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SPECIFIC WAYS TO IMPROVE MATHEMATICAL LITERACY IN THE PROCESS OF SENDING STUDENTS TO HINGER EDUCATION

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ABSTRACT

This article describes specific and convenient ways for entrants to solve math assignments in higher education entrance exams.

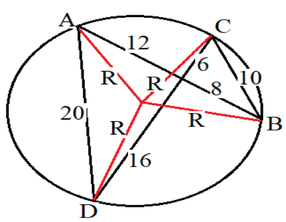
KEYWORDS: *Mathematical Ability, Mathematical Literacy, Problem, Perpendicular, Intersection, Mathematical Forms, Theorem, Polynomial, Equation, Inequality.*

INTRODUCTION

Today, the capacity building of knowledge, skills and abilities in the preparation of students for higher education institutions requires adequate training. To do this, we need to pay more attention to solving complex examples and problems in tests, which is important for the work to be effective.

Below are comments on solving some examples that have raised many questions by applicants.

1 -Problem. The two vertices of a circle are perpendicular to each other, and one of them divides from the point of intersection into 8 and 12 pieces, and the other into 6 and 16 pieces. Find the radius of this circle.

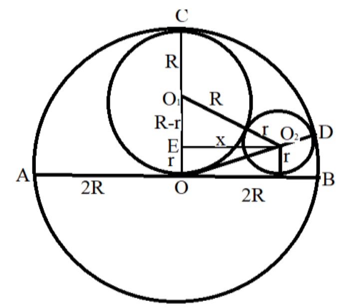


Solution: We get an AB vatar in a circle and a CD vatar perpendicular to it. Let point E be the point of intersection of them and point O be the center of the circle. and a right-angled triangle is formed. According to the Pythagorean theorem, CB = 10 and AD = 20 is derived.$\Delta CEB \Delta AED$

$AO = OD = CO = OB = R$ According to the theorem on intersecting waters,$\overset{\frown}{AD} = \angle AOD = \alpha \overset{\frown}{CB} = \angle COB = \beta$

we create. It follows that. . We apply the theorems of cosines to DAOD and DCOB and add them step by step. In that case It turns out that$\angle AED = \angle CED = \frac{\overset{\frown}{AD}+\overset{\frown}{CB}}{2} = 90^0 = \frac{\alpha+\beta}{2} \alpha + \beta = 180° \beta = 180° - \alpha 4R^2 = 500 R = 5\sqrt{5}$

2 - Problem.AB is the diameter of the intersecting circle, the center of which is drawn in the middle of the circle and the second circle striking the arc of the circle.



Solution: If we define the radius of the second circle as R, then the radius of the first circle is equal to 2R. we draw a section EO2 passing through the center of the third circle and parallel to AB, where EO1O2 formed a right triangle.$r = \sqrt{\frac{2}{\pi}}$

We apply the Pythagorean theorem:

$O_1O_2 = R + r O_1E = R - r EO_2 = x = ? x^2 = 4Rr x = 2\sqrt{Rr}$

Now we apply the Pythagorean theorem to e.OEO_2

$OD = 2R$ we find we equate the xs found above. hence we send to The surface of the second circle is equal.$O_2D = r OO_2 = 2R - r OE = r x x^2 = 4R^2 - 4Rr 4Rr = 4R^2 - 4Rr Rr = R^2 - Rr Rr = R - r 2r = R S = \pi R^2 = \pi(2r)^2 = 4\pi r^2 r^2 = \frac{2}{\pi}$ So, Answer: $8 S = 4\pi r^2 = 4\pi \frac{2}{\pi} = 8$

