Faculty of Management Science and Informatics

Admission exam, form C

01

Which statement about an equilateral triangle *KLM* with a side *m* is false?

A) Every equilateral triangle is congruent with triangle *KLM.*

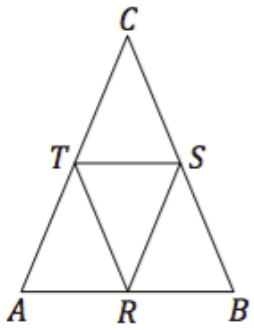
B) The length of each median of triangle *KLM* is $m\sqrt{3}/2$.

C) The center of a circle circumscribed to the triangle *KLM* lies in its centroid.

D) The triangle *KLM* has both point reflection symmetry and line symmetry.

02

The base *AB* of an isosceles triangle *ABC* is 10 cm long. The two equal sides have length 13 cm. Let us denote *R*, *S*, *T* the midpoints of triangle sides (see figure). What is the distance from the centroid of triangle *RST* to the side *ST*?



A) 2 cm

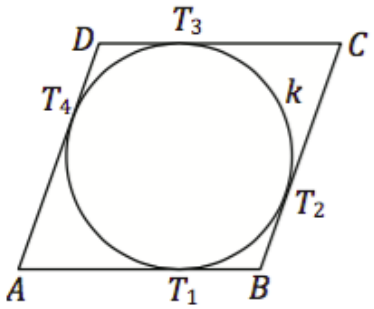
B) 3 cm

C) 4 cm

D) 6 cm

03

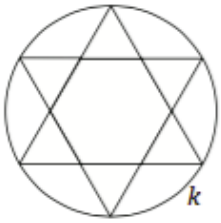
The length of a side of a rhombus *ABCD* is 7. A circle *k* is inscribed inside the rhombus. The tangent points T_1, T_2, T_3, T_4 divide each side of the rhombus in the ratio 2:5. What is the radius of the circle *k*?



A) $\sqrt{10}$
B) $2\sqrt{10}$
C) 10
D) 20

04

A geometric figure consisting of a regular hexagon and six equilateral triangles is inscribed into a circle k (see figure). The side of the triangle has length 4. What is the radius r of the circle k?



A) $2\sqrt{3}$
B) $2\sqrt{5}$
C) $4\sqrt{3}$
D) $4\sqrt{5}$

05

The figure shows a shaded area between two concentric circles. There is a triangle inscribed into this area in such a way that its vertices lie on the outer circle and the sides are tangent to the inner circle. What is the ratio of the radii of the two circles?

A) $4:3$
B) $3:2$
C) $3:1$
D) $2:1$

06

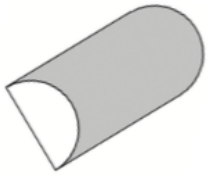
Points E, F, G lie on a circle k and divide its circumference in the ratio $2:1:3$. What are the inner angles of the triangle EFG?
A) $90°, 45°, 45°$
B) $90°, 60°, 30°$
C) $90°, 75°, 15°$
D) $75°, 60°, 45°$

07

A kitchen ground plan has the shape of right trapezoid with the bases 5.5 m and 3.5 m and height 3 m. The family wants to put up a molding around the whole circumference. At least how many whole meters of molding should they buy when they want to have at least half a meter extra just in case?
A) 19
B) 18
C) 17
D) 16

08

What is the volume of a half cylinder with base diameter 0.8 m and height 1.8 m?



