1. How many two digit prime numbers are there in which both digits are prime numbers? (For example, 23 is one of these numbers but 31 is not, since 1 is not a prime number.)

(A) 3

(B) 4

(C) 5

(D) 8

(E) 15

2. You own thirteen pairs of socks, all different, and all of the socks are individually jumbled in a drawer. One morning you rummage through the drawer and continue to pull out socks until you have a matching pair. How many socks must you pull out to guarantee having a matching pair?

(A) 3

(B) 12

(C) 13

(D) 14

(E) 25

3. A jeweler has a 20 gram ring that is 60% gold and 40% silver. He wants to melt it down and

add enough gold to make it 80% gold. How many grams of gold should be added?

(A) 4 grams

(B) 8 grams

(C) 12 grams

(D) 16 grams

(E) 20 grams

4. Consider the following game. A referee has cards labeled *A*, *B*, *C*, and *D*, and places them face down in some order. You point to each card in turn, and guess what letter is written on the bottom. You guess each of *A*, *B*, *C*, and *D* exactly once (otherwise there is no chance of getting them all right!).

You play this game once, and then the referee tells you that you guessed exactly *n* of the letters

correctly. Which value of *n* is not a possible value of *n*?

(A) 0

(B) 1

(C) 2

(D) 3

(E) 4

5. What is the value of ?

(A) 1

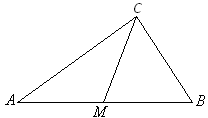
(B) 4

(C) 2

(D)

(E) 8

6. The triangle *ABC* has sides of the following lengths: *AB* = 24, *BC* = 7, and *AC* = 25. Let *M* be the midpoint of . What is the length of ? (The ﬁgure below is not drawn to scale.)



(A) 1

(B)

(C) 12

(D)

(E) 16

7. What is the value of ?

(A)

(B) 2

(C)

(D) 6

(E) 32

8. On a test the passing students had an average of 83, while the failing students had an average of 55. If the overall class average was 76, what percent of the class passed?

(A) 44%

(B) 66%

(C) 68%

(D) 72%

(E) 75%

9. Jack and Lee walk around a circular track. It takes Jack and Lee respectively 6 and 10 minutes to ﬁnish each lap. They start at the same time, at the same point on the track, and walk in the same direction around the track. After how many minutes will they be at the same spot again (not necessarily at the starting point) for the ﬁrst time after they start walking?

(A) 15

(B) 16

(C) 30

(D) 32

(E) 60

10. If sin(*x*)+cos(*x*) = 0.5, what is the value of sin3(*x*)+cos3(*x*)?

(A)

(B)

(C)

(D)

(E)

11. The two roots of the quadratic equation *x*2− 85*x*+*c* = 0 are prime numbers. What is the value of *c*?

(A) 84

(B) 166

(C) 332

(D) 664

(E) 1328

12. How many pairs (*x*, *y*) of integers satisfy *x*4−*y*4 = 16?

(A) 0

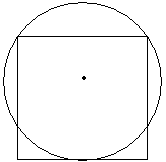
(B) 1

(C) 2

(D) 4

(E) Inﬁnitely many

13. A circle passes through two adjacent vertices of a square and is tangent to one side of the square. If the side length of the square is 2, what is the radius of the circle?



(A)

(B)

(C)

(D)

(E) None of these

14. If *x* and *y* are positive real numbers, neither of which is equal to 1, what is the smallest non-negative value of ?

(A) 0

(B)

(C)

(D) 2

(E) 10

15. What is the value of ?

(A) 1

(B) -1

(C) 0

(D)

(E)

16. What is the largest integer n such that is an integer?

(A) 36

(B) 38

(C) 72

(D) 76

(E) None of these

17. For a positive integer *n*, deﬁne *S*(*n*) to be the sum of the positive divisors of *n*. Which of the following is the smallest?

(A) *S*(2010)

(B) *S*(2011)

(C) *S*(2012)

(D) *S*(2013)

(E) *S*(2014)

18. A class has three girls and three boys. These students line up at random, one after another. What is the probability that no boy is right next to another boy, and no girl is right next to another girl?

(A)

(B)

(C)

(D)

(E)

19. Suppose *f*(*x*) = *ax*+*b* and *a* and *b* are real numbers. We deﬁne *f*1(*x*) = *f*(*x*) and *fn*+1(*x*) = *f*(*fn*(*x*)) for all positive integers *n*. If *f*7(*x*) = 128*x*+381, what is the value of *a*+*b*?

