

## Section 4-4: Using Formulas to Solve Problems

1. 060407a, P.I. A.M.2  
If the temperature in Buffalo is  $23^{\circ}$  Fahrenheit, what is the temperature in degrees

Celsius? [Use the formula  $C = \frac{5}{9}(F - 32)$ .]

[A] 45      [B] -45      [C] -5      [D] 5

2. 089908a, P.I. A.M.2  
The formula  $C = \frac{5}{9}(F - 32)$  can be used to find the Celsius temperature ( $C$ ) for a given Fahrenheit temperature ( $F$ ). What Celsius temperature is equal to a Fahrenheit temperature of  $77^{\circ}$ ?

[A]  $8^{\circ}$       [B]  $171^{\circ}$       [C]  $45^{\circ}$       [D]  $25^{\circ}$

3. 060021a, P.I. A.M.2  
The formula for changing Celsius ( $C$ ) temperature to Fahrenheit ( $F$ ) temperature is  $F = \frac{9}{5}C + 32$ . Calculate, to the nearest degree, the Fahrenheit temperature when the Celsius temperature is  $-8$ .

4. 010734a, P.I. A.M.2  
The formula  $C = \frac{5}{9}(F - 32)$  is used to convert Fahrenheit temperature,  $F$ , to Celsius temperature,  $C$ . What temperature, in degrees Fahrenheit, is equivalent to a temperature of  $10^{\circ}$  Celsius?

5. 080019a, P.I. A.M.1  
A girl can ski down a hill five times as fast as she can climb up the same hill. If she can climb up the hill and ski down in a total of 9 minutes, how many minutes does it take her to climb up the hill?

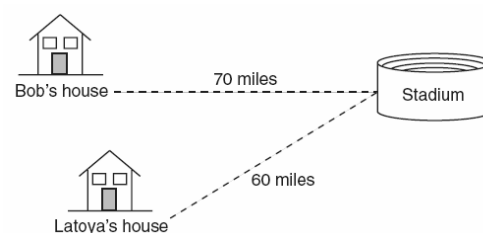
[A] 4.5      [B] 1.8      [C] 7.2      [D] 7.5

6. 010027a, P.I. A.M.1  
A truck traveling at a constant rate of 45 miles per hour leaves Albany. One hour later a car traveling at a constant rate of 60 miles per hour also leaves Albany traveling in the same direction on the same highway. How long will it take for the car to catch up to the truck, if both vehicles continue in the same direction on the highway?

7. 060010a, P.I. A.M.1  
A truck travels 40 miles from point  $A$  to point  $B$  in exactly 1 hour. When the truck is halfway between point  $A$  and point  $B$ , a car starts from point  $A$  and travels at 50 miles per hour. How many miles has the car traveled when the truck reaches point  $B$ ?

[A] 25      [B] 60      [C] 40      [D] 50

8. 010433a, P.I. A.M.1  
Bob and Latoya both drove to a baseball game at a college stadium. Bob lives 70 miles from the stadium and Latoya lives 60 miles from it, as shown in the accompanying diagram. Bob drove at a rate of 50 miles per hour, and Latoya drove at a rate of 40 miles per hour. If they both left home at the same time, who got to the stadium first?



9. 010125a, P.I. A.M.1  
Two trains leave the same station at the same time and travel in opposite directions. One train travels at 80 kilometers per hour and the other at 100 kilometers per hour. In how many hours will they be 900 kilometers apart?

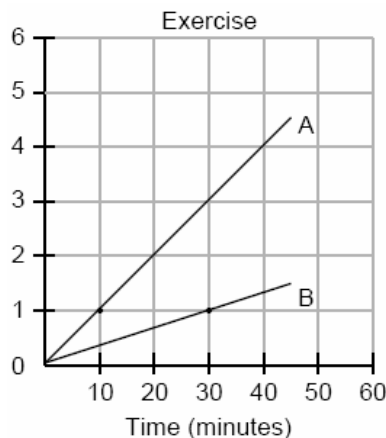
10. 080632a, P.I. A.M.1  
Running at a constant speed, Andrea covers 15 miles in  $2\frac{1}{2}$  hours. At this speed, how many *minutes* will it take her to run 2 miles?

11. 080415a, P.I. A.M.1  
A rocket car on the Bonneville Salt Flats is traveling at a rate of 640 miles per hour. How much time would it take for the car to travel 384 miles at this rate?

[A] 245 minutes      [B] 1.7 hours  
[C] 256 minutes      [D] 36 minutes

12. 080518a, P.I. A.M.1  
A bicyclist leaves Bay Shore traveling at an average speed of 12 miles per hour. Three hours later, a car leaves Bay Shore, on the same route, traveling at an average speed of 30 miles per hour. How many hours after the car leaves Bay Shore will the car catch up to the cyclist?
- [A] 8      [B] 2      [C] 5      [D] 4

13. 069926a, P.I. A.M.1  
During a 45-minute lunch period, Albert (A) went running and Bill (B) walked for exercise. Their times and distances are shown in the accompanying graph. How much faster was Albert running than Bill was walking, in miles per hour?