A) 0.45 m^3
B) 0.9 m^3
C) 1.8 m^3
D) 3.6 m^3

09

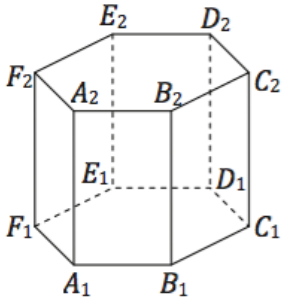
How many edges does a solid with 6 faces and 5 vertices have?
A) 12
B) 11
C) 10
D) 9

10

Volume of a cone created by rotation of a right triangle PRS around its leg RS, is 800π. The length of the leg RS is 24. What is the length of the other leg of this triangle?
A) $50/3$
B) 10
C) $25/6$
D) $\sqrt{3}$

11

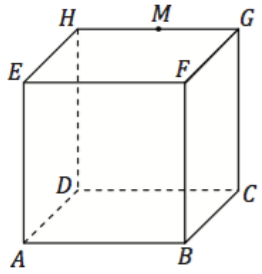
There is a regular right hexagonal prism in the figure. How many lines passing through the vertices of this prism are parallel to the line C_1D_1?



A) five
B) four
C) three
D) two

12

A cube $ABCDEFGH$ has an edge of length 2. M is a midpoint of the edge GH. What is the circumference of the shape that results from a cut of the cube $ABCDEFGH$ by a plane ACM?



A) $3\sqrt{2}+\sqrt{5}$
B) $3\sqrt{5}+2\sqrt{3}$
C) $3\sqrt{2}+2\sqrt{5}$
D) $3\sqrt{2}+2\sqrt{3}$

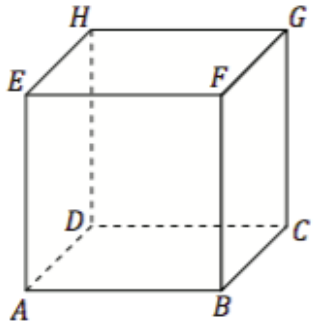
13

What is the length of the chord defined by a secant line $y = -\frac{x}{2}$ on a circle $x^2+y^2=20$?

A) $2\sqrt{5}$
B) $4\sqrt{5}$
C) $10\sqrt{2}$
D) $5\sqrt{2}$

14

The edges AB and CD of a cube $ABCDEFGH$ lie on the lines $p: 3x + 4y + 4 = 0$ and $q: 3x + 4y + 14 = 0$. What is the volume of this cube?



A) 1000
B) 100
C) 28
D) 8

15

Three of these points lie on the same line. Which point <u>does not lie</u> on this line?

A) $A[-1; -6]$
B) $B[0; -3]$
C) $C[1; 3]$
D) $D[-2; -15]$

16

Which of these lines is perpendicular to the line p: $2x - 3y - 8 = 0$?

A) a: $2x - 3y + 3 = 0$
B) b: $2x + 3y - 3 = 0$
C) c: $3x + 2y - 2 = 0$
D) d: $3x - 2y + 2 = 0$

17

Every day from December 1 to December 31, Adam has put tickets with the day number into an envelope. There was one ticket with number 1, two tickets with number 2, three tickets with number 3, ... and there were 31 tickets with number 31 on them. How many tickets in the envelope have an even number written on them?

A) 496
B) 256
C) 248
D) 240

18

In each *Lacto-PLUS* probiotic capsule, there are 2×10^7 active Lactobacillus bacteria. After the expiration date, this number decreases by half every month. How many months after the expiration date will the number of bacteria in one capsule be less than $1{,}000{,}000$?

A) 4
B) 5
C) 10
D) 11

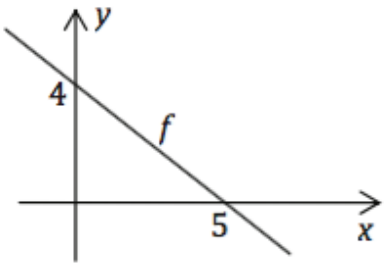
19

There were three harvesters harvesting the field on the first day, four on the second day and eight on the third day. After those three days, one quarter of the field has still not been harvested. How long would it take two harvesters to harvest the whole field? (We assume that all harvesters work at the same pace.)

A) 40
B) 30
C) 20
D) 10

20

There is a linear function $f(x)$ in this graph. What is the value of this function at x = 20?



