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: 203

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

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

Question 2. Given two sets $X = \{A;1;2;4;6\}$, $Y = \{3;7;4;\varnothing\}$, the union of X and Y is

A. $\{1;2;3;4;5;6;7\}$. **B.** $\{1;2;3;4;6;7\}$. **C.** $\{A;1;2;3;4;6;7;\varnothing\}$. **D.** $\{A;1;2;3;4;6;7\}$.

Question 3. In the Oxy coordinate plane, given $A(2;-6)$. Let B be the point which is symmetric to point A with respect to the origin O. Find the coordinates of point C satisfying that its horizontal coordinate equals -4 and ΔABC has the right angle at C.

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

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

Question 4. Among the following propostions, whose inverse proposition is **true**?

A. If a quadrilateral is an isosceles trapezoid then its two diagonals have the same length.
B. If two triangles are congruent then their corresponding angles are equal.
C. If n is a natural number then n is a real number.
D. If a triangle is not regular then it has at least one interior angle less than 60 degrees.

Question 5. Given two non-zero vectors $\vec{a}$ and $\vec{b}$. Which of the following statements is **false?**

A. Two vectors $\vec{a}$ and $\vec{b}$ with opposite direction to another nonzero vector are parallel.
B. Two vectors $\vec{a}$ and $-3\vec{a}$ have the same direction.
C. Two vectors $\vec{a}$ and $k\vec{a}$ are parallel.
D. Two vectors $\vec{a}$ and $\vec{b}$ with the same direction are parallel.

Question 6. 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.** 6. **C.** 4. **D.** 2.

Question 7. 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. $\frac{R}{r} = 1+\sqrt{2}$. **B.** $\frac{R}{r} = \frac{2+\sqrt{2}}{2}$. **C.** $\frac{R}{r} = \frac{1+\sqrt{2}}{2}$. **D.** $\frac{R}{r} = \frac{\sqrt{2}-1}{2}$.

Question 8. Given a right triangle ABC at A. Which of the following statements is **false?**

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

Question 9. 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. $t=1$. **B.** $t=4$. **C.** $t=6$. **D.** $t=2$.

Question 10. 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. $-1<m<1$. **B.** $\frac{-5}{3}<m<-1$. **C.** $m<-1$ or $m>1$. **D.** $1<m<\frac{5}{3}$.

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A. -3. **B.** 5. **C.** 2. **D.** -5.

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

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Question 15. Given rectangle $ABCD$ with $AD=2$. Suppose that E is the point which lies on the side AB such that $AE=2BE$ and $\sin\widehat{BDE}=\frac{1}{5}$. Compute the length of the segment AB.

A. $AB=\sqrt{3}$. **B.** $AB=3\sqrt{3}$. **C.** $AB=2\sqrt{2}$. **D.** $AB=\sqrt{6}$.

Question 16. Given ΔABC with $AB=13$, $BC=2\sqrt{33}$, $CA=17$. Compute the length of the median AM of ΔABC.

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

Question 17. Given equation $(x^2-x+1)(x-1)(x+1)=0$. Which of the following equations is equivalent to the given equation?

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Question 19. 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.** $m=-\frac{1}{2}, n=\frac{1}{2}$.

Question 20. 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. Fourteen is a prime number. **B.** Fourteen has only two factors 1 and 14.

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

Question 25. 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.** $\widehat{ABC}=120^0$. **C.** $\widehat{ABC}=150^0$. **D.** $\widehat{ABC}=30^0$.

Question 26. 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. 0. **B.** 3. **C.** 1. **D.** 2.

Question 27. 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. 60. **B.** 80. **C.** 100. **D.** 90.

Question 28. Given $A=\{1;2;3;4\}$. How many subsets does the set A have?

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

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Question 33. Which of the following sentences is **not** a proposition?

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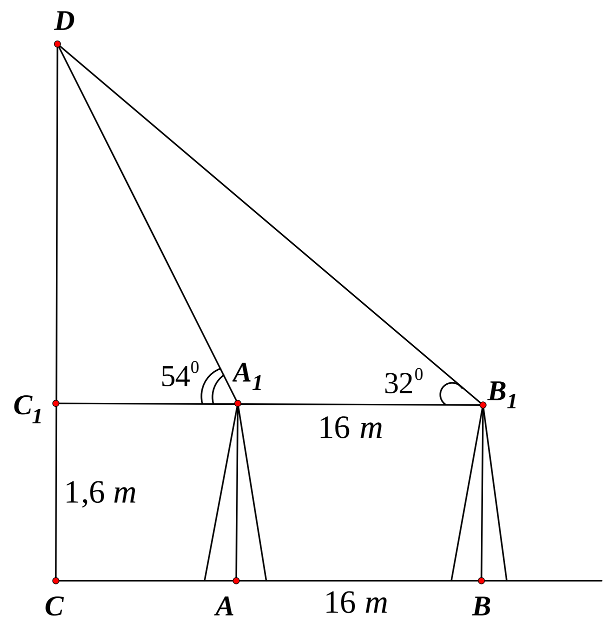
Write the solutions to the following problems in the provided space on your answer sheet.

Problem 1. (1,0 point)

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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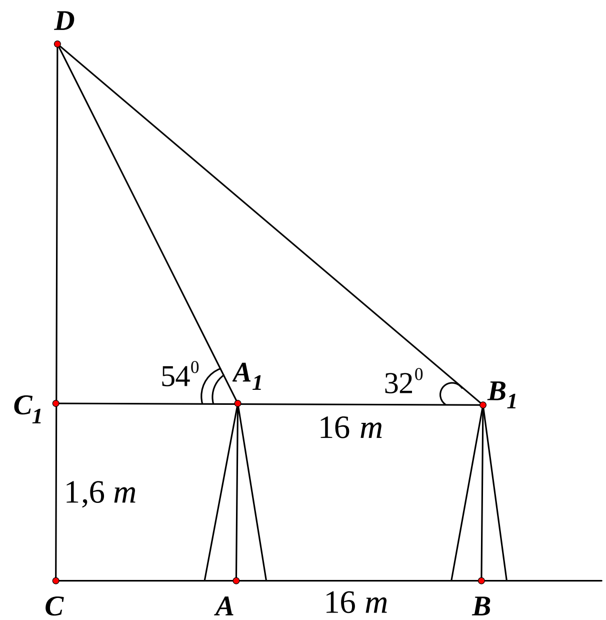

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