# CALIFORNIA STATE UNIVERSITY, BAKERSFIELD
# Lee Webb Math Field Day 2023
# 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. What is the $50^{th}$ number in the sequence that starts 2, 5, 10, 17, 26, 37, …?

| | | |
|---|---|---|
| 1. 2500 | 2. 2498 | 3. 2502 |
| 4. 2501 | 5. 2499 | |

2. Simplify this compound fraction: $\dfrac{1}{1-\dfrac{1}{1-\dfrac{2}{7}}}$

| | | |
|---|---|---|
| 1. 3/7 | 2. 4/7 | 3. -3/5 |
| 4. -5/2 | 5. -2/5 | |

3. When 5/13 is written as a repeating decimal, what is the last digit before the expansion starts to repeat?

| | | |
|---|---|---|
| 1. 4 | 2. 5 | 3. 6 |
| 4. 7 | 5. 8 | |

4. Suppose *l* is the line with equation $y=\sqrt{3}x$ and *m* is the line with equation $y=ax$. At the origin, *m* bisects the angle that *l* makes with the x-axis. What is the value of *a*?

| | | |
|---|---|---|
| 1. 2 X | 2. $\sqrt{2}$ | 3. $\dfrac{\sqrt{3}}{2}$ |
| 4. $\sqrt{3}/3$ | 5. 60 | |

5. How many distinct solutions does the equation $x^4-x^2=-1/4$ have?

| | | |
|---|---|---|
| 1. 0 | 2. 1 | 3. 2 |
| 4. 3 | 5. 4 | |

6. On a 20 question test, Lee answered 65% correctly. On a 25 question test, Le answered 80% correctly. On a 40 question test, Li answered 90% correctly. Together what was their overall correct percentage (rounded to the nearest whole percent)?

1. 75 2. 77 3. 79
4. 80 5. 81

7. Kate started a job with an annual salary of $50,000 and she will get a raise every month of ½ %. In dollars, what will her salary be 4 years later?

1. $50000e^{0.24}$ 2. $50000(1.06)^4$ 3. $50000(1.005)^{48}$
4. $25000(1.01)^{24}$ 5. $50000e^{1.005*48}$

8. Suppose $f(x)=\frac{2x-b}{3x+d}$ and $f(6)=0$ and $f(1)=-5$ . What is $f(0)$ ?

1. $-4$ 2. $-12$ 3. 0
4. 12 5. 4

9. Fifteen pairs of shoes are in the closet – each pair is a different size. Max the dog goes to the closet and brings back one shoe. When he is done chewing on that shoe, he goes back and gets a second shoe. If each time, the shoe is chosen randomly, what is the probability that he only ruined one pair of shoes?

1. 1/15 2. 1/12 3. 1/23
4. 1/29 5. 3/23

10. Tommy is trying to determine the PIN for a lock. He notices that on the 10 digit keypad, the buttons with 3, 4, and 7 are worn down considerably compared with the other keys. Assuming the correct PIN is a sequence of 4 digits that only use these 3 digits and uses each of these digits at least once, how many possible sequences should Tommy consider trying?

1. 24 2. 28 3. 32
4. 36 5. 40

11. Thirty-two table tennis players enter a triple-elimination tournament. This means that a player is not eliminated until they have lost 3 games. In the first round, everyone is paired up randomly. In the second round, winners from the first round are paired with each other and losers are paired with each other. After that, players are paired with other players who have the same number of wins and losses as they do, or as close as possible to this. Assuming that there are never any ties (every game has a winner and a loser), what is the minimum number of games that must be played before there is an overall winner of the tournament?

1. 62 2. 64 3. 87
4. 92 5. 93

12. A dress has 200 decorative beads. 70% of them are green and the rest are blue. The costume manager sews additional beads onto the dress in the following pattern – blue, blue, green. How many beads are on the dress when the percentage of blue beads first reaches (or surpasses) 50%?