3 - Example. Polynomial: if given$P(x) = ax^3 + bx^2 + cx + d$

if $P(1) = P(2) = P(3) = 0, P(4) = 2a = ?$

Solution: $ax^3 + bx^2 + cx + d = a(x - x_1)(x - x_2)(x - x_3)$

$$P(x) = a(x-1)(x-2)(x-3)$$

$$P(1) = P(2) = P(3) = 0 \quad P(4) = 22 = a(3)(2)(1)6a = 2a = 1/3$$

4 - Example.$(1 + tg7^0)(1 + tg8^0)(1 + tg37^0)(1 + tg38^0) = ?$ Calculate

$$(1 + tg7^0)(1 + tg8^0)(1 + tg37^0)(1 + tg38^0)$$
$$= (1 + tg7^0)(1 + tg8^0)\big(1 + tg(45^0 - 8^0)\big)\big(1 + tg(45^0 - 7^0)\big)$$
$$= (1 + tg7^0)(1 + tg8^0)\left(1 + \frac{1 - tg8^0}{1 + tg8^0}\right)\left(1 + \frac{1 - tg7^0}{1 + tg7^0}\right)$$
$$= (1 + tg7^0)(1 + tg8^0)\left(\frac{1 + tg8^0 + 1 - tg8^0}{1 + tg8^0}\right)\left(\frac{1 + tg8^0 + 1 - tg7^0}{1 + tg7^0}\right) = 4$$

5 - Example. 72010-52010 find the remainder when the expression is 24.

Solution: We use comparisons and their properties:

$7^{2} \equiv 1$ (mod24) $7^{2010} \equiv 1$ (mod24) $5^{2} \equiv 1$ (mod24) $5^{2010} \equiv 1$ (mod24)

$-\begin{cases} 7^{2010} \equiv 1(\mathrm{mod}24) \\ 5^{2010} \equiv 1(\mathrm{mod}24) \end{cases}$ 7^{2010}-$5^{2010} \equiv 0$ (mod24) Answer: residual 0

6 - Example. if $xy + \sqrt{(1+x^2)(1+y^2)} = \sqrt{5}$

$x\sqrt{(1+y^2)} + y\sqrt{(1+x^2)}$ =? find.

Solution: We define the second equation as.z

$$xy + \sqrt{(1+x^2)(1+y^2)} = \sqrt{5}$$

$x\sqrt{(1+y^2)} + y\sqrt{(1+x^2)} = z$ We square both equations:

$$(xy)^2 + (1+x^2)(1+y^2) + 2xy\sqrt{(1+x^2)(1+y^2)} = 5$$
$$x^2(1+y^2) + y^2(1+x^2) + 2xy\sqrt{(1+x^2)(1+y^2)} = z^2$$

$$(xy)^2 + 1 + x^2 + y^2 + x^2y^2 + 2xy\sqrt{(1+x^2)(1+y^2)} = 5$$
$$x^2 + x^2y^2 + y^2 + x^2y^2 + 2xy\sqrt{(1+x^2)(1+y^2)} = z^2$$

From the above equation we separate the following equation:

$1 = 5 + z^2 z^2 = 4 \quad z = \pm 2$ Check: So $z > 0 z = 2$

7 - For example.. Arithmetic progression The sum of all three consecutive terms is $40. a_1 a_2 a_3$ ... $a_6 a_7 a_8 a_3 = 6 a_1 + a_8$ =?

Solution: Similarly $a_1 + a_2 + a_3 = 40 a_3 = 6 a_1 + a_2 = 34 a_2 + a_4 = 34$

$$-\begin{cases} a_1 + a_2 = 34 \\ a_2 + a_4 = 34 \end{cases} = a_1 - a_4 = 0 a_4 + a_5 = 34$$

$$+\begin{cases} a_1 - a_4 = 0 \\ a_4 + a_5 = 34 \end{cases} = a_1 + a_5 = 34 a_5 + a_6 + a_7 = 40$$

$$-\begin{cases} a_1 + a_5 = 34 \\ a_5 + a_6 + a_7 = 40 \end{cases} = a_1 - a_6 - a_7 = -6 a_6 + a_7 + a_8 = 40$$

$+\begin{cases} a_1 - a_6 - a_7 = -6 \\ a_6 + a_7 + a_8 = 40 \end{cases} = a_1 + a_8 = 34$ Answer: 34

8- Example. f (x) = 2f (ctgx) =? A) 2sinx · tgx B) tgx C) cosx D) 2cosx · ctgx$\frac{x^2}{\sqrt{1+x^2}}\frac{1}{2}$

