

## Skills Handbook P. 765: Perimeter, Area, and Volume

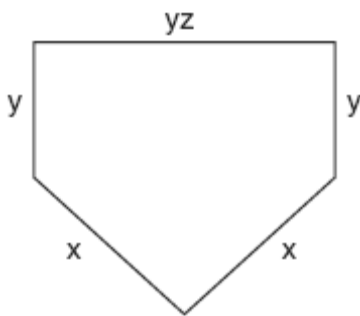
1. 089905a, P.I. A.G.1

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

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

3. 010212a, P.I. A.G.1

What is the area of a square whose perimeter is represented by  $12x$ ?

- [A]  $12x^2$                       [B]  $144x^2$   
[C]  $9x^2$                       [D]  $6x\sqrt{2}$

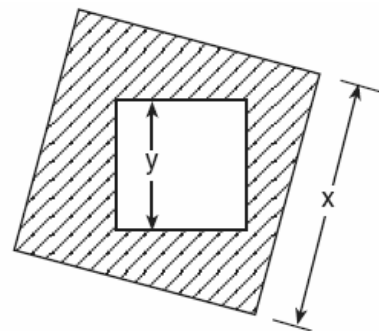
4. 060527a, P.I. A.G.1

The length of a side of a square window in Jessica's bedroom is represented by  $2x - 1$ . Which expression represents the area of the window?

- [A]  $2x^2 + 1$                       [B]  $4x^2 + 1$   
[C]  $4x^2 + 4x - 1$                       [D]  $4x^2 - 4x + 1$

5. 060302a, P.I. A.G.1

The accompanying diagram shows a square with side  $y$  inside a square with side  $x$ .

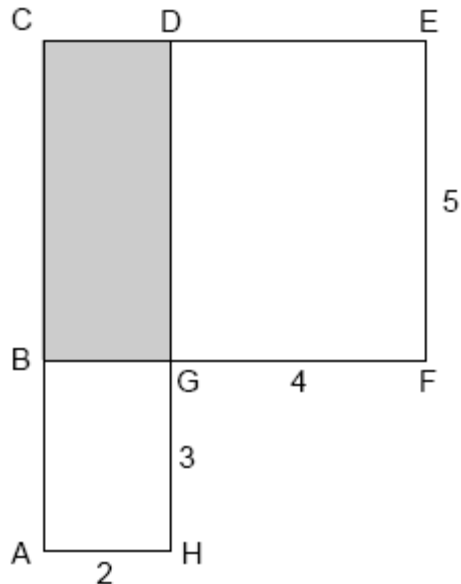


Which expression represents the area of the shaded region?

- [A]  $y^2$                       [B]  $x^2 - y^2$   
[C]  $y^2 - x^2$                       [D]  $x^2$

6. 069916a, P.I. A.G.1

In the accompanying figure,  $ACDH$  and  $BCEF$  are rectangles,  $AH = 2$ ,  $GH = 3$ ,  $GF = 4$ , and  $FE = 5$ .



What is the area of  $BCDG$ ?

- [A] 20      [B] 6      [C] 10      [D] 8

7. 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.

8. 060437a, P.I. A.G.1

Express both the perimeter and the area of the rectangle shown in the accompanying diagram as polynomials in simplest form.



9. 080031a, P.I. A.G.1

Mr. Santana wants to carpet exactly half of his rectangular living room. He knows that the perimeter of the room is 96 feet and that the length of the room is 6 feet longer than the width. How many square feet of carpeting does Mr. Santana need?

10. 080023a, P.I. A.G.1

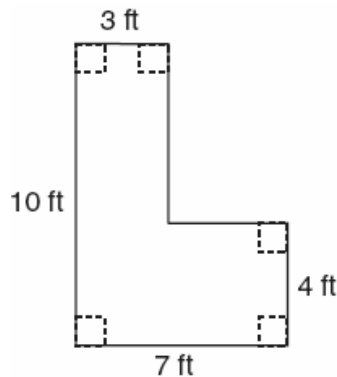
Kerry is planning a rectangular garden that has dimensions of 4 feet by 6 feet. Kerry wants one-half of the garden to have roses, and she says that the rose plot will have dimensions of 2 feet by 3 feet. Is she correct? Explain.