(A) 1

(B) 2

(C) 5

(D) 7

(E) 8

20. A bag contains 11 candy bars: three cost 50 cents each, four cost $1 each and four cost $2 each. How many ways can 3 candy bars be selected from the 11 candy bars so that the total cost is more than $4?

(A) 8

(B) 28

(C) 46

(D) 66

(E) 70

21. Consider the following game, in which a referee picks a random integer between 1 and 100. One after the other, each of three players tries to guess the number the referee picked. Each player announces his or her guess before the next player guesses. Each guess has to be different from the previous guesses. The winner is the player who comes closest to the referee’s number without exceeding it. (It is possible for none of the players to win.)

Suppose that Player 1 guesses 24, and that Player 3 will guess a number that gives her/him the best chance of winning. What number should Player 2 guess to maximize his/her chances of winning?

(A) 1

(B) 25

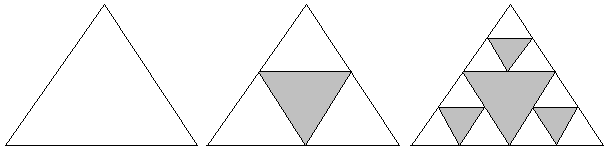
(C) 62

(D) 63

(E) 64

22. The Sierpinski Triangle involves a sequence of geometric ﬁgures. The ﬁrst ﬁgure in the sequence is an equilateral triangle. The second has an inverted (shaded) equilateral triangle inscribed inside an equilateral triangle as shown. Each subsequent ﬁgure in this sequence is obtained by inserting an inverted (shaded) triangle inside each non-inverted (white) triangle of the previous ﬁgure, as shown below. How many regions (both shaded and white together) are in the ninth ﬁgure in this sequence?

For example, the ﬁrst three ﬁgures in the sequence have 1 region, 4 regions, and 13 regions respectively.



(A) 4021

(B) 4022

(C) 4023

(D) 9841

(E) 9842

23. How many positive integers *n* have the property that when 1,000,063 is divided by *n*, the remainder is 63?

(A) 29

(B) 37

(C) 39

(D) 49

(E) 79

24. I have twenty 3¢ stamps and twenty 5¢ stamps. Using one or more of these stamps, how many different amounts of postage can I make?

(A) 150

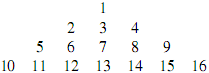
(B) 152

(C) 154

(D) 396

(E) 400

25. All of the positive integers are written in a triangular pattern, beginning with the following four lines and continuing in the same way:



Which number appears directly below 2012?

(A) 2100

(B) 2102

(C) 2104

(D) 2106

(E) 2108

26. Two spies agreed to meet at a gas station between noon and 1pm, but they have both forgotten the arranged time. Each arrives at a random time between noon and 1pm and stays for 6 minutes unless the other is there before the 6 minutes are up. Assuming all random times are equally likely, what is the probability that they will meet within the hour (noon to 1pm)?

(A) 0.12

(B) 0.15

(C) 0.17

(D) 0.19

(E) 0.25

27. A farmer has 12 plots of land, arranged in a row. To ensure viability of the soil, the farmer never uses two adjacent plots at the same time. This season, the farmer wishes to plant one plot of each of the following: corn, wheat, soybeans, and rice. Each crop is assigned its own plot of land. How many ways can the farmer allocate plots of land for these crops?

(A) 1680

(B) 3024

(C) 5040

(D) 7920

(E) 11880

28. How many triples (*x*, *y*, *z*) of rational numbers satisfy the following system of equations?

*x*+*y*+*z* = 0

*xyz*+*z* = 0

*xy*+*y*+*xz*+*y* = 0

(A) 1

(B) 2

(C) 3

(D) 4

(E) 5

29. A coin has a probability of for coming up heads and for coming up tails. On average, how many ﬂips of this coin are needed to guarantee both heads and tails appear at least once?

(A) 2.25

(B) 2.5

(C) 3

(D) 3.5

(E) 5

30. Suppose *a*, *b*, and *c* are three successive terms in a geometric progression, and are also the lengths of the three sides opposite the angles *A*, *B*, and *C*, respectively, of *ABC*. Which of the following intervals is the set of possible values of ?

(A)

(B)

(C)

(D)

(E)