Multiple Choice: Simplify the following expressions. You may write on this test but only the answer sheet will be graded. You must shade in the box on the answer sheet containing the letter associated with your answer. Circled answers are incorrect. The choice "none" implies that the correct answer is not given as a choice. Assume no variable will cause an expression to be undefined.

1) How many cubic inches are there in 5 cubic feet?

A) 8,640 cubic inches **B)** 60 cubic inches **C)** 720 cubic inches **D)** 100 cubic inches **E) none**

2) Simplify $\frac{12,496}{11,968}$.

A) $\frac{81}{79}$ **B)** $\frac{21}{20}$ **C)** $\frac{9}{8}$ **D)** $\frac{71}{68}$ **E) none**

3) Find the sum of the first 10 prime numbers.

A) 129 **B)** 126 **C)** 121 **D)** 130 **E) none**

4) Evaluate the sum

$$1 + 2 + 3 + \cdots + 199 + 200.$$

A) 19900 **B)** 20100 **C)** 20000 **D)** 19800 **E) none**

5) Find the difference between the mean and median of

$$18, 8, 7, 6, 20$$

A) -2.8 **B)** 8 **C)** 11.8 **D)** 3.8 **E) none**

6) Find 8% of 124 (to the nearest tenth)

A) 9.9 **B)** 9.8 **C)** 10.0 **D)** 9.7 **E) none**

7) Find the smallest positive integer divisible by four primes.

A) 220 **B)** $1,155$ **C)** 210 **D)** 30 **E) none**

8) Evaluate the sum

$$1^2 + 2^2 + 3^2 + \cdots + 11^2 + 12^2.$$

A) 600 **B)** 650 **C)** 700 **D)** 750 **E) none**

9) Calculate $f(4)$ if $f(x) = -x^2 + x^{-\frac{1}{2}}$.

A) $\frac{31}{2}$ **B)** $-\frac{31}{2}$ **C)** $\frac{36}{2}$ **D)** $-\frac{36}{2}$ **E) none**

10) Find the least common multiple (LCM) of $21, 36, 51$.

A) 756 **B)** $4,284$ **C)** $1,836$ **D)** $38,556$ **E) none**

11) Find the greatest common divisor (GCD) of 240 and 1860.

A) 60 **B)** 2 **C)** 10 **D)** 20 **E) none**

12) Assume that you breathe once every 6 seconds. How many breaths do you take in 2 weeks?

A) $181,440$ **B)** $260,480$ **C)** $201,600$ **D)** $1,209,600$ **E) none**

13) Write the repeating decimal, $0.2\overline{354}$ as a fraction in lowest terms.

A) $\frac{1,176}{4,995}$ **B)** $\frac{1,177}{5,000}$ **C)** $\frac{392}{1,665}$ **D)** $\frac{2,354}{10,000}$ **E) none**

14) A college has a student-faculty ratio of 21 to 2. If the college has 600 faculty members, how many students does it have?

A) 6,300 **B)** 6,310 **C)** 6,250 **D)** 6,200 **E) none**

15) A swimming pool is 3 feet deep, 30 feet long, and 4 feet wide. What is the area of the water's surface?

A) 360 square feet **B)** 120 square feet **C)** 90 square feet **D)** 30 square feet **E) none**

16) Successive discounts of 30% and 15% are equivalent to a single discount of

A) 15% **B)** 45% **C)** 39.5% **D)** 40.5% **E) none**

17) Evaluate $\left(\sqrt{9}^{\sqrt{3}}\right)^{\sqrt{3}}$.

A) $3\sqrt{3}$ **B)** 9 **C)** 3 **D)** $\sqrt{3}$ **E) none**

18) An initial investment of \$12,000 is invested for a year in an account that earns 4% interest, compounded semiannually. Find the amount of money in the account at the end of the year.

A) \$12,240 **B)** \$12,480 **C)** \$12,484.8 **D)** \$12,240.8 **E) none**

19) Convert 728 feet into yards. Round to the nearest thousandth (there are three feet in a yard).