A) −16
B) −12
C) −11
D) −8

21

Let us denote a circle k with center O at the origin and radius $r = 2$ a 2circle. Then we denote by R such point on the 2circle that the ray OR has a 60° angle with the positive x axis. What is the y-coordinate of the point R?

A)**A)** $\sqrt{3}/4$

B) $\sqrt{3}/2$

C) 1

D) $\sqrt{3}$

22

What function is symmetric to $y = (\frac{2}{3})^x$ with respect to the y-axis?

A) $y = (\frac{3}{2})^x$

B) $y = (\frac{3}{2})^{-x}$

C) $y = -(\frac{2}{3})^x$

D) $y = -(\frac{2}{3})^{-x}$

23

The function f: $y = \log_{16} x - \frac{1}{2}$ has the value 0 at

A) $x = 16.$

B) $x = 8.$

C) $x = 4.$

D) $x = 2.$

24

What is the equation of a function g, which is symmetric to the function f: $y = \cos x + 1$ with respect to the line of symmetry $y = 1$?

A) $y = \cos x - 1$
B) $y = \cos x + 2$
C) $y = -\cos x - 1$
D) $y = -\cos x + 1$

25

A client has invested 5000 € into a fund. The fund manager guarantees a profit of 2.4% per year if the client does not withdraw any money for five years. How much interest will be added to the account at the end on the second year?

A) 120 €
B) 122,88 €
C) 242,88 €
D) 360 €

26

If the interval $I = (-1; 5)$ is the solution of an inequality $x - a < 3$, then

A) $a = 8$.
B) $a = 4$.
C) $a = 2$.
D) $a = -2$.

27

The graph of a function $f(x)$: $y = \frac{1}{x+2} - 3$ has a point of symmetry S. What are the coordinates of the point S?

A) $[-2; -3]$
B) $[-2; 3]$
C) $[2; -3]$
D) $[2; 3]$

28

How many times is the number $2^a + 2^a + 2^a + 2^a$ greater than the number $2^a . \frac{1}{2}$?

A) 2 times
B) 4 times
C) 8 times
D) 16 times

29

We have a function $f: y = \frac{1}{x^2-4x-5}$. The number -1/8 is a value of this function at

A) two values x, and their sum is 4.
B) two values x, and their sum is -4.
C) two values x, and their difference is 3.
D) one value x from the interval $(-1; 0)$.

30

In real numbers, the equation $\log_2 x^3 - \log_2 x = 10$ has

A) a single root in the interval $(1000; 1040)$.
B) a single root in the interval $(20; 40)$.
C) two roots and their sum is 0.
D) no roots.

31

For which value of the parameter $p \in R$ has the equation $(x + p).(2x - 1) = 0$ a double root?

A) $p = 2$
B) $p = 1/2$
C) $p = -1/2$
D) $p = -2$

32

How many ordered pairs $[x; y]$ are solutions to the system of equations
$(x - 2) . (y\ 3) = 8$
$(x - 2) . (y^2 - 9) = 16$?

A) none
B) one
C) two
D) infinitely many

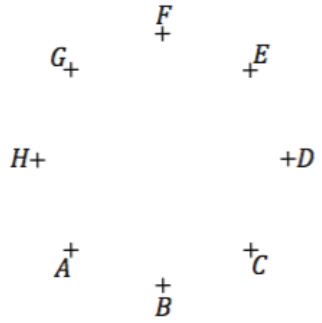
33

Denise plays tennis. So far, she has played 20 matches and won 8 of them. If she does not lose any match from now on, at least how many does she have to win to have a 50% success rate?

A) 2
B) 4
C) 6
D) 8

34

The points in the figure are vertices of a regular octagon $ABCDEFGH$. We randomly select two of these points and connect them into a segment. What is the probability that the segment is a diagonal of the octagon?



