

**CALIFORNIA STATE UNIVERSITY, BAKERSFIELD**  
**Lee Webb Math Field Day 2017**  
**Individual Medley, Freshman- Sophomore Level**

Your answers to these questions should be on the side of the answer sheet that has answer spaces 1, 2, 3, 4, 5 (NOT A, B, C, D, E). On the answer sheet you should write your name, school name, level (Freshman-Sophomore), and Division (your proctor should have a list of which schools are in which divisions).

For each of the following questions, blacken the appropriate circle on the answer sheet. Each correct answer is worth four points. **One point is deducted for each incorrect answer.** An unanswered question is given zero points. Note that random guessing may adversely affect your score.

You have 50 minutes to complete the examination. If you finish early, review your answers. When the exam is over, give your answer sheet to the proctor.

All calculators, cell phones, music players, and other electronic devices should be put away in backpacks, purses, pockets, etc. Leaving early or otherwise disrupting other contestants may be cause for disqualification.

1. How many natural numbers are between  $\frac{\pi}{10}$  and  $10\pi$  ?

1. 10

2.  $10\pi - \frac{\pi}{10}$

3.  $\frac{5\pi}{5}$

4. 30

5. 31

2. If 14 centimeters of a certain kind of wire weighs 125 grams, then how much of the same kind of wire weighs 5 kilograms?

1. 5.6 meters

2. 52 km

3. 56 cm

4. 28 cm

5. 2.8 meters

3. What is the units digit in the sum  $2!+4!+6!+8!+10!+12!+\dots+100!$  ?

1. 2

2. 4

3. 6

4. 8

5. 0

4. What is the value of  $\sqrt{2+\sqrt{2+\sqrt{2+\sqrt{2+\dots}}}}$

1. 2

2.  $\sqrt{3}$

3. 3

4. 8

5.  $\infty$

5. What is the sum of the entries of the first row of Pascal's Triangle that contains the number 20?

1. 32

2. 64

3. 128

4. 256

5. 400

6. Using each of the digits 2, 0, 1, 7 exactly once, how many four-digit number can be made – leading 0 not allowed?

- |       |       |       |
|-------|-------|-------|
| 1. 8  | 2. 10 | 3. 12 |
| 4. 15 | 5. 18 |       |

7. How many 4 digit numbers are there that do not contain any of the digits 2, 0, 1, 7 – leading 0 not allowed?

- |         |         |         |
|---------|---------|---------|
| 1. 8103 | 2. 6666 | 3. 2017 |
| 4. 1296 | 5. 7704 |         |

8. A line goes through the point (12,2) with slope  $\frac{1}{3}$ . What is the area of the region in the 4<sup>th</sup> quadrant that is determined by the axes and this line?

- |                   |       |                  |
|-------------------|-------|------------------|
| 1. 4              | 2. 6  | 3. $\frac{8}{3}$ |
| 4. $\frac{15}{2}$ | 5. 10 |                  |

9. A triangle has perimeter 20 and each side's length is a natural number. What is the largest possible value of any of its side lengths.

- |       |       |       |
|-------|-------|-------|
| 1. 20 | 2. 15 | 3. 12 |
| 4. 10 | 5. 9  |       |

10. A pizza is cut into 6 equal pieces. Then the curved edge of each piece is cut off to make each piece a triangle. To the nearest whole number, what percentage of the pizza is removed?

