

## Lucky Leprechaun Half-Life Problems

1. An isotope of Luckycharmium has a half-life of 120 days. **How many days** will have passed when 50% of a Luckycharmium sample remains?



2. The half-life of Cloverium-131 is 8 days. **How many grams** of a 777g sample will remain after 40 days have passed?

0	8 days	16 days	24 days	32 days	40 days

3. The half-life of PotOGoldium-222 is 38 seconds. If you had a 12 g sample, **how much would be left** after...

76 seconds?

152 seconds?



4. An isotope of Irishmanium has a half-life of 15 minutes. **How many half-lives** have passed when about 1.88 g of Irishmanium remains from an original 30 g sample?

5. The half-life of Luckium-51 is 28 days. If a sample contains 510 g, **how much was present** 84 days ago?



6. A leprechaun requests 1 g of Rainbowium-214, which has a half-life of 20 minutes. **How many grams** of Rainbowium-214 must be prepared if the shipping time is 1 hour?

7. It takes a middle school student's body 5 hours to metabolize  $\frac{1}{2}$  of the caffeine in a Shamrock Shake. There are 320 mg of caffeine per shake. Erin wakes up on St. Patty's Day and drinks 3 Shamrock Shakes at 7 a.m. By what time will Erin's body have metabolized the caffeine to 60 mg?

8. Henry stayed up late last night playing X-Box. At the stroke of midnight (12:00 a.m.), a leprechaun visited Henry and gave him a pot filled with 1,348 radioactive gold coins that decay into coal. Before vanishing, he said:



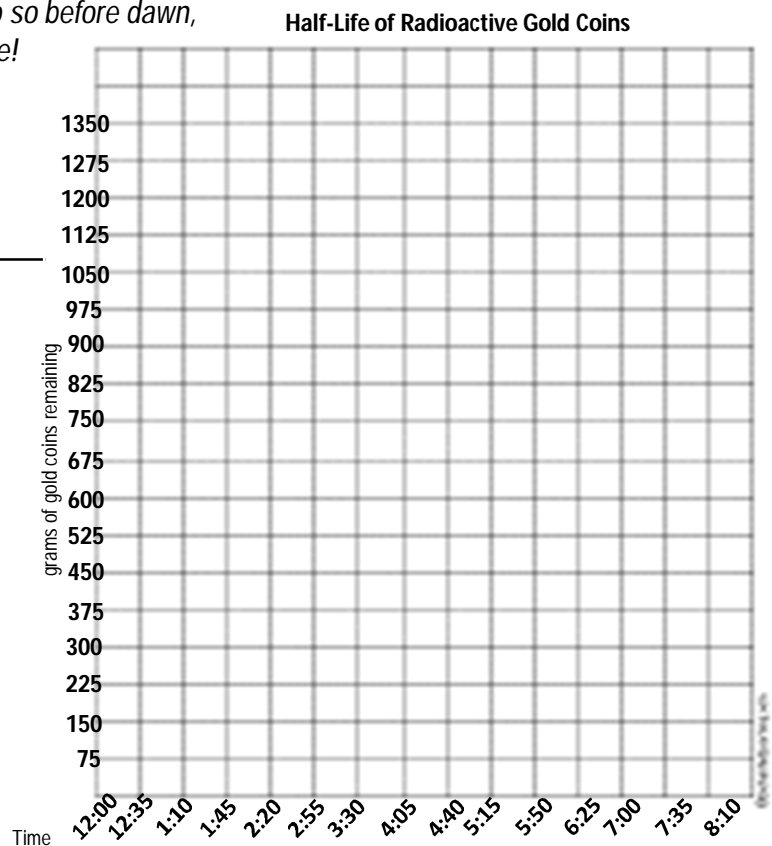
*I've come over the rainbow and through the cold  
Cause your luck has struck this radioactive gold!  
To show your friends, you must do so before dawn,  
For in 35 minutes, half will be gone!*

a. Fill in the half-life table for the data:

12:00	12:35		1:45			3:30					
		337 g		84.25 g							

b. Graph the decay of the 1,348 radioactive coins.

