Literal Expressions

9

DIAGNOSTIC TEST

Directions: Work out each problem. Circle the letter that appears before your answer.

Answers are at the end of the chapter.

1. If one book costs c dollars, what is the cost, in dollars, of m books?

   (A) $m + c$

   (B) $\dfrac{m}{c}$

   (C) $\dfrac{c}{m}$

   (D) mc

   (E) $\dfrac{mc}{100}$

2. Represent the cost, in dollars, of k pounds of apples at c cents per pound.

   (A) kc

   (B) $100kc$

   (C) $\dfrac{kc}{100}$

   (D) $100k + c$

   (E) $\dfrac{k}{100} + c$

3. If p pencils cost c cents, what is the cost of one pencil?

   (A) $\dfrac{c}{p}$

   (B) $\dfrac{p}{c}$

   (C) pc

   (D) $p - c$

   (E) $p + c$

4. Express the number of miles covered by a train in one hour if it covers r miles in h hours.

   (A) rh

   (B) $\dfrac{h}{r}$

   (C) $\dfrac{r}{h}$

   (D) $r + h$

   (E) $r - h$

5. Express the number of minutes in h hours and m minutes.

   (A) mh

   (B) $\dfrac{h}{60} + m$

   (C) $60(h + m)$

   (D) $\dfrac{h + m}{60}$

   (E) $60h + m$

6. Express the number of seats in the school auditorium if there are r rows with s seats each and s rows with r seats each.

   (A) $2rs$

   (B) $2r + 2s$

   (C) $rs + 2$

   (D) $2r + s$

   (E) $r + 2s$

7. How many dimes are there in n nickels and q quarters?

    (A) $10nq$

    (B) $\dfrac{n+q}{10}$

    (C) $\dfrac{1}{2}n+\dfrac{5}{2}q$

    (D) $10n + 10q$

    (E) $2n+\dfrac{q}{10}$

8. Roger rents a car at a cost of D dollars per day plus c cents per mile. How many dollars must he pay if he uses the car for 5 days and drives 1000 miles?

    (A) $5D + 1000c$

    (B) $5D + \dfrac{c}{1000}$

    (C) $5D + 100c$

    (D) $5D + 10c$

    (E) $5D + c$

9. The cost of a long-distance telephone call is c cents for the first three minutes and m cents for each additional minute. Represent the price of a call lasting d minutes if d is more than 3.

    (A) $c + md$

    (B) $c + md - 3m$

    (C) $c + md + 3m$

    (D) $c + 3md$

    (E) cmd

10. The sales tax in Morgan County is $m\%$. Represent the total cost of an article priced at $D.

    (A) $D + mD$

    (B) $D + 100mD$

    (C) $D + \dfrac{mD}{100}$

    (D) $D + \dfrac{m}{100}$

    (E) $D + 100m$

1. COMMUNICATING WITH LETTERS

Many students who have no trouble computing with numbers panic at the sight of letters. If you understand the concepts of a problem in which numbers are given, you simply need to apply the same concepts to letters. The computational processes are exactly the same. Just figure out what you would do if you had numbers and do exactly the same thing with the given letters.

Example:

Express the number of inches in y yards, f feet, and i inches.

Solution:

We must change everything to inches and add. Since a yard contains 36 inches, y yards will contain $36y$ inches. Since a foot contains 12 inches, f feet will contain $12f$ inches. The total number of inches is $36y + 12f + i$.

Example:

Find the number of cents in $2x - 1$ dimes.

Solution:

To change dimes to cents we must multiply by 10. Think that 7 dimes would be 7 times 10 or 70 cents. Therefore the number of cents in $2x - 1$ dimes is $10(2x - 1)$ or $20x - 10$.

Example:

Find the total cost of sending a telegram of w words if the charge is c cents for the first 15 words and d cents for each additional word, if w is greater than 15.

Solution:

To the basic charge of c cents, we must add d for each word over 15. Therefore, we add d for $(w - 15)$ words. The total charge is $c + d(w - 15)$ or $c + dw - 15d$.

Example:

Kevin bought d dozen apples at c cents per apple and had 20 cents left. Represent the number of cents he had before this purchase.

Solution:

In d dozen, there are $12d$ apples. $12d$ apples at c cents each cost $12dc$ cents. Adding this to the 20 cents he has left, we find he started with $12dc + 20$ cents.

Exercise 1

Work out each problem. Circle the letter that appears before your answer.

1. Express the number of days in w weeks and w days.

   (A) $7w^2$
   (B) $8w$
   (C) $7w$
   (D) $7 + 2w$
   (E) w^2

2. The charge on the Newport Ferrry is D dollars for the car and driver and m cents for each additional passenger. Find the charge, in dollars, for a car containing four people.

