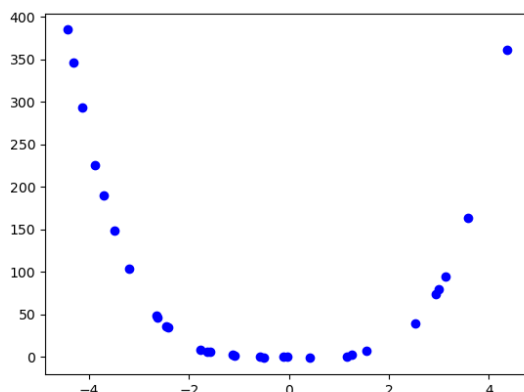


This key should allow you to understand why you choose the option you did (beyond just getting a question right or wrong). More instructions on how to use this key can be found [here](#).

If you have a suggestion to make the keys better, please fill out the short survey [here](#).

Note: This key is auto-generated and may contain issues and/or errors. The keys are reviewed after each exam to ensure grading is done accurately. If there are issues (like duplicate options), they are noted in the offline gradebook. The keys are a work-in-progress to give students as many resources to improve as possible.

1. Determine the appropriate model for the graph of points below.



The solution is Non-linear Power model, which is option B.

- A. Exponential model

For this to be the correct option, we want an extremely slow change early, then a rapid change later.

- B. Non-linear Power model

For this to be the correct option, we need to see a polynomial or rational shape.

- C. Linear model

For this to be the correct option, we need to see a mostly straight line of points.

- D. Logarithmic model

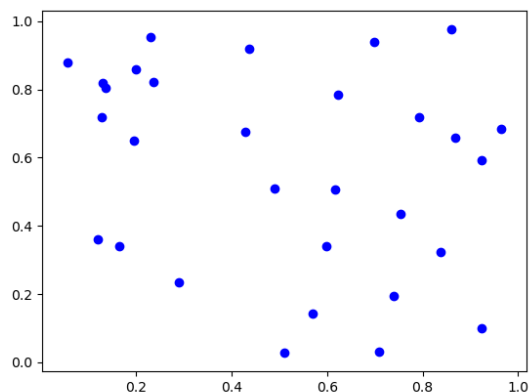
For this to be the correct option, we want a rapid change early, then an extremely slow change later.

- E. None of the above

For this to be the correct option, we want to see no pattern in the points.

General Comment: This question is testing if you can associate the models with their graphical representation. If you are having trouble, go back to the corresponding Core module to learn about the specific function you are having trouble recognizing.

2. Determine the appropriate model for the graph of points below.



The solution is None of the above, which is option E.

A. Exponential model

For this to be the correct option, we want an extremely slow change early, then a rapid change later.

B. Non-linear Power model

For this to be the correct option, we need to see a polynomial or rational shape.

C. Linear model

For this to be the correct option, we need to see a mostly straight line of points.

D. Logarithmic model

For this to be the correct option, we want a rapid change early, then an extremely slow change later.

E. None of the above

For this to be the correct option, we want to see no pattern in the points.

General Comment: This question is testing if you can associate the models with their graphical representation. If you are having trouble, go back to the corresponding Core module to learn about the specific function you are having trouble recognizing.

3. Using the scenario below, model the situation using an exponential function and a base of $\frac{1}{2}$. Then, solve for the half-life of the element, rounding to the nearest day.

The half-life of an element is the amount of time it takes for the element to decay to half of its initial starting amount. There is initially 920 grams of element X and after 4 years there is 131 grams remaining.

The solution is About 365 days, which is option B.

A. About 0 days

This models half-life as a linear function.

B. About 365 days

* This is the correct option.

C. About 1825 days

This uses the correct model but solves for the exponential constant incorrectly.

D. About 730 days

This uses the correct model but a base of e rather than $\frac{1}{2}$.

E. None of the above

Please contact the coordinator if you believe all the options above are incorrect.

General Comment: The model should be $A(t) = A_0(\frac{1}{2})^{kt}$, where $A(t)$ is the amount after t years, A_0 is the initial amount, and k is decay constant. To find the half-life, you need to solve for k by using the amount after x years, then solve for the time t when $A = \frac{A_0}{2}$. Your answer would be in years, so convert to days.

4. Solve the modeling problem below, if possible.

A new virus is spreading throughout the world. There were initially 4 many cases reported, but the number of confirmed cases has doubled every 4 days. How long will it be until there are at least 1000000 confirmed cases?

The solution is About 72 days, which is option A.

A. About 72 days

* This is the correct option.

B. About 50 days

You modeled the situation with e as the base, but solved correctly otherwise.

C. About 27 days

You modeled the situation correctly but did not apply the properties of log correctly.

D. About 24 days

You modeled the situation with e as the base and did not apply the properties of log correctly.

E. There is not enough information to solve the problem.

If you chose this option, please contact the coordinator to discuss why you think this is the case.

General Comment: Set up the model the same as in Module 11M. Then, plug in 1000000 and solve for d in your model.

