2018 Metrobank-MTAP-DepEd Math Challenge
Division Round
Grade 8

15-Second Questions [2 points each]

1. If $9^x = \dfrac{3^{x-1}}{2^{x+1}}$, find x. $[-1]$
2. Solve for x in the equation $|2x - 1| = 5$. $[x = -2 \text{ or } x = 3]$
3. A computer screensaver displays a circle with radius 3 cm and enlarges it. What is the radius of the enlarged circle if its area is four times the original? [6 cm]
4. Factor completely: $6x^3 + x^2 - 12x$ $[x(2x + 3)(3x - 4)]$
5. Find the solution set of the inequality $\frac{3}{2}x < 2x + \frac{5}{4}$ and write it in interval notation. $[(-\frac{5}{2}, +\infty)]$
6. If $f(x) = x - x^2$ find $f(1 - x)$. $[x - x^2]$
7. Write $\dfrac{4x^2}{x^2 - 1} - \dfrac{2x}{x - 1}$ as a single fraction in lowest terms. $\left[\dfrac{2x}{x + 1}\right]$
8. Find c such that the line $9x + 8y + 4c = 0$ passes through the point $(4, -7)$. [5]
9. In a game show, the winner spins a wheel to determine his prize. The prize wheel is divided into 4 equal wedges that are labelled Php 10,000, Php 15,000, Php 20,000 and Php 30,000. What is the probability that after spinning the wheel once, the winner gets at least 20,000 pesos? $[\frac{1}{2}]$
10. In an isosceles right triangle, the length of each leg is 2 cm. What is the length of the altitude to the hypotenuse of the triangle? $[\sqrt{2} \text{ cm}]$
11. What is the slope of the line if its x-intercept is 6 and its y-intercept is $\frac{2}{3}$? $[-\frac{1}{9}]$

30-Second Questions [3 points each]

1. Write the expression $\left(\dfrac{x^{-1}y^{-1}}{x^{-1} + y^{-1}}\right)^{-1}$ in lowest terms with only positive exponents. $[x + y]$
2. Divide $\sqrt{6} + \sqrt{3}$ by $\sqrt{6} - \sqrt{3}$ and express the quotient in simplest form. $[3 + 2\sqrt{2}]$
3. Write an equation of the line that is parallel to the line $3x - 2y + 8 = 0$ and which passes through the point $(-5, 7)$. $[3x - 2y + 29 = 0]$
4. Factor completely: $(x + 3y)(x + 3y - 3) + 2$ $[(x + 3y - 2)(x + 3y - 1)]$
5. In how many ways can a 4-digit PIN be formed if the first digit cannot be zero and the last digit cannot be the same as the first digit? [8100]
6. A tech company employs full time and part time call center agents. Let F be the number of full time agents and let P be the number of part time agents that the company employs at any given time. From the volume of calls received daily by the company and the average handle time of the agents, F and P must satisfy the inequality $7F + 5.5P \leq 753$. If the company employs 65 full time agents, how many part time agents at most can the company hire? [54]

1-Minute Questions [5 points each]

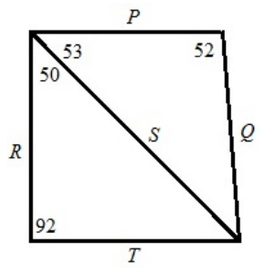
1. A number x is 20% more than y, and a number z is 25% more than x. How many percent more than y is z? [50%]

2. The sum of 2^x and its reciprocal is b. What is the sum of 4^x and its reciprocal in terms of b? [$b^2 - 2$]

3. A car and a bus approach the same intersection from roads that are perpendicular. If the car averages 80 kph and the bus 60 kph, what is the distance between the car and the bus 3 minutes after they cross the intersection? [5 km]

4. A function f is defined on the set of positive integers as follows: $f(1) = 1$, and for all integers $n \geq 2$, $f(n) = f(n-1) + n - 1$. Find $f(5)$. [11]

5. In the figure, angles and sides have measures as indicated but are not drawn to scale. Arrange P, Q, R, S, T in increasing order. [R, T, S, Q, P]



6. Concentric circles are drawn on a circular dartboard such that the diameter of the inner bullseye is 1 inch and the diameter of the outer bull is 3 inches. A dart thrown at the dartboard always lands inside the board and every location on the board is equally likely to be hit by the dart. If the diameter of the dartboard is 18 inches, what is the probability that a dart thrown at the board misses the inner bullseye but lands inside the outer bull? [$\frac{2}{81}$]

Clincher Questions

1. Find the solution set of the equation $2|x| = x - 1$. [empty set]

2. If $4^y = 16(2^{2x})$ and $x + y = 4$ what is the value of 4^{xy}? [64]

3. Find the range of values of the function $f(x) = \dfrac{3x+1}{x+2}$ if the domain is restricted to $x \geq 0$. Write your answer in interval notation. [$[\frac{1}{2}, 3)$]

Do or Die Question

Find the solution set of the inequality $2 - 7x \leq 2x + 5 \leq 3 - 4x$. [$\{-\frac{1}{3}\}$]