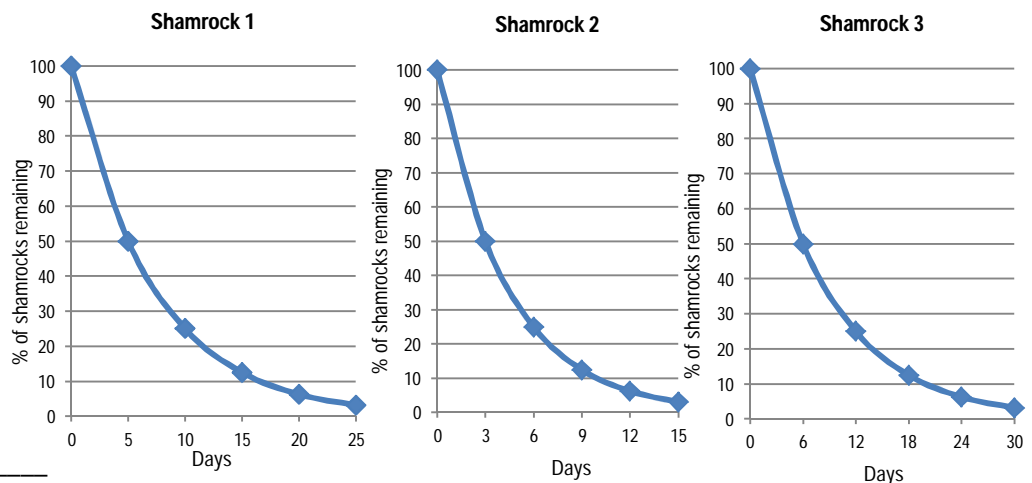
c. By what time will Henry have only one full gold coin left to show his friends?



9. The atoms of the three radioactive shamrock species in Leprechaun Ville have different half-lives. Look at the graphs to the right to answer the questions:

a. Which species has the **shortest** half-life? \_\_\_\_\_

b. You pick a bouquet of Shamrock 3 on St. Patty's Day (March 17). On what day of the month will you have only 25% of your bouquet left? \_\_\_\_\_



## Lucky Leprechaun Half-Life Problems

1. An isotope of Luckycharmium has a half-life of 120 days. **How many days** will have passed when 50% of a Luckycharmium sample remains?

**120 days**



2. The half-life of Cloverium-131 is 8 days. **How many grams** of a 777g sample will remain after 40 days have passed?

0	8 days	16 days	24 days	32 days	40 days
777 g	388.5 g	194.25g	97.13 g	48.56 g	24.28 g

3. The half-life of PotOGoldium-222 is 38 seconds. If you had a 12 g sample, **how much would be left** after...

76 seconds? **3 g**

152 seconds? **0.75 g**

0	1 (38 s)	2 (56 s)	3 (114 s)	4 (152 s)
12 g	6 g	3 g	1.5 g	0.75 g



4. An isotope of Irishmanium has a half-life of 15 minutes. **How many half-lives** have passed when about 1.88 g of Irishmanium remains from an original 30 g sample?

0	1	2	3	4
30 g	15 g	7.5 g	3.75 g	1.88 g

**4 half-lives**

5. The half-life of Luckium-51 is 28 days. If a sample contains 510 g, **how much was present** 84 days ago?

84 days ago	56 days ago	28 days ago	today
4080 g	2040 g	1020 g	510 g

**4080 g**



6. A leprechaun requests 1 g of Rainbowium-214, which has a half-life of 20 minutes. **How many grams** of Rainbowium-214 must be prepared if the shipping time is 1 hour?

60 min ago	40 min ago	20 min ago	Now
8 g	4 g	2 g	1 g

**8 g**

7. It takes a middle school student's body 5 hours to metabolize  $\frac{1}{2}$  of the caffeine in a Shamrock Shake. There are 320 mg of caffeine per shake. Erin wakes up on St. Patty's Day and drinks 3 Shamrock Shakes at 7 a.m. By what time will Erin's body have metabolized the caffeine to 60 mg?

$$320 \times 3 = 960 \text{ mg}$$

0 (7 am)	1 (12 p.m.)	2 (5 pm)	3 (10 pm)	4 (3 am)
960 mg	480 mg	240 mg	120 mg	60 mg

at 3 a.m.

