

## Warm Up

1. Multiply:  $(5 + 4i)(3 - 2i) = 23 + 2i$

2. Solve the following by completing the square:  
 $x^2 + 12x + 9 = 0$

$(x+6)^2 = 27$

3. Simplify:  $\sec x \cos x - \tan^2 x \cos^2 x$

$\frac{1}{\cos x} \cos x - \frac{\sin x}{\cos x} \cos^2 x = 1 - \sin x \cos x$

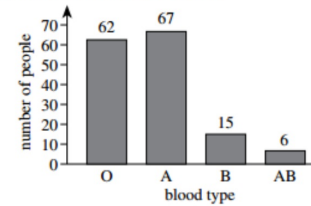
4. Solve:  $\log 4x - \log 2 = \log 16$

$x = 8$

5. A population is increasing by 2.5% each year. If the current population is 60,561 what will the population be in 14 years?  $85571.10757$

## ACT Question of the Day

1. The blood types of 150 people were determined for a study as shown in the figure below.

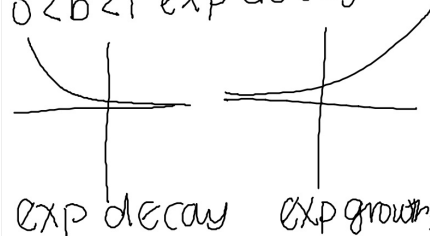


If 1 person from this study is randomly selected, what is the probability that this person has either Type A or Type AB blood?

- A.  $\frac{62}{150}$
- B.  $\frac{66}{150}$
- C.  $\frac{68}{150}$
- D.  $\frac{73}{150}$
- E.  $\frac{84}{150}$

## Exponential Growth and Decay

- $y = ab^x$
- b is always positive
  - b is always the # with the x
- y - int (0, a)
  - a - initial value
- b > 1 exp growth
- 0 < b < 1 exp decays



•  $A(t) = a(1+r)^t$   
 A(t) - final amount  
 a - initial amt. r - rate as decimal  
 t - time in years

Compounded Contin.  
 $A(t) = Pe^{rt}$   
 p - principal rate (initial amt)

Compounded \_\_\_\_\_  
 $A(t) = P(1 + \frac{r}{n})^{nt}$   
 n - # of compounds in a yr  
 annually = 1    quarterly = 4  
 semi-annly = 2    month = 12  
 weekly = 52    daily = 365

## Player/Coach Review

1. Convert the following to exponential form:

$\log_3 x = 2$

$b = 10 \quad x = 3x \quad y = 2 \quad 10^2 = 3x$

2. Convert the following to logarithmic form:

$e^x = 5$

$\ln e^x = \ln 5$   
 $x = \ln 5$

3. Solve the following:

$3\log 2 + \log 4 = \log x$

$\log 2^3 + \log 4 = \log x$   
 $\log 32 = \log x$   
 $x = 32$

4. Solve the following:

$\log_3 48 - \log_3 16 = 4x$

$\log_3 (3) = 4x$      $b=3$   
 $3^{4x} = 3$      $x=3$   
 $\frac{4x}{4} = \frac{1}{4}$      $y=4x$   
 $x = \frac{1}{4}$

5. You invest \$1000 in an account compounded continuously at a rate of 4.5%. How much money will you have in the account after 5 years?  $A(t) = Pe^{rt}$

$$r = .045 \quad P = 1000 \quad t = 5 \quad A(t) = 1000e^{(.045)(5)} = 1,252.32$$

6. How long will it take for \$3000 to triple in an account that compounds continuously with a rate of 3.5%?  $P = 3000 \quad r = .035 \quad t = ? \quad A(t) = 9000$

$$\frac{9000}{3000} = \frac{3000e^{(.035)t}}{3000} \quad 3 = e^{.035t} \quad \ln 3 = \ln e^{.035t} \quad \frac{\ln 3}{.035} = \frac{.035t}{.035} \quad t = 31.38$$

7. A population is declining at a rate of 5%. If the population is currently 54,897 who long will it take for the population to be 48,000?  $A(t) = a(1 \pm r)^t$

$$r = .05 \quad a = 54,897 \quad t = ? \quad A(t) = 48,000 \quad t$$

$$\frac{48,000}{54,897} = \frac{54,897(1-.05)^t}{54,897} \quad .87 = .95^t$$

$$b = .95 \quad x = .87 \quad y = t$$

$$\log_{.95} .87 = t = \frac{\log .87}{\log .95} = 2.7$$

Example 2: In order to save some money you want to come up with a plan for saving. Option A involves saving \$1000 each year in a mutual fund that yields an average of 4.5% per year for 20 years. Option B involves saving \$500 each year for 30 years with the same 4.5% rate. Which option will yield the most money?

Option A  $a_1 = 1000 \quad r = 1.045 \quad n = 20$

Option B  $a_1 = 500 \quad r = 1.045 \quad n = 30$

$$S_{nA} = \frac{1000(1-1.045^{20})}{1-1.045} = 31,371.42$$

$$S_{nB} = \frac{500(1-1.045^{30})}{1-1.045} = 30,503.53$$

Example 3: Ms. Donoghue wants to plan early for her retirement. If she wants to have \$100,000 when she retires. How much money will she need to save each year if she plans to retire in 30 years with a rate of 5.6%?

$$S_n = 100,000 \quad r = 1.056 \quad n = 30$$

$$100,000 = \frac{a_1(1-1.056^{30})}{(1-1.056)}$$

$$100,000 = \frac{a_1(-4.1)}{-0.056} = \frac{100,000}{73.70} = \frac{a_1 73.70}{73.70}$$

$$a_1 = 1,356.70$$

Explicit Formula Geometric Series:  $|r| > 1$

$$S_n = \frac{a_1(1-r^n)}{1-r}$$

rate is less than 1  
you add 1

$a_1$	200
$r$	$.056 + 1 = 1.056$
$n$	5
$S_n$	

Example 1: You want to set aside some money each year to save for a car. You save \$200 each year in an account that yields 5.6%. How much money will you have in total after 5 years?

$$S_n = \frac{200(1-1.056^5)}{(1-1.056)}$$

$$S_n = 1,118.45$$

Example 4: (From the released exam)

A board is made up of 9 squares. A certain number of pennies is placed in each square, following a geometric sequence. The first square has 1 penny, the second has 2 pennies, the third has 4 pennies, etc. When every square is filled, how many pennies will be used in total?

- A 512
- B 511
- C 256
- D 81

$$n = 9 \quad a_1 = 1 \quad r = 2$$

$$S_n = \frac{1(1-2^9)}{1-2}$$

$$511$$