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.

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1. Solve the modeling problem below, if possible.

   In CHM2045L, Brittany created a 27 liter 36 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 7 percent and 36 percent solutions, what was the amount she used of the 36 percent solution?

   The solution is 27.00, which is option B.

   A. 25.23

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

   B. 27.00

      *This is the correct option.

   C. 13.50

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

   D. -0.00

      This is the concentration of 7 percent 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.

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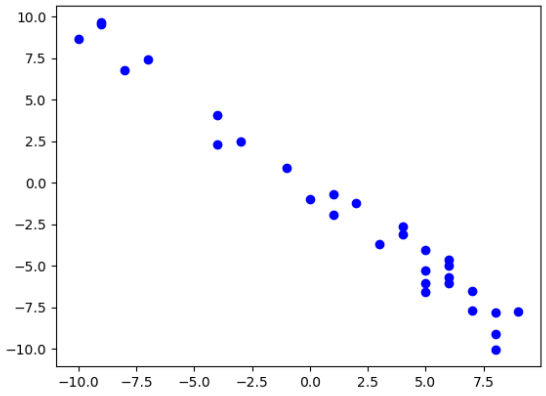
2. Determine the appropriate model for the graph of points below.



The solution is Linear model, which is option B.

A. Non-linear Power model

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

B. Linear model

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

C. Logarithmic model

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

D. Exponential model

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

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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 577 grams of element X and after 4 years there is 82 grams remaining.

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

   A. About 1825 days

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

   B. About 365 days

      * This is the correct option.

C. About 730 days

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

D. About 0 days

This models half-life as a linear function.

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.

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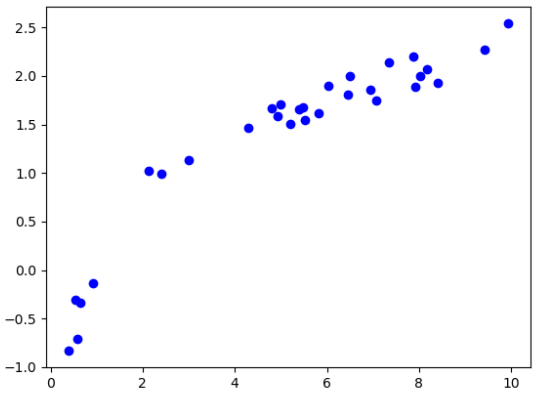
4. Determine the appropriate model for the graph of points below.



The solution is Logarithmic model, which is option A.

A. Logarithmic model

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

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

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5. The temperature of an object, T, in a different surrounding temperature T_s will behave according to the formula $T(t) = Ae^{kt} + T_s$, where t is minutes, A is a constant, and k is a constant. Use this formula and the situation below to construct a model that describes the uranium's temperature, T, based on the amount of time t (in minutes) that have passed. Choose the correct constant k from the options below.

   Uranium is taken out of the reactor with a temperature of 180° *C and is placed into a* 11° *C bath to cool. After 17 minutes, the uranium has cooled to* 110° *C.*

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

   A. $k = -0.03517$

      This uses A as the initial temperature and solves for k incorrectly.

   B. $k = -0.03517$

      This uses A as the initial temperature and solves for k correctly.

   C. $k = -0.04410$

      This uses A correctly and solves for k incorrectly.

   D. $k = -0.04365$

      This uses A as the initial temperature and solves for k incorrectly.

   E. None of the above

      * This is the correct answer as $k = -0.03146$.

   General Comment: The initial temperature is when $t = 0$. Unlike power models, that means A is not the initial temperature!

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

   Pringles wants to add 47 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 14 percent, which is option B.

   A. About 24 percent

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

   B. About 14 percent

      * This is the correct option.

   C. About 4 percent

      This corresponds to not solving for the increase properly.

   D. About 21 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 discus 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.

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7. 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 tripled every 5 days. How long will it be until there are at least 10000 confirmed cases?

The solution is About 36 days, which is option C.

A. About 40 days

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

B. About 19 days

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

C. About 36 days

* This is the correct option.

D. About 20 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 10000 and solve for d in your model.

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8. Solve the modeling problem below, if possible.

A new virus is spreading throughout the world. There were initially 5 many cases reported, but the number of confirmed cases has quadrupled every 5 days. How long will it be until there are at least 10000 confirmed cases?

The solution is About 28 days, which is option B.

A. About 18 days

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

B. About 28 days

* This is the correct option.

C. About 16 days

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

D. About 39 days

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

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 10000 and solve for d in your model.

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

   Pringles wants to add 31 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 9 percent, which is option B.

   A. About 3 percent

      This corresponds to not solving for the increase properly.

   B. About 9 percent

      * This is the correct option.

   C. About 16 percent

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

   D. About 14 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 discus 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.

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10. Solve the modeling problem below, if possible.

    In CHM2045L, Brittany created a 27 liter 26 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 10 percent and 32 percent solutions, what was the amount she used of the 32 percent solution?

    The solution is 19.64, which is option C.

    A. 14.42

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

    B. 13.50

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

    C. 19.64

       *This is the correct option.

    D. 7.36

       This is the concentration of 10 percent 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.
