Factoring 4

1. Find the sum, in base 6, of $2003_4 + 2004_5$

   A. 1441 B. 4001 C. 333
   D. 225 E. NOTA

2. If the units digit in 2003^{227} = *now*, and the hundreds digit in 1980^{725} = *then*, Find *then* – *now*.

   A. -7 B. 0 C. 1
   D. 9 E. NOTA

3. Find the number of positive integral factors of 5544.

   A. 12 B. 24 C. 48
   D. 96 E. NOTA

4. Simplify $\dfrac{\left(2k^2\right)^2\left(3k^3\right)}{\left(4k^4\right)^2}$

   A. $\dfrac{3k}{4}$ B. $\dfrac{6k}{4}$ C. $3k$
   D. $\dfrac{3}{4k}$ E. NOTA

5. Simplify: $\dfrac{1}{1-\dfrac{1}{1+x}} - \dfrac{1+x}{\dfrac{1}{1-x}-1}$

   A. $1+x$ B. $\dfrac{1}{1-x}$ C. x^2+x
   D. $\dfrac{-x^2+x+2}{x}$ E. NOTA

6. Change 324 to an equivalent base 5 number

   A. 324 B. 2200 C. 2244
   D. 2424 E. NOTA

7. The number of subsets of $\{0,2,3,5\}$ is

   A. 4 B. 8 C. 16
   D. 0 E. NOTA

8. Find the sum of all prime divisors of 1988.

   A. 80 B. 82 C. 83
   D. 501 E. NOTA

9. Compute the number of integral factors of 7!

A. 6 B. 7 C. 60
D. 5040 E. NOTA

10. Evaluate $6^2 \div 3 \cdot 4 - \left(5^2 \cdot 2^3\right) + 48 - 24 \div 6 \cdot 2 + 48 \div 6$

A. 120 B. 104 C. -104
D. -120 E. NOTA

11 Convert 123_4 to base 10

A. 113 B. 108 C. 27
D. 22 E. NOTA

12 Simplify $\left(x^{\frac{3}{5}}\right)^3 \left(x^{-\frac{2}{9}}\right) x$ for $x > 0$.

A. $\sqrt[116]{x^{45}}$ B. $\sqrt[118]{x^{45}}$ C. $\sqrt[45]{x^{118}}$
D. $\frac{1}{\sqrt[116]{x^{45}}}$ E. NOTA

13 When the decimal number 25^{52} is written in base 12, what is the units digit?

A. 1 B. 5 C. 7
D. 9 E. NOTA

14 Simplify $\frac{x^7 y^{12} z^{15}}{x^{10} y^7 z^{16}}$

A. $x^3 y^5 z$ B. $x^{-3} y^{-5} z^{-1}$ C. $x^3 y^{-5} z$
D. $x^{-3} y^5 z^{-1}$ E. NOTA

15. What is the prime factorization of 4320?

A. $2^5 3^2 5$ B. $2^5 3^2 5^2$ C. $2^5 3^3 5$
D. $2^5 3^5 5$ E. NOTA

16 What is the least common multiple of 5, 24, and 32?

A. 480 B. 768 C. 1048
D. 3840 E. NOTA

17 Simplify: $10^2 \left[\left(\frac{10-(-5)}{5}\right)^2 \div \left(\frac{14}{7}\right)\right]$

A. -450 B. -50 C. 50
D. 450 E. NOTA

18. What is the units digit of $825^{824} - 827^{824} - 823^{824}$?

A. 2 B. 3 C. 5
D. 6 E. NOTA

19. How many zeros are at the end of 32!

A. 3 B. 6 C. 7
D. 9 E. NOTA

Short Answer

20 Simplify the following and express as one fraction with positive exponents. Assume $x, y, z \neq 0$

$$\left(\frac{3x^5y}{2xy^4}\right)^{-4} 3\cdot\left(\frac{4x^{-5}yz^5}{5xy^7z^{-4}}\right)\div\left(\frac{3xyz}{4x^{-5}z^5}\right)^{-3}$$

21 Determine the value of x if $3^{2x+5} = \frac{\sqrt{3}}{27}$

22 If Set A is $\{3,5,7,9,11\}$ and Set B is $\{6,7,8,9,10\}$, how many elements are in the union of A and B?

23 How many prime numbers are there between 120 and 140?

24 What is the prime factorization of 1092?

25 What is the greatest common factor of 28 and 146?

26. What is the least common multiple of 28 and 246?

27. Express 132_8 as a base 2 number.

28.

a If $A = 2^4 3^3 5^5 7^2$, how many integral factors does A have?

b How many even factors does A have?

c How many factors does A have that end in two zeros?

d How many factors does A have that end in 5?

e How many factors does A have that are multiples of 3?

f In how many zeros does A end?

g. What is the quotient when A is divided by 315000?

29. Which of the digits 1, 3, 5, 7, 9 is not the unit's digit of a power of 3?

30 If x and y are positive integers, and $2003x = 2004y$, what is the least possible value of x?

31. What are both nonzero integers x which satisfy $\left(x^2\right)\left(x^0\right)\left(x^0\right)\left(x^3\right) = x^{2003}$?

32 If n is a positive integer, what is the largest possible value of

$$\frac{1}{n^2} + \frac{1}{(n+1)^2} + \frac{1}{(n+2)^2}$$