1. How many integers between 100 and 1000 are multiples of 7?

(A) 128

(B) 130

(C) 132

(D) 134

(E) 136

2. Four friends go fishing one day and bring home a total of 11 fish. If each person caught at least one fish, then which one of the following must be true?

(A) Somebody caught exactly 2 fish.

(B) Somebody caught exactly 3fish.

(C) Somebody caught fewer than 3 fish.

(D) Somebody caught more than 3 fish.

(E) Two people each caught more than 1 fish.

3. Given that *P* = (1, 0), *Q* = (0, 2), *R* = (−1, 1), and *T* are the vertices of a parallelogram, which one of the following is possible?

(A) *T* = (0, 0)

(B) *T* = (-1, -1)

(C) *T* = (2, 2)

(D) *T* = (2, 0)

(E) *T* = (-2, 3)

4. Determine the number of different pairs (*x*, *y*) that satisfy the system of equations

(A) 0

(B) 1

(C) 2

(D) 3

(E) 4

5. How many integers *x* in {1, 2, 3, …, 99, 100} are there such that *x*2+*x*3 is the square of an integer?

(A) 6

(B) 4

(C) 8

(D) 9

(E) 10

6. Suppose that for some numbers *a*, *b*, and *k*, we have the factorization

*x*4+2*x*3+*kx*2−*x*+2 = (*x*2+*ax*+1)(*x*2+*bx*+2). What is the value of *k*?

(A) -2

(B) -5

(C) -12

(D) -15

(E) -23

7. A used car dealer sold two cars and received $560 for each car. One of these transactions amounted to a 40% profit for the dealer, whereas the other amounted to a 20% loss. What is the dealer’s net profit on the two transactions?

(A) $20

(B) $36

(C) $56

(D) $84

(E) $112

8. The two shortest sides of a right triangle have lengths and 2. Let *α* be the smallest interior angle of this triangle. What is the value of sin*α*?

(A)

(B)

(C)

(D)

(E)

9. A game is played by one person with two fair coins as follows. The player makes four “throws” in succession. Each throw consists of tossing the two coins simultaneously. If at least one of the throws results in both coins showing “heads,” the player wins; otherwise the player loses. Which answer is nearest in value to the probability that the player wins?

(A) 43%

(B) 51%

(C) 68%

(D) 80%

(E) 100%

10. What is the area of an equilateral triangle if its circumscribed circle has radius 10?

(A) 50

(B) 100

(C) 75

(D) 100

(E) 150

11. Which one of the following numbers is largest?

(A)

(B)

(C)

(D)

(E)

12. Recall that the iterated power denotes . Given that *x* is a real number which satisfies the equation , what is the value of ?

(A) 2

(B) 4

(C) 8

(D) 16

(E) 32

13. If the roots of *x*2−*bx*+*c* = 0 are and , then *b*2 =

(A) *c*

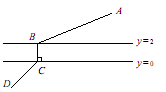
(B) 1+2*c*

(C) 1+*c*

(D) 1-*c*

(E) 1+*c*2

14. The coordinates for *A* and *D* are (7, 4) and (−5, −3) respectively. What is the shortest possible length of a path *ABCD* where *B* is a point on the line *y* = 2, *C* is a point on the line *y* = 0, and the line segment is perpendicular to the line *y* = 0?



(A)

(B) 14

(C) 15

(D) 2+

(E) 16

15. There are 6 gallons of pure alcohol in container *A* and 6 gallons of pure water in container *B*. An empty bottle is filled with alcohol from *A* and then emptied into *B*. After stirring, the bottle is filled with this mixture from *B* and emptied into *A*. The ratio of alcohol to water in container *A* is now 4:1. Assuming there were no spills, what is the size of the bottle in gallons?

(A) 1.2

(B) 1.5

(C) 1.8

(D) 2.0

(E) 2.5

16. Let *P*(*x*) be a polynomial of degree four such that *P*(2) = *P*(−2) = *P*(−3) = −1 and *P*(1) = *P*(−1) = 1. What is *P*(0)?

(A) 2

(B) 3

(C) 4

(D) 5

(E) 6

17. USC juniors and seniors were polled on the question “Do you believe there is life on Mars?” An equal number of juniors and seniors responded, and every respondent answered either “Yes” or “No.” If 60% of those who said “Yes” were seniors, and 80% of those who said “No” were juniors, then what percentage of the juniors polled said “Yes”?