A) $2/7$
B) $1/2$
C) $5/7$
D) $9/14$

35

At an exam, student is given three questions randomly selected from a pool of 50 known questions. However, he only had time to study for 45 of them. What is the probability that he has studied for all three selected questions?

A) $90\ \%$
B) $72.4\ \%$
C) $67.6\ \%$
D) $60\ \%$

36

There are 30 students in the classroom. Everyone gets grades form 1 to 5, 1 being the best grade, 5 being the worst. Their average math grade for the first semester was 2.50. In the second semester, two students improved their math grades by 2, six students improved their math grades by 1 and 4 students worsened their math grades by 1. What was the average math grade of the class in the second semester?

A) 2.40
B) 2.33
C) 2.30
D) 2.26

37

George has a 5-digit passcode on his phone. The first two digits are even and the remaining three digits are odd. George forgot the passcode but he remembers that the digits do not repeat, the passcode does not start with 0 and it ends with either a 3 or a 5. How many different codes he might have to try?

A) 5 . 4 + 5. 4. 3
B) 5 . 4 . 5 . 4 . 3
C) 4 . 4 + 4 . 3 . 2
D) 4 . 4 . 4 . 3 . 2

38

There were six teams at a hockey tournament. Every team played one game with every other team. How many games were played in this tournament?

A) 15
B) 24
C) 30
D) 36

39

How many 7-digit numbers can be created using three ones, two twos and two threes?

A) 5040
B) 840
C) 420
D) 210

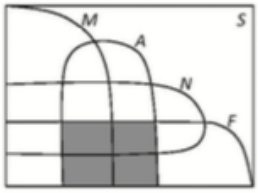
40

In a flower warehouse, they have 420 white, 660 yellow and 780 red roses. The order says they should use the roses to make as many bouquets as possible and all the bouquets have to be the same. How many yellow roses will there be in one bouquet?

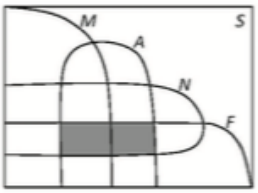
A) 31
B) 13
C) 11
D) 7

41

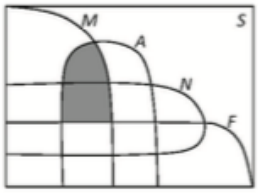
These Venn diagrams include the following groups of students:
S – all students
M – students of mathematics
A – students who speak English
N – students who speak German
F – students who speak French
Which diagram shows in gray the students of mathematics who speak English and German but do not speak French?



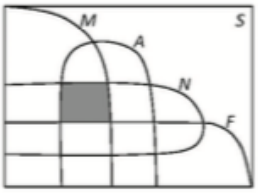
A)



B)



C)



D)

42

Nina told her parents that she had missed at most 14 days of school but it was not true. This means, Nina has missed
A) at least 15 days.
B) exactly 15 days.
C) at least 14 days.
D) at most 13 days.

43

How many non-empty subsets M_n of the set $P = \{1, 2, 3, 4, 5, 6\}$ have the property $\{2, 4, 6\} \cap M_n = \emptyset$?

A) nine
B) eight
C) seven
D) six

44

A negation of a statement „If a number is greater than 100, then it is not a prime.“ is the statement

A) Every number greater than 100 is prime.
B) If a number is less than 100, then it is prime.
C) If a number is less than 100, then it is not prime.
D) There exists a prime number greater than 100.

45

The letters A, B, C denote three different odd digits in the number $5\mathrm{A}71\mathrm{B}5\mathrm{C}$. We know that this number is divisible by both three and five. Which of these numbers can be the sum $\mathrm{A} + \mathrm{B}$?

A) 1
B) 4
C) 5
D) 6

46

There are r rows in a theater and each row has s seats. The tickets in the first five rows cost 17 € each, from the sixth to the tenth row they cost 15 € and they cost 12 € for all other rows. What would be the revenue if the theater was completely sold out?

