1-2 Order of Operations

Evaluate each expression.

20. $10 + 8^3 \div 16$

SOLUTION:

$$10 + 8^3 \div 16 = 10 + 512 \div 16 \quad \text{Evaluate powers.}$$
$$= 10 + 32 \qquad\qquad \text{Divide 512 by 16.}$$
$$= 42 \qquad\qquad\quad \text{Add 10 and 32.}$$

24. $(12 - 6) \cdot 5^2$

SOLUTION:

$$(12 - 6) \cdot 5^2 \quad \text{Original expression}$$
$$= (6) \cdot 5^2 \qquad \text{Subtract 6 from 12.}$$
$$= 6 \cdot 25 \qquad\; \text{Evaluate powers.}$$
$$= 150 \qquad\quad \text{Multiply 6 by 25.}$$

26. $108 \div [3(9 + 3^2)]$

SOLUTION:

$$108 \div \left[3\left(9 + 3^2\right)\right] \quad \text{Original expression}$$
$$= 108 \div [3(9 + 9)] \quad \text{Evaluate powers.}$$
$$= 108 \div [3(18)] \qquad \text{Add 9 and 9.}$$
$$= 108 \div [54] \qquad\;\; \text{Multiply 3 by 18.}$$
$$= 2 \qquad\qquad\qquad \text{Divide 108 by 54.}$$

28. $\dfrac{8 + 3^3}{12 - 7}$

SOLUTION:

$$\frac{8 + 3^3}{12 - 7} = \frac{8 + 27}{12 - 7} \quad \text{Evaluate powers.}$$
$$= \frac{35}{5} \qquad 8 + 27 = 35, 12 - 7 = 5$$
$$= 7 \qquad \text{Divide 35 by 7.}$$

Evaluate each expression if $a = 8$, $b = 4$, and $c = 16$.

50. $\dfrac{c^2}{b^2} + \dfrac{b^2}{a^2}$

SOLUTION:

Replace a with 8, b with 4, and c with 16.

$$\frac{c^2}{b^2} + \frac{b^2}{a^2} = \frac{16^2}{4^2} + \frac{4^2}{8^2} \quad \text{Substitute.}$$

$$= \frac{256}{16} + \frac{16}{64} \quad \text{Evaluate powers.}$$

$$= 16 + \frac{1}{4} \quad \text{Simplify.}$$

$$= 16\frac{1}{4} \quad \text{Add 16 and } \frac{1}{4}.$$

$$= \frac{65}{4} \quad \text{Rewrite fraction.}$$

52. $\dfrac{3ab + c^2}{a}$

SOLUTION:

Replace a with 8, b with 4, and c with 16.

$$\frac{3ab + c^2}{a} = \frac{3(8)(4) + 16^2}{8} \quad \text{Substitute.}$$

$$= \frac{3(8)(4) + 256}{8} \quad \text{Evaluate powers.}$$

$$= \frac{24(4) + 256}{8} \quad \text{Multiply 3 and 8.}$$

$$= \frac{96 + 256}{8} \quad \text{Multiply 24 and 4.}$$

$$= \frac{352}{8} \quad \text{Add 96 and 256.}$$

$$= 44 \quad \text{Simplify.}$$

54. $\dfrac{2a-b^2}{ab} + \dfrac{c-a}{b^2}$

SOLUTION:

Replace *a* with 8, *b* with 4, and *c* with 16.

$$\dfrac{2a-b^2}{ab} + \dfrac{c-a}{b^2}$$

$$= \dfrac{2(8)-4^2}{(8)(4)} + \dfrac{16-8}{4^2} \qquad \text{Substitute.}$$

$$= \dfrac{2(8)-16}{(8)(4)} + \dfrac{16-8}{16} \qquad \text{Evaluate powers.}$$

$$= \dfrac{16-16}{(8)(4)} + \dfrac{16-8}{16} \qquad \text{Multiply 2 and 8.}$$

$$= \dfrac{16-16}{32} + \dfrac{16-8}{16} \qquad \text{Multiply 8 and 4.}$$

$$= \dfrac{0}{32} + \dfrac{8}{16} \qquad \text{Subtract 16 from 16.}$$

$$= 0 + \dfrac{1}{2} \qquad \text{Simplify.}$$

$$= \dfrac{1}{2} \qquad \text{Add } \dfrac{1}{2} \text{ and 0.}$$

55. **SALES** One day, 28 small and 12 large merchant spaces were rented. Another day, 30 small and 15 large spaces were rented. Write and evaluate an expression to show the total rent collected.

SOLUTION:

To find how much money was earned for each type of space, multiply the number of spaces by the price per space. Then, to find the total cost, add each of these products together. The first day 28 small spaces were rented at $15, 28 (15). The first day 12 large spaces were rented at $20, 12(20). The second day 30 small spaces were rented at 415, 30(15). The second day 15 large spaces were rented at $20, 15(20). So, the expression would be 28(15) + 12(20) + 30(15) + 15(20).
Evaluate the expression to find the total cost.

$$28(15) + 12(20) + 30(15) + 15(20)$$
$$= 420 + 240 + 450 + 300$$
$$= 1410$$

The total amount of money collected was $1410.

