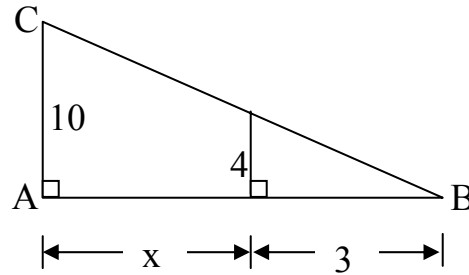


Varsity Ciphering 2007

Round 1

1. Find the distance from  $R(6, -4)$  to the line with the equation  $y = 12$ .
2. Solve  $2 \cos^2 x + \cos x = 1$  for  $0 \leq x < 2\pi$ .

3. Shown in the figure is a right triangle  $ABC$  with line segments with the indicated measures. Find the value of  $x$ . Express the answer as a reduced fraction.



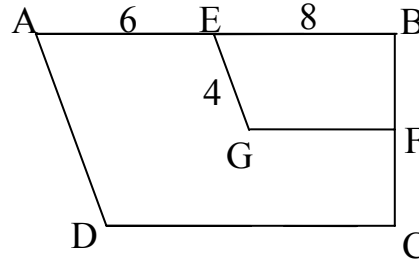
4. If  $100 \times 19.98 \times 1.998 \times 1000 = x^2$  find  $x$  for  $x > 0$ .
5. The length of one side of an equilateral triangle is 4 centimeters. Find the length of an altitude of the triangle.
6. Simplify the following:  $\frac{x^{-1} + y^{-1}}{x^{-1} - y^{-1}}$ . Leave no negative exponents nor complex fractions.
7. State the period of  $y = \frac{1}{2} \tan 8x$ .
8. If  $@$  is defined for all positive numbers  $a$  and  $b$  by  $a @ b = 5 - 2ab - b^2$  find  $5 @ 2$ .

Round 2

1. Find the value of “k” so that the slope of the line through the points (5, k) and (9, 4) is  $\frac{3}{2}$ .

2. Solve  $2 \sin x + 1 = 0$  on the interval  $[0, 2\pi)$ .

3. Shown in the figure are similar trapezoids ABCD and EFGH with line segment measures as indicated. Find the measure of  $\overline{AD}$ .

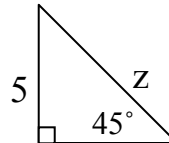


4. An island has no currency, instead it has the following exchange rate:

$$\begin{aligned} 50 \text{ bananas} &= 20 \text{ coconuts} \\ 30 \text{ coconuts} &= 12 \text{ fish} \\ 100 \text{ fish} &= 1 \text{ hammock} \end{aligned}$$

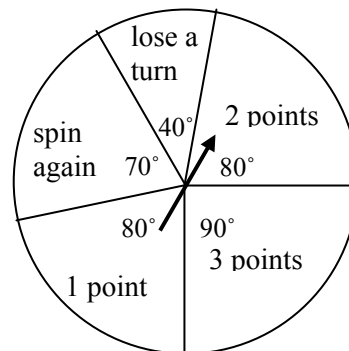
How many bananas equal 1 hammock?

5. In the triangle shown with the indicated measures find the value of z.



6. Solve the following:  $1 + \sqrt{y + 4} = \sqrt{3y + 1}$ .
7. Starting from the origin and for  $x \geq 0$  in radians what are the coordinates of first occurrence of the maximum point of the graph of  $y = -2 \cos 2x$ ?

8. The spinner shown is a circle subdivided into sectors with central angles as shown. Find the probability that the spinner will land on “lose a turn”.



## Varsity Ciphery 2007 Answers

### Round 1

1. 16

2.  $x = \frac{\pi}{3}, \pi, \frac{5\pi}{3}$

3.  $\frac{9}{2}$

4. 1998

5.  $2\sqrt{3}$  cm

6.  $\frac{y+x}{y-x}$

7.  $\frac{\pi}{8}$

8. -19

### Round 2

1. -2

2.  $\frac{7\pi}{6}, \frac{11\pi}{6}$

3. 7

4. 625

5.  $5\sqrt{2}$

6. 5

7.  $\left(\frac{\pi}{2}, 2\right)$

8.  $\frac{1}{9}$