

MATHCOUNTS® Problem of the Week Archive

Asteroid Blaster – September 26, 2022

Problems & Solutions

In the video arcade game Asteroid Blaster, there are a total of five rounds on the first level. During each round, asteroids appear on the screen and players must blast as many as possible before time expires. To advance to the next round, a player must destroy all the asteroids in the current round.

Round	1	2	3	4	5
Asteroids	1	8	27		

This becomes more difficult to accomplish because the number of asteroids increases with each round. The table shows the number of asteroids for each of the first three rounds. If this pattern continues, how many asteroids will there be to destroy in Round 4?

We can't really tell much by just looking at Round 1. But for Round 2, we can see there are 8 asteroids. The pattern could be $2 \times 4 = 8$ or $2 \times 2 \times 2 = 8$. Let's look at Round 3 to get more information. Round 3 has 27 asteroids, which is either 3×9 or $3 \times 3 \times 3$. It looks like the pattern is $1^3, 2^3, 3^3, \dots$. In which case, the next round would have $4^3 = 4 \times 4 \times 4 = 64$ asteroids.

As the number of asteroids increases with each round of Asteroid Blaster, so does the amount of time within which a player must blast all the asteroids. The table shows the time limit, in seconds, for each round. If this pattern continues, what is the maximum number of seconds allotted to complete all five rounds of this level?

Round	1	2	3	4	5
Seconds	2	4	8	16	

In the first round, there are 2 seconds. The second round has a time limit of $2 \times 2 = 4$ seconds. Then the third round gives the player $2 \times 2 \times 2 = 8$ seconds. In Round 4, a player has $2 \times 2 \times 2 \times 2 = 16$ seconds. Therefore, a player will have $2 \times 2 \times 2 \times 2 \times 2 = 32$ seconds to complete Round 5. To complete all five rounds, a player can take a maximum of $2 + 4 + 8 + 16 + 32 = 62$ seconds.

The number of points awarded for blasting each asteroid also increases with each round. The table shows the number of points awarded for each asteroid shot per round. How many points will a player earn for completing Rounds 1 through 4 and blasting 2/5 of the asteroids in Round 5 before time expires?

Round	1	2	3	4	5
Points (per asteroid)	10	20	30	40	50

For blasting every asteroid in Rounds 1 through 4, a player will earn $(1 \times 10) + (8 \times 20) + (27 \times 30) + (64 \times 40) = 10 + 160 + 810 + 2560 = 3540$ points. The total number of asteroids in Round 5 is $5 \times 5 \times 5 = 125$ asteroids. If a player blasts 2/5 of the asteroids in that round, that is equal to $(2/5) \times 125 = 50$ asteroids. Since it's Round 5, 50 points are awarded for each asteroid blasted, which is $50 \times 50 = 2500$ points. Therefore, the total number of points the player will earn is $3540 + 2500 = 6040$ points.

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