Solution: 2f (ctgx) = 2 $\cdot \frac{ctg^2x}{\sqrt{1+ctg^2x}} = \frac{2 \cdot ctg^2x}{\sqrt{1+\frac{cos^2x}{sin^2x}}} = \frac{2 \cdot ctgx \cdot ctgx \cdot sinx}{\sqrt{sin^2x+cos^2x}} = \frac{2 \cdot cosx \cdot ctg^2x}{\sqrt{1}} = 2cosx \cdot ctgx$

9 - For example. If so, find the value of the expression.$n = \log_{1,4} 3 \; \frac{7^{2n} - 5^{2n}}{7^{2n} + 2 \cdot 7^{2n} \cdot 5^{2n} + 5^{2n}}$

Solution: We potentiate the function, that is, we convert it from a logarithmic expression to an exponential expression. Now let's simplify the expression:$n = \log_{1,4} 3 \; 1{,}4^n = 3\left(\frac{14}{10}\right)^n = 3\left(\frac{7}{5}\right)^n = 3\,\frac{7^n}{5^n} = 37^n = 3 \cdot 5^n$

$$\frac{7^{2n} - 5^{2n}}{7^{2n} + 2 \cdot 7^{2n} \cdot 5^{2n} + 5^{2n}} = \frac{(7^n - 5^n)(7^n + 5^n)}{(7^n + 5^n)^2} = \frac{(7^n - 5^n)(7^n + 5^n)}{(7^n + 5^n)(7^n + 5^n)} = \frac{7^n - 5^n}{7^n + 5^n}$$
$$= \frac{3 \cdot 5^n - 5^n}{3 \cdot 5^n + 5^n} = \frac{2 \cdot 5^n}{4 \cdot 5^n} = \frac{2}{4} = 0{,}5$$

10 - Example. find the product of the function.$y = lnx^{lnx^{lnx}}$

Solution:$y = lnx^{lnx^{lnx}} = lnx^{lnx \cdot lnx} = lnx \cdot lnx \cdot lnx = ln^3 x$

$$y' = 3ln^2 x \cdot \frac{1}{x} = \frac{3ln^2 x}{x}$$

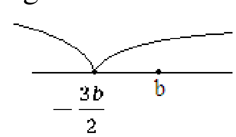
11 - Example.$x^2 + y^2 + |z - 2xy| - 2x + 4y - 5$ If the expression reaches the smallest value, find xyz.

Solution: $x^2 - 2x + 1 - 1 + y^2 + 4y + 4 - 4 + |z - 2xy| - 5 = (x - 1)^2 + (y + 2)^2 - 10 + |z - 2xy|$

In the resulting expression always takes a positive value when the numbers are squared, which means that the smallest value of these numbers is 0. Equating the square numbers to 0, we find the values of x and y: (x-1) 2 = 0 Now the expression looks like this:$(x - 1)^2 + (y + 2)^2 - 10 + |z - 2xy| (x - 1)^2 (y + 2)^2 (y + 2)^2 = 0 x = 1 y = -2$

Given that the value of the expression under the module is always positive, its smallest value is 0, in which case it is the smallest value of the expression.$(x - 1)^2 + (y + 2)^2 - 10 + |z - 2xy| = 0 + 0 - 10 + |z - 2xy| = -10 + |z - 2xy| - 10 xyz = 1 \cdot (-2) \cdot z = ? \, z |z - 2xy| = 0 \quad z - 2xy = 0 \quad z = 2xy \quad z = 2 \cdot 1 \cdot (-2) = -4, xyz = 1 \cdot (-2) \cdot (-4) = 8$

12 - Example.If a and b are real numbers and, then find the largest integer value of the product ab. $a^2 + 3ab + 5b^2 = 80$



Solution:$a^2 + 3ab + 5b^2 = 80 a, b \in R \; ab_{max} = ?$

$$y = a^2 + 3ab + 5b^2 - 80 y_a' = 0$$

here it is not necessary to check the signs, because as a result of derivation a single point is found, at which point the expression reaches either max or min. Substituting the found value into the expression we find the value of b . $y_a' = 2a + 3b \; 2a + 3b = 0 2a = -3b a = -\frac{3b}{2}\left(-\frac{3b}{2}\right)^2 + 3 \cdot \left(-\frac{3b}{2}\right) b + 5 \cdot b^2 = 80$

$$\frac{9b^2}{4} - \frac{9b^2}{2} + 5b^2 = 80 \frac{11b^2}{4} = 80 11b^2 = 320 b^2 = \frac{320}{11}$$

abmax $=-\frac{3b}{2}b=-\frac{3b^2}{2}=-\frac{3}{2}\cdot\frac{320}{11}$

13 - Example. Find the face of the painted sphere, drawn inside a quarter circle on a square whose side is equal to 1 unit.