11. 060631a, P.I. A.G.1

Determine the area, in square feet, of the *smallest* square that can contain a circle with a radius of 8 feet.

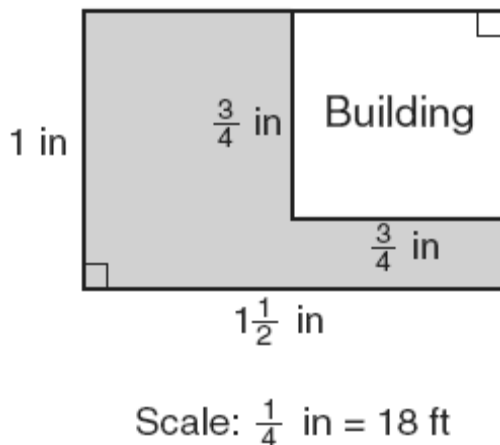
12. 060132a, P.I. A.G.1

Keesha wants to tile the floor shown in the accompanying diagram. If each tile measures 1 foot by 1 foot and costs \$2.99, what will be the total cost, including an 8% sales tax, for tiling the floor?



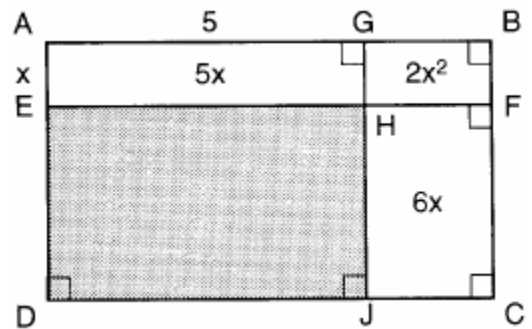
13. 080738a, P.I. A.G.1

The accompanying diagram represents a scale drawing of the property where Brendan's business is located. He needs to purchase rock salt to melt the ice on the parking lot (shaded area) around his building. A bag of rock salt covers an area of 1,500 square feet. How many bags of rock salt does Brendan need to purchase to salt the entire parking lot?



14. 010028a, P.I. A.G.1

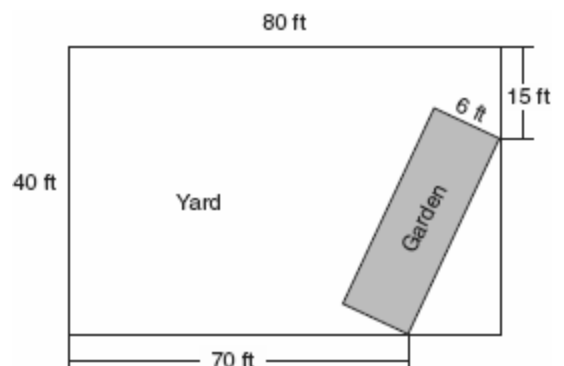
In the figure below, the large rectangle,  $ABCD$ , is divided into four smaller rectangles. The area of rectangle  $AEHG = 5x$ , the area of rectangle  $GHFB = 2x^2$ , the area of rectangle  $HJCF = 6x$ , segment  $AG = 5$ , and segment  $AE = x$ .



- Find the area of the shaded region.
- Write an expression for the area of the rectangle  $ABCD$  in terms of  $x$ .

15. 010330a, P.I. A.G.1

A rectangular garden is going to be planted in a person's rectangular backyard, as shown in the accompanying diagram. Some dimensions of the backyard and the width of the garden are given. Find the area of the garden to the nearest square foot.



16. 010202b, P.I. A.G.1

Chad had a garden that was in the shape of a rectangle. Its length was twice its width. He decided to make a new garden that was 2 feet longer and 2 feet wider than his first garden. If  $x$  represents the original width of the garden, which expression represents the difference between the area of his new garden and the area of the original garden?

- [A]  $6x + 4$  [B] 8  
[C]  $x^2 + 3x + 2$  [D]  $2x^2$

17. 080130b, P.I. A.G.1

A small, open-top packing box, similar to a shoebox without a lid, is three times as long as it is wide, and half as high as it is long. Each square inch of the bottom of the box costs \$0.008 to produce, while each square inch of any side costs \$0.003 to produce. Write a function for the cost of the box described above. Using this function, determine the dimensions of a box that would cost \$0.69 to produce.

