Mathletics Contest 2015 Integrated Mathematics II Released Items

1. Which of the following are zeros of the function $f(x) = x^2 + 3x + 5$

   (a) $\dfrac{-3 \pm \sqrt{11}}{2}$ (b) $\dfrac{-3 \pm i\sqrt{11}}{2}$ (c) $\dfrac{3 \pm i\sqrt{11}}{2}$ (d) $\dfrac{3 \pm \sqrt{11}}{2}$

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2. Which of the following is a possible simplification of $\dfrac{2}{1+i}$?

   (a) $1 - i$ (b) $\dfrac{1+i}{2}$ (c) $1 + i$ (d) $\dfrac{1-i}{2}$

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3. If $f(x) = x^{5/3}$, then $f(4) =$ _____ .

   (a) $8\sqrt[3]{2}$ (b) $\sqrt[5]{4^3}$ (c) $\sqrt[5]{64}$ (d) $64\sqrt[3]{16}$

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4. Which of the following equations is true for all rational number values of x, y, and z?

   (a) $x(y+z) = (y+z)x$ (b) $x(y+z) = (x+y)z$
   (c) $x(y+z) = xy + z$ (d) $x(y+z) = (xy)(xz)$

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5. A geometric sequence with a missing term is shown below.

   $$\frac{2}{25},\ \frac{2}{5},\ \underline{?},\ 10,\ 50, \ldots$$

   What is the missing term in the sequence?

   (a) $\dfrac{1}{5}$ (b) $\dfrac{1}{2}$ (c) 2 (d) 5

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6. At a craft shop, paint is sold in jars in the shape of right circular cylinders. A jar of black paint has half the radius and double the height of a jar of yellow paint.

   Which of the following statements correctly compares the volumes of the jars of paint?

   (a) The jar of yellow paint has 2 times the volume of the jar of black paint.
   (b) The jar of yellow paint has 4 times the volume of the jar of black paint.
   (c) The jar of yellow paint has 8 times the volume of the jar of black paint.
   (d) The jar of yellow paint has the same volume as the jar of black paint.

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7. In the equation below, k and m represent rational numbers.

$$km = 1$$

   Which of the following **must** be true?

   (a) either k or m is equal to 1
   (b) k and m are both less than 0
   (c) k is the multiplicative inverse of m
   (d) k and m are both the same distance from 0 on a number line

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8. What is the value of the expression below?

$$240 \div (4-6)^3 \cdot 5$$

   (a) -200 (b) -150 (c) -8 (d) -6

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9. Which number can be used in to fill in the blank of $f(x) = x^2 - 22x +$____ to make a perfect square trinomial?

   (a) -121 (b) -11 (c) 11 (d) 121

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10. The recursive function $f(0) = 1$,$f(x) = f(x-1) + 2x$ represents

    (a) a linear function (b) a geometric function
    (c) an exponential function (d) a quadratic function
