



- 1 The table below shows the probability distribution of the number of televisions in each house in a community.

Televisions	Probability
0	0.04
1	0.38
2	0.27
3	x
4	y
5 or more	0.13

What is the probability that a house in the community will have at least 3 televisions?

- A 0.69
- B 0.31
- C 0.18
- D 0.09

$1 - P(\text{FAILURE})$   
 $1 - (0.04 + 0.38 + 0.27)$

- 2 Anna and Zach each have \$600 to invest. Anna's investments earn a rate of 10.5%, and Zach's investments earn a rate of 6.5%. **Approximately**, how much more money will Anna have than Zach when Zach's investments are worth \$900? (Assume continuous compounding.)

- A \$184
- B \$241
- C \$255
- D \$264

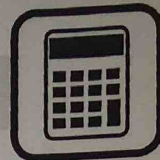
$\hookrightarrow A = Pe^{rt}$

Anna  
 $y = 600e^{.105t}$   
 $y = 600e^{.105(6.24)}$   
**\$1155.32**

Zach  
 $900 = 600e^{.065t}$   
 $1.5 = e^{.065t}$   
 $\ln 1.5 = .065t$   
 $t = 6.24$

How much more \$:

$1155.32 - 900$



- 3 A solution's pH is given by the function  $p(t) = -\log(t)$ , where  $t$  is the hydronium ion concentration, in moles per liter. A sample of coffee has a pH of 5.0. What is the **approximate** hydronium ion concentration of the sample?

A 0.000001

B 0.00001

C 0.0001

D 0.001

$$5 = -\log(t)$$

$$-5 = \log_{10}(t)$$

$$10^{-5} = t$$

$$\text{calc: } 1e^{-5}$$

\*change to exponential form

.00001

- 4 A sequence is shown below.

1, 0.1, 0.01, 0.001, 0.0001, ...

What is the sum of the sequence? the "...↑" above shows that this is an infinite series

A  $1\frac{1}{10}$

B  $1\frac{1}{9}$

C  $1\frac{2}{9}$

D  $1\frac{9}{10}$

$$S = \frac{a_1}{1-r} \quad \text{where } |r| < 1$$

$$r = \frac{1}{10}$$

$$S = \frac{1}{1-\frac{1}{10}} = 1.\overline{111} \text{ or } \frac{10}{9}$$





5 Which statement is true about the sequence shown below?

0, 4.5, 12, 22.5, . . .

divergent b/c the sum keeps getting larger!

- A The series converges because the limit of the sequence as  $n$  approaches infinity is infinity.
- B The series converges because the limit of the sequence as  $n$  approaches infinity is 30.
- C The series diverges because the limit of the sequence as  $n$  approaches infinity is infinity.
- D The series diverges because the limit of the sequence as  $n$  approaches infinity is 30.

6 A pharmaceutical company is creating a new cholesterol drug to prevent heart disease. The company must collect data by testing the drug before it is approved. Which would be the **best** method of data collection?

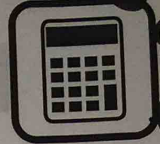
- A experimental study
- B observational study
- C simulation
- D survey

← proves cause & effect!  
the researcher has an active role and assigns groups!

# Stat EDIT, stat CALC, 1-VAR STATS

\*must do separately for midterm & final

## ADVANCED FUNCTIONS AND MODELING — RELEASED FORM



midterm & final

The table below shows the midterm and final exam grades of ten students.

Midterm	68	78	92	90	88	82	94	83	71	62	$\bar{x} = 80.8$	$s_x = 10.9$
Final Exam	62	77	99	87	85	84	95	98	72	64	$\bar{x} = 82.3$	$s_x = 13.3$

Which comparison between the midterm grades and the final exam grades is true?

- A The final exam grades have a higher mean and standard deviation than the midterm grades.
- B The final exam grades have a lower mean and standard deviation than the midterm grades.
- C The final exam grades have a higher mean and a lower standard deviation than the midterm grades.
- D The final exam grades have a lower mean and a higher standard deviation than the midterm grades.