A) 242.667 yards **B)** 242.666 yards **C)** 242.333 yards **D)** 241.333 yards **E) none**

20) $\dfrac{3+i}{2+i} =$

A) $\dfrac{7}{5} - \dfrac{1}{5}i$ **B)** $\dfrac{5}{2}$ **C)** $\dfrac{7}{5} + \dfrac{1}{5}i$ **D)** $-\dfrac{7}{5} + \dfrac{1}{5}i$ **E) none**

21) Simplify $-i^{2023}$

A) i **B)** i **C)** 1 **D)** -1 **E) none**

22) Simplify $\left(\frac{1}{2} + \frac{\sqrt{3}}{2}i\right)^3$

A) 1 **B)** -1 **C)** i **D)** $-i$ **E) none**

23) Simplify $\left(\frac{1}{2} + \frac{\sqrt{3}}{2}i\right)^{60}$

A) 1 **B)** -1 **C)** i **D)** $-i$ **E) none**

24) Suppose a person buys a \$4 cup of coffee three times a day, everyday of the year. Assuming there are 365 days in a year, how much money does this coffee habit cost over 30 years?

A) \$4,380 **B)** \$1,460 **C)** \$156,000 **D)** \$131,400 **E) none**

25) $\left(\dfrac{16}{81}\right)^{\frac{1}{4}} (125)^{-\frac{1}{3}}$

A) $\dfrac{10}{3}$ **B)** $\dfrac{2}{15}$ **C)** $-\dfrac{2}{5}$ **D)** $\dfrac{2}{3}$ **E) none**

26) What is the best approximation to $\sqrt{150}$?

A) 12 **B)** 12.3 **C)** 13 **D)** 12.7

27) $\dfrac{1000!}{998! \cdot 2!} =$

A) $450,000$ **B)** $900,000$ **C)** $999,000$ **D)** $499,500$ **E) none**

28) If $f(x) = \dfrac{x^2+3}{x^3-2x}$, find $f(f(-1))$.

A) $-\dfrac{19}{56}$ **B)** -4 **C)** 4 **D)** $\dfrac{19}{56}$ **E) none**

29) Find the determinant of

$$\begin{bmatrix} 2 & -3 & 0 & 5 \\ 0 & 5 & 100 & 4 \\ 0 & 0 & 9 & \pi \\ 0 & 0 & 0 & 8 \end{bmatrix}$$

A) 720 **B)** 24 **C)** 720π **D)** 0 **E) none**

30) Find the determinant of

$$\begin{bmatrix} 1 & -1 & 0 \\ 2 & -3 & 1 \\ 3 & -1 & 7 \end{bmatrix}$$

A) 9 **B)** -9 **C)** 6 **D)** -6 **E) none**

31) How many 4 person committees could be formed from a group of 10 people? Assume everyone on the committee has equal standing.

A) $10,000$ **B)** 210 **C)** $5,040$ **D)** $2,520$ **E) none**

32) Find the remainder when $x^3 + 3x^2 - 2x + 5$ is divided by $x + 2$

A) 13 **B)** 5 **C)** 2 **D)** 0 **E) none**

33) The mean of the following set of scores is 82. Find the missing score: $62, 105, 120, 75, x$

A) 96 **B)** 48 **C)** 122 **D)** 64 **E) none**

34) Calculate the sum of the first 15 positive odd integers

A) 219 **B)** 221 **C)** 225 **D)** 223 **E) none**

35) Evaluate the sum

$$1^3 + 2^3 + 3^3 + \cdots + 8^3 + 9^3.$$

A) 1950 **B)** 1975 **C)** 2000 **D)** 2025 **E) none**

36) Simplify $\left(\frac{1}{2}+\frac{3}{5}\right)^{-1}$

A) $\frac{11}{10}$ **B)** $\frac{10}{11}$ **C)** $\frac{4}{7}$ **D)** $\frac{7}{4}$ **E) none**

37) What is the remainder when 8,427,480 is divided by 6?

A) 1 **B)** 2 **C)** 3 **D)** 4 **E) none**

38) Find 37% of 984 minus 984% of 37.

A) 984 **B)** -984 **C)** 37 **D)** -37 **E) none**

39) Evaluate the sum

$$51 + 52 + \cdots + 80 + 81.$$

A) 2046 **B)** 2036 **C)** 2026 **D)** 2016 **E) none**

40) Calculate the remainder of 2^{2023} when divided by 5

A) 1 **B)** 2 **C)** 3 **D)** 4 **E) none**

Thank you for participating in the Pittsburg State Math Relays!