¶ **1.** Which number(s) divides 2711814?

  (a) 6

  (b) 8

  (c) 9

  (d) 11

¶ **2.** If x and y are two numbers such that $x + y = 35$ and $xy = 5$, then the value of $\dfrac{1}{x} + \dfrac{1}{y}$ is

  (a) 7

  (b) 40

  (c) $\dfrac{1}{7}$

  (d) 30

  (e) cannot be determined

¶ **3.** The value of the sum $1 - 2 + 3 - 4 + 5 - 6 + \cdots + 997 - 998 + 999 - 1000$ is

  (a) -500

  (b) -1000

  (c) -999

  (d) -1001

  (e) 5005

¶ **4.** Which number below is the greatest?

  (a) 6^{100}

  (b) 5^{200}

  (c) 4^{300}

  (d) 3^{400}

  (e) 2^{500}

¶ **5.** The fraction $\dfrac{7}{\sqrt{12}}$ can also be written in the form

  (a) $\dfrac{14}{\sqrt{3}}$

  (b) $\dfrac{7\sqrt{3}}{6}$

  (c) $\dfrac{7}{3\sqrt{2}}$

¶ **6.** Solve the quadratic equation $x^2 - x - 1 = 0$

¶ **7.** Simplify the fraction $\dfrac{(1/2 + 1/3)/(5/12)}{(1 - 1/2)(1 - 1/3)(1 - 1/4)}$

¶ **8.** Expand

  (a) $(a + b)^2 =$

  (b) $(a - b)^2 =$

  (c) $a^2 - b^2 =$

¶ **9.** Give an algebraic proof of the following fact: If n is an odd number, then n^2 is an odd number.

¶ **10.** A bookcase contains two rows of identical textbooks. One row is 18 inches long, the other 24 inches long. The longer row contains 4 more textbooks than the shorter one.

  (a) How thick is each textbook?

  (b) How many textbooks are there in the bookshelf?

¶ **11.** If ABC is a triangle with vertex points A, B and C, then a, b, and c denote the corresponding opposite sides. The Pythagorean Theorem says that if ABC is a right triangle with right angle at vertex C, then the lengths of the sides satisfy $a^2 + b^2 = c^2$. Conversely, if ABC is a triangle whose sides satisfy the equation $a^2 + b^2 = c^2$, then ABC is a right triangle with right angle at vertex C.

(a) Is there a right triangle with sides of lengths 3, 4 and 5?

(b) Is there a right triangle whose shorter sides have lengths 5 and 12?

¶ **12.** A rectangle is inscribed in the quadrant of a circle as shown in the figure. What is the length of the diagonal AB of this rectangle?
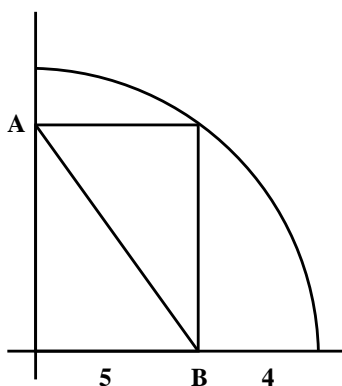
(a) $\sqrt{41}$

(b) 9

(c) $2 + \sqrt{5}$

(d) 20

(e) 41

¶ **13.** A chain suspended from the top of an upright post has a length of 2 feet lying on the ground. On being drawn to its full length, so as just to touch the ground, its end is found to be 8 feet from the post. What is the length of the chain?

(a) 34

(b) 30

(c) 28

(d) 17

(e) 15

¶ **14.** The perimeter of a geometric figure is the sum of the lengths of all its sides. For a circle, we have the formula

$$\text{Perimeter } P = 2\pi \text{ (Radius } r)$$

(a) If a circle has perimeter 8π, what is its diameter?

(b) If a half-circle has radius 3, what is its perimeter?

¶ **15.** What is the perimeter of a right triangle whose smaller sides have lengths 7 and 24?