8 A baseball team scored the following number of runs in its games this season: 6, 2, 5, 9, 11, 4, 5, 8, 6, 7, 5. There is one more game in the season. If the team wants to end the season with an average of at least 6 runs per game, what is the least number of runs the team must score in the final game of the season?

11 games so far

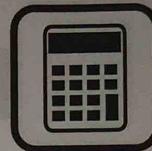
- A 2
- B 4
- C 6
- D 8

$$\frac{6+2+5+9+11+4+5+8+6+7+5+x}{12} = 6$$

$$68+x = 72$$

$$x = 4$$





9 If the probability of giving birth to a boy is 0.52, what is the *approximate* probability of giving birth to four consecutive boys?

- A 0.021
- B 0.062
- C 0.073
- D 0.130

$$0.52 \times 0.52 \times 0.52 \times 0.52$$

or can do :

$$\text{binompdf}(4, 0.52, 4)$$

10 How many more ways can 10 juniors running for the positions of president, vice president, secretary, and treasurer be selected when compared to 12 sophomores running for 5 identical positions of class representative?

Math, PRB

- A 94,830
- B 11,628
- C 4,320
- D 4,248

Juniors

$$10 P_4 \text{ or } 10 \cdot 9 \cdot 8 \cdot 7$$

$$5040$$

Sophomores

$$12 C_5$$

$$792$$

how many more:  $5040 - 792$

11 A starting line for a hockey team should consist of 3 offensive players, 2 defensive players, and 1 goaltender. A coach has 11 offensive players, 6 defensive players, and 2 goaltenders from which to choose the starting line. How many unique starting lines can the coach create?

- A 132
- B 792
- C 4,950
- D 59,400

offense

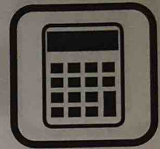
Defense

Goalie

$$11 C_3$$

$$\cdot 6 C_2$$

$$\cdot 2 C_1$$



12 It costs a bakery \$3.50 to make apple pies that sell for \$12 the first day they are baked.

- If a pie is not sold on the first day, the new price is \$8.50.
- The probability of selling the apple pie the first day is 75%.
- There is a 12% probability of selling it on the second day.
- If the apple pie does not sell by the end of the second day, it is donated.

↓ **expected value!**

What is the **approximate** expected profit per pie for the bakery on the sale of its apple pies?

$$EV = (.75)(8.50) + (.12)(5) + (.13)(-3.50)$$

$(\$12 - 3.50)$        $(\$8.50 - 3.50)$        $(\$0 - 3.50)$

- A \$5.67
- B \$6.52**
- C \$9.57
- D \$10.02

13 The number of household members,  $x$ , living in Cityville homes has the following probability distribution:

$x$	1	2	3	4	5	6	7	8
$P(x)$	0.21	0.28	0.16	0.22	0.06	0.04	0.02	0.01

What is the expected size of a household in Cityville?

$$EV = (.21)(1) + (.28)(2) + (.16)(3) + (.22)(4) + (.06)(5) + (.04)(6) + (.02)(7) + (.01)(8)$$

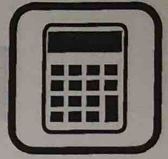
A 2.43

**B 2.89**

C 3.17

D 4.50





remember Pascal's  $\Delta$ !

14 What is the middle term for the expansion of  $(x^2 + 3)^{12}$ ?

A  $729x^{12}$

B  $924x^{12}$

C  $673,596x^{12}$

D  $665,280x^{12}$

row 0  
1  
row 1  
1 2  
row 2  
1 3 3  
row 3  
1 4 6 4  
row 4  
1 5 10 10 5  
row 5  
1 6 15 20 15 6  
row 6  
1 7 21 35 35 21 7  
row 7  
1 8 28 56 70 56 28 8  
row 8  
1 9 36 84 126 126 84 36 9  
row 9  
1 10 45 120 210 252 210 120 45 10  
row 10  
1 11 55 165 330 462 462 330 165 55 11  
row 11  
1 12 66 220 495 792 924 792 495 220 66 12  
row 12

