12. The equation $a^6 + b^2 + c^2 = 2009$ has a solution in positive integers a, b, and c in which exactly two of a, b, and c are powers of 2. Find $a + b + c$.

A. 43 B. 45 C. 47 D. 49 E. 51

13. ACME Widget employees are paid every other Friday (i. e., on Fridays in alternate weeks). The year 2008 was unusual in that ACME had 3 paydays in February. What is the units digit of the next year in which ACME has 3 February paydays?

A. 0 B. 2 C. 4 D. 6 E. 8

14. Five murder suspects, including the murderer, are being interrogated by the police. Results of a polygraph indicate two of them are lying and three are telling the truth. If the polygraph results are correct, who is the murder?

Suspect A: "D is the murderer" Suspect B: "I am innocent" Suspect C: "It wasn't E"
Suspect D: "A is lying" Suspect E: "B is telling the truth"

A. A B. B C. C D. D E. E

15. Two arithmetic sequences are multiplied together to produce the sequence 468, 462, 384, ... What is the next term of this sequence?

A. 250 B. 286 C. 300 D. 324 E. 336

16. In ΔABC, $AB = 5$, $BC = 9$, and $AC = 7$. Find the value of $\dfrac{\tan\frac{A-B}{2}}{\tan\frac{A+B}{2}}$.

A. $\frac{1}{8}$ B. $\frac{7}{9}$ C. $\frac{3}{2}$ D. $\frac{9}{7}$ E. 8

17. A pyramid has a square base 6 m on a side and a height of 9 m. Find the volume of the portion of the pyramid which lies above the base and below a plane parallel to the base and 3 m above the base.

A. 32 m^3 B. 36 m^3 C. 64 m^3 D. 72 m^3 E. 76 m^3

18. In ΔABC, $AB = AC$ and in ΔDEF, $DE = DF$. If AB is twice DE and $\angle D$ is twice $\angle A$, then the ratio of the area of ΔABC to the area of ΔDEF is:

A. tan A B. 2 sec A C. csc $2A$ D. sec A tan A E. cot $2A$

19. In hexagon $PQRSTU$, all interior angles = 120°. If $PQ = RS = TU = 50$, and $QR = ST = UP = 100$, find the area of the triangle bounded by QT, RU, and PS to the nearest tenth.

A. 1082.5 B. 1082.9 C. 1083.3 D. 1083.5 E. 1083.9

20. For all integers $k \geq 0$, $P(k) = \left(2^2 + 2^1 + 1\right)\left(2^2 - 2^1 + 1\right)\left(2^4 - 2^2 + 1\right)\cdots\left(2^{2^{k+1}} - 2^{2^k} + 1\right) - 1$ is always the product of two integers n and $n + 1$. Find the smallest value of k for which $n + (n + 1) \geq 10^{1000}$.

A. 9 B. 10 C. 11 D. 12 E. 13