18. 060611a, P.I. A.G.1

The second side of a triangle is two more than the first side, and the third side is three less than the first side. Which expression represents the perimeter of the triangle?

- [A]  $2x - 1$  [B]  $x + 5$   
[C]  $x^2 - x - 6$  [D]  $3x - 1$

19. 060713a, P.I. A.G.1

If the base of a triangle is represented by  $x + 4$  and the height is represented by  $2x$ , which expression represents the area of the triangle?

- [A]  $(x + 4)(2x)$  [B]  $\frac{1}{2}((x + 4) + (2x))$   
[C]  $(x + 4) + (2x)$  [D]  $\frac{1}{2}(x + 4)(2x)$

20. 010335a, P.I. A.G.1

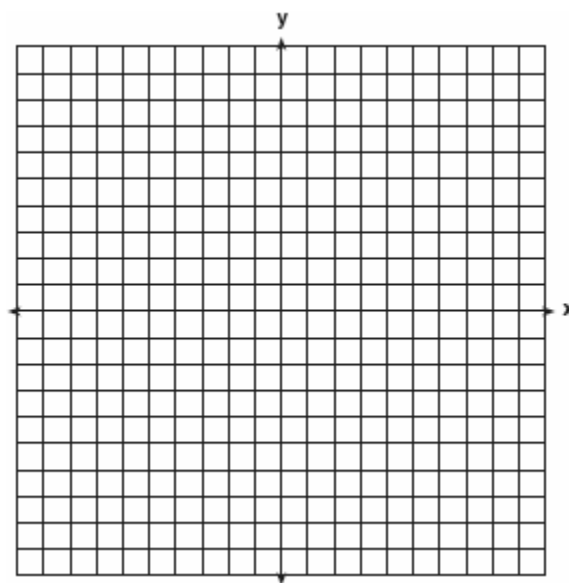
On the accompanying set of axes, graph and label the following lines:

$$y = 5$$

$$x = -4$$

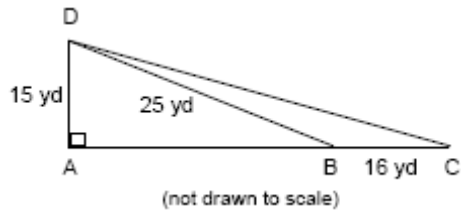
$$y = \frac{5}{4}x + 5$$

Calculate the area, in square units, of the triangle formed by the three points of intersection.



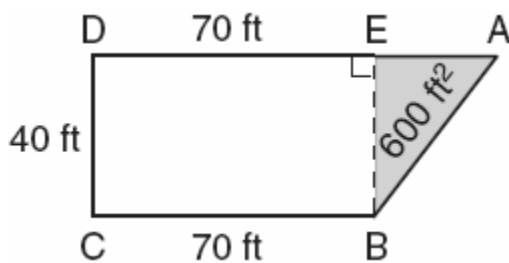
21. 089934a, P.I. A.G.1

Mr. Gonzalez owns a triangular plot of land  $BCD$  with  $DB = 25$  yards and  $BC = 16$  yards. He wishes to purchase the adjacent plot of land in the shape of right triangle  $ABD$ , as shown in the accompanying diagram, with  $AD = 15$  yards. If the purchase is made, what will be the total number of square yards in the area of his plot of land,  $\triangle ACD$ ?



22. 060134a, P.I. A.G.1

The plan of a parcel of land is represented by trapezoid  $ABCD$  in the accompanying diagram. If the area of  $\triangle ABE$  is 600 square feet, find the minimum number of feet of fence needed to completely enclose the entire parcel of land,  $ABCD$ .



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[1] A \_\_\_\_\_

[2] C \_\_\_\_\_

[3] C \_\_\_\_\_

[4] D \_\_\_\_\_

[5] B \_\_\_\_\_

[6] C \_\_\_\_\_

[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

[7] obviously incorrect procedure.

