Engage

A) Your favorite shoes are on sale 30% off. The original price was $74.99. What is the sale price of the shoes?

B) You and your friend go to dinner and the bill is $45.62. You want to tip the waiter 23% because 23 is your favorite number. What will be the total including the tip?

Explain

<table>
<thead>
<tr>
<th>General Growth/Decay</th>
<th>Percentage Rate Growth/Decay</th>
<th>Half-Life</th>
</tr>
</thead>
<tbody>
<tr>
<td>( y = a(b)^x )</td>
<td>( y = a(1 + r)^x )</td>
<td>( y = a\left(\frac{1}{2}\right)^{-\frac{\text{time}}{\text{half-life}}} )</td>
</tr>
<tr>
<td>( y = a(1 - r)^x )</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1. Ed bought a new mustang for $20,000. Mustangs depreciate at a rate of 22% per year.

a) What is the initial value?

b) What is the growth/decay rate?

c) Write an equation.

d) How much will the Mustang be worth in 6 years when he graduates from college?

e) When will the car be worth $1000?
2. The school currently has 1800 students and a 25% rate of growth due to people moving in to the school each year.
   a) What is the initial amount?

   b) What is the growth rate?

   c) Write an equation.

   d) Predict the number of students in 2 years.

3. The Interwrite Pad Mrs. Granier is using this year has become famous and is now considered a collector's item. As a result, it will appreciate at a rate of 15% per year. The school paid $150 for the pad initially.
   a) What is the initial value?

   b) What is the growth/decay rate?

   c) Write an equation.

   d) How much will it be worth in 10 years?

   e) When will it be worth $10,000?

4. The number of redhawks in Frisco is doubling every 6 months. Currently there are 200 redhawks in Frisco.
   a) What is the initial amount?

   b) What is the growth/decay rate?

   c) Write an equation.

   d) How many redhawks will there be in 4 years?

   e) When will there be 10,000 redhawks in the area?
5. Mr. Smith had to take 50 mg of Iodine-131 to treat his thyroid disease. Iodine-131 has a half-life of 8 hours.
   a) What is the initial amount?
   b) What is the growth/decay rate?
   c) Write an equation.
   d) How much was left in his body after 1 day?
   e) When did the amount drop below 1 mg?

6. A new drug to treat a disease has a half-life of 3 hours. If 50cc is initially administered, how much will still be in your system 24 hours later?

7. Nobelium -259 has a half-life of 58 minutes. How much remains of a 1 kg sample of 1 day?

8. Dubnium-262 has a half-life of 34 seconds. How many grams did we begin with if, after 5 minutes, we are left with only 1 gram?

9. Caffeine in the blood stream has a half-life of 5 hours as shown in the table below. A venti sized coffee from Starbucks has 415 mg of caffeine. How much caffeine would be left behind in your body 24 hours after drinking a venti coffee?

<table>
<thead>
<tr>
<th>Time (hours)</th>
<th>Amount of caffeine in body (mg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>415</td>
</tr>
<tr>
<td>5</td>
<td>207.5</td>
</tr>
<tr>
<td>10</td>
<td>103.75</td>
</tr>
<tr>
<td>15</td>
<td>51.875</td>
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