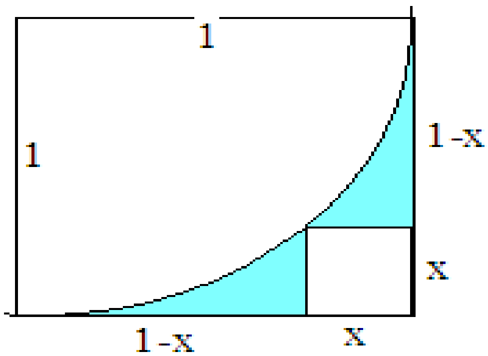


Figure 1

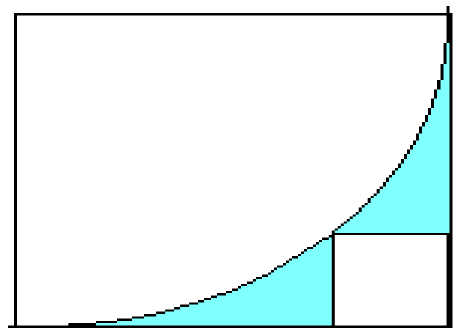
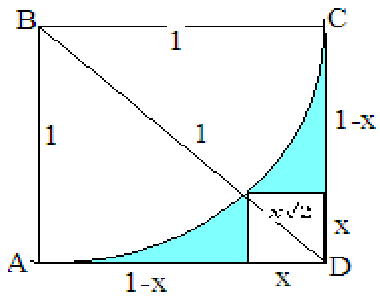


Figure 2

Solution:



$$S_{soxa}=S_{kvadrat}-S_{sektor}-x^2 S_{soxa}=1-\frac{\pi}{4}-x^2$$

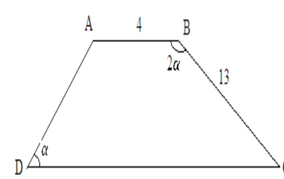
We apply the Pythagorean theorem to a right triangle ABD or BCD:

$$1^2+1^2=(1+x\sqrt{2})^2 2=1+2\,x\sqrt{2}+2x^2$$

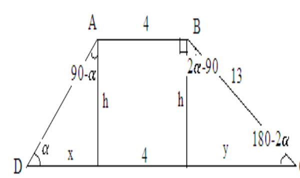
$$2x^2+2\,x\sqrt{2}-1=0 x=\frac{2-\sqrt{2}}{2} x^2=\frac{3}{2}-\sqrt{2}$$

$$S_{soxa}=1-\frac{\pi}{4}-\left(\frac{3}{2}-\sqrt{2}\right) S_{soxa}=\frac{4\sqrt{2}-2-\pi}{4}$$

14 - Example. ABCD trapezoid AB‖DC. ∠ ABC = 2∠ ADC, | AB | = 4, | BC | = 13. | DC | Find the length of the base.



Solution: We use the sine theorem: from: $\frac{x}{cos\alpha}=\frac{h}{sin\alpha}\frac{h}{sin2\alpha}=\frac{13}{1}=\frac{y}{\sin(2\alpha-90^0)}$

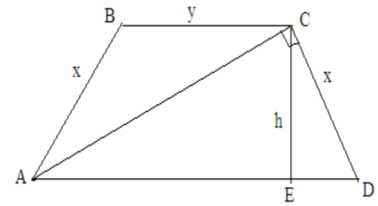


$y=-13cos2\alpha$ it follows that we reduce the resulting equations to the 1st proportion . from which we find x: $h=13sin2\alpha\frac{x}{cos\alpha}=$