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[3] Perimeter =  $4x + 4$  or  $4(x + 1)$  and area =  $x^2 + 2x - 24$ , and appropriate work is shown.

[2]  $4x + 4$  and  $x^2 + 2x - 24$ , and appropriate work is shown, but the answers are not labeled or are labeled incorrectly.

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

or [2] Area =  $x^2 + 2x - 24$ , and appropriate work is shown, but the perimeter is not found or is found incorrectly.

or [2] The area and perimeter are represented correctly, but only one of them is expressed in simplest form.

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

or [1] Perimeter =  $4x + 4$ , and appropriate work is shown, but the area is not found or is found incorrectly.

or [1] The area and perimeter are represented correctly, but neither is expressed in simplest form.

or [1] Perimeter =  $4x + 4$  or  $4(x + 1)$  and area =  $x^2 + 2x - 24$ , but no work is shown.

[0] Perimeter =  $4x + 4$  or area =  $x^2 + 2x - 24$ , but no work is shown.

or [0]  $4x + 4$  and  $x^2 + 2x - 24$ , but no work is shown and the answers are not labeled or are labeled incorrectly.

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.

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[4] 283.5 or 284 and appropriate work or an explanation is shown, such as  $4x + 12 = 96$ ,  $\frac{21 \times 27}{2}$ , or trial and error.

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

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

or [2] 283.5 or 284 and only a check is shown.

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

or [1] 283.5 or 284 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.

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[2] Kerry is incorrect and an explanation is given that the original area is  $24 \text{ ft}^2$  and the area of the rose plot is  $6 \text{ ft}^2$ , which is not half of  $24 \text{ ft}^2$ .

or [2] Kerry is incorrect and an explanation is given that since the original area is  $24 \text{ ft}^2$ , the area of the rose plot should be  $12 \text{ ft}^2$ , so the new dimensions should multiply to 12, such as  $3 \times 4$ ,  $4 \times 3$ ,  $2 \times 6$ ,  $2 \times 6$ .

or [2] Kerry is incorrect and a diagram is used to show the original area is  $24 \text{ ft}^2$  and the area of the rose plot is  $6 \text{ ft}^2$ .

[1] Kerry is incorrect but the work or diagram shows one error.

or [1] Appropriate work is shown, but the incorrect conclusion is found.

[0] Kerry is incorrect or correct but no explanation is given.

or [0] Kerry is correct and  $\frac{1}{2}(4) = 2$  or

$\frac{1}{2}(6) = 3$  is shown.

or [0] Kerry is correct and the student uses the perimeter.

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

[10] obviously incorrect procedure.

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[2] 256, and appropriate work is shown, such as finding the side of the square and calculating the area.

[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] Appropriate work is shown, but only the area of the circle is found.

or [1] An incorrect value for the side of the square is determined, but an appropriate area is found.

or [1] A correct value for the side of the square is determined, but the area is not found or is found incorrectly.

or [1] The area for the square inscribed in the circle is found, resulting in an answer of 128.

or [1] 256, 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

[11] incorrect procedure.

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[4] \$148.54, and appropriate work is shown.

[3] The correct pre-tax amount of \$137.54 is found, but no tax or an incorrect tax is shown.

or [3] Appropriate work is shown, but one computational error is made.

[2] The correct area of  $46 \text{ ft}^2$  is found, but no cost is shown.

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

or [2] An incorrect area is determined, such as by adding or multiplying all sides, but then a final cost including tax is determined appropriately.

[1] An incorrect area is shown, and one computational error is made.

or [1] \$148.54, 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

[12] incorrect procedure.

