Year 9 Worksheet 2:
Expressions,equations and inequalities

Question 1: Answer the following.

(1) The algebraic expression that represents 4 more than twice a number x is:

A. $2x + 4$ B. $4x - 2$ C. $2x - 4$ D. $4x + 2$ E. $x + 4$

(2) Simplify the expression $3(xy+2x)-5y$:

A. $3xy + 2x - 5y$
B. $3xy + 6x - 5$
C. $3xy + 6x - 5xy$
D. $3xy + 2x - 5$
E. $3xy + 6x - 5y$

(3) Solve the equation $2x - 5 = 7$.

A. -1   B. 6   C. 5   D. 1   E. 12

(4) Evaluate the expression $4^3 - 2^4$:

A. 16   B. 40   C. 48   D. 32   E. 8

(5) If the sum of two consecutive even integers is 38, what are the integers?

A. 18 and 20   B. 16 and 22   C. 15 and 23   D. 19 and 21   E. 14 and 24

(6) Solve the equation $5(x+2) = 2(x-1)$:

A. -1 B. 1 C. -3 D. 3 E. -4

(7) The area of a rectangle is given by $A = lw$, where $l = 6$ and $A = 48$. Find the width w:

A. 6 B. 7 C. 8 D. 9 E. 12

(8) Solve the inequality $3x - 4 > 5$:

A. $x > 3$ B. $x < 3$ C. $x < -2$ D. $x > -2$ E. $x < 1$

(9) Solve the simultaneous equations:

$$2x + y = 5$$
$$x + 3y = 5$$

A. x=1, y=1 B. x=0, y=1 C. x=1, y=0 D. x=2, y=1 E. x=1, y=2

(10) Solve the simultaneous equations:

$$3y - 2x = 4$$
$$2y + 3x = 7$$

A. x=2, y=1 B. x=1, y=2 C. x=1, y=0 D. x=0, y=1 E. x=1, y=1

Question 2: Answer the following.

1	Evaluate these expressions if a = 4, b = -3 and c = -5. a. $12a - 3(a + b - 1)$ b. $c^2 - ab$ c. $3(a + 2b) - (3c + b)$
2	Simplify the following. a. $3x + 2y - 5x - y$. b. $2a^2b - 4ab^2 + 5a^2b + 3ab^2$.

	c. $4m^2n + 3mn - 2m^2n + 5mn$. d. $a^2b - 2ab^2 + 5a^2b + b^2a$.
3	Solve each of the following equations. a. $\frac{x}{5} - 3 = 12$ b. $18 - 3x = 9$ c. $\frac{2x-6}{7} = 4$ d. $14 = 8 + \frac{3x}{4}$

4	Solve each of the following equations. a. $3(2x - 1) = 3(3x + 4) - 5$. b. $2(3y - 2) + 4(2y + 1) = 3(4y - 3) - 5$.
5	In a bicycle race, the second segment was half the length of the first segment, the third segment was two-thirds of the length of the second segment, and the last segment was twice the length of the second segment. If the total distance covered in the race was 153 kilometers, determine the length of each segment.

6	Find the solution set for each of the following inequalities. a. $8 - 3x > 5$ b. $3a + 6 \leq 5a + 2$ c. $\frac{p}{5} - 6 \geq -10$
7	Solve each of the following pairs of simultaneous equations by using substitution or elimination. a. Equation 1: $2x + 3y = 10$ Equation 2: $4x - 2y = 8$

	b. Equation 1: $3x - 2y = 5$ Equation 2: $6x + 4y = 10$
8	Emily purchased two boxes of chocolates and three cans of soda for a total of $22. In the same store, Daniel bought one box of chocolates and two cans of soda for $13. What is the cost of each box of chocolates and each can of soda?