A) $5.s.(17 + 15) + 12.s.(r - 10)$
B) $5.(17 + 15) + 12.r.(s - 10)$
C) $5.r.s.17 + 17.15 + 12.s.(r - 10)$
D) $5.r.17 + 5.s.15 + 12.(r - 10)$

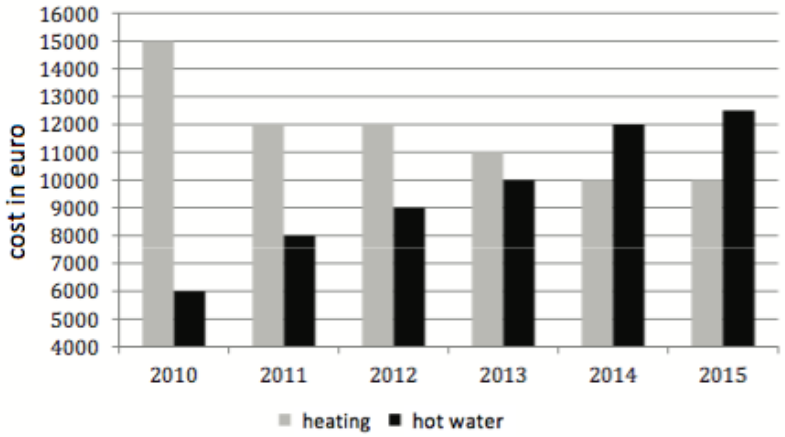
47

Peter has left for a hike early in the morning and after several hours he reached a mountain lodge. There he rested for one hour and then went home. The track home took him an hour longer because he was tired and every hour covered one fifth less distance than an hour in the morning. How many hours was his whole trip?

A) 5
B) 8
C) 9
D) 10

48

A building manager has published a chart, which shows the household payments for heating and for hot water.



By how many percent did the sum for heating decrease from 2010 to the year, in which the sum for hot water was greater than the sum for heating for the first time?

A) by 50 %
B) by 33.3 %
C) by 25 %
D) by 16.7 %

49

Numbers a, b, c are depicted on a numeric axis. In which interval will be the number $m = \frac{a.b}{c}$?

A) $(1; \infty>$
B) $(0; 1>$
C) $(-1; 0>$
D) $(-\infty; -1>$

50

Ohm's law for closed circuit is given by

$I = \frac{U_e}{R + R_i}$

Which of the following formulas is for the inner source resistance R_i?

A) $R_i = \frac{U_e}{I.R+I}$

B) $R_i = U_e - I.R$

C) $R_i = \frac{U_e}{I} - I.R$

D) $R_i = \frac{U_e - I.R}{I}$

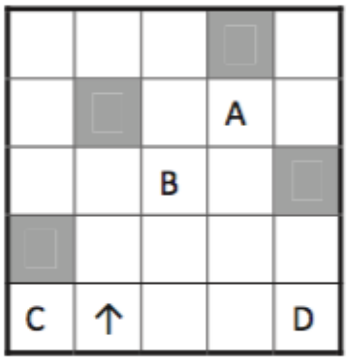
51

A robot moves in a square room with white tiles according to these rules:

1) if it can, it goes straight,

2) if it cannot go straight, it turns 90° to the right.

Its initial position and orientation are depicted by an arrow. The grey color denotes obstacles that the robot cannot pass.



Which of these tiles will the robot never visit?

A) A

B) B

C) C

D) D

52

Program PASSGEN generates random passwords in these four steps:
1. User inputs an integer from 4 to 23.
2. Program randomly increases or decreases this number by 1, 2 or 3.
3. Program then writes that letter of the alphabet that corresponds to the number from step two (i.e. letter B if the result was 2) and after that writes the letter that corresponds to the number from step 2 starting from the end of the alphabet (i.e. letter Y if the result was 2).
4. After these two letters, the program writes the sum of the original input from step 1 and the number from step 2.
The program works with a standard 26-letter alphabet:
ABCDEFGHIJKLMNOPQRSTUVWXYZ.
We have entered number 8 into PASSGEN. Which of these passwords could the program generate?