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- [4] 4, and appropriate work is shown.  
 [3] Appropriate work is shown, but one computational or rounding error is made.  
 or [3] Appropriate work is shown to find 4,860, the area of the parking lot, but no further correct work is shown.  
 [2] Appropriate work is shown, but two or more computational or rounding errors are made.  
 or [2] Appropriate work is shown, but one conceptual error is made, such as using an incorrect conversion.  
 or [2] The property has been divided into appropriate sections (e.g.,  $108 \times 72$ , the entire property, and  $52 \times 52$ , the building) and correct areas are found, but no further correct work is shown.  
 [1] Appropriate work is shown, but one conceptual error and one computational or rounding error are made.  
 or [1] 4, 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.
- [13] \_\_\_\_\_
- a [2] 15 and an appropriate method is shown, such as finding  $GB = JC = 2x$  and  $FC = ED = HJ = 3$ .  
 [1] 15 and no work is shown.  
 or [1] At least one of the values is correct, as shown above, and the area is calculated based on the incorrect value.  
 b [1] Any form equivalent to  $(2x + 5)(x + 3)$  is shown, such as  $5x + 2x^2 + 6x + 15$ .  
 or [1] Any correct total area based on the students incorrect answer in part a is found.  
 a and b [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] 162, and appropriate work is shown.  
 [2] The Pythagorean theorem is used correctly to find the hypotenuse, but the result is not multiplied by 6.  
 or [2] Appropriate work is shown, but one computational or rounding error is made.  
 [1] Appropriate work is shown, but more than one computational or rounding error is made.  
 or [1] 162, 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.
- [15] \_\_\_\_\_
- [16] A \_\_\_\_\_
- [4]  $c(x) = 0.06x^2$  or an equivalent equation; width =  $\sqrt{11.5}$  inches or an equivalent, length =  $3\sqrt{11.5}$  inches or an equivalent, and height =  $\frac{3}{2}\sqrt{11.5}$  inches or an equivalent, and appropriate work is shown.  
 [3] Appropriate work is shown, but one computational error is made.  
 or [3] One or more dimensions are represented incorrectly, but all further work is appropriate.  
 or [3] The correct function is found and solved for x, but no further work is shown.  
 [2] The dimensions are represented correctly, but the equation is incorrect, but all further work is appropriate.  
 or [2] The dimensions are represented correctly, and the correct function is written, but further work is incomplete or is incorrect.  
 [1] The dimensions are represented correctly, but the function is written and solved incorrectly.  
 or [1]  $\sqrt{11.5}$ ,  $3\sqrt{11.5}$ , and  $\frac{3}{2}\sqrt{11.5}$ , 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 incorrect procedure.
- [17] \_\_\_\_\_
- [18] D \_\_\_\_\_



[19] D

[4] All lines are graphed and labeled correctly and area = 10, and appropriate work is shown.

[3] The lines are graphed and labeled correctly, but the area of the triangle is missing or is incorrect.

or [3] One of the lines is graphed incorrectly, but the area for the given triangle is found appropriately.

[2] One of the lines is graphed incorrectly, and the area of the triangle is missing or is incorrect.

[1] Only one line is graphed and labeled correctly, and no further correct work is shown.

or [1] All three lines are graphed incorrectly, but the area for the given triangle is found appropriately.

or [1] Area = 10, 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

[20] incorrect procedure.

[4] 270 and an appropriate method is shown, such as using the Pythagorean theorem or trigonometry to find base  $AC = 36$ .

[3] An appropriate method is shown, but one computational mistake is made.

[2] An inappropriate formula for the area of the triangle is used, but work is carried to a solution.

or [2] The Pythagorean theorem is used correctly, but only the area of triangle  $ADB$  is found, as 150.

or [2] The Pythagorean theorem is used incorrectly arriving at incorrect  $AB$ , but work is carried to its appropriate solution for triangle  $ADC$ .

[1] Only the area of triangle  $DBC$  is found, as 120.

or [1] The Pythagorean theorem is used incorrectly, and the area is not found.

or [1] 270 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

[21] incorrect procedure.

[4] 260, and appropriate work is shown, such as applying the appropriate area formula,

or  $A = \frac{1}{2}bh$  or  $A = \frac{1}{2}h(b_1 + b_2)$ , to find the

length of  $\overline{AE}$  and using the Pythagorean theorem or stating the Pythagorean triple to determine  $AB$ .

[3] 300, because  $\overline{BE}$  is added to the perimeter.

or [3] Appropriate work is shown, but one computational error is made.

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

or [2] Only  $AB$  and  $AE$  are determined correctly.

[1] Only  $AB$  or  $AE$  is determined correctly.

or [1] 260, 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.