14. 080736a, P.I. A.M.1  
The trip from Manhattan to Montauk Point is 120 miles by train or by car. A train makes the trip in 2 hours, while a car makes the trip in  $2\frac{1}{2}$  hours. How much faster, in miles per hour, is the average speed of the train than the average speed of the car?

15. fall0734ia, P.I. A.M.1  
Hannah took a trip to visit her cousin. She drove 120 miles to reach her cousin's house and the same distance back home. It took her 1.2 hours to get halfway to her cousin's house. What was her average speed, in miles per hour, for the first 1.2 hours of the trip? Hannah's average speed for the remainder of the trip to her cousin's house was 40 miles per hour. How long, in hours, did it take her to drive the remaining distance? Traveling home along the same route, Hannah drove at an average rate of 55 miles per hour. After 2 hours her car broke down. How many miles was she from home?

16. 060116b, P.I. A.M.1  
On her first trip, Sari biked 24 miles in  $T$  hours. The following week Sari biked 32 miles in  $T$  hours. Determine the ratio of her average speed on her second trip to her average speed on her first trip.

[A]  $\frac{3}{4}$       [B]  $\frac{3}{2}$       [C]  $\frac{4}{3}$       [D]  $\frac{2}{3}$

17. 080111b, P.I. A.M.1  
On a trip, a student drove 40 miles per hour for 2 hours and then drove 30 miles per hour for 3 hours. What is the student's average rate of speed, in miles per hour, for the whole trip?

[A] 36      [B] 34      [C] 35      [D] 37

18. 080119b, P.I. A.M.1

If Jamar can run  $\frac{3}{5}$  of a mile in 2 minutes 30 seconds, what is his rate in miles per minute?

- [A]  $3\frac{1}{10}$  [B]  $4\frac{1}{6}$  [C]  $\frac{6}{25}$  [D]  $\frac{4}{5}$

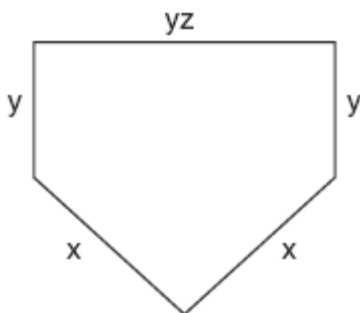
19. 089905a, P.I. A.G.1

The Pentagon building in Washington, D.C., is shaped like a regular pentagon. If the length of one side of the Pentagon is represented by  $n + 2$ , its perimeter would be represented by

- [A]  $n + 10$  [B]  $5n + 10$   
[C]  $10n$  [D]  $5n + 2$

20. 010603a, P.I. A.G.1

The lengths of the sides of home plate in a baseball field are represented by the expressions in the accompanying figure.



Which expression represents the perimeter of the figure?

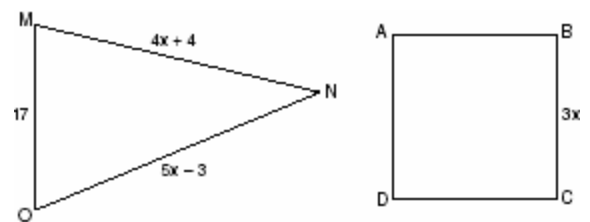
- [A]  $2x + 3yz$  [B]  $2x + 2y + yz$   
[C]  $5xyz$  [D]  $x^2 + y^3z$

21. 080124a, P.I. A.G.1

An engineer measured the dimensions for a rectangular site by using a wooden pole of unknown length  $x$ . The length of the rectangular site is 2 pole measures increased by 3 feet, while the width is 1 pole measure decreased by 4 feet. Write an algebraic representation, in terms of  $x$ , for the perimeter of the site.

22. 080537a

In the accompanying diagram, the perimeter of  $\triangle MNO$  is equal to the perimeter of square ABCD. If the sides of the triangle are represented by  $4x + 4$ ,  $5x - 3$ , and 17, and one side of the square is represented by  $3x$ , find the length of a side of the square.



[1] C

[2] D

[2] 18 and correct substitution,  $F = \frac{9}{5}(-8) +$

32, is shown.

[1] A correct substitution method is shown, but one computational error is made.

or [1] The answer is not rounded to the nearest integer, such as 17.6 or 17.

or [1] The student substitutes -8 for  $F$ , but then solves appropriately for  $C$ .

or [1] The student substitutes +8 for  $C$ , but then solves appropriately for  $F$ .

or [1] 18 but no work is shown.

[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously

[3] incorrect procedure.