A) EV14
B) EV13
C) GU15
D) GU14

53

The Addams family has a father, mother and some children. Their son Oliver has been thinking: „If I had one more brother, there would be the same number of males and females in my family. If I had one more sister, there would be twice as many females as males in our family.“
How many daughters are there in the Addams family?
A) 1
B) 2
C) 3
D) 4

54

We say that an integer is *ordered*, if it has this property: *each of its digits is greater than all digits to the left of it,* e.g. the numbers 278 and 1679 are ordered, while the numbers 63 and 2446 are not. Which of the following statements about ordered numbers is true?

A) There exists a 10-digit ordered number.
B) If a number *N* is ordered, then also a number *N*+1 is ordered.
C) Sum of two ordered numbers is an ordered number.
D) No ordered number can contain the digit 0.

55

This sequence follows a logical principle: 2, 3, 7, 13, 27, 53, ... Which two numbers could be next?

A) 105, 211
B) 105, 209
C) 107, 213
D) 107, 212

56

This sequence follows a logical principle: aBC, eDF, iGH, oJK, ... Which term could be next?

A) uLM
B) uMN
C) yLM
D) yMN

57

1000 voters have participated in a poll before elections and said which of the three parties they would vote for. The table shows the poll results.

	Age of voters			
	18 – 22	23 – 30	31 – 60	over 60
Party A	25	20	111	53
Party B	110	97	230	0
Party C	0	23	154	177

Which statement about the poll is <u>false</u> according to the table?

A) The largest age group polled was the 31 – 60 years group.

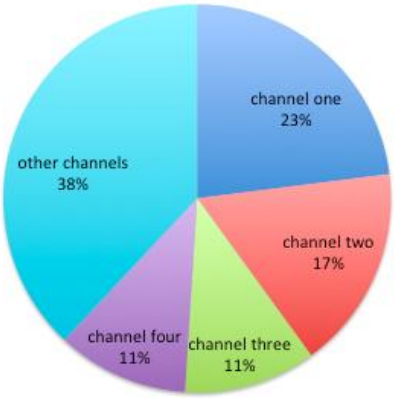
B) Party B gained the most votes and also most people under 31 voted for this party.

C) Voters under 22 mostly chose the party that was completely ignored by the voters over 60.

D) Party A gained most voters among those over 60.

58

The chart shows viewership of individual channels over a certain period of time.



Which statement follows from the chart?
A) Channel one was the second most watched channel.
B) Channel one has almost one quarter of viewership.
C) Channel two has larger viewership than channels three and four combined.
D) The viewers of channels three and four were always watching at the same time.

59

George is three times older than Michael. Charles is two times younger than Michael. Which statement is then true?
A) Charles is six times older than George.
B) Charles is five times older than George.
C) George is six times older than Charles.
D) George is five times older than Charles.

60

There are more than 15 apples in the basket. At most 5 of them are red, the rest of them are green. Therefore,

A) at least 11 apples are green.
B) at most 10 apples are green.
C) exactly 11 apples are green.
D) exactly 10 apples are green.

61

Disappointed tourist is calling a meteorologist: „*There were at least eight rainy days during my ten day vacation. And you had said it would be sunny.*“ The meteorologist found out that the caller was mistaken. That means during the vacation,

A) all days were sunny.
B) there were at most three rainy days.
C) there were exactly two rainy days.
D) there were at most seven rainy days.

62

Three of these words have something in common. Which word logically does not belong?

A) hand
B) liver
C) leg
D) kidney

63

Three of these expressions have something in common. Which expression logically does not belong?

A) short time
B) long time
C) soon
D) a moment

64

Three of these words have something in common. Which word logically does not belong?

