NAM DINH DEPARTMENT OF EDUCATION AND TRAINING

OFFICIAL

CONTEST OF MATH AND SCIENCE IN ENGLISH
School year: 2020 - 2021
Subject: MATH - Grade 10
Time allowed: 90 minutes

CODE: 201

I. PART I. MULTIPLE CHOICE QUESTIONS (7,0 points)

Write the correct answer (A, B, C or D) for each of the following questions in the correspondingly numbered space on your answer sheet.

Question 1. Given three distinct points A, B and C. Which of the following statements is **true?**

A. $\overrightarrow{CA}-\overrightarrow{AB}=\overrightarrow{CB}$. **B.** $\overrightarrow{AB}+\overrightarrow{CA}=-\overrightarrow{BC}$. **C.** $\overrightarrow{BA}+\overrightarrow{AC}=\overrightarrow{CB}$. **D.** $\overrightarrow{BA}-\overrightarrow{BC}=\overrightarrow{AC}$.

Question 2. In the Oxy coordinate plane, given ΔABC with $A(-1;-4)$, $B(6;7)$ and $C(-2;9)$. Let G be the centroid of ΔABC. The coordinates of G are

A. $G(1;4)$. **B.** $G(-1;4)$. **C.** $G(1;-4)$. **D.** $G(3;12)$.

Question 3. Given a right triangle ABC at A. Which of the following statements is **false?**

A. $\overrightarrow{AB}.\overrightarrow{AC}<\overrightarrow{BA}.\overrightarrow{BC}$. **B.** $\overrightarrow{AC}.\overrightarrow{BC}<\overrightarrow{BC}.\overrightarrow{AB}$. **C.** $\overrightarrow{AB}.\overrightarrow{BC}<\overrightarrow{CA}.\overrightarrow{CB}$. **D.** $\overrightarrow{AC}.\overrightarrow{CB}<\overrightarrow{AC}.\overrightarrow{BC}$.

Question 4. Given $A=\{1;2;3;4\}$. How many subsets does the set A have?

A. 18. **B.** 16. **C.** 15. **D.** 14.

Question 5. Given equation $(x^2-x+1)(x-1)(x+1)=0$. Which of the following equations is equivalent to the given equation?

A. $x+1=0$. **B.** $x-1=0$. **C.** $x^2-x+1=0$. **D.** $(x-1)(x+1)=0$.

Question 6. Find all values of m such that function $y=(m-1)x+2021$ is decreasing on its domain.

A. $m>1$. **B.** $m\geq 1$. **C.** $m\leq 1$. **D.** $m<1$.

Question 7. Let a,b,c be three positive real numbers satisfying $a+b+c=3$. Determine the maximum value of $T=\sqrt{ab}+\sqrt{bc}+\sqrt{ca}$.

A. 3. **B.** 4. **C.** 2. **D.** 6.

Question 8. Given the fact that the system of equations $\begin{cases} x^3(2+3y)=8 \\ (y^3-2)x=6 \end{cases}$ has exactly two distinct solutions $(x_1,y_1);(x_2,y_2)$. The value of $S=x_1^4+y_1^4+x_2^4+y_2^4$ is

A. 34. **B.** 40. **C.** 28. **D.** 36.

Question 9. Find all parameters m such that equation $x^2+(m-1)x+m^2-1=0$ has two distinct roots and these roots have the same sign.

A. $m<-1$ or $m>1$. **B.** $1<m<\frac{5}{3}$. **C.** $-1<m<1$. **D.** $\frac{-5}{3}<m<-1$.

Question 10. Given two equations $mx^2-2(m-1)x+m-2=0$ and $(m-2)x^2-3x+m^2-15=0$. How many values of m which make these above equations equivalent?

A. 2. **B.** 3. **C.** 0. **D.** 1.

Question 11. Given ΔABC with $AB=13$, $BC=2\sqrt{33}$, $CA=17$. Compute the length of the median AM of ΔABC.

A. $AM=2\sqrt{35}$. **B.** $AM=15$. **C.** $AM=\sqrt{194}$. **D.** $AM=14$.

Question 12. A ball is thrown straight up from 60 meters above the ground with a velocity of 20 meters per second (20 m/s). The height of the ball at second t after throwing can be computed by the quadratic function $s(t) = -5t^2 + 20t + 60$, where $s(t)$ is in meters. After how many seconds does the ball hit the ground?

A. $t=2$. **B.** $t=1$. **C.** $t=4$. **D.** $t=6$.

Question 13. Given ΔABC with the sides $AC = 3\sqrt{3},$ side $BC = 3\sqrt{2}$, $A = 45^0$ and $B > A + C$. Compute the degree measure of $\widehat{ABC}$.