[2] 50, and appropriate work is shown, such as solving the equation  $10 = \frac{5}{9}(F - 32)$ .

[1] Appropriate work is shown, but one computational error is made.

or [1] Appropriate work is shown, but one conceptual error is made.

or [1] Correct substitution is made into the equation, but no further correct work is shown.

or [1] 50, but no work is shown.

[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously

[4] incorrect procedure.

[5] D

[3] 3 hours and an appropriate method or equation is shown, such as  $45(x + 1) = 60x$ .

[2] An appropriate method is shown, but an incorrect answer is found, such as 4 hours (the truck's time) or 180 miles traveled.

[1] An appropriate equation or method is shown, but no answer is found, such as showing an equation that reflects a one-hour difference in time but it is not solved.

or [1] 3 hours and no work is shown.

[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously

[6] incorrect procedure.

[7] A

[2] Bob, and appropriate work is shown, such as using the distance formula to calculate the two travel times or setting up a proportion.

[1] Appropriate work is shown, but one computational or conceptual error is made, but an appropriate answer is found.

or [1] Appropriate work is shown, but no answer or an incorrect answer is found.

[0] Bob, but no work or inappropriate work is shown.

or [0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an

[8] obviously incorrect procedure.

[2] 5, and appropriate work is shown, such as solving the linear equation  $80x + 100x = 900$ , using a diagram or proportion or trial and error.

[1] Appropriate work is shown, but one computational error is made.

or [1] 5, but no work is shown.

[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously

[9] incorrect procedure.

[2] 20, and appropriate work is shown, such as  $\frac{15}{150} = \frac{2}{x}$ .

[1] Appropriate work is shown, but one computational error is made.

or [1] Appropriate work is shown, but one conceptual error is made, such as expressing the answer as  $\frac{1}{3}$  hour.

or [1] 20, but no work is shown.

[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

[10]

D

[11]

B

[12]

[3] 4 and an appropriate method is shown, such as calculating A at 6 mph and B at 2 mph through arithmetic, formula, or extending the graph to 60 minutes.

[2] The speeds of 6 and 2 are found but not their difference.

or [2] Their difference is found but not in miles per hour.

[1] Only distances of 4.5 miles and 1.5 miles are found.

or [1] The speeds found are incorrect but then are subtracted appropriately.

or [1] 3 times as fast and no appropriate explanation is given.

or [1] 4 and no appropriate explanation is given.

[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously

[13]

incorrect procedure.

[3] 12, and appropriate work is shown, such as finding the rates of both vehicles and then subtracting 48 from 60.

[2] Appropriate work is shown, but one computational error is made.

or [2] The rates of both vehicles are found correctly, and appropriate work is shown, but they are not subtracted.

or [2] The rates of both vehicles are found correctly, and the correct difference is found, but no work is shown.

[1] Appropriate work is shown, but two or more computational errors are made.

or [1] Appropriate work is shown, but one conceptual error is made.

or [1] The rates of both vehicles are found correctly, but no work is shown, and the difference is not found.

or [1] 12, but no work is shown.

[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

[14]

[3] 50, 1.5, and 10, and appropriate work is shown.

[2] Appropriate work is shown, but one computational error is made.

[1] Appropriate work is shown, but one conceptual error is made.

or [1] Appropriate work is shown, but two or more computational errors are made.

or [1] 50, and appropriate work is shown, but no further correct work is shown.

or [1] 1.5, and appropriate work is shown, but no further correct work is shown.

or [1] 10, and appropriate work is shown, but no further correct work is shown.

or [1] 50, 1.5, and 10, but no work is shown.

[0] 50 or 1.5 or 10, but no work is shown.

or [0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an

[15]

obviously incorrect procedure.

[16] C

[17] B

[18] C

[19] B

[20] B

[2]  $6x - 2$  or an equivalent expression, and appropriate work is shown, such as  
 $2(2x + 3) + 2(x - 4) = 6x - 2$ .

[1] The length is represented correctly as  $2x + 3$  and the width as  $x - 4$ , but the representation of the perimeter is determined incorrectly.

or [1] The length, the width, and the perimeter are represented appropriately, but by a variable other than  $x$ .

or [1] One or both dimensions are represented incorrectly, but the perimeter is represented appropriately.

[0] One or both dimensions are represented incorrectly, and the perimeter is not determined.

or [0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an

[21] obviously incorrect procedure.

[3] 18, and appropriate work is shown.

[2] Appropriate work is shown, but one computational error is made.

or [2] Appropriate work is shown, and the value of  $x$  is found, but no further correct work is shown.

[1] Appropriate work is shown, but two or more computational errors are made.

or [1] Appropriate work is shown, but one conceptual error is made.

or [1] A correct expression is written for the perimeter of each figure, but no further correct work is shown.

or [1] 18, but no work is shown.

[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously

[22] incorrect procedure.