- |       |       |       |
|-------|-------|-------|
| 1. 17 | 2. 20 | 3. 23 |
| 4. 7  | 5. 14 |       |

11. Points A, B, C, D are on a circle with center Q. Point P is outside the circle such that P, A, B are collinear with A between P and B; P, C, D are also collinear, with C between P and D. Angle BQD measures 20 degrees. Angle AQC measures 10 degrees. What is the measure, in degrees, of angle APC?
1. 5                                      2. 8                                      3. 10
4. 15                                      5. 30
12. Ella's team has won 70% of their games so far this season. She figures out that if they win the rest of their games they can bring their winning average up to 80%. What is the smallest number of games that could make up her team's season?
1. 10                                      2. 12                                      3. 15
4. 20                                      5. 30
13. How many of the factors of 10800 are squares?
1. 4                                      2. 6                                      3. 12
4. 14                                      5. 15
14. Let  $N = 1492 \cdot 2155 \cdot 3525$ . What is the remainder when  $N$  is divided by 7?
1. 0                                      2. 1                                      3. 2
4. 3                                      5. 4
15. How many subsets of size 4 can be chosen from  $\{5, 8, 23, 37, 99, 128, 2017\}$  so that the sum of the 4 numbers is even?
1. 12                                      2. 13                                      3. 14
4. 15                                      5. 16

16. Angle A in triangle ABC measures 50 degrees. Point D is inside the triangle such that segments BD and CD bisect the triangle's angles at B and C. What is the measure, in degrees, of angle BDC?

- 1. 80
- 2. 90
- 3. 100
- 4. 105
- 5. 115

17. Two numbers are solutions to the equation  $(x-6)(x+4)=25$  . What is the product of the two numbers.

- 1. 25
- 2. -35
- 3. 48
- 4. -49
- 5. 24

18. Point T is on a circle and point P is such that line PT is tangent to the circle and segment PT has length 6. Points A and B are on the circle so that chord AB has length 9 and so that A, B, P are collinear. What is the shortest possible value of segment AP?

- 1. 1
- 2. 3
- 3.  $3\sqrt{3}$
- 4.  $6\sqrt{3}$
- 5. 9

19. Two adjacent sides of a rectangle have lengths 8 and 10. A point in the interior is chosen randomly. What is the probability that the point is at least 1 unit away from each of the sides?

- 1. 40%
- 2. 50%
- 3. 60%
- 4. 55%
- 5. 75%

20. Ally, Bob, Celia, Daniel and Eli each throw two bean bags at a carnival booth. They hit targets that are labeled 1,2,3,..., 10. Their scores, the sum of the two targets they hit are, 16, 4, 7, 11, 17, respectively. No target was hit more than once. Whose bean bag hit the target labeled 6?

1. Ally                      2. Bob                      3. Celia  
4. Daniel                  5. Eli

21. A right triangle has perimeter 40 and the shortest side has length 8. What is the altitude from the right angle to the hypotenuse?

1. 6                          2. 7                          3.  $2\sqrt{30}$   
4.  $4\sqrt{2}$                   5. 120/17

22. In rectangle ABCD, AB has length 10, BC has length 6. Side AB is also the diameter of a semicircle that is inside the rectangle. A circle is inscribed so that it is tangent to the semicircle and to sides BC and CD. What is the radius of the circle?

1. 1                          2. 2                          3.  $16-2\sqrt{55}$   
4.  $6-3\sqrt{2}$                   5.  $\frac{15-\sqrt{10}}{2}$

23. Rip Winkle has 7 sons and no daughters. Some of his sons have 7 sons and no daughters, and the rest have no children. When they all got together for a family portrait, there were 29 people in the picture. How many of these people do not have children?

1. 25                          2. 21                          3. 14  
4. 16                          5. 13

24. A sequence is defined as follows.  $a_1=1, a_2=2$  And whenever  $n$  is even,  $a_{2n}=n+a_n+a_{n/2}$  . What is the value of  $a_{64}$  ?

1. 112

2. 107

3. 54

4. 76

5. 64

25. The corners are cut off a square to form a regular octagon. What is the ratio of the area of the octagon to the area of the original square?

1.  $\frac{\sqrt{2}}{(1+\sqrt{2})}$

2.  $\frac{\sqrt{2}}{(1+\sqrt{2})^2}$

3.  $3-2\sqrt{2}$

4.  $\sqrt{2}-1$

5.  $2\sqrt{2}-2$