CATS contest[1]   Name _____

1 November 2014

                                                        Grade_____

    Write your answer in the box provided. Answers must be exact. Thus, if the
answer is 1/3, 0.33 will not be marked correct. You may not use a calculator. You
may use scratch paper.

1. Today is Saturday. What day of the week will it be in 10 days?

Tuesday

2. Today is still Saturday. What day of the week will be in 2014 days?

Thursday

3. A book is regularly priced at $24 and is on sale for 25% off. What is the sale
   price?

$18

4. A square has side length of 7 feet. Give the area of the figure that remains after
   we remove a square of side length 6 inches from each corner.

48 ft^2.

5. A book is on sale for 20% off. If the sale price is $16, what was the original
   price?

$20

6. Write as a single fraction in reduced form.

$$\frac{1}{2} + \frac{1}{3} + \frac{1}{7}$$

41/42

---

[1]CATS stands for CATS[1] Are Top Solvers

7. Find the largest prime factor of 72.

$$\boxed{ \\ 3}$$

8. The roots of the equation $x^2 + bx + c = 0$ are 5 and -3. Find b.

$$\boxed{ \\ \text{-2}}$$

9. Find the sum
$$1 + 2 + 3 + 4 + 5 + 6 + 7 + 8 + 9 + 10$$

$$\boxed{ \\ 55}$$

10. Find the sum
$$1 + 3 + 5 + 7 + \ldots + 49.$$

$$\boxed{ \\ 625}$$

11. Express $0.2\bar{3} = 0.2333333333333333\ldots$ as a fraction in lowest terms.

$$\boxed{ \\ 7/30}$$

12. What is the smallest positive integer $a > 1$ such that a^N and a have the same last digit for all $N = 1, 2, 3, \ldots$?

$$\boxed{ \\ 5}$$

13. In a polygon, a diagonal is a line joining two non-adjacent vertices. Thus a square has two diagonals. How many diagonals does a regular hexagon have?

$$\boxed{ \\ 9}$$

14. A pair of ordinary dice are rolled. What is the probability that the product of the numbers on the dice is 9?

$$\boxed{ \\ 1/36}$$

15. Find the largest prime factor of 2014.

$$\boxed{53}$$

16. How many two digit numbers are divisible by 2 but not by 3?

$$\boxed{30}$$

17. What is the largest volume a sphere can have such that its surface area is less than or equal to 100π units^2?

$$\boxed{\frac{500}{3}\pi \text{ units}^3}$$

18. How many lines of symmetry does a regular polygon with 2014 sides have?

$$\boxed{2014}$$

19. A person flips 4 coins. What are the odds that an even number of heads are flipped? (Express your answer as a fraction in lowest terms.)

$$\boxed{1/2}$$

20. A class of 8 students must divide into pairs of two for a group project. How many different ways can the students be paired?

$$\boxed{105}$$

21. Two runners start running around a circular track starting from the same location and run at constant rates. Runner 1 takes 9 minutes to complete a lap and Runner 2 takes 15 minutes to complete a lap. If they run for an hour, how many times will Runner 1 pass Runner 2?

$$\boxed{2}$$

22. A square is inscribed inside a circle of radius 1 unit as in the diagram below. Find the area of the shaded region.
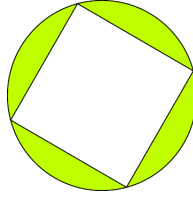
$\pi - 2$ units^2

23. A man has a sock drawer with 8 black socks and 12 brown socks If he selects two socks at random, what are the odds he selects a matching pair? (Express your answer as a fraction in lowest terms.)

47/95

24. What is the smallest prime p such that dividing $(2014)^{2014}$ by p gives a remainder of 1?

3

25. Suppose the ages of three sisters are A, B, and C. If $A + B + C = 15$ and $A \cdot B \cdot C = 96$, what is the age of the youngest sister?

3