A. $\widehat{ABC} = 60^0$. **B.** $\widehat{ABC} = 150^0$. **C.** $\widehat{ABC} = 30^0$. **D.** $\widehat{ABC} = 120^0$.

Question 14. In the Oxy coordinate plane, given Parabol $(P): y = x^2 - 5x + 2m.$ Let S be the set of all values of m such that the Parabol (P) cuts Ox at two distinct points A, B satisfying $OA = 4OB.$ Determine the sum of all elements of S.

A. $\frac{2}{9}$. **B.** $\frac{-32}{9}$. **C.** 2. **D.** $\frac{-16}{9}$.

Question 15. Which of the following two inequations are **not** equivalent?

A. $2x - 1 > 0$ and $2x - 1 + \frac{1}{2x^2+1} > \frac{1}{2x^2+1}$. **B.** $-2x + 1 > 0$ and $2x - 1 < 0$.

C. $3x^2 + 1 \le 2x - 1$ and $3x^2 - 2x + 2 \le 0$. **D.** $5x - 1 + \frac{1}{x-2} > \frac{1}{x-2}$ and $5x - 1 > 0$.

Question 16. Given an isosceles right triangle ABC with sides $AB = AC = 42\,cm.$ Two medians BE and CF intersect at point $G.$ The area of the triangle GEC is

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A. $C(2\sqrt{6}; -4)$ or $C(-2\sqrt{6}; -4)$. **B.** $C(-4; 24)$ or $C(-4; -24)$.

C. $C(-4; -2\sqrt{6})$ or $C(-4; 2\sqrt{6})$. **D.** $C(24; -4)$ or $C(-24; -4)$.

Question 20. In the Oxy coordinate plane, let M be the vertex of Parabol $y = ax^2 + bx + c\,(a \ne 0).$ The coordinates of M are

A. $\left(\frac{b}{2a}; \frac{4ac-b^2}{4a}\right)$. **B.** $\left(\frac{-b}{4a}; \frac{4ac-b^2}{4a}\right)$. **C.** $\left(\frac{-b}{2a}; \frac{b^2-4ac}{4a}\right)$. **D.** $\left(\frac{-b}{2a}; \frac{4ac-b^2}{4a}\right)$.

Question 21. In the Oxy coordinate plane, given $A(1; -3)$ and $B(-5; 4)$. The coordinates of vector $\overrightarrow{BA}$ are

A. $\overrightarrow{BA} = (6; 7)$ **B.** $\overrightarrow{BA} = (6; -7)$. **C.** $\overrightarrow{BA} = (-4; 1)$. **D.** $\overrightarrow{BA} = (-6; 7)$.

Question 22. Among the following propostions, whose inverse proposition is **true**?

A. If a triangle is not regular then it has at least one interior angle less than 60 degrees.

B. If two triangles are congruent then their corresponding angles are equal.

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Question 23. Given ΔABC. Let M and N be the mid-points of sides AB and AC, respectively. Find the scalars m and n such that $\overrightarrow{NM} = m\overrightarrow{AB} - n\overrightarrow{AC}.$

A. $m = -\frac{1}{2},\ n = \frac{1}{2}.$ **B.** $m = -\frac{1}{2},\ n = -\frac{1}{2}.$ **C.** $m = \frac{1}{2},\ n = \frac{1}{2}.$ **D.** $m = \frac{1}{2},\ n = -\frac{1}{2}.$

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A. Two vectors $\vec{a}$ and $\vec{b}$ with opposite direction to another nonzero vector are parallel.

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Question 25. The domain of the function $y = \frac{2}{\sqrt{6-2x}}$ is

A. $D = (-\infty;3].$ **B.** $D = (-\infty;3).$ **C.** $D = (3;+\infty).$ **D.** $D = \mathbb{R}\setminus\{3\}.$

Question 26. In the Oxy coordinate plane, given ΔABC. Points $M(-2;3)$, $N(4;-1)$, $P(1;1)$ are the mid-points of sides BC, CA and AB, respectively. The coordinates of vertex A are

A. $A(-10;0).$ **B.** $A(7;-3).$ **C.** $A(-7;3).$ **D.** $A(10;0).$

Question 27. Which of the following sentences is **not** a proposition?

