Russian School of Math: Lesson 4

James & Patrick

Revised: October 27, 2024

Abstract

This note reviews a small number of problems from the Russian School of Math test. Written for personal use.

1

Cagney can frost a cupcake every 20 seconds and Lacey can frost a cupcake every 30 seconds. Working together, how many cupcakes can they frost in 5 minutes?

(a) 20

(b) 25

(c) 30

(d) 35

(e) 40

2

In $\triangle ABC$, we have $AC = BC = 7$ and $AB = 2$. Suppose that D is a point on line AB such that B lies between A and D and $CD = 8$. What is BD?

(a) 1

(b) $\sqrt{3}$

(c) 3

(d) 4

(e) $4\sqrt{2}$

3

Let x be a real number such that $\sec x - \tan x = 2$. Then $\sec x + \tan x =$?

(a) 0.3

(b) 0.4

(c) 0.5

(d) 0.6

(e) 0.7

4

Find positive consecutive integers starting with a whose average is b. What is the average of 5 consecutive integers that start with b?

(a) $a + 2$

(b) $a + 3$

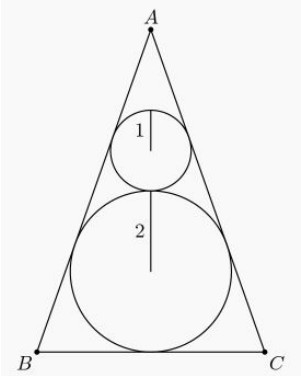
(c) $a + 4$

(d) $a + 5$

(e) $a + 6$

5

A circle of radius 1 is tangent to a circle of radius 2. The sides of $\triangle ABC$ are tangent to the circles as shown, and the sides AB and AC are congruent. What is the area of $\triangle ABC$?



(a) $\frac{35}{2}$

(b) $16\sqrt{2}$

(c) $\frac{64}{3}$

(d) $18\sqrt{2}$

(e) 24

6

What is the value of the expression

$$\frac{1}{\log_2 100!} + \frac{1}{\log_3 100!} + \frac{1}{\log_4 100!} + \ldots + \frac{1}{\log_{100} 100!}$$

(a) 0.1

(b) 1

(c) 10

(d) 100

(e) 1000

7

A parking lot has 16 spaces in a row. Twelve cars arrive, each of which requires one parking space, and their drivers chose spaces at random from among the available spaces. Auntie Em then arrives in her SUV, which requires 2 adjacent spaces. What is the probability that she is able to park?

(a) $\frac{11}{20}$

(b) $\frac{4}{7}$

(c) $\frac{81}{140}$

(d) $\frac{17}{28}$

(e) $\frac{19}{28}$

8

Let $ABCD$ be a trapezoid with $AB||CD$, $AB = 11$, $BC = 5$, $CD = 19$, and $DA = 7$. Bisectors of $\angle A$ and $\angle D$ meet at P, and bisectors of $\angle B$ and $\angle C$ meet at Q. What is the area of hexagon $ABQCDP$?

(a) $24\sqrt{3}$

(b) $28\sqrt{3}$

(c) $30\sqrt{3}$

(d) $35\sqrt{3}$

(e) $36\sqrt{3}$