)^2$
4) $I = \sqrt{P - R}$

10 The formula for the volume of a cone is $V = \frac{1}{3}\pi r^2 h$. The radius, r, of the cone may be expressed as

1) $\sqrt{\frac{3V}{\pi h}}$
2) $\sqrt{\frac{V}{3\pi h}}$
3) $3\sqrt{\frac{V}{\pi h}}$
4) $\frac{1}{3}\sqrt{\frac{V}{\pi h}}$

11 The distance a free falling object has traveled can be modeled by the equation $d = \frac{1}{2}at^2$, where a is acceleration due to gravity and t is the amount of time the object has fallen. What is t in terms of a and d?

1) $t = \sqrt{\frac{da}{2}}$
2) $t = \sqrt{\frac{2d}{a}}$
3) $t = \left(\frac{da}{d}\right)^2$
4) $t = \left(\frac{2d}{a}\right)^2$

12 The formula for blood flow rate is given by $F = \frac{p_1 - p_2}{r}$, where F is the flow rate, p_1 the initial pressure, p_2 the final pressure, and r the resistance created by blood vessel size. Which formula can *not* be derived from the given formula?

1) $p_1 = Fr + p_2$
2) $p_2 = p_1 - Fr$
3) $r = F(p_2 - p_1)$
4) $r = \frac{p_1 - p_2}{F}$

13 Students were asked to write a formula for the length of a rectangle by using the formula for its perimeter, $p = 2\ell + 2w$. Three of their responses are shown below.

I. $\ell = \frac{1}{2}p - w$

II. $\ell = \frac{1}{2}(p - 2w)$

III. $\ell = \frac{p - 2w}{2}$

Which responses are correct?

1) I and II, only
2) II and III, only
3) I and III, only
4) I, II, and III

14 When the equation $\frac{x-1}{2} - \frac{a}{4} = \frac{3a}{4}$ is solved for x in terms of a, the solution is

1) $\frac{3a}{2} + 1$
2) $a + 1$
3) $\frac{4a + 1}{2}$
4) $2a + 1$

15 When solved for x in terms of a, the solution to the equation $3x - 7 = ax + 5$ is

1) $\frac{12}{3a}$
2) $\frac{12}{3 - a}$
3) $\frac{3a}{12}$
4) $\frac{3 - a}{12}$

16 The formula for the sum of the degree measures of the interior angles of a polygon is $S = 180(n - 2)$. Solve for n, the number of sides of the polygon, in terms of S.

17 The formula $a = \frac{v_f - v_i}{t}$ is used to calculate acceleration as the change in velocity over the period of time. Solve the formula for the final velocity, v_f, in terms of initial velocity, v_i, acceleration, a, and time, t.

18 The formula $d = t\left(\frac{v_i + v_f}{2}\right)$ is used to calculate the distance, d, covered by an object in a given period of time, t. Solve the formula for v_f, the final velocity, in terms of d, t, and v_i, the initial velocity.

19 The temperature inside a cooling unit is measured in degrees Celsius, C. Josh wants to find out how cold it is in degrees Fahrenheit, F. Solve the formula $C = \frac{5}{9}(F - 32)$ for F so that Josh can convert Celsius to Fahrenheit.

20 The formula for converting degrees Fahrenheit (F) to degrees Kelvin (K) is:

$$K = \frac{5}{9}(F + 459.67)$$

Solve for F, in terms of K.

21 Solve the equation below for x in terms of a.

$$4(ax + 3) - 3ax = 25 + 3a$$

22 A formula for determining the finite sum, S, of an arithmetic sequence of numbers is $S = \frac{n}{2}(a + b)$, where n is the number of terms, a is the first term, and b is the last term. Express b in terms of a, S, and n.

23 The formula for the area of a trapezoid is $A = \frac{1}{2}h(b_1 + b_2)$. Express b_1 in terms of A, h, and b_2. The area of a trapezoid is 60 square feet, its height is 6 ft, and one base is 12 ft. Find the number of feet in the other base.

24 The formula $F_g = \frac{GM_1M_2}{r^2}$ calculates the gravitational force between two objects where G is the gravitational constant, M_1 is the mass of one object, M_2 is the mass of the other object, and r is the distance between them. Solve for the positive value of r in terms of F_g, G, M_1, and M_2.

25 The volume of a large can of tuna fish can be calculated using the formula $V = \pi r^2 h$. Write an equation to find the radius, r, in terms of V and h. Determine the diameter, to the *nearest inch*, of a large can of tuna fish that has a volume of 66 cubic inches and a height of 3.3 inches.

