



ADDING AND SUBTRACTING MONOMIALS (COLLECTING LIKE TERMS)



CHECK YOUR UNDERSTANDING





PART A

1) State the value that should be placed in each box.

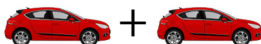



a)  = 

b)  = 







c)  + 2  = 

d) 3  + 4  - 2  = 

2) State the value that should be placed in each box.

a)  +  =  + 

b)  +  =  + 

c) 7  + 4  - 3  + 5  =  + 

3) Identify each of the following pairs as like terms or unlike terms.

a) $6x$ and $14x$ b) $10x$ and $10y$ c) $-5a$ and $10a$ d) $-9x$ and 5

4) State the coefficient for each of the following terms.

a) $8x$ b) $15y$ c) $-4x$ d) x e) $-y$

5) Simplify each of the following expressions by collecting like terms.

a) $x+x+x+x$ b) $2y+5y$ c) $3x+4x+x$ d) $9a-5a+4a$

e) $2x+6x-8x$ f) $3k-7k$ g) $w+5w-9w$ h) $2z-10z+7z$

6) Simplify each of the following expressions by collecting like terms.

a) $x+x+y+y+y$ b) $2a+5a+6b+10b$ c) $3g+10h+4g+3h$

d) $10c+8d-4c-3d$ e) $5x+2y-8x-y$ f) $6m-4m+6n-3m-2n$

7) Shagun stated that $5x+2$ is equal to $7x$. Is Shagun's claim correct? Explain.

PART B

8) Kalani and Marc were asked to simplify the expression $9x+3-4x-10$ by collecting like terms. Kalani's answer was $5x+(-7)$ and Marc's answer was $5x-7$. Was Kalani correct? Was Marc correct? Explain.

9) Express each of the following without using brackets.

a) $8x + (-3)$ b) $-4x - (-6)$ c) $8x + (-4y)$ d) $-9a - (-4b)$

10) Simplify each of the following expressions by collecting like terms.

a) $2x + 5x + 6 + 8$ b) $7x + 3 + 4x + 2$ c) $8p - 10p + 4 + 12$
d) $5y - 8y + 6 - 10$ e) $6t + 5 - t - 9$ f) $3x + 4 - x + 7 - 6x$

11) Simplify each of the following expressions by collecting like terms.

a) $-5x + 6x + (-3x)$ b) $-8x - (-2x)$ c) $16x - 4y + x + 12y$
d) $-a + 4a - 9 + 15$ e) $4x - 3 - 9x + 6$ f) $2 - 4m + 9 + (-11m)$

12) Simplify each of the following expressions by collecting like terms and then evaluate for $x = 3$ and $y = -4$.

a) $9x + 8y - 4x + 5y$ b) $-7x - (-4x) - 8 + 15$ c) $-9 - 4y + 7 - y$

13) Identify each of the following pairs as like terms or unlike terms.

a) $5x$ and $3x^2$ b) $-8x$ and $\frac{2}{3}x$ c) $-\frac{1}{2}t^2$ and $\frac{1}{3}t^2$ d) $3y^2$ and $2y^3$

14) Simplify each of the following expressions by collecting like terms.

a) $4x^2 + 2x^2 + 3x + 15x$ b) $14x^2 + 5x + 3x^2 - 2x$ c) $-3y + 4y^2 + 8y - 7y^2$
d) $-20x^2 + 4x + (-4x^2) - 5x$ e) $-a^2 - 3a - (-5a) + 10a^2$ f) $x^2 - 4x + x^2 + (-3x)$

15) Simplify each of the following expressions by collecting like terms and then evaluate for $x = -2$ and $y = 3$.

a) $-2x^2 + 4x + 6x^2 - 7x$ b) $3x^2 + 8x - 7 + 5x^2 - 9x - 2$ c) $3x^2 + 2y^2 - 2x^2 + 4y^2$
d) $4y - y^2 + 9y - 8 - 5y^2$ e) $8 + y - 3y^2 + 12 - 7y^2$ f) $3x^2 - 4y + 7x - 8y^2 + 6y - 7x$

16) Nina is confused about the meaning of the expressions $2x$ and x^2 .

- Explain the meaning of each of these expressions.
- Are there any values of x for which these two expressions are equal? Explain.

17) Xianna earns \$17 per hour at her summer job. At the end of each month, she also receives a \$100 bonus. Her friend, Marcel, earns \$15 per hour with a \$200 monthly bonus.

- Write an expression to represent the total amount that Xianna earns for a month in which she works t hours.
- Write an expression to represent the total amount that Marcel earns for a month in which he works t hours.
- Write a simplified expression to represent the combined earnings for Xianna and Marcel for a month in which they both worked t hours.



18) Simplify each of the following expressions by collecting like terms.

a) $\frac{1}{2}x^2 + \frac{5}{6}x^2 - \frac{2}{3}x^2$

b) $\frac{3}{5}a + \frac{1}{3}b + \frac{2}{3}a - \frac{1}{5}b$

c) $\frac{2}{3}x + 5 - \frac{5}{6}x + \frac{4}{3}$

19) Explain why $\frac{1}{2}x$ and $\frac{x}{2}$ are equal and then simplify the expression $\frac{x}{2} + \frac{5}{4}x$.

20) Explain why $\frac{2}{3}x$ and $\frac{2x}{3}$ are equal and then simplify the expression $\frac{2x}{3} - \frac{4x}{9}$.