A) cholera
B) starvation
C) malaria
D) plague

65

The words *puppy* -> *dog* are in the same logical relation as the words

A) lamb -> goat.
B) cat -> tomcat.
C) horse -> foal.
D) child -> adult.

66

The words *native healer* -> *doctor* are in the same logical relation as the words

A) oracle -> forecaster.
B) amateur actor -> theater.
C) astrologist -> astronaut.
D) shaman -> judge.

67

The words *ring* -> *circus* are in the same logical relation as the words
A) stands -> stadium.
B) orchestra -> opera.
C) stage -> theater.
D) movie -> movie theater.

68

We have left out all vowels from four nouns. In three of the nouns it were the same three vowels. From which word have we left out a different triplet of vowels?
A) PLC
B) CRF
C) DMG
D) SLV

69

In which of the following words can we replace question marks with letters (1 question mark = 1 letter) so that we get a word denoting a type of historical building?
A) ???HED??
B) ???ILI???
C) ???DNI???
D) ???TUN???

70

First determine what the question is and then select the correct answer. (Each dot represents a single letter.)
How many m••••s does a y••r have?
A) 2
B) 12
C) 22
D) 200

71

Mirka likes to invent puzzles for her brother. First she chooses a word and divides it into three parts. Then she writes each part in reverse and joins them. For example: ALBATROS -> ALB+ATR+OS -> BLA+RTA+SO -> BLARTASO.
She shows the result to her brother and he is supposed to guess the original word. Mirka has made a mistake when creating one of the following puzzles. Which one?
A) ARTLEVRE
B) OCSIPRNO
C) ROMILAYT
D) ORBUCHER

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Which group of words can be arranged into a meaningful sentence? (Ignore missing comas, periods and capitalization.)
A) influence radicals from cells apricots free protect
B) drinking cough helps apple and flu juice with sick
C) when arise lacks body problems water various a functional
D) produce organism cannot an minerals itself enough can

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Which two words can fill in the blanks to give a meaningful text?
The court has investigated a complaint of an employee, who did not like that the employer has _____ him with the records from his discussions on social networks. They were supposed to refute the employee's statement that he uses the company internet solely for _____ purposes.
A) presented / business
B) presented / private
C) alienated / business
D) alienated / private

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Four of the following sentences can be arranged into a meaningful text. Which sentence will not be used in this text?
S1 He calmed down a little after he had taken a sip.
S2 His neighbor has never diluted wine with water.
S3 She ran to get the water from the kitchen.
S4 He asked her to add a spoonful of wine from the bottle into it.
S5 She noticed a jar of water on the counter, poured it into a glass and brought it over.
A) S1
B) S2
C) S4
D) S5

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Excerpt

They passed from Zavory to Ticha before sunset. It is cozier here than in Smreciny. Wide, flat meadow from both sides surrounded by undisturbed woods, a brook runs through it and there is a log cabin with a proper shingle roof under two spruces on the other end. Drak whistles twice, the dogs look back and when they see that their master has stopped, they run to the front of the herd and stop it. Drak walks across the meadow, returns, pushes his hat to the back and scratches his forehead. The grass is not bad. It would not hurt the bulls to graze on it for a few days, they need to gain strength. It will be steeper through the Pysne mountain. On the other hand, Tomanova is in Poland. Simon listens to him and sees that he is right. However, they are supposed to be back in a week. He wants to remind Drak about it but stops soon enough. He does not think he should make the decision about this. Either way, they will not move from here till the morning, the cattle need rest.

(Dobroslav Chrobák – Drak returns)

Which statement does not follow from the text?
A) It has not been dark yet, when they passed from Zavory to Ticha.
B) Drak has a hat on his head.
C) Two dogs guard the herd of bulls.
D) The grass is good for the cattle to graze on.