26 The formula for the volume of a cone is $V = \frac{1}{3}\pi r^2 h$. Solve the equation for h in terms of V, r, and π.

27 Using the formula for the volume of a cone, express r in terms of V, h, and π.

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Answer Section

1 ANS: 3 REF: 011704ai
2 ANS: 3 REF: 011606ai
3 ANS: 1

$Ax + By = C$

$By = C - Ax$

$y = \frac{C - Ax}{B}$

REF: 062211ai
4 ANS: 2

$v^2 - u^2 = 2as$

$\frac{v^2 - u^2}{2s} = \frac{2as}{2s}$

$\frac{v^2 - u^2}{2s} = a$

REF: 012408ai
5 ANS: 4

$2A = (b_1 + b_2)h$

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

REF: 062315ai
6 ANS: 4

$V = \frac{1}{2}a(b + c)h$

$2V = a(b + c)h$

$\frac{2V}{ah} = b + c$

$\frac{2V}{ah} - c = b$

REF: 082224ai

7 ANS: 2

$$\frac{Q}{mC} = T_f - T_i$$

$$\frac{Q}{mC} + T_i = T_f$$

REF: 012318ai

8 ANS: 1 REF: 011516ai

9 ANS: 2

$$P = I^2 R$$

$$I^2 = \frac{P}{R}$$

$$I = \sqrt{\frac{P}{R}}$$

REF: 011920ai

10 ANS: 1

$$V = \frac{1}{3}\pi r^2 h$$

$$3V = \pi r^2 h$$

$$\frac{3V}{\pi h} = r^2$$

$$\sqrt{\frac{3V}{\pi h}} = r$$

REF: 061423ai

11 ANS: 2

$$d = \frac{1}{2}at^2$$

$$2d = at^2$$

$$\frac{2d}{a} = t^2$$

$$\sqrt{\frac{2d}{a}} = t$$

REF: 061519ai

12 ANS: 3 REF: 061723ai

13 ANS: 4 REF: 061823ai

14 ANS: 4

$$\frac{x-1}{2} = a$$

$$x - 1 = 2a$$

$$x = 2a + 1$$

REF: 062223ai

15 ANS: 2

$$3x - ax = 12$$

$$x(3 - a) = 12$$

$$x = \frac{12}{3 - a}$$

REF: 062422ai

16 ANS:

$$\frac{S}{180} = n - 2$$

$$\frac{S}{180} + 2 = n$$

REF: 061631ai

17 ANS:

$$at = v_f - v_i$$

$$at + v_i = v_f$$

REF: 081928ai

18 ANS:

$$2d = t(v_i + v_f)$$

$$\frac{2d}{t} = v_i + v_f$$

$$\frac{2d}{t} - v_i = v_f$$

REF: 082328ai

19 ANS:

$$9C = 5F - 160$$

$$F = \frac{9C + 160}{5}$$

REF: 062131ai

20 ANS:

$9K = 5F + 2298.35$

$F = \dfrac{9K - 2298.35}{5}$

REF: 081829ai

21 ANS:

$4ax + 12 - 3ax = 25 + 3a$

$ax = 13 + 3a$

$x = \dfrac{13 + 3a}{a}$

REF: 081632ai

22 ANS:

$2S = n(a + b)$

$\dfrac{2S}{n} = a + b$

$\dfrac{2S}{n} - a = b$

REF: 012032ai

23 ANS:

$A = \dfrac{1}{2}h(b_1 + b_2)$ $b_1 = \dfrac{2(60)}{6} - 12 = 20 - 12 = 8$

$\dfrac{2A}{h} = b_1 + b_2$

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

REF: 081434ai

24 ANS:

$F_g = \dfrac{GM_1M_2}{r^2}$

$r^2 = \dfrac{GM_1M_2}{F_g}$

$r = \sqrt{\dfrac{GM_1M_2}{F_g}}$

REF: 011830ai

25 ANS:

$\frac{V}{\pi h} = \frac{\pi r^2 h}{\pi h}$ $d = 2\sqrt{\frac{66}{3.3\pi}} \approx 5$

$\frac{V}{\pi h} = r^2$

$\sqrt{\frac{V}{\pi h}} = r$

REF: 081535ai

26 ANS:

$V = \frac{1}{3}\pi r^2 h$

$3V = \pi r^2 h$

$\frac{3V}{\pi r^2} = h$

REF: 061930ai

27 ANS:

$V = \frac{1}{3}\pi r^2 h$

$3V = \pi r^2 h$

$\frac{3V}{\pi h} = r^2$

$\sqrt{\frac{3V}{\pi h}} = r$

REF: 081727ai