

Quadratics: Rectangle Problems

20 problems · area, frames, borders and one stubborn field · Algebra I & II

Name _____ Date _____

BEFORE YOU START

Draw it. Name one side x . Write the other side in terms of x . Multiply. Solve.
A border of width x adds $2x$ to the length AND $2x$ to the width. Not x . Two sides.
Then throw out the answer that would give you a negative fence.

PART A · ONE RECTANGLE, ONE EQUATION

warm-up

1. The length of a rectangular rug is 5 ft more than its width, w . Write a function $A(w)$ for the area of the rug.



KEY

- long side — 5 more than the width
----- short side — call this w

.....
Answer _____

2. A vegetable patch is 6 m longer than it is wide. Its area is 91 m^2 . Find both dimensions.

.....
Answer _____

3. The length of a whiteboard is 3 ft less than twice its width, x . The area is 54 ft^2 . Write an equation and solve it.



KEY

—— long side — 3 less than twice the short side

---- short side — call this x

.....
Answer _____

4. A flower bed's width is half its length. The area is 60 ft^2 . Find the width to the nearest tenth of a foot.

.....
Answer _____

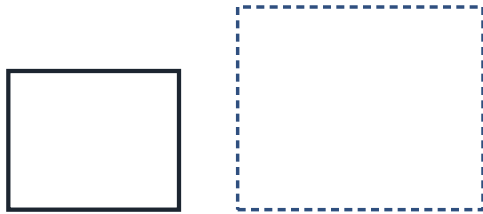
5. A school is building a rectangular soccer field with an area of $7,500 \text{ yd}^2$. The field must be 25 yd longer than it is wide. Find the dimensions.

.....
Answer _____

PART B · TWO RECTANGLES, ONE EQUATION

comparisons

6. Each side of a square is increased by 4 in. The new area is 9 times the original area. Find the side of the original square.



KEY

- original square
 - - - - every side 4 longer; area is 9 times bigger

.....
 Answer _____

7. A room is 6 ft longer than it is wide. If each dimension grows by 2 ft, the area grows by 48 ft^2 . Find the original dimensions.

.....
 Answer _____

8. A rectangle is 10 cm longer than it is wide. If each dimension shrinks by 2 cm, the area drops by 76 cm^2 . Find the original dimensions.

.....
 Answer _____

9. Joe's patio is 10 ft by 14 ft. He adds the same length x to both dimensions and ends up with 192 ft^2 . Write an equation and find x .



KEY

- patio now: 10 ft by 14 ft
 ---- patio after: each dimension x longer

Answer _____

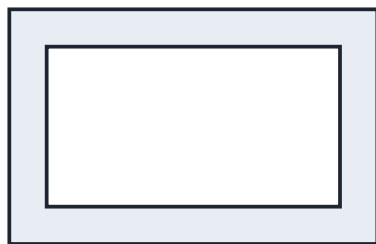
10. A rectangular sheet of paper is twice as long as a square sheet and 4 in wider. The rectangular sheet has an area of 120 in^2 . Find the side of the square sheet.

Answer _____

PART C · FRAMES, BORDERS AND WALKWAYS

the $2x$ trap lives here

11. A 10 in by 14 in photo gets a frame of uniform width x . The framed picture covers 192 in^2 of wall. How wide is the frame?



KEY

- inner: the photo, 10 in by 14 in
 [shaded box] the frame — width x on all four sides
 — outer: $10 + 2x$ by $14 + 2x$

Answer _____

12. A garden 12 m by 18 m has a walkway of uniform width x around it. Garden and walkway together cover 315 m^2 . Write an equation and find x .



KEY

- inner: the garden
- the walkway — same width all the way round
- outer: garden plus walkway

Answer _____

13. A mirror 10 in by 15 in has a frame of uniform width. The area of the frame is equal to the area of the mirror. Find the width of the frame.

Answer _____

14. A page has a 1 in margin on all four sides and must hold 40 in^2 of print. The page is 3 in longer than it is wide. How big is the page?

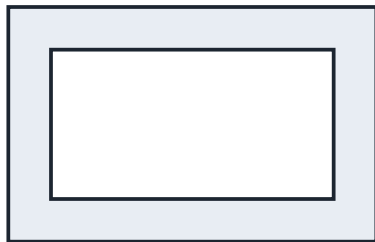


KEY

- outer: the whole page
- the 1 in margin
- inner: the printed part, 40 in^2

Answer _____

15. A lawn is 30 ft by 40 ft. You mow a strip of uniform width around the outside and stop when exactly half the lawn is cut. How wide is the strip?



KEY

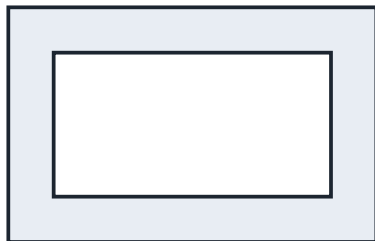
- the strip you already mowed — width x
- inner: the uncut middle
- outer: the whole lawn

Answer _____

PART D · THE ONES THAT BITE

read twice, reject one root

16. A field is 100 ft by 120 ft. A ring of uniform width is cut around the outside edge, leaving two-thirds of the field uncut. How wide is the ring? Both roots are real — say why one of them is nonsense.



KEY

- the ring that was cut
- inner: two-thirds of the field, still standing
- outer: 100 ft by 120 ft

Answer _____

17. A farmer's field is 150 ft by 200 ft. He wants 50% more area by cultivating a band of uniform width around the outside. How wide a band, to the nearest tenth of a foot?

Answer _____

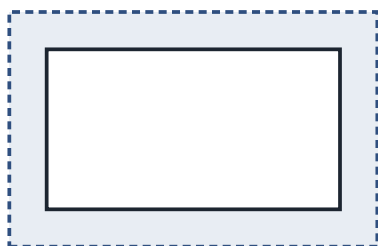
18. A contractor has 44 m of fencing for the perimeter of a rectangular garden with an area of 105 m^2 . Find the dimensions algebraically.

Answer _____

19. A square garden is redesigned: one side is doubled, the other is cut by 4 m. The new rectangular garden has 50% more area than the square did. Find the original side, then the new area.

Answer _____

20. A picture is 8 in by 10 in. Simon builds a frame from wood strips of equal width so the framed picture takes up at most 143 in^2 of wall. Write an inequality and find the widest strip he can use, to the nearest tenth of an inch.



KEY

- inner: the picture, 8 in by 10 in
- wood strips — all the same width
- - - outer: must stay at or under 143 in^2

Answer _____

ANSWER KEY

one line of setup, one line of algebra

1. $A(w) = w(w + 5) = w^2 + 5w$
2. $w(w + 6) = 91 \rightarrow w^2 + 6w - 91 = 0 \rightarrow (w + 13)(w - 7) = 0 \rightarrow$ **7 m by 13 m**
3. $x(2x - 3) = 54 \rightarrow 2x^2 - 3x - 54 = 0 \rightarrow (2x + 9)(x - 6) = 0 \rightarrow x = 6 \rightarrow$ **6 ft by 9 ft**
4. $(2w)(w) = 60 \rightarrow w^2 = 30 \rightarrow w \approx$ **5.5 ft** (length $\approx$ 11.0 ft)
5. $w(w + 25) = 7500 \rightarrow w^2 + 25w - 7500 = 0 \rightarrow (w - 75)(w + 100) = 0 \rightarrow$ **75 yd by 100 yd**
6. $(x + 4)^2 = 9x^2 \rightarrow 8x^2 - 8x - 16 = 0 \rightarrow x^2 - x - 2 = 0 \rightarrow (x - 2)(x + 1) = 0 \rightarrow$ **side 2 in**
7. $(x + 2)(x + 8) = x(x + 6) + 48 \rightarrow x^2 + 10x + 16 = x^2 + 6x + 48 \rightarrow 4x = 32 \rightarrow$ **8 ft by 14 ft**
8. $(x - 2)(x + 8) = x(x + 10) - 76 \rightarrow x^2 + 6x - 16 = x^2 + 10x - 76 \rightarrow$ **15 cm by 25 cm**
9. $(10 + x)(14 + x) = 192 \rightarrow x^2 + 24x - 52 = 0 \rightarrow (x + 26)(x - 2) = 0 \rightarrow$ **x = 2 ft**
10. $2s(s + 4) = 120 \rightarrow s^2 + 4s - 60 = 0 \rightarrow (s + 10)(s - 6) = 0 \rightarrow$ **square side 6 in**
11. $(10 + 2x)(14 + 2x) = 192 \rightarrow x^2 + 12x - 13 = 0 \rightarrow (x + 13)(x - 1) = 0 \rightarrow$ **frame 1 in wide**
12. $(12 + 2x)(18 + 2x) = 315 \rightarrow 4x^2 + 60x - 99 = 0 \rightarrow (2x + 33)(2x - 3) = 0 \rightarrow$ **x = 1.5 m**
13. Mirror = 150 in², so total = 300 in². $(10 + 2x)(15 + 2x) = 300 \rightarrow 2x^2 + 25x - 75 = 0 \rightarrow (2x - 5)(x + 15) = 0 \rightarrow$ **2.5 in**
14. $(w - 2)(w + 1) = 40 \rightarrow w^2 - w - 42 = 0 \rightarrow (w - 7)(w + 6) = 0 \rightarrow$ **page is 7 in by 10 in**
15. $(30 - 2x)(40 - 2x) = 600 \rightarrow x^2 - 35x + 150 = 0 \rightarrow (x - 5)(x - 30) = 0 \rightarrow$ **5 ft** ($x = 30$ would eat the whole lawn)
16. $(100 - 2x)(120 - 2x) = 8000 \rightarrow x^2 - 110x + 1000 = 0 \rightarrow (x - 10)(x - 100) = 0 \rightarrow$ **10 ft**. $x = 100$ is rejected: the field is only 100 ft across, so a 100 ft ring on both sides is impossible.
17. $(150 + 2x)(200 + 2x) = 45,000 \rightarrow x^2 + 175x - 3750 = 0 \rightarrow x = (-175 + \sqrt{45625}) / 2 \rightarrow \approx$ **19.3 ft**
18. $l + w = 22$, so $w(22 - w) = 105 \rightarrow w^2 - 22w + 105 = 0 \rightarrow (w - 7)(w - 15) = 0 \rightarrow$ **7 m by 15 m**
19. $2x(x - 4) = 1.5x^2 \rightarrow 0.5x^2 - 8x = 0 \rightarrow x(x - 16) = 0 \rightarrow$ **original side 16 m; new area 384 m²** (32 by 12)
20. $(8 + 2x)(10 + 2x) \leq 143 \rightarrow 4x^2 + 36x - 63 \leq 0 \rightarrow (2x + 21)(2x - 3) \leq 0 \rightarrow 0 < x \leq 1.5 \rightarrow$ **1.5 in**

Worksheets are prepared from previous class notes and assigned homework, and every question and answer was checked for accuracy before publishing. Spot a mistake? Email burketutoringinfremont@outlook.com or text (510) 453-0350 and it gets fixed the same week. Free to print and copy for classroom and home use.

Burke Tutoring In Fremont · in-home math tutoring in Fremont, Newark and Union City · burketutoringinfremont.com