ANSWERS

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32. The situations that could produce an exponential graph are:

a) The pyramid scam
d) The decay of Carbon-14.

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26. There are three possible functions:

1) The value increases by a factor of 1.2 every year. → $y = 5(1.2)^x$
2) The value increases by a factor of 3 every six years → $y = 5(3)^{\frac{x}{6}}$
3) The value increases by a factor of 9 every twelve years. → $y = 5(9)^{\frac{x}{12}}$.

27. The initial value 1.85 (a); doubles (b=2); every 5 years (c=5).

Equation: $y = ab^{\frac{x}{c}}$

$y = 1.85(2)^{\frac{x}{5}}$

In 2022 (x= 27)

↳ $y = 1.85(2)^{\frac{27}{5}}$

$y = \$78.11$

In 2022, the car will be worth $78.11.

Hilroy

28. $P = 4.22(2)^{\frac{t}{16}}$

Using the written description only, the initial value in 1990 ($t=0$) is 4.22; the population doubled (2); the doubling occurred after 16 years.

29. Initial value → 300 (a)
Population doubled → 2 (b)
15 minutes to double → 15 (c)

$y = ab^{\frac{x}{c}}$

$y = 300(2)^{\frac{x}{15}}$
Chester's Answer (in minutes)

$y = 300(2)^{4x}$
Rosalee's Answer (in hours)

The 2 functions have the same base (b=2) because the population is doubling, and they have the same initial value (a=300) because regardless of the units of time, the initial population for the bacteria is 300 /mm².

- Chester needed the resulting exponent to be 1 when he substituted 15 min for x. This could only be achieved by using an exponent of $\frac{x}{15}$ in his function.
- Rosalee needed the resulting exponent to be 1 when she substituted $\frac{1}{4}$ for x. This could only be achieved by using an exponent of $4x$ in her function

↳ Therefore, both students are correct!

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31. $P = 300(2)^{\frac{t}{20}}$

a) The initial concentration of bacteria was 300 bacteria/cm^2.

b) It takes 20 min for the concentration to double.

c)

$P = 300(2)^{\frac{t}{20}}$

In 50 min:

$P = 300(2)^{\frac{50}{20}}$

$= 300(2)^{2.5}$

$= 1697$ bacteria/cm^2

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34. Initial amount of carbon-14 → 2.8mg (a)
Decays to half its original mass → 1/2 (b)
5750 years to decay by half → 5750 (c)

a) Equation: $y = ab^{\frac{x}{c}}$

$y = 2.8\left(\frac{1}{2}\right)^{\frac{x}{5750}}$ OR $y = 2.8\left(\frac{1}{2}\right)^{\frac{t}{5750}}$

b) If the skull were 12000 years old:

$y = 2.8\left(\frac{1}{2}\right)^{\frac{12000}{5750}}$

$= 0.66$ mg.

35. Initial amount of investment → $1000 (a)
Investment doubles → 2 (b)
Doubling time → 8 (c)

Equation: $y = ab^{\frac{x}{c}}$

$y = 1000(2)^{\frac{x}{8}}$

Therefore, after 4 years: $y = 1000(2)^{\frac{4}{8}}$

$y = 1000(2)^{1/2}$

$y = \$1414.21$

Jim's assumption was wrong because after 4 years his investment will be worth $1414.21.

36. Initial population → 3500
After 2 days → 2200

Common Ratio = $\frac{2200}{3500}$
$= 0.6286$

a) Equation: $y = ab^{\frac{x}{c}}$
$y = 3500(0.6286)^{\frac{x}{2}}$

b) After 4 days: $y = 3500(0.6286)^{\frac{x}{2}}$
$y = 3500(0.6286)^{\frac{4}{2}}$
$y = 3500(0.6286)^{2}$
$y = 1383$ frogs

<u>OR</u> Without the equation:

Day 0 3500 frogs) × 0.6286
Day 2 2200 frogs) × 0.6286
Day 4 1383 frogs

c) After 7 days: $y = 3500(0.6286)^{\frac{7}{2}}$
$y = 689$ frogs.