9	Find exact solution(s), where possible, to the following equations. a. $x^2 - 121 = 0$ b. $250 - 3x^2 = 7, x > 0$ c. $\frac{x^2}{4} = 16, x < 0$
10	The formula to calculate the area of a trapezium is $A = \frac{1}{2}(a + b)h$. A new garden patio in the shape of the given trapezium is being planned. Currently, with dimensions a = 15 meters and h = 8 meters, we need to determine: a. The range of values for b that will result in an area of at most 140 square meters.

	b. Rearrange the formula to solve for b. c. Use the rearranged formula from part b to find the length of b required to achieve an area of 120 square meters. d. Rearrange the formula to solve for h. e. If b is set to 10 meters, calculate the reduction needed in the width of the deck (h in meters) to achieve an area of 110 square meters.

Answer Key

Question 1: Answer the following.

(1) The algebraic expression that represents 4 more than twice a number x is:

A. 2x+4 B. 4x-2 C. 2x-4 D. 4x+2 E. x+4

Answer: A. 2x+4

(2) Simplify the expression 3(xy+2x)−5y:

A. 3xy+2x−5y
B. 3xy+6x−5
C. 3xy+6x−5xy
D. 3xy+2x−5
E. 3xy+6x−5y

Answer: E. 3xy+6x−5y

(3) Solve the equation 2x−5=7.

A. -1 B. 6 C. 5 D. 1 E. 12

Answer: B. 6

(4) Evaluate the expression $4^3 - 2^4$:

A. 16 B. 40 C. 48 D. 32 E. 8

Answer: C. 48

(5) If the sum of two consecutive even integers is 38, what are the integers?

A. 18 and 20 B. 16 and 22 C. 15 and 23 D. 19 and 21 E. 14 and 24

Answer: A. 18 and 20

(6) Solve the equation $5(x+2)=2(x-1)$:

A. -1 B. 1 C. -3 D. 3 E. -4

Answer: E. -4

(7) The area of a rectangle is given by $A=lw$, where $l=6$ and $A=48$. Find the width w:

A. 6 B. 7 C. 8 D. 9 E. 12

Answer: C. 8

(8) Solve the inequality $3x-4>5$:

A. $x > 3$ B. $x < 3$ C. $x < -2$ D. $x > -2$ E. $x < 1$

Answer: A. $x > 3$

(9) Solve the simultaneous equations:

$$2x+y = 5$$
$$x+3y = 5$$

A. $x=1, y=1$ B. $x=0, y=1$ C. $x=1, y=0$ D. $x=2, y=1$ E. $x=1, y=2$

Answer: D. $x=2, y=1$

(10) Solve the simultaneous equations:

$$3y-2x = 4$$
$$2y+3x = 7$$

A. $x=2, y=1$ B. $x=1, y=2$ C. $x=1, y=0$ D. $x=0, y=1$ E. $x=1, y=1$

Answer: B. $x=1, y=2$

Question 2: Answer the following.

1	Evaluate these expressions if a = 4, b = -3 and c = -5. a. $12a - 3(a + b - 1)$ = 48 b. $c^2 - ab$ = 37 c. $3(a + 2b) - (3c + b)$ = 12
2	Simplify the following. a. $3x + 2y - 5x - y$. $= (3x - 5x) + (2y - y) = -2x + y$. b. $2a^2b - 4ab^2 + 5a^2b + 3ab^2$. $= (2a^2b + 5a^2b) - (4ab^2 + 3ab^2) = 7a^2b - 7ab^2 = 7ab(a-b)$. c. $4m^2n + 3mn - 2m^2n + 5mn$. $= (4m^2n - 2m^2n) + (3mn + 5mn) = 2m^2n + 8mn = 2mn(m+4)$. d. $a^2b - 2ab^2 + 5a^2b + b^2a$ $= (a^2b + 5a^2b) + (- 2ab^2 + b^2a) = 6a^2b - b^2a = ab(6a-b)$.
3	a. $\frac{x}{5} - 3 = 12$ x = 75 b. $18 - 3x = 9$ x = 3 c. $\frac{2x-6}{7} = 4$ x = 17 d. $14 = 8 + \frac{3x}{4}$ x = 8

