



ADVANCED FUNCTIONS AND MODELING

The questions you read next will require you to answer in writing.

1. Write your answers on separate paper.
2. Be sure to write your name on each page.

- 1 The table below shows the estimated average hours each person in a city spent playing video games in different years.

Years since 2002	Hours
0	71
1	80
2	82
3	78
4	80
5	91
6	107
7	121
8	125
9	131
10	142

Put in
L₁

Put in
L₂

$$y = 69.5(1.07)^x$$

Stat → Calc → Opt-0

- Write an equation for the **best fit exponential model** for the data.
- What is the meaning of the base of the model in the context of the problem? **7% increase in the # of hours played**
- What is the meaning of the coefficient of the model in the context of the problem? **Initial value in 2002**

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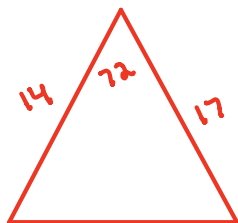
22 How does the graph of $g(x) = 0.5\cos(2x)$ differ from the graph of its parent function, $f(x) = \cos(x)$, over the interval $-\pi \leq x \leq \pi$?

Amp. b period = $\frac{2\pi}{2} = \pi$ (shortened)

- A The amplitude is smaller, and the period is shorter.
- B The amplitude is smaller, and the period is longer.
- C The amplitude is larger, and the period is shorter.
- D The amplitude is larger, and the period is longer.

23 Two sides of a triangle measure 14 ft and 17 ft, respectively. The included angle is 72° . **Approximately** how long is the third side of the triangle?

- A 18.4 ft
- B 20.3 ft
- C 25.1 ft
- D 30.7 ft



$$x^2 = 14^2 + 17^2 - 2(14)(17)\cos 72$$

$$\sqrt{x^2} = \sqrt{337.91}$$

$$x \approx 18.38$$

24 In a **geometric sequence**, $a_1 = 12$ and $r = \sqrt{2}$. What is the **approximate** sum of the first 20 terms of the sequence?

- A 339.4
- B 8,688.9
- C 29,624.9
- D 29,636.9

$$a_n = a_1(r)^{n-1}$$

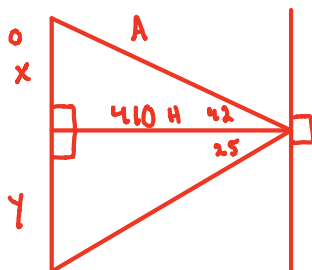
$$S_{20} = \frac{12(1 - (\sqrt{2})^{20})}{(1 - \sqrt{2})}$$

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- 19 A water tower is located 410 feet from a building. From a window in the building, it is observed that the angle of elevation to the top of the tower is 42 degrees and the angle of depression to the bottom of the tower is 25 degrees. **Approximately** how tall is the water tower?

- A 191 feet
- B 369 feet
- C 448 feet
- D 560 feet



SOH CAH TOA

$$\frac{\tan 42}{1} = \frac{x}{410}$$

$$\tan 25 = \frac{y}{410}$$

$$x = 410 \tan 42$$

$$y = 410 \tan 25$$

$$x \approx 369.17$$

$$y = 191.19$$

- 20 Given the table below:

starts @ $\frac{\pi}{2}$

x	$\frac{\pi}{2}$	$\frac{3\pi}{4}$	π	$\frac{5\pi}{4}$	$\frac{3\pi}{2}$
y	0.5	0	-0.5	0	0.5

What function fits the data?

- A $y = 0.5 \cos(2x - \pi) \rightarrow y = 0.5 \cos(2(x - \frac{\pi}{2}))$
- B $y = 0.5 \cos(x - \pi)$
- C $y = 0.5 \cos(2x + \frac{\pi}{2})$
- D $y = \cos(2x + \frac{\pi}{2})$