   (A) $D + .03m$
   (B) $D + 3m$
   (C) $D + 4m$
   (D) $D + 300m$
   (E) $D + 400m$

3. If g gallons of gasoline cost m dollars, express the cost of r gallons.

   (A) $\dfrac{mr}{g}$
   (B) $\dfrac{rg}{m}$
   (C) rmg
   (D) $\dfrac{mg}{r}$
   (E) $\dfrac{m}{rg}$

4. How many quarters are equivalent to n nickels and d dimes?

   (A) $5n + 10d$
   (B) $25n + 50d$
   (C) $\dfrac{n+d}{25}$
   (D) $25n + 25d$
   (E) $\dfrac{n+2d}{5}$

5. A salesman earns a base salary of $100 per week plus a 5% commission on all sales over $500. Find his total earnings in a week in which he sells r dollars worth of merchandise, with r being greater than 500.

   (A) $125 + .05r$
   (B) $75 + .05r$
   (C) $125r$
   (D) $100 + .05r$
   (E) $100 - .05r$

RETEST

Work out each problem. Circle the letter that appears before your answer.

1. If a school consists of b boys, g girls, and t teachers, represent the number of students in each class if each class contains the same number of students. (Assume that there is one teacher per class.)

   (A) $\dfrac{b+g}{t}$

   (B) $t(b+g)$

   (C) $\dfrac{b}{t}+g$

   (D) $bt+g$

   (E) $\dfrac{bg}{t}$

2. Represent the total cost, in cents, of b books at D dollars each and r books at c cents each.

   (A) $\dfrac{bD}{100}+rc$

   (B) $\dfrac{bD+rc}{100}$

   (C) $100bD+rc$

   (D) $bD+100rc$

   (E) $bD+\dfrac{rc}{100}$

3. Represent the number of feet in y yards, f feet, and i inches.

   (A) $\dfrac{y}{3}+f+12i$

   (B) $\dfrac{y}{3}+f+\dfrac{i}{12}$

   (C) $3y+f+i$

   (D) $3y+f+\dfrac{i}{12}$

   (E) $3y+f+12i$

4. In a group of m men, b men earn D dollars per week and the rest earn half that amount each. Represent the total number of dollars paid to these men in a week.

   (A) $bD+b-m$

   (B) $\dfrac{1}{2}D(b+m)$

   (C) $\dfrac{3}{2}bD+mD$

   (D) $\dfrac{3}{2}D(b+m)$

   (E) $bD+\dfrac{1}{2}mD$

5. Ken bought d dozen roses for r dollars. Represent the cost of one rose.

   (A) $\dfrac{r}{d}$

   (B) $\dfrac{d}{r}$

   (C) $\dfrac{12d}{r}$

   (D) $\dfrac{12r}{d}$

   (E) $\dfrac{r}{12d}$

6. The cost of mailing a package is c cents for the first b ounces and d cents for each additional ounce. Find the cost, in cents, for mailing a package weighing f ounces if f is more than b.

   (A) $(c+d)(f-b)$
   (B) $c+d(f-b)$
   (C) $c+bd$
   (D) $c+(d-b)$
   (E) $b+(f-b)$

7. Josh's allowance is m cents per week. Represent the number of dollars he gets in a year.

   (A) $\dfrac{3m}{25}$

   (B) $5200m$

   (C) $1200m$

   (D) $\dfrac{13m}{25}$

   (E) $\dfrac{25m}{13}$

8. If it takes T tablespoons of coffee to make c cups, how many tablespoons of coffee are needed to make d cups?

   (A) $\dfrac{Tc}{d}$

   (B) $\dfrac{T}{dc}$

   (C) $\dfrac{Td}{c}$

   (D) $\dfrac{d}{Tc}$

   (E) $\dfrac{cd}{T}$

9. The charge for renting a rowboat on Loon Lake is D dollars per hour plus c cents for each minute into the next hour. How many dollars will Mr. Wilson pay if he used a boat from 3:40 P.M. to 6:20 P.M.?

   (A) $D + 40c$
   (B) $2D + 40c$
   (C) $2D + 4c$
   (D) $2D + .4c$
   (E) $D + .4c$

10. The cost for developing and printing a roll of film is c cents for processing the roll and d cents for each print. How much will it cost, in cents, to develop and print a roll of film with 20 exposures?

    (A) $20c + d$
    (B) $20(c + d)$
    (C) $c + 20d$

    (D) $c + \dfrac{d}{20}$

    (E) $\dfrac{c + d}{20}$

SOLUTIONS TO PRACTICE EXERCISES

Diagnostic Test

1. (D) This can be solved by a proportion, comparing books to dollars.

$$\frac{1}{c} = \frac{m}{x}$$

$$x = mc$$

2. (C) The cost in cents of k pounds at c cents per pound is kc. To convert this to dollars, we divide by 100.

3. (A) This can be solved by a proportion, comparing pencils to cents.

$$\frac{p}{c} = \frac{1}{x}$$

$$x = \frac{c}{p}$$

4. (C) This can be solved by a proportion, comparing miles to hours.

$$\frac{r}{h} = \frac{x}{1}$$

$$\frac{r}{h} = x$$

5. (E) There are 60 minutes in an hour. In h hours there are $60h$ minutes. With m additional minutes, the total is $60h + m$.