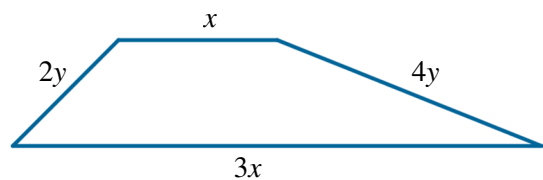
21) Simplify each of the following expressions by collecting like terms.

a) $\frac{x}{4} + \frac{2y}{3} - \frac{5y}{6} + \frac{4x}{3}$

b) $v - \frac{v}{3} + 2 - \frac{3}{4}$

c) $\frac{2m}{7} + \frac{3n}{8} - \frac{3m}{2} + 2n$

22) Determine a simplified expression for the perimeter of the trapezoid shown on the right.



PART C

23) Simplify each of the following expressions by collecting like terms.

a) $7x - 4y + 8z - x + 9y - 10z$

b) $6x - 8xy - 4x + 3xy$

c) $5a - 4abc + 5ab - 3abc + 6ab$

24) Simplify each of the following expressions by collecting like terms.

a) $2x^2y + 3xy - 7xy + 3x^2y$

b) $6xy^2 + 4x^2y - 2xy^2 - 3x^2y$

c) $-7a^2b - 4a^2b^2 + 8ab^2 + 3a^2b^2 - 2a^2b$

d) $6xy + 6x^2 + 10yx + 2y^2 - 4xy$

25) The width of a rectangle is x metres. The height of the rectangle is three times the width. Determine a simplified expression to represent the perimeter of the rectangle.

26) A square has a side length of $5a$ cm. A triangle has a base of $4a$ cm and a height of $7a$ cm. Determine a simplified expression to represent the difference in the areas of these two shapes. Which shape has the greater area?

27) A circle has a radius that is twice the length of a smaller circle's radius. If the radius of the larger circle is r cm, determine a simplified expression to represent the exact difference in the areas of the two circles.

ANSWERS

- 1) a) 3 b) 4 c) 3 d) 5 2) a) 2, 3 b) 4, 3 c) 4, 9
3) a) like terms b) unlike terms c) like terms d) unlike terms
4) a) 8 b) 15 c) -4 d) 1 e) -1
5) a) $4x$ b) $7y$ c) $8x$ d) $8a$ e) 0 f) $-4k$ g) $-3w$ h) $-z$
6) a) $2x+3y$ b) $7a+16b$ c) $7g+13h$ d) $6c+5d$ e) $-3x+y$ f) $-m+4n$
7) Shagun's claim is incorrect. $5x$ and 2 are not like terms and thus cannot be combined into a single term.
8) Both Kalani and Marc were correct, since adding -7 has the same effect as subtracting 7 (moving left 7 on the number line).
9) a) $8x-3$ b) $-4x+6$ c) $8x-4y$ d) $-9a+4b$
10) a) $7x+14$ b) $11x+5$ c) $-2p+16$ d) $-3y-4$ e) $5t-4$ f) $-4x+11$
11) a) $-2x$ b) $-6x$ c) $17x+8y$ d) $3a+6$ e) $-5x+3$ f) $-15m+11$
12) a) $5x+13y; -37$ b) $-3x+7; -2$ c) $-5y-2; 18$
13) a) unlike terms b) like terms c) like terms d) unlike terms
14) a) $6x^2+18x$ b) $17x^2+3x$ c) $-3y^2+5y$ d) $-24x^2-x$ e) $9a^2+2a$
f) $2x^2-7x$
15) a) $4x^2-3x; 22$ b) $8x^2-x-9; 25$ c) $x^2+6y^2; 58$ d) $-6y^2+13y-8; -23$
e) $-10y^2+y+20; -67$ f) $3x^2+2y-8y^2; -54$
16) a) $2x = x+x$, whereas $x^2 = x \times x$. b) 0 and 2. When $x = 0$, both expressions work out to 0. When $x = 2$, both expressions work out to 4.
17) a) $17t+100$ b) $15t+200$ c) $32t+300$
18) a) $\frac{2}{3}x^2$ b) $\frac{19}{15}a + \frac{2}{15}b$ c) $-\frac{1}{6}x + \frac{19}{3}$
19) Multiplying x by $\frac{1}{2}$ is equivalent to dividing x by 2. Also, $\frac{1}{2}x = \frac{1}{2} \times x = \frac{1}{2} \times \frac{x}{1} = \frac{1 \times x}{2 \times 1} = \frac{x}{2}$.
The simplified expression is $\frac{7}{4}x$ (or $\frac{7x}{4}$).
20) Multiplying x by $\frac{2}{3}$ is equivalent to multiplying x by 2 and then dividing the result by 3.
Also, $\frac{2}{3}x = \frac{2}{3} \times x = \frac{2}{3} \times \frac{x}{1} = \frac{2 \times x}{3 \times 1} = \frac{2x}{3}$. The simplified expression is $\frac{2}{9}x$ (or $\frac{2x}{9}$).
21) a) $\frac{19}{12}x - \frac{1}{6}y$ (or $\frac{19x}{12} - \frac{y}{6}$) b) $\frac{2}{3}v + \frac{5}{4}$ (or $\frac{2v}{3} + \frac{5}{4}$)
c) $-\frac{17}{14}m + \frac{19}{8}n$ (or $-\frac{17m}{14} + \frac{19n}{8}$)
22) $4x+6y$ 23) a) $6x+5y-2z$ b) $2x-5xy$ c) $5a+11ab-7abc$
24) a) $5x^2y-4xy$ b) $4xy^2+x^2y$ c) $-9a^2b-a^2b^2+8ab^2$ d) $6x^2+12xy+2y^2$
25) $8x$ m 26) $11a^2$ cm²; the square has the greater area
27) $\frac{3}{4}\pi r^2$ cm²