$(x^2)^{12} \cdot 3^0$   
 $(x^2)^6 \cdot (3)^6$   
 $(x^2)^0 \cdot 3^{12}$

$924 \cdot x^{12} \cdot 729 = 673,596x^{12}$

15 Abby took an 8-question multiple-choice quiz. Suppose that her probability of correctly answering any question is 0.75. What is Abby's probability of incorrectly answering exactly two questions on the quiz? → get 6 correct

A  $P = 0.089$

B  $P = 0.240$

C  $P = 0.311$

D  $P = 0.623$

$\text{binompdf}(8, .75, 6)$

or

$\text{binompdf}(8, .25, 2)$

16 Which function results by shifting the graph of  $y = \ln(x + 3) - 6$  to the left 4 units and down 3 units?

A  $y = \ln(x + 7) - 9$

B  $y = \ln(x - 1) - 9$

C  $y = \ln(x + 7) - 3$

D  $y = \ln(x - 1) - 3$

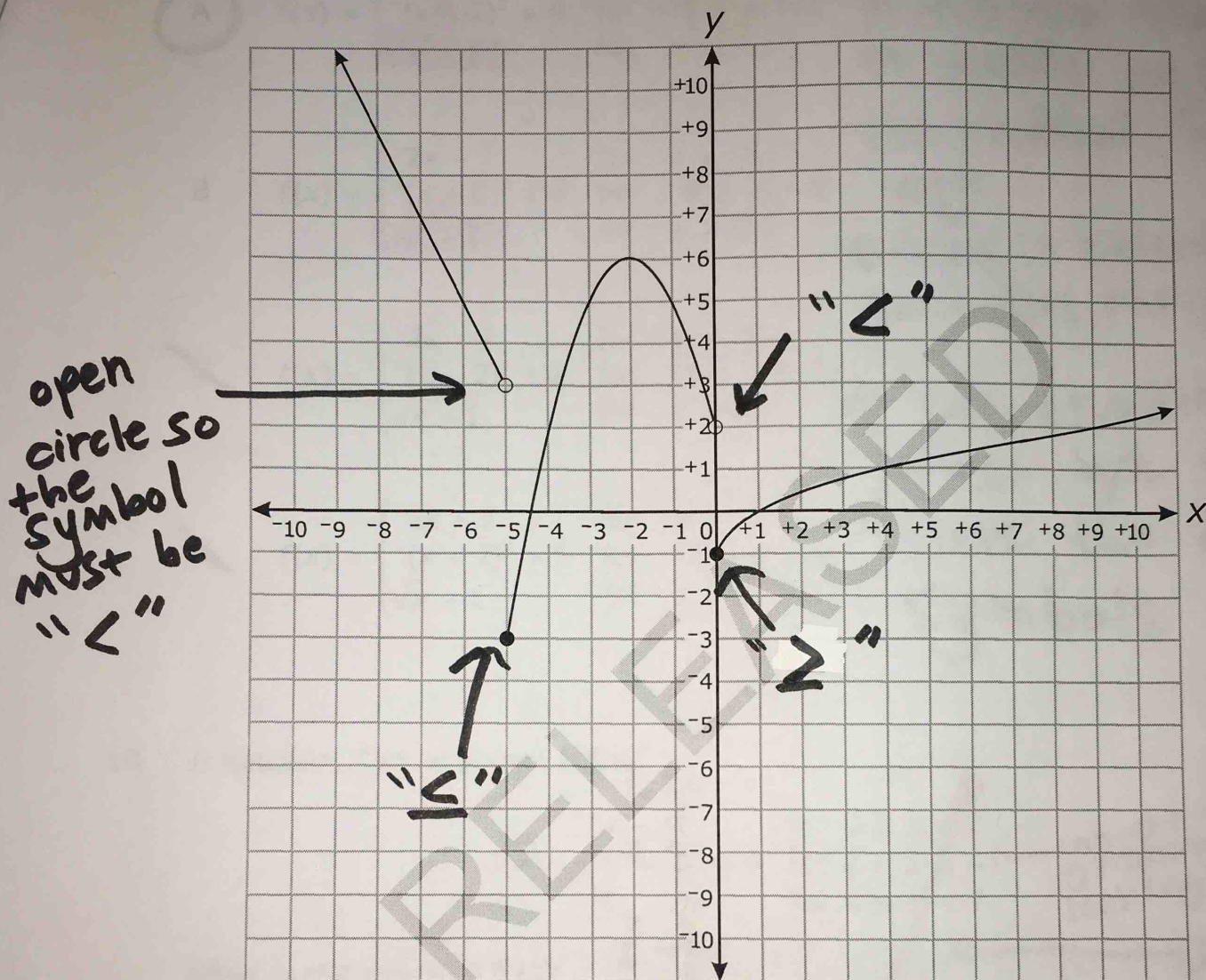
can graph in calc!