A. Five divides twenty. **B.** If "$3+x=4$" then "$x=1$".

C. If "1+2 = 7" then "7 is an odd number". **D.** What a nice day!

Question 28. In the Oxy coordinate plane, let $A(-3;-5); B(2;5).$ Determine the slope of line $AB.$

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Question 30. Given an isosceles triangle ABC with the right angle A, inscribed in a circle with center O and radius R. Let r be the radius of the incircle of triangle $ABC.$ The ratio of R to r is

A. $\frac{R}{r} = \frac{1+\sqrt{2}}{2}.$ **B.** $\frac{R}{r} = 1+\sqrt{2}.$ **C.** $\frac{R}{r} = \frac{2+\sqrt{2}}{2}.$ **D.** $\frac{R}{r} = \frac{\sqrt{2}-1}{2}.$

Question 31. A man travels from city X to city Y by train, then returns to city Y by his car. Given that the distance between these two cities is 200 km and the average speed of his car is 10 km/h faster than the train's average speed. His journey takes 9 hours, find the sum of average speeds of the train and his car.

A. 90. **B.** 80. **C.** 60. **D.** 100.

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A. $a^2 > b^2.$ **B.** $-2020a > -2020b.$ **C.** $2021a > 2021b.$ **D.** $\frac{1}{a} > \frac{1}{b}.$

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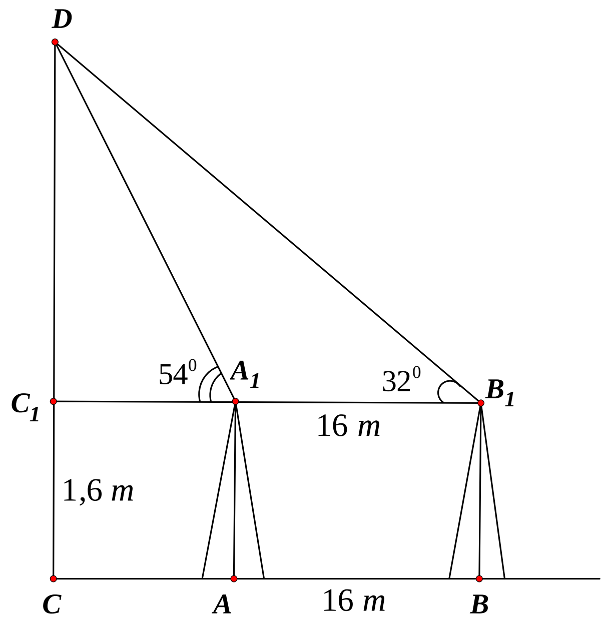
To measure the height of the Cham temple tower Po Klong Garai in Ninh Thuan province (Figure 1), two points A and B which are chosen on the ground with the length $AB = 16m$ and the bottom C of the tower are collinear (Figure 2). Two total stations whose tripods have a height $h = 1,6m$ are put at point A and point B. Let D be the top of the tower and two points A_1, B_1 be collinear to C_1 on height CD of the tower. The measurements are $\widehat{DA_1C_1} = 54^0$ and $\widehat{DB_1C_1} = 32^0$. Caculate the height CD of the tower then round the result to 3 decimal places.

Figure 1



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Student's full name: ……………………………… Student's ID: ………………………………………

First observer's name and signature: …………… Second observer's name and signature: …………..

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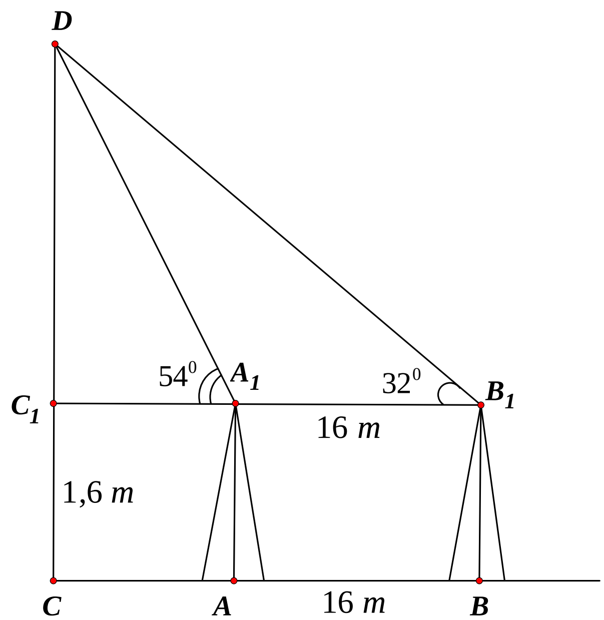

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The sum of 2025 consecutive positive integers is a perfect square. Find the minimum value of the largest of these integers?

----------- THE END ----------

Student's full name: ……………………………… Student's ID: ………………………………………

First observer's name and signature: …………… Second observer's name and signature: …………..