5. Solve the modeling problem below, if possible.

In CHM2045L, Brittany created a 29 liter 24 percent solution of chemical χ using two different solution percentages of chemical χ . When she went to write her lab report, she realized she forgot to write the amount of each solution she used! If she remembers she used 18 percent and 37 percent solutions, what was the amount she used of the 37 percent solution?

The solution is 9.16, which is option B.

A. 19.84

This is the concentration of 18 percent solution.

B. 9.16

*This is the correct option.

C. 13.84

This was a random value. If this was not a guess, contact the coordinator to talk about how you got this value.

D. 14.50

This would be correct if Brittany used equal parts of each solution.

E. There is not enough information to solve the problem.

You may have chose this if you thought you needed to know how much of the second solution was used in the problem. Remember that the total minus the first solution would give you the second amount used.

General Comment: Build the model exactly as you did in Module 9M. Then, solve for the volume you are looking for.

6. Solve the modeling problem below, if possible.

A new virus is spreading throughout the world. There were initially 3 many cases reported, but the number of confirmed cases has tripled every 4 days. How long will it be until there are at least 1000 confirmed cases?

The solution is About 22 days, which is option C.

A. About 13 days

You modeled the situation correctly but did not apply the properties of log correctly.

B. About 24 days

You modeled the situation with e as the base, but solved correctly otherwise.

C. About 22 days

* This is the correct option.

D. About 14 days

You modeled the situation with e as the base and did not apply the properties of log correctly.

E. There is not enough information to solve the problem.

If you chose this option, please contact the coordinator to discuss why you think this is the case.

General Comment: Set up the model the same as in Module 11M. Then, plug in 1000 and solve for d in your model.

7. For the scenario below, use the model for the volume of a cylinder as $V = \pi r^2 h$.

Pringles wants to add 35 percent more chips to their cylinder cans and minimize the design change of their cans. They've decided that the best way to minimize the design change is to increase the radius and height by the same percentage. What should this increase be?

The solution is About 11 percent, which is option A.

A. About 11 percent

* This is the correct option.

B. About 3 percent

This corresponds to not solving for the increase properly.

C. About 18 percent

This corresponds to treating both radius and height as equal contributors and not solving correctly.

D. About 16 percent

This corresponds to solving correctly but treating both radius and height as equal contributors to the volume.

E. None of the above

If you chose this, please contact the coordinator to discuss how you solved the problem.

General Comment: Remember that when plugging the increases of values in, you need to treat it as that percentage above 100. For example, a 5 percent increase means 105 percent.

8. For the scenario below, use the model for the volume of a cylinder as $V = \pi r^2 h$.

Pringles wants to add 44 percent more chips to their cylinder cans and minimize the design change of their cans. They've decided that the best way to minimize the design change is to increase the radius and height by the same percentage. What should this increase be?

The solution is About 13 percent, which is option A.

A. About 13 percent

* This is the correct option.

B. About 20 percent

This corresponds to solving correctly but treating both radius and height as equal contributors to the volume.

C. About 22 percent

This corresponds to treating both radius and height as equal contributors and not solving correctly.

D. About 4 percent

This corresponds to not solving for the increase properly.

E. None of the above

If you chose this, please contact the coordinator to discuss how you solved the problem.

General Comment: Remember that when plugging the increases of values in, you need to treat it as that percentage above 100. For example, a 5 percent increase means 105 percent.

9. Using the scenario below, model the situation using an exponential function and a base of $\frac{1}{2}$. Then, solve for the half-life of the element, rounding to the nearest day.

The half-life of an element is the amount of time it takes for the element to decay to half of its initial starting amount. There is initially 510 grams of element X and after 20 years there is 72 grams remaining.

The solution is About 2555 days, which is option B.

A. About 730 days

This models half-life as a linear function.

B. About 2555 days

* This is the correct option.

C. About 3650 days

This uses the correct model but a base of e rather than $\frac{1}{2}$.

D. About 9125 days

This uses the correct model but solves for the exponential constant incorrectly.

E. None of the above

Please contact the coordinator if you believe all the options above are incorrect.

General Comment: The model should be $A(t) = A_0\left(\frac{1}{2}\right)^{kt}$, where $A(t)$ is the amount after t years, A_0 is the initial amount, and k is decay constant. To find the half-life, you need to solve for k by using the amount after x years, then solve for the time t when $A = \frac{A_0}{2}$. Your answer would be in years, so convert to days.

10. Solve the modeling problem below, if possible.

In CHM2045L, Brittany created a 22 liter 28 percent solution of chemical χ using two different solution percentages of chemical χ . When she went to write her lab report, she realized she forgot to write the amount of each solution she used! If she remembers she used 6 percent and 32 percent solutions, what was the amount she used of the 32 percent solution?

The solution is 18.62, which is option B.

A. 16.60

This was a random value. If this was not a guess, contact the coordinator to talk about how you got this value.

B. 18.62

*This is the correct option.

C. 3.38

This is the concentration of 6 percent solution.

D. 11.00

This would be correct if Brittany used equal parts of each solution.

E. There is not enough information to solve the problem.

You may have chose this if you thought you needed to know how much of the second solution was used in the problem. Remember that the total minus the first solution would give you the second amount used.

General Comment: Build the model exactly as you did in Module 9M. Then, solve for the volume you are looking for.