or can think about function rules:

left + 4 → need to add 4 inside parentheses

down 3 → need to subtract 3 outside parentheses

17 Which piecewise function is graphed below?



Answer choices are on the following page.





A  $f(x) = \begin{cases} -2x - 7 & \text{for } x < -5 \\ -(x + 2)^2 + 6 & \text{for } -5 \leq x < 0 \\ \sqrt{x} - 1 & \text{for } x \geq 0 \end{cases}$

B  $f(x) = \begin{cases} -2x - 7 & \text{for } x < -5 \\ -(x - 2)^2 + 6 & \text{for } -5 \leq x < 0 \\ \sqrt{x} - 1 & \text{for } x \geq 0 \end{cases}$

~~C~~  $f(x) = \begin{cases} -2x - 7 & \text{for } x \leq -5 \\ -(x - 2)^2 + 6 & \text{for } -5 < x \leq 0 \\ \sqrt{x} - 1 & \text{for } x > 0 \end{cases}$

~~D~~  $f(x) = \begin{cases} -2x - 7 & \text{for } x \leq -5 \\ -(x + 2)^2 + 6 & \text{for } -5 < x \leq 0 \\ \sqrt{x} - 1 & \text{for } x > 0 \end{cases}$

only differences between A + B are the "+" or "-" in middle equation and the radical in the bottom eqn.

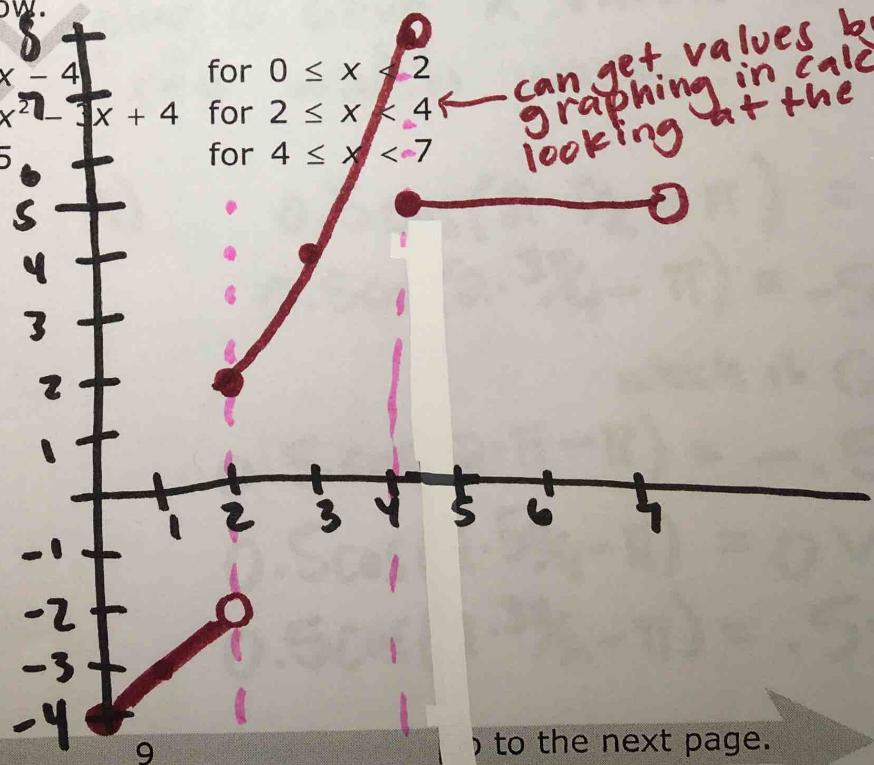
Graph in calca to see which matches the picture!

Can eliminate these first b/c they don't have the correct symbols

18 A function,  $f(x)$ , is shown below.

$f(x) = \begin{cases} x - 4 & \text{for } 0 \leq x < 2 \\ x^2 - 3x + 4 & \text{for } 2 \leq x < 4 \\ 5 & \text{for } 4 \leq x < 7 \end{cases}$

can get values by graphing in calc. & looking at the table



What is the range of  $f(x)$ ?

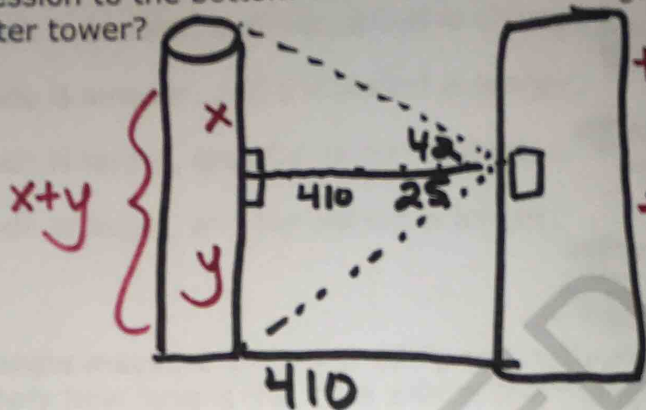
- A  $[-4, 5)$
- B  $[-4, 8)$
- C  $[-4, -2) \cup [2, 5)$
- D  $[-4, -2) \cup [2, 8)$**



**★ DEGREE MODE ★**

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



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

$$x = 369.17$$

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

$$y = 191.19$$

20 Given the table below:

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

Which function fits the data?

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

**★ RADIAN MODE ★**

plug & chug x values to see which works!

A)  $0.5 \cos(2 \cdot \frac{\pi}{2} - \pi) = .5 \checkmark$   
 $0.5 \cos(2 \cdot \frac{3\pi}{4} - \pi) = -0.5 \checkmark$   
 which is 0  $\checkmark$   
 $0.5 \cos(2 \cdot \pi - \pi) = -.5 \checkmark$   
 $0.5 \cos(2 \cdot \frac{5\pi}{4} - \pi) = 0 \checkmark$   
 $0.5 \cos(2 \cdot \frac{3\pi}{2} - \pi) = .5 \checkmark$





$$y = a \cos(kx + c) + h$$

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  $-\pi \leq x \leq \pi$ ?

- 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.

amplitude =  $|a|$

period =  $\frac{2\pi}{k}$

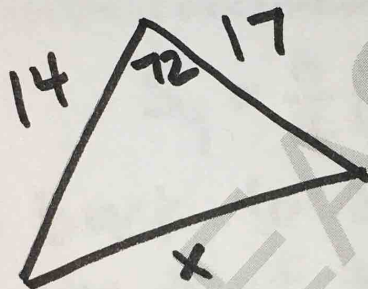
original parent function period =  $2\pi$

new function period :  $\frac{2\pi}{2} = \pi$  repeats faster!

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

Degree Mode

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



Law of Cosines

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

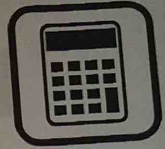
$$x^2 = 337.9079107$$

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

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

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



25

A bathroom floor has tiles arranged in 9 circles. The innermost circle contains 9 tiles. Each successive circle contains 9 more tiles than the previous circle. How many total tiles are on the bathroom floor?

- A 81
- B 396
- C 405
- D 729

$\therefore a_1 = