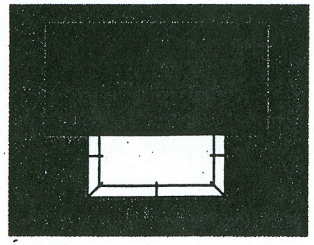
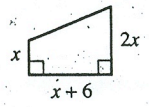
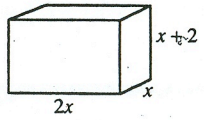
3. A positive real number is 1 more than its reciprocal. Find the number.
4. Two positive real numbers have a sum of 5 and product of 5. Find the numbers.
5. A rectangular field with area 5000 m^2 is enclosed by 300 m of fencing. Find the dimensions of the field.
6. A rectangular animal pen with area 1200 m^2 has one side along a barn. The other three sides are enclosed by 100 m of fencing. Find the dimensions of the pen.



7. A walkway of uniform width has area 72 m^2 and surrounds a swimming pool that is 8 m wide and 10 m long. Find the width of the walkway.
8. A 5 in. by 7 in. photograph is surrounded by a frame of uniform width. The area of the frame equals the area of the photograph. Find the width of the frame.
9. When mineral deposits formed a coating 1 mm thick on the inside of a pipe, the area through which fluid can flow was reduced by 20%. Find the original inside diameter of the pipe. (*Remember:* Area of circle = πr^2 and diameter = $2r$.)
10. The area of the trapezoid shown below is 90 square units. Find the value of x.



Ex. 10



Ex. 11

B 11. The total surface area of the rectangular solid shown is 36 m^2. Find the value of x.

12. In a *golden rectangle* the ratio of the length to the width equals the ratio of the length plus width to the length. Find the value of this *golden ratio*. (Do not approximate the answer.)
13. A box with height $(x + 5)$ cm has a square base with side x cm. A second box with height $(x + 2)$ cm has a square base with side $(x + 1)$ cm. If the two boxes have the same volume, find the value of x.
14. A box with a square base and no lid is to be made from a square piece of metal by cutting squares from the corners and folding up the sides. The cut-off squares are 5 cm on a side. If the volume of the box is 100 cm^3, find the dimensions of the original piece of metal.
15. A hydrofoil made a round trip of 144 km in 4 h. Because of head winds, the average speed on returning was 15 km/h less than the average speed going out. Find the two speeds.

Solve each equation after rewriting it in the form $ax^2 + bx + c = 0$. Give answers involving radicals in simplest radical form.

7. $5r^2 + 8 = -12r$
8. $2w^2 + 4w = -3$
9. $3y^2 = 1 - y$
10. $8x = 1 - x^2$
11. $2x(x + 1) = 7$
12. $5 = 4r(2r + 3)$
13. $(3n - 5)(2n - 2) = 6$
14. $(2x + 1)(2x - 1) = 4x$
15. $\frac{w^2}{2} - w = \frac{3}{4}$
16. $\frac{t^2}{2} + 1 = \frac{t}{5}$
17. $\frac{2m^2 + 16}{5} = 2m$
18. $\frac{4 - 2y^2}{7} = 2y$

Solve each equation and approximate solutions to the nearest hundredth. A calculator may be helpful.

19. $2n^2 - 4n = 8$
20. $2x^2 - 3x = 7$
21. $3t^2 - 6t - 7 = 0$
22. $4x(x + 1) = 2.75$
23. $3x(x + 2) = -2.5$
24. $2t(t - 4) = -3$

Solve each equation (a) by factoring and (b) by using the quadratic formula.

25. $5x^2 - 45 = 0$
26. $3y^2 - 48 = 0$
27. $3x^2 - 6x + 3 = 0$
28. $4y^2 + 4y - 15 = 0$

Solve each equation. Give answers involving radicals in simplest radical form.

B 29. $x^2 - x\sqrt{2} - 1 = 0$
30. $x^2 - x\sqrt{5} - 1 = 0$
31. $t^2 - 2t\sqrt{2} + 1 = 0$
32. $u^2 + 2u\sqrt{3} - 3 = 0$
33. $\sqrt{2}x^2 + 5x + 2\sqrt{2} = 0$
34. $\sqrt{3}x^2 - 2x + 2\sqrt{3} = 0$
35. $z^2 + iz + 2 = 0$
36. $z^2 + 2iz - 1 = 0$
37. $z^2 - (3 + 2i)z + (1 + 3i) = 0$
38. $iz^2 + (2 - 3i)z - (3 + i) = 0$
39. $\frac{2w + i}{w - i} = \frac{3w + 4i}{w + 3i}$
40. $\frac{1}{2z + i} + \frac{1}{2z - i} = \frac{4}{z + 2i}$
41. Show that the solutions of $3x^2 - 2x + 3 = 0$ are reciprocals.

C 42. Prove that if the roots of $ax^2 + bx + c = 0$ $(a \neq 0)$ are reciprocals, then $a = c$.

Problems

Solve each problem. Approximate any answers involving radicals to the nearest hundredth. A calculator may be helpful.

A 1. Each side of a square is 4 m long. When each side is increased by x m, the area is doubled. Find the value of x.
2. A rectangle is 6 cm long and 5 cm wide. When each dimension is increased by x cm, the area is tripled. Find the value of x.