6. (A) r rows with s seats each have a total of rs seats. s rows with r seats each have a total of sr seats. Therefore, the school auditorium has a total of $rs + sr$ or $2rs$ seats.

7. (C) In n nickels, there are $5n$ cents. In q quarters, there are $25q$ cents. Altogether we have $5n + 25q$ cents. To see how many dimes this is, divide by 10.

$$\frac{5n + 25q}{10} = \frac{n + 5q}{2} = \frac{1}{2}n + \frac{5}{2}q$$

8. (D) The daily charge for 5 days at D dollars per day is $5D$ dollars. The charge, in cents, for 1000 miles at c cents per mile is $1000c$ cents. To change this to dollars, we divide by 100 and get $10c$ dollars. Therefore, the total cost in dollars is $5D + 10c$.

9. (B) The cost for the first 3 minutes is c cents. The number of additional minutes is $(d - 3)$ and the cost at m cents for each additional minute is thus $m(d - 3)$ or $md - 3m$. Therefore, the total cost is $c + md - 3m$.

10. (C) The sales tax is $\frac{m}{100} \cdot D$ or $\frac{mD}{100}$. Therefore, the total cost is $D + \frac{mD}{100}$.

Exercise 1

1. (B) There are 7 days in a week. w weeks contain $7w$ days. With w additional days, the total number of days is $8w$.

2. (A) The charge is D dollars for car and driver. The three additional persons pay m cents each, for a total of $3m$ cents. To change this to dollars, divide by 100, for a total of $\frac{3m}{100}$ dollars. This can be written in decimal form as $.03m$. The total charge in dollars is then $D + .03m$.

3. (A) This can be solved by a proportion, comparing gallons to dollars.
$$\frac{g}{m} = \frac{r}{x}$$
$$gx = mr$$
$$x = \frac{mr}{g}$$

4. (E) In n nickels, there are $5n$ cents. In d dimes, there are $10d$ cents. Altogether, we have $5n + 10d$ cents. To see how many quarters this gives, divide by 25.
$$\frac{5n + 10d}{25} = \frac{n + 2d}{5}$$, since a fraction can be simplified when *every* term is divided by the same factor, in this case 5.

5. (B) Commission is paid on $(r - 500)$ dollars. His commission is $.05(r - 500)$ or $.05r - 25$. When this is added to his base salary of 100, we have $100 + .05r - 25$, or $75 + .05r$.

Retest

1. (A) The total number of boys and girls is $b + g$. Since there are t teachers, and thus t classes, the number of students in each class is $\frac{b + g}{t}$.

2. (C) The cost, in dollars, of b books at D dollars each is bD dollars. To change this to cents, we multiply by 100 and get $100bD$ cents. The cost of r books at c cents each is rc cents. Therefore, the total cost, in cents, is $100bD + rc$.

3. (D) In y yards there are $3y$ feet. In i inches there are $\frac{i}{12}$ feet. Therefore, the total number of feet is $3y + f + \frac{i}{12}$.

4. (B) The money earned by b men at D dollars per week is bD dollars. The number of men remaining is $(m - b)$, and since they earn $\frac{1}{2}D$ dollars per week, the money they earn is $\frac{1}{2}D(m - b) = \frac{1}{2}mD - \frac{1}{2}bD$. Therefore, the total amount earned is $bD + \frac{1}{2}mD - \frac{1}{2}bD = \frac{1}{2}bD + \frac{1}{2}mD = \frac{1}{2}D(b + m)$.

5. (E) This can be solved by a proportion, comparing roses to dollars. Since d dozen roses equals $12d$ roses,
$$\frac{12d}{r} = \frac{1}{x}$$
$$12d \cdot x = r$$
$$x = \frac{r}{12d}$$

6. (B) The cost for the first b ounces is c cents. The number of additional ounces is $(f - b)$, and the cost at d cents for each additional ounce is $(f - b)d$. Therefore, the total cost is $c + d(f - b)$.

7. (D) Since there are 52 weeks in a year, his allowance in cents is $52m$. To change to dollars, we divide by 100 and get $\frac{52m}{100}$ or $\frac{13m}{25}$.

8. (C) This can be solved by a proportion comparing tablespoons to cups.

$$\frac{T}{c} = \frac{x}{d}$$
$$cx = Td$$
$$x = \frac{Td}{c}$$

9. (D) The amount of time from 3:40 P.M. to 6:20 P.M. is 2 hrs. 40 min. Therefore, the charge at D dollars per hour and c cents per minute into the next hour is $2D$ dollars + $40c$ cents or $2D + .4c$ dollars.

10. (C) The cost for processing the roll is c cents. The cost for printing 20 exposures at d cents per print is $20d$ cents. Therefore, the total cost is $c + 20d$.