# St John Baptist De La Salle Catholic School

Mathematics Olympiad

Grade 9

March, 2023

1. $\dfrac{1}{\sqrt{2}+\sqrt{3}-1}$ is equal to

   A. $\dfrac{\sqrt{2}-\sqrt{3}+1}{2}$ B. $\dfrac{2\sqrt{2}}{4}-\dfrac{1}{3}-\dfrac{1}{2}$ C. $\dfrac{2\sqrt{3}}{4}-\dfrac{1}{\sqrt{2}}-\dfrac{1}{2}$ D. $\dfrac{\sqrt{2}}{2}-\dfrac{2\sqrt{3}}{2}-\dfrac{1}{2}$

2. $\dfrac{\sqrt{-5-2\sqrt{6}}\cdot\sqrt{5+2\sqrt{6}}}{\sqrt[3]{-125}}$ is equal to

   A. $\dfrac{-1}{5}$ B. $\dfrac{\sqrt{13}}{5}$ C. $-\dfrac{\sqrt{13}}{5}$ D. $\dfrac{1}{5}$

3. Which of the following functions has exactly one zero?
   A. $F(x)=-(x+5)^2$ B. $F(x)=x^2-1$ C. $(x-3)^2+1$ D. $F(x)=x^2+4$

4. A manufacturer estimated that the total cost( in **ETB**) of operating a factory is given by the function $C(x)=0.5x^2-20x+500$. What is the minimum possible cost of operating the factory?
   A. 4600 Birr B. 4800 Birr C. 5200 Birr D. 5000 Birr

5. Given three sets $A, B, C$ and a universal set $U$, which one of the following is true about these sets?
   A. $A\subseteq A\cap B$ B. $A\cap U=U$ C. $A\cap(B\cap C)=(A\cap B)\cap C$ D. $A\cap(B\cap C)'=(A\cap B')\cap C'$

6. Let $x, y,$ and $z$ be real numbers such that

   - $3x+y=1$
   - $3y+z=\frac{1}{2}$
   - $3z+x=-\frac{1}{2}$

   What is the value of $x+y+z$?
   A. 1 B. $\dfrac{1}{2}$ C. $\dfrac{1}{4}$ D. $\dfrac{1}{3}$ E. 0

7. Suppose $a$ satisfies the equation $4=a+a^{-2}$. What is the value of $a^4+a^{-4}$?
   A. 164 B. 172 C. 192 D. 212

8. What is the greatest common factor of $(b, r)$ if $a=9\times b+r$ and the greatest common factor of $(a, b)$ and $(a, r)$ is 2 and 3 respectively?

9. What is the smallest number that leaves a remainder of 25 when divided by 35 and remainder of 45 when divided by 45?

10. The simplified expression of $\dfrac{1+\sqrt{2}}{\sqrt{2}-1}$