(A) 20%

(B) 25%

(C) 45%

(D) 50%

(E) 60%

18. How many 9’s are there in the decimal expansion of 999998999992?

(A) 7

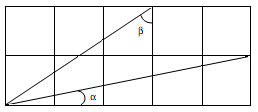
(B) 9

(C) 11

(D) 13

(E) 15

19. Ten squares of equal size are arranged in the grid below. What is the value of *β*−*α*?



(A) 36

(B) 37.5

(C) 45

(D) 48

(E) 52.5

20. There is a unique positive integer that has less than 11 decimal digits, ends in a 6, and if this 6 is removed and put at the front of the number (e.g., 136 613), then the resulting number is exactly four times the original number. How many digits does this number have?

(A) 5

(B) 6

(C) 7

(D) 8

(E) 10

21. What is the remainder when *x*200−2*x*199+*x*50−2*x*49+*x*2+*x*+1 is divided by (*x*−1)(*x*−2)?

(A) 2*x*-1

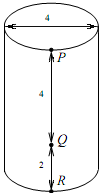
(B) 7

(C) 2*x*+3

(D) 1

(E) 6*x*-5

22. A cylindrical can is six inches tall and its base is four inches in diameter. A bug crawls from a point *P* on the upper rim of the can once around the can to a point *Q* which is four inches directly below *P*. Then the bug crawls from *Q* once around the can to a point *R* on the bottom rim of the can directly below *P* (so the distance from*Q* to *R* is two inches). What is the length of the shortest path in inches that the bug could have made from *P* to *R*?



(A)

(B)

(C)

(D)

(E)

23. For how many primes *p* is the value of *p*2+21*p*−1 also prime?

(A) 0

(B) 1

(C) 3

(D) 5

(E) Infinitely many

24. Consider the following 502 curves:

the vertical lines *x* = −100, *x* = −99, …, *x* = 99, *x* = 100;

the horizontal lines *y* = −100, *y* = −99, …, *y* = 99, *y* = 100;

the circles centered at the origin with radii .

No three of the curves intersect in a common point. What is the total number of points of intersection among these curves?

(A) 80001

(B) 80101

(C) 80201

(D) 80301

(E) 80401

25. Let *a* and *b* be two distinct roots of the equation *x*3+3*x*2−1 = 0. Which one of the following equations has *ab* as a root?

(A) *x*3−3*x*−1 = 0

(B) *x*3+*x*2−3*x*+1 = 0

(C) *x*3+3*x*2+1 = 0

(D) *x*3+*x*2+3*x*–1 = 0

(E) *x*3−3*x*2+1 = 0

26. What is the number of pairs of nonnegative integers (*x*, *y*) which satisfy the equation ?

(A) 0

(B) 2

(C) 3

(D) 4

(E) 6

27. How many ways are there to choose three positive integers *x*, *y*, and *z* so that *xyz* = 4000? For example, *x* = 10, *y* = 10, *z* = 40 and *x* = 10, *y* = 40, *z* = 10 are considered to be different choices.

(A) 24

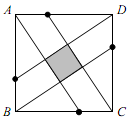
(B) 72

(C) 120

(D) 144

(E) 210

28. The area of the square *ABCD* is equal to 1. Determine the area of the shaded region if the indicated points on the sides of *ABCD* divide those sides in a 2:1 ratio as shown.



(A)

(B)

(C)

(D)

(E)

29. For real numbers *x* ≥ 3, let . Which one of the following is true?

(A) *f*(*x*) > 0 for all *x* ≥ 3

(B) *f*(*x*) < 0 for all *x* ≥ 3

(C) *f*(*x*) = 0 for all *x* ≥ 3

(D) *f*(*x*) = 0 for exactly one value of *x* ≥ 3

(E) None of the above is true

30. Let *a*, *b*, and *n* be positive integers satisfying with reduced (so *a* and *b* have no common prime divisor). Given that *n* is the smallest positive integer for which 1000 divides *a*, what is the sum of the digits of *n*?

(A) 2

(B) 7

(C) 12

(D) 13

(E) No such *n* exists