

A savings account starts

with \$500. Each

subsequent year it earns

8% in interest. After a certain number of

quarters it has \$4,313.

## mobius

## **Exponential Function Solving - Growth** (Discrete, Mis-matched Time Units)



## **Scenario to Time**

How would you solve for the time given this scenario?

 $egin{aligned} \mathsf{A}_t &= rac{1}{4} \cdot rac{\mathsf{ln} rac{P}{P_0}}{\mathsf{ln} \left( 1 - r 
ight)} & \mathsf{B}_t &= 4 \cdot rac{\mathsf{ln} rac{P}{P_0}}{\mathsf{ln} \left( 1 + r 
ight)} \ & \mathsf{C}_t &= rac{1}{4} \cdot rac{\mathsf{ln} rac{P}{P_0}}{\mathsf{ln} \left( 1 + r 
ight)} & \mathsf{D}_t &= 4 \cdot rac{\mathsf{ln} \, P \cdot P_0}{\mathsf{ln} \left( 1 + r 
ight)} \end{aligned}$ 

2

A savings account starts with \$400. Each subsequent month it earns 8% in interest. After a certain number of years it has \$587. How would you solve for the time given this scenario?

 $egin{aligned} egin{aligned} \mathsf{A} & t = 12 \cdot rac{\mathsf{ln} rac{P}{P_0}}{\mathsf{ln} \left( 1 + r 
ight)} & egin{aligned} \mathsf{B} & t = rac{1}{12} \cdot rac{\mathsf{ln} rac{P}{P_0}}{\mathsf{ln} \left( 1 + r 
ight)} \end{aligned} \ & \mathcal{C} = rac{1}{12} \cdot rac{\mathsf{ln} \, P \cdot P_0}{\mathsf{ln} \left( 1 + r 
ight)} \end{aligned}$ 

3

A savings account starts with \$300. Each subsequent year it earns 4% in interest. After a certain number of quarters it has \$657.

How would you solve for the time given this scenario?

$$egin{aligned} \mathsf{A}_t &= rac{1}{4} \cdot rac{\ln rac{P}{P_0}}{\ln \left( 1 + r 
ight)} & \mathsf{B}_t &= rac{1}{4} \cdot rac{\ln rac{P}{P_0}}{\ln \left( 1 - r 
ight)} \ & \mathsf{C}_t &= 4 \cdot rac{\ln rac{P}{P_0}}{\ln \left( 1 + r 
ight)} \end{aligned}$$

4

A savings account starts with \$400. Each subsequent month it earns 2% in interest. After a certain number of quarters it has \$468. How would you solve for the time given this scenario?

$$egin{aligned} \mathsf{A} & t = rac{1}{3} \cdot rac{\ln rac{P}{P_0}}{\ln \left( 1 + r 
ight)} \end{aligned} egin{aligned} \mathsf{B} & t = 3 \cdot rac{\ln rac{P}{P_0}}{\ln \left( 1 + r 
ight)} \end{aligned} \ \mathcal{C} & t = rac{1}{3} \cdot rac{\ln P \cdot P_0}{\ln \left( 1 + r 
ight)} \end{aligned}$$

5

A credit card starts with \$500 of debt. Each subsequent quarter it grows by 4% in interest. After a certain number of months the debt has grown to \$1,139.

How would you solve for the time given this scenario?

$$egin{aligned} \mathsf{A} & t = rac{1}{3} \cdot rac{\mathsf{ln} \, rac{D}{D_0}}{\mathsf{ln} \, (1+r)} \end{aligned} egin{aligned} \mathsf{B} & t = 3 \cdot rac{\mathsf{ln} \, D \cdot D_0}{\mathsf{ln} \, (1+r)} \end{aligned} \ \mathsf{C} & t = 3 \cdot rac{\mathsf{ln} \, rac{D}{D_0}}{\mathsf{ln} \, (1+r)} \end{aligned} \end{aligned} egin{aligned} \mathsf{D} & t = rac{1}{3} \cdot rac{\mathsf{ln} \, rac{D}{D_0}}{\mathsf{ln} \, (1-r)} \end{aligned}$$

6

A credit card starts with \$800 of debt. Each subsequent quarter it grows by 9% in interest. After a certain number of years the debt has grown to \$1,036.

How would you solve for the time given this scenario?

$$egin{aligned} \mathsf{A}_t = \mathsf{4} \cdot rac{\mathsf{ln} \, rac{D}{D_0}}{\mathsf{ln} \, (\mathsf{1} - r)} & \mathsf{B}_t = \mathsf{4} \cdot rac{\mathsf{ln} \, rac{D}{D_0}}{\mathsf{ln} \, (\mathsf{1} + r)} \ & \mathsf{C}_t = rac{\mathsf{1}}{\mathsf{4}} \cdot rac{\mathsf{ln} \, rac{D}{D_0}}{\mathsf{ln} \, (\mathsf{1} + r)} \end{aligned}$$

7

A credit card starts with \$500 of debt. Each subsequent quarter it grows by 7% in interest. After a certain number of years the debt has grown to \$859.

How would you solve for the time given this scenario?

$$egin{aligned} \mathsf{A} & \mathsf{t} = \mathsf{4} \cdot rac{\mathsf{ln} \, rac{D}{D_0}}{\mathsf{ln} \, (\mathsf{1} + r)} & \mathsf{B} & \mathsf{t} = \mathsf{4} \cdot rac{\mathsf{ln} \, rac{D}{D_0}}{\mathsf{ln} \, (\mathsf{1} - r)} \end{aligned}$$

8

A credit card starts with \$300 of debt. Each subsequent quarter it grows by 6% in interest. After a certain number of months the debt has grown to \$1,019.

How would you solve for the time given this scenario?

$oxed{A} t = rac{1}{3} \cdot rac{ \ln rac{D}{D_0}}{\ln \left( 1 - r  ight)}$	$egin{aligned} B \ t = 3 \cdot rac{In  rac{D}{D_0}}{In  (1+r)} \end{aligned}$
$t = rac{1}{3} \cdot rac{ \ln rac{D}{D_0}}{\ln \left( 1 + r  ight)}$	