8. Henry stayed up late last night playing X-Box. At the stroke of midnight (12:00 a.m.), a leprechaun visited Henry and gave him a pot filled with 1,348 radioactive gold coins that decay into coal. Before vanishing, he said:



*I've come over the rainbow and through the cold  
Cause your luck has struck this radioactive gold!  
To show your friends, you must do so before dawn,  
For in 35 minutes, half will be gone!*

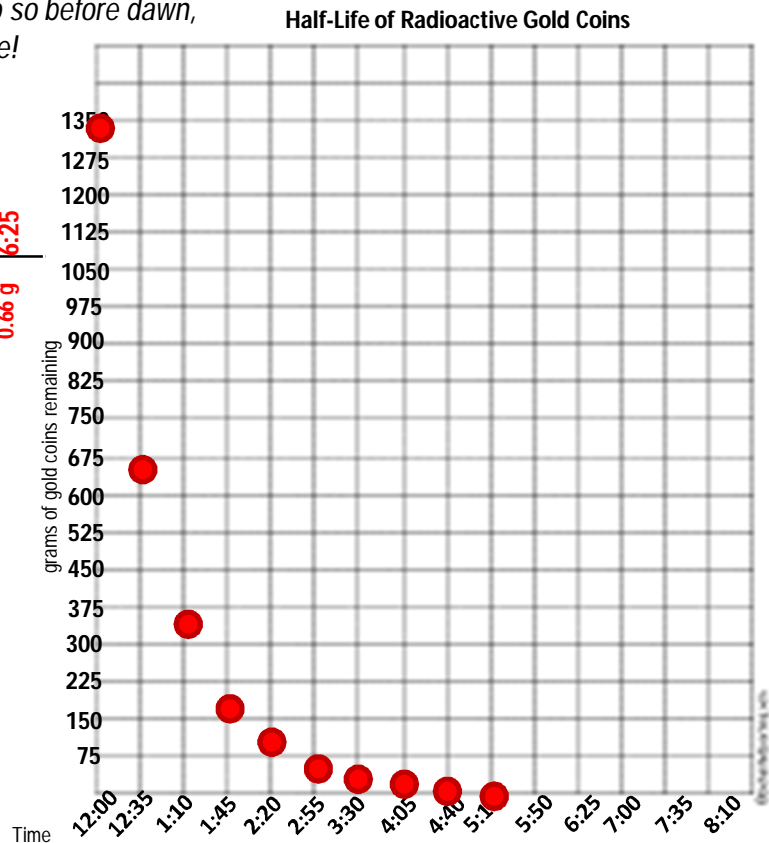
a. Fill in the half-life table for the data:

12:00	12:35	1:10	1:45	2:20	2:55	3:30	4:05	4:40	5:15	5:50	6:25
1348 g	674 g	337 g	168.5 g	84.25 g	42.13 g	21.06 g	10.53 g	5.27 g	2.64 g	1.32 g	0.66 g

b. Graph the decay of the 1,348 radioactive coins.

c. By what time will Henry have only one full gold coin left to show his friends?

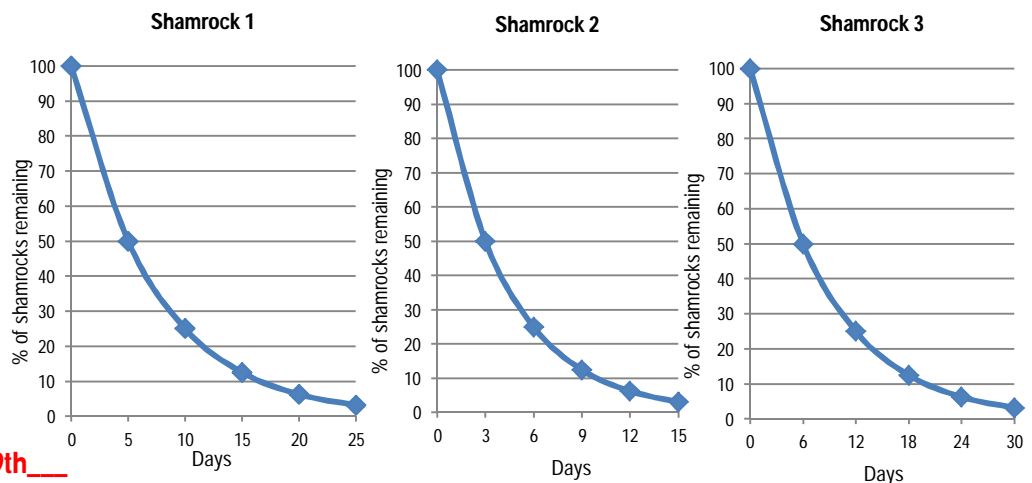
5:50 a.m.



9. The atoms of the three radioactive shamrock species in Leprechaun Ville have different half-lives. Look at the graphs to the Right to answer the questions:

a. Which species has the shortest half-life? 2

b. You pick a bouquet of Shamrock 3 on St. Patty's Day (March 17). On what day of the month will you have only 25% of your bouquet left? March 29th



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