



ΚΥΠΡΙΑΚΗ ΜΑΘΗΜΑΤΙΚΗ
ΕΤΑΙΡΕΙΑ
ΜΑΘΗΜΑΤΙΚΗ ΣΚΥΤΑΛΟΔΡΟΜΙΑ 2018
ΓΙΑ ΤΟ ΓΥΜΝΑΣΙΟ
Παρασκευή 26 Ιανουαρίου 2016 – ΛΕΥΚΩΣΙΑ
Τάξη: Α' Γυμνασίου

ΣΥΝΕΡΓΑΣΙΑ



SCHOOL

Starting
Time 10:15

Ending
Time 10:30

Time of
Delivery

A. PROBLEM

Consider a 6X6 grid consisting of 36 unit squares (i.e. squares with side length of 1 unit each), as shown in Figure 1.

(a) Suppose that we shade the unit square appearing in the first line and first column of the grid, as shown in Figure 2. Determine the number of 3X3 squares in the grid which **do not** cover (i.e. do not contain) the shaded square.

(b) Suppose that we shade the unit square appearing in the second line and third column of the grid, as shown in Figure 3. Determine the total number of squares in the grid (of any possible size) which **do not** cover (i.e. do not contain) the shaded square.

(c) Shade a unit square in Figure 1 such that the total number of squares in the grid (of any possible size) which **do not** cover (i.e. do not contain) that shaded square, is exactly equal to 63.

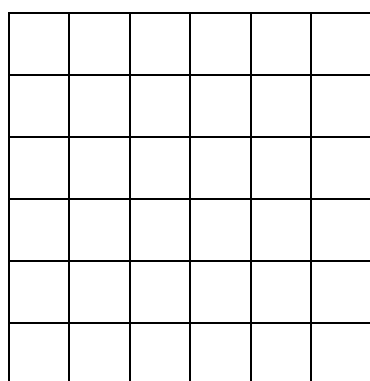


Figure 1

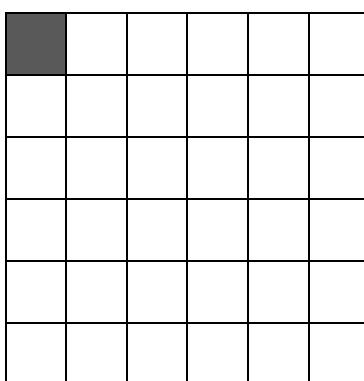


Figure 2

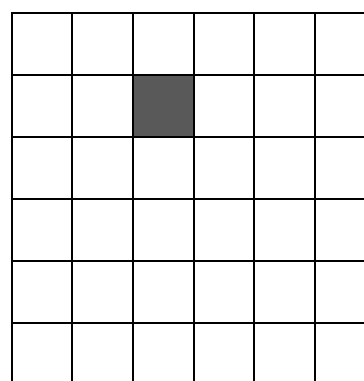


Figure 3

SOLUTION (Explain your answer fully)



**ΚΥΠΡΙΑΚΗ ΜΑΘΗΜΑΤΙΚΗ
ΕΤΑΙΡΕΙΑ**
ΜΑΘΗΜΑΤΙΚΗ ΣΚΥΤΑΛΟΔΡΟΜΙΑ 2018
ΓΙΑ ΤΟ ΓΥΜΝΑΣΙΟ
Παρασκευή 26 Ιανουαρίου 2018 – ΛΕΥΚΩΣΙΑ
Τάξη: Β' Γυμνασίου

ΣΥΝΕΡΓΑΣΙΑ



SCHOOL

Starting
Time

Ending
Time 11:00

Time of
Delivery

PROBLEM

Five contestants A, B, Γ, Δ, E take part in a TV game show. The show takes place during the weekend and has the following rules:

- On Saturday, the contestants answer knowledge questions and collect a non-negative integer number of points each. They transfer these points to the part of the show on Sunday.
- On Sunday, there are **five rounds** of questions and in each round the weakest contestant 'loses'.
- If a contestant 'loses' on a round, he/she can still remain in the game by giving to each of the four other contestant as many points as each has (i.e. in that case, every other contestant doubles its points). If he/she is unable to do so, then he/she leaves the game.

On Sunday, the contestants who 'lost' on each round were A, B, Γ, Δ, E , in this order. After the end of the 5th round, all contestants were still in the game, and in fact had the same integer amount of points x .

(a) Complete the following table showing the number of points that each contestant had **at the beginning of each round**.

(b) Determine the smallest possible number of points that each contestant could have before the start of the show on Sunday.

SOLUTION (*Explain your answer fully*)

(a)

	A	B	Γ	Δ	E
1 st round					
2 nd round					
3 rd round					
4 th round					
5 th round					

(b)



**ΚΥΠΡΙΑΚΗ ΜΑΘΗΜΑΤΙΚΗ
ΕΤΑΙΡΕΙΑ**
ΜΑΘΗΜΑΤΙΚΗ ΣΚΥΤΑΛΟΔΡΟΜΙΑ 2018
ΓΙΑ ΤΟ ΓΥΜΝΑΣΙΟ
Παρασκευή 26 Ιανουαρίου 2018 – ΛΕΥΚΩΣΙΑ
Τάξη: Γ' Γυμνασίου

ΣΥΝΕΡΓΑΣΙΑ



SCHOOL

Starting
Time

Ending
Time 11:45

Time of
Delivery

PROBLEM

Maria and George took part in a treasure hunt organised by the Cyprus Mathematical Society during its Mathematical Summer School. They both started from point A , looking for control point B and moving in the following way:

- George moved due south for 150 m reaching point Z , and then moved due east for 600 m , reaching control point B .
- Maria moved due north reaching point Γ , and then moved on a straight line reaching control point B .

(a) Suppose that Maria and George walked exactly the same distance from point A until control point B . Determine the distance that Maria walked from point A to point Γ .

(b) Suppose that the treasure is at a point θ which is equidistant (i.e. has the same distance) from the points B, Γ and equidistant (i.e. has the same distance) from the lines $\Gamma Z, BZ$. By drawing a figure, explain how you would determine the position of the treasure.

(c) If $\theta Z = \delta\text{ m}$, determine, as a function of δ , the distance of the treasure from point A .

SOLUTION (*Explain your answer fully*)