4	Solve each of the following equations. a. 3(2x – 1) = 3(3x + 4) – 5. 6x - 3 = 9x + 12 - 5. -3x - 3 = 7. -3x = 10. x = -10/3. b. 2(3y – 2) + 4(2y + 1) = 3(4y – 3) – 5. 6y - 4 + 8y + 4 = 12y - 9 - 5 14y - 12y = 12y - 12y - 14 2y = -14 y = -7
5	In a bicycle race, the second segment was half the length of the first segment, the third segment was two-thirds of the length of the second segment, and the last segment was twice the length of the second segment. If the total distance covered in the race was 153 kilometers, determine the length of each segment. x + (1/2)x + (1/3)x + x = 153 (17/6)x = 153 x ≈ 54 km So, the lengths of the segments are as follows: The first segment is approximately 54 kilometers. The second segment is (1/2) * 54 = 27 kilometers. The third segment is (1/3) * 54 ≈ 18 kilometers. The last segment is 2 * 27 = 54 kilometers.
6	Find the solution set for each of the following inequalities. a. 8–3x > 5 x < 1 b. 3a + 6 ≤ 5a + 2 a ≥ 2 c. $\frac{p}{5} - 6 \geq -10$ p ≥ −20

7	Solve each of the following pairs of simultaneous equations by using substitution or elimination. a. Equation 1: $2x + 3y = 10$ Equation 2: $4x - 2y = 8$ Multiply Equation 1 by 2 to make the coefficients of x in both equations equal: Equation 1 (multiplied by 2): $4x + 6y = 20$ Now, subtract Equation 2 from Equation 1 to eliminate x: $(4x + 6y) - (4x - 2y) = 20 - 8$ $4x + 6y - 4x + 2y = 12$ $8y = 12$ $y = 3/2$ Now that we have found the value of y, substitute it back into Equation 1 to solve for x: $2x + 3(3/2) = 10$ $2x = 11/2$ $x = 11/4$ So, the solutions to the system of equations are: $x = 11/4$ and $y = 3/2$. b. Equation 1: $3x - 2y = 5$ Equation 2: $6x + 4y = 10$ Multiply Equation 1 by 2 to make the coefficients of x in both equations equal: Equation 1 (multiplied by 2): $6x - 4y = 10$ Now, subtract Equation 2 from Equation 1 to eliminate x: $(6x - 4y) - (6x + 4y) = 10 - 10$ $6x - 4y - 6x - 4y = 0$

	-8y = 0 y = 0 Now that we have found the value of y, substitute it back into Equation 1 to solve for x: 3x - 2(0) = 5 3x - 0 = 5 3x = 5 x = 5/3 So, the solutions to the system of equations are: x = 5/3 and y = 0.
8	Emily purchased two boxes of chocolates and three cans of soda for a total of $22. In the same store, Daniel bought one box of chocolates and two cans of soda for $13. What is the cost of each box of chocolates and each can of soda? Answer: Let's denote the cost of each box of chocolates as "C" dollars and the cost of each can of soda as "S" dollars. Now, we can use a system of equations to solve for C and S: 2C + 3S = 22 1C + 2S = 13 Multiply equation 2 by 2 to make the coefficients of C in both equations equal: 2C + 3S = 22 2C + 4S = 26 Now, subtract equation 1 from equation 2 to eliminate C: (2C + 4S) - (2C + 3S) = 26 - 22 2C + 4S - 2C - 3S = 4 S = 4

	Now that we have found the cost of each can of soda (S = \$4), we can substitute this value back into equation 2 to solve for C: 1C + 2(4) = 13 1C + 8 = 13 C = 5 Therefore, each box of chocolates costs \$5, and each can of soda costs \$4.
9	Find exact solution(s), where possible, to the following equations. a. $x^2 - 121 = 0$ $x = \pm 11$ b. $250 - 3x^2 = 7$, $x > 0$ x = 7 since $x > 0$ c. $\frac{x^2}{4} = 16$, $x < 0$ x = -8 since $x < 0$
10	Answer: a. $0 \le b \le 20$ b. To rearrange the area formula to make b the subject, we already have the formula from part a: $b = (2A)/h - a$ c. The length of b required for an area of 120 square meters is 15 meters. d. $h = (2A)/(a+b)$ e. If b is set to 10 meters and we want to achieve an area of 110 square meters, we can use the rearranged formula from part d: h=8.8 meters