56. **SHOPPING** Evelina is shopping for back-to-school clothes. She bought 3 skirts, 2 pairs of jeans, and 4 sweaters. Write and evaluate an expression to find out how much money Evelina spent on clothes, without including sales tax.

Clothing	
skirt	$35.99
jeans	$49.99
sweater	$32.99

SOLUTION:

To find how much money Evelina spent on clothes, multiply the price of the item by the number bought. Then, to find the total cost, add each of these products together. Three skirts for $35.99 each is 3(35.99). Two pairs of jeans for $49.99 each is 2(49.99). Four sweaters for $32.99 each is 4(32.99). So, the expression would be 3(35.99) + 2(49.99) + 4(32.99).

$$3(35.99) + 2(49.99) + 4(32.99)$$
$$= 107.97 + 99.98 + 131.96$$
$$= 339.91$$

Evelina spent $339.91 on clothes, not including sales tax.

58. **FINANCIAL LITERACY** Ginger is determining her monthly expenses. She has monthly rent r, monthly utilities u, weekly food expense f, and weekly auto expense a. Assume there are 4 weeks in a month.
a. Write an algebraic expression to represent her spending in one month.
b. Suppose her monthly rent is $550, her monthly utilities are $115, her weekly food expenses are $75, and her weekly auto expenses are $125. Determine her total monthly expenses?

SOLUTION:

a. To find Ginger's spending in one month, add her monthly rent, monthly utilities, 4 times her weekly food expense, and 4 times her weekly auto expense. Her weekly food and auto expenses are multiplied by 4 because we are assuming that there are 4 weeks in a month. So, the expression would be $r + u + 4f + 4a$.

b. Evaluate the expression in part **a** when $r = 550$, $u = 115$, $f = 75$, and $a = 125$.
$$r + u + 4f + 4a = 550 + 115 + 4(75) + 4(125)$$
$$= 550 + 115 + 300 + 500$$
$$= 1465$$

Ginger's total monthly expenses are $1465.

59. **ERROR ANALYSIS** Tara and Curtis are simplifying $[4(10) - 3^2] + 6(4)$. Is either of them correct? Explain your reasoning.

Tara	Curtis
$= [4(10) - 9] + 6(4)$	$= [4(10) - 9] + 6(4)$
$= 4(1) + 6(4)$	$= (40 - 9) + 6(4)$
$= 4 + 6(4)$	$= 31 + 6(4)$
$= 4 + 24$	$= 31 + 24$
$= 28$	$= 55$

SOLUTION:

Tara did not follow the order of operations. She subtracted 9 from 10 before multiplying 4 by 10. Curtis did follow the order of operations.

Curtis is correct.

61. **PROBLEM SOLVING** Write an expression using the whole numbers 1 to 5 using all five digits and addition and/or subtraction to create a numeric expression with a value of 3.

SOLUTION:

$$5 + 4 - 3 - 2 - 1 = 9 - 3 - 2 - 1$$
$$= 6 - 2 - 1$$
$$= 4 - 1$$
$$= 3$$

65. Edgar buys a apples, b bananas, and c cantaloupes at the farmer's market. The prices at the market are shown in the table.

Fruit	Price Each
Apples	$0.50
Bananas	$0.20
Cantaloupes	$1.50

Edgar has a coupon for a free apple. If he gets 5 apples, 4 bananas, and 2 cantaloupes, how much money does he spend?

A $2.20
B $4.50
C $5.80
D $6.30

SOLUTION:

The number of apples Edgar buys can be represented by $5a$. So Edgar spends 5($0.50), or $2.50, on apples.
The number of bananas Edgar buys can be represented by $4b$. So Edgar spends 4($0.20), or $0.80, on bananas.
The number of cantaloupes Edgar buys can be represented by $2c$. So Edgar spends 2($1.50), or $3.00, on cantaloupes.

Now we need to find the sum of these amounts and subtract the cost of one apple from it, since Edgar had a coupon for a free apple.
The total amount that Edgar spent at the farmer's market is

$$5(0.50) + 4(0.20) + 2(1.50) - 0.50 = 2.50 + 0.80 + 3.00 - 0.50$$
$$= 5.80$$

So the correct answer is C.

67. Maya has one bran muffin, 16 ounces of orange juice, 3 ounces of sunflower seeds, 2 slices of turkey, and half of a cup of spinach.

Food	Protein (g)
bran muffin (1)	3
orange juice (8 oz)	2
sunflower seeds (1 oz)	2
turkey (1 slice)	12
spinach (1 cup)	5

Find the total number of grams of protein she consumed.

F 24
G 37.5
H 39.5
J 42

SOLUTION:

To find the total number of grams of protein Maya consumed, we need to multiply each amount in the table by the amount of each item she consumed. For example, since Maya consumed 16 ounces of orange juice and the number of grams of protein in the table is based on 8 ounces, we need to multiply by 2.

Food	Protein (g)	Amount Consumed	Total Protein (g)
bran muffin (1)	3	1	3
orange juice (8 oz)	2	2	4
sunflower seeds (1 oz)	2	3	6
turkey (1 slice)	12	2	24
spinach (1 cup)	5	0.5	2.5

Now we need to find the sum of these numbers. $3 + 4 + 6 + 24 + 2.5 = 39.5$. So Maya consumed 39.5 grams of protein.
The correct answer is H.