$\frac{13\cdot 2 sin\alpha cos\alpha}{sin\alpha} x = 26\cos^2\alpha = 26\cdot\frac{1+cos2\alpha}{2}$

$x = 13 + 13cos2\alpha$ we replace: $x = 13 - yx + y = 13DC = x + y + 4DC = 17$

15 - Example.In an equilateral ABCD trapezoid, the AC is perpendicular to the diagonal CD. If, find.$AD = 4|AB|^2 + |BC|^2 = 11\ |AB|$



Solution: $AE = \frac{4+y}{2} ED = \frac{4-y}{2} x^2 + y^2 = 11$

$$x^2 - \left(\frac{4-y}{2}\right)^2 = h^2 h^2 = \frac{4+y}{2}\cdot\frac{4-y}{2}$$

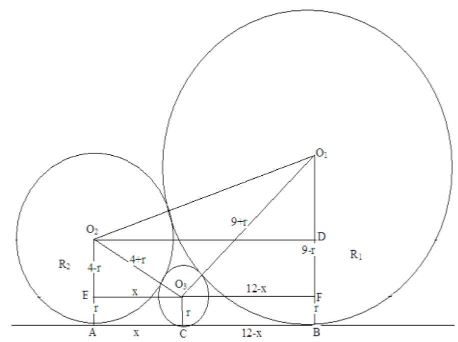
$$x^2 = \frac{16-y^2}{4} + \frac{(16-8y+y^2)}{4} = \frac{32-8y}{4} = 8-2y$$

$$11 - y^2 = 8 - 2yy^2 - 2y - 3 = 0$$

$$y = \pm 3y = -1x^2 + 9 = 11x = \sqrt{2}$$

16– Example. Two circles with radii 9 and 4 try from the outside. Find the radius of the circle that is trying to be their arcs and their total effort.

Solution:



$$16 - 8r + r^2 + x^2 = 16 + 8r + r^2$$

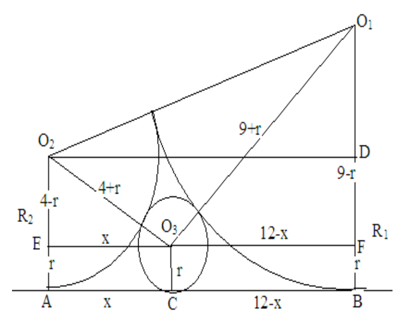
$$81 - 18r + r^2 + (12-x)^2 = 81 + 18r + r^2$$

$$x^2 = 16r(12-x)^2 = 36r144 - 24x + 16r = 36r$$

$$144 - 24x = 20r36 - 6x = 5r$$

$$x = \frac{36-5r}{6} x^2 = \frac{(36-5r)^2}{36}$$

$x^2 = 16rx^2 = \frac{(36-5r)^2}{36} = 16r$



$$36^2 - 360r + 25r^2 = 16r\cdot 36$$

$$25r^2 - 360r + 1296 - 576r = 0$$

$$25r^2 - 936r + 1296 = 0$$

$$D = 876096 - 129600 = 746496 = 864^2$$

$$r_{1,2} = \frac{936 \pm 864}{50}$$

$$r_1 = 36r_2 = 1{,}44$$

17 - Example.$\begin{cases} x^2 + y^2 - 2x - 4y \le -1 \\ 3x - 2y + 1 \ge 0 \end{cases}$Calculate the area of the sphere formed by the set of points (x y) satisfying the system of inequalities.

Solution: Substituting the given system of inequalities, we make it as follows.

$$\begin{cases} x^2 - 2x + 1 + y^2 - 4y + 4 \le -1 + 1 + 4 \\ 2y \le 3x + 1 \end{cases} \qquad \begin{cases} (x-1)^2 + (y-2)^2 \le 2 \\ y \le \dfrac{3x+1}{2} \end{cases}$$

The radius of inequality 1 in the system gives the surface of a circle of radius 2, and inequality 2 gives us a straight line that divides the circle into two equal parts and does not exceed the intersection. This means that the area formed is a semicircle with radius 2. And his face,

$$S = \frac{\pi R^2}{2} = \frac{4\pi}{2} = 2\pi$$ ga teng.

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