2002

Questions with Multiple Choices

1. We have $2 \div (-\frac{1}{2})2 + (-2)^3 = 2 \div \frac{1}{4} - 8 = 0$. **Answer: (b)**

2. Note that 49^1 ends in 49, 49^2 ends in 01, 49^3 ends in 49, and so on. Since 2001 is odd, 49^{2001} ends in 49. **Answer: (b)**

3. The sum is equal to $7 \times 7^7 = 7^8$. **Answer: (b)**

4. There are 6 possible positions for the lone 3. After it is fixed, there are $\frac{5\times4}{2} = 10$ possible positions for the pair of 2's. The remaining positions are filled with 1's. Hence there are $6 \times 10 = 60$ such numbers. **Answer: (c)**

5. The largest number entered must be close to twice $35\frac{5}{7}$ and be 1 more than a multiple of 7. Hence it must be 71. The sum of the first 71 positive integer is $\frac{71\times72}{2} = 2556$. The sum of the 70 numbers actually entered is $35\frac{5}{7} \times 70 = 2500$. It follows that the number left out is $2556 - 2500 = 56$. **Answer: (c)**

6. We have $3 \oplus (2 \otimes 4) = 3 \oplus (2^2 + 4^2 - 2 \times 4) = 3 \oplus 12 = 3 + 12 + 3 \times 12 - 1 = 50$. **Answer: (d)**

7. If the old price is 1, then the new one is $(1 + \frac{r}{100})(1 - \frac{r}{100}) = 1 - \frac{r^2}{10000}$. **Answer: (d)**

8. Each day, the goat eats $\frac{1}{x}$ of the cabbage while the rabbit eats $\frac{1}{y}$. Hence the number of days the cabbage will last is $1 \div (\frac{1}{x} + \frac{1}{y}) = \frac{xy}{x+y}$. **Answer: (c)**

9. Let the present ages of Ace and Bea be x and y respectively. When Ace was y years old, Bea was $y - (x - y) = 10$ years old. When Bea is x years old, Ace will be $x + (x - y) = 25$ years old. Subtracting the first equation from the second, we have $3(x - y) = 15$, so that Ace is 5 years older than Bea. **Answer: (a)**

10. We have $(\frac{2}{x} + x)^2 = \frac{4}{x^2} + 4 + x^2 = (\frac{2}{x} - x)^2 + 8 = 9$ so that $\frac{2}{x} + x = 3$. **Answer: (d)**

11. Since the two sides differ by 5 and the perimeter is odd, the third side must be even and greater than 5. Hence its smallest possible value is 6. **Answer: (b)**

12. Any set of three lines through the centre of the hexagon forming six 60° angles there will divide the hexagon into three identical pieces. **Answer: (d)**

13. The sum of the angles of an n-sided polygon is $(n - 2)180°$. When 2001 is divided by 180, the quotient is 11 and the remainder is 21. Hence the largest possible value of n is 11+2=13. **Answer (c)**

14. The circle with centre F and radius AF will pass through B since $AF = FB$, and also through E since $\angle BEA = 90°$. Hence $BF = EF = BE$ so that BEF is an equilateral triangle. Now $\angle CAB = 90° - \angle ABE = 30°$ and $\angle BCA = \frac{1}{2}(180° - \angle CAB) = 75°$. bf Answer: (c)

15. Let E be the midpoint of AD. Then $AE = 3$. Since $AC = CD$, AD is perpendicular to CE. By Pythagoras' Theorem, $CE = \sqrt{AC^2 - AE^2} = 4$. The area of triangle CAD is $\frac{1}{2}AD \cdot CE = 12$. Since $BD = 2CD$, the area of triangle BAD is twice that of triangle CAD. It follows that the area of triangle ABC is $3 \times 12 = 36$. **Answer: (b)**