1. 435 2. 436 3. 437,
4. 439 5. 440

13. Suppose $(x+7)^2-(x+2)^2=(y+8)^2-(y+4)^2$ . If , x=3 what is y?

1. 23
2. 25/2
3. 37/4
4. 27/8
5. 44/7

14. The corners of a square are at (6,0), (14,6), (8,14), and (0,8). A circle is inscribed in the square. What is the radius of the circle?

1. 5
2. $5\sqrt{2}$
3. 7.5
4. 10
5. $10\sqrt{2}$

15. Ella needs to change a light bulb in a chandelier that is 20 cm below the ceiling. The ceiling is 235 cm above the floor. Ella is 1.6 m tall and reach 44 cm above her head. What is the height, in cm, of the smallest stool she could use to change the bulb?

1. 10
2. 11
3. 15
4. 17
5. 19

16. What is the least integer value of x such that there is an integer y that makes the following equation true: $(x+9)^2-(x+6)^2=(2y-1)^2-(y-2)^2$ ?

1. -10
2. -8
3. -6
4. 6
5. 8

17. Sayali has two non-standard dice. They both have 6 sides and are shaped like a cube. Each side is equally likely to come up when the dice are rolled. One die has only even numbers – two 2's, two 4's, two 6's. The other die has only odd numbers – two 1's, two 3's, two 5's. If they are both rolled what is the probability that the resulting sum will be 7 ?

1. 1 / 2
2. 1/2
3. 1/4
4. 1/6
5. 1/12

18. C, D, E, F, G, H, I, J are on line segment BK (in this order). A is a point such that AB is perpendicular to BK. Angles BAC, CAD, DAE, EAF, FAG, GAH, HAI, IAJ, and JAK have degree measures 1, 2, 3, 4, 5, 6, 7, 8, and 9, respectively. If AK has length 8, then the length of AB is

1. 7
2. 4
3. $8\sqrt{2}$
4. $4\sqrt{2}$
5. $4/\sqrt{2}$

19. Brian works 4 hours and is then joined by Phil. Together they work 4 more hours doing trim work on the rooms in a hotel. At this point, they've finished 14 rooms. The next day Phil works for 3 hours before he is jointed by Brian. After 5 more hours, they finish 18 rooms on the second day. If they both show up together on the third day, how many hours will it take to finish the remaining 20 rooms? (Answer to the nearest tenth of an hour.)

1. 6.4
2. 12.8
3. 9.2
4. 10.7
5. 7.7

20. Let $f(x)=\frac{3x-4}{2x+3}$ Which of the following is $f^{-1}(x)$ ?

1. $\frac{-3x+4}{2x-3}$
2. $\frac{3x-4}{2x-3}$
3. $\frac{3x+4}{-2x+3}$
4. $\frac{3x+4}{2x+3}$
5. $\frac{2x+3}{3x-4}$

21. Triangle XYZ has area 90. W is the midpoint of YZ. V is on WX and the ratio of lengths XV/XW = 2/3. S and T are on XY ad XZ, respectively. Segment ST is parallel to YZ and goes through V. What is the area of quadrilateral SVWY?

1. 14 2. 25/2 3. 90/7
4. 24 5. 25

22. Joe has 30 cards. For each number 1, 2, 3, …, 10 and for each color red, blue, grreen, there is a card. From Joe's deck of cards, how many pairs can be made such that the values on the cards do not match?

1. 400 2. 405 3. 800
4. 805 5. 810

23. Suppose x and y are positive integers and $x+xy+y=114$ , what is the value of $x+y$ ?

1. 23 2. 26 3. 28
4. 30 5. 36

24. What is the tens digit of $2^{2023}$ ?

1. 0 2. 4 3. 7
4. 8 5. 9

25. There are 12 steps to get to the main door of Trigos Elementary School. Javier can take 1 or 2 steps at a time. In how many ways can Javier climb the steps?

1. 200 2. 213 3. 233
4. 275 5. 302