List of formulas

Powers:

$$a^x.a^y=a^{x+y} \quad \frac{a^x}{a^y}=a^{x-y} \quad \left(a^x\right)^y=a^{x.y} \quad (a.b)^x=a^x.b^x \quad \left(\frac{a}{b}\right)^x=\frac{a^x}{b^x} \quad a^{-x}=\frac{1}{a^x} \quad a^{\frac{x}{y}}=\sqrt[y]{a^x}$$

Goniometric functions:

$$\sin^2 x+\cos^2 x=1 \qquad \operatorname{tg}x.\operatorname{cotg}x=1,\ x\neq k\cdot\frac{\pi}{2} \qquad \sin 2x=2.\sin x.\cos x \qquad \cos 2x=\cos^2 x-\sin^2 x$$

$$\left|\sin\frac{x}{2}\right|=\sqrt{\frac{1-\cos x}{2}} \qquad \left|\cos\frac{x}{2}\right|=\sqrt{\frac{1+\cos x}{2}} \qquad \sin\left(\frac{\pi}{2}-x\right)=\cos x \qquad \cos\left(\frac{\pi}{2}-x\right)=\sin x$$

$$\operatorname{tg}\left(\frac{\pi}{2}-x\right)=\operatorname{cotg}x,\ x\neq k\pi$$

$$\operatorname{cotg}\left(\frac{\pi}{2}-x\right)=\operatorname{tg}x,\ x\neq(2k+1)\frac{\pi}{2}$$

$$\sin(x\pm y)=\sin x.\cos y\pm\cos x.\sin y$$

$$\cos(x\pm y)=\cos x.\cos y\mp\sin x.\sin y$$

x	0	$\frac{\pi}{6}$	$\frac{\pi}{4}$	$\frac{\pi}{3}$	$\frac{\pi}{2}$
sin x	0	$\frac{1}{2}$	$\frac{\sqrt{2}}{2}$	$\frac{\sqrt{3}}{2}$	1
cos x	1	$\frac{\sqrt{3}}{2}$	$\frac{\sqrt{2}}{2}$	$\frac{1}{2}$	0

Trigonometry:

Law of sines: $\frac{a}{\sin\alpha}=\frac{b}{\sin\beta}=\frac{c}{\sin\gamma}=2r$ Law of cosines: $c^2=a^2+b^2-2ab.\cos\gamma$

Logarithm: $\log_z(x.y)=\log_z x+\log_z y$ $\log_z\frac{x}{y}=\log_z x-\log_z y$

$\log_z x^k=k.\log_z x$ $\log_y x=\frac{\log_z x}{\log_z y}$

Arithmetic sequence: $a_n=a_1+(n-1).d$ $s_n=\frac{n}{2}(a_1+a_n)$

Geometric sequence: $a_n=a_1.q^{n-1}$ $s_n=a_1\frac{q^n-1}{q-1},\ q\neq 1$

Combinatorics: $P(n)=n!$ $V(k,n)=\frac{n!}{(n-k)!}$ $C(k,n)=\binom{n}{k}=\frac{n!}{k!(n-k)!}$

$P'(n_1,n_2,\ldots,n_k)=\frac{n!}{n_1!.n_2!\ldots n_k!}$ $V'(k,n)=n^k$

Analytical geometry:

General line equation: $ax+by+c=0;\ [a;b]\neq[0;0]$

Slope form of line equation: $y=kx+q$

Equation of a circle: $(x-m)^2+(y-n)^2=r^2$

Distance of point M from line p: $|Mp|=\frac{|m_1.a+m_2.b+c|}{\sqrt{a^2+b^2}}$

Volumes and Surfaces:

	Box	Cylinder	Pyramid	Cone	Sphere
Volume	abc	$\pi r^2 v$	$\frac{1}{3}S_p v$	$\frac{1}{3}\pi r^2 v$	$\frac{4}{3}\pi r^3$
Surface	$2(ab+ac+bc)$	$2\pi r(r+v)$	S_p+Q	$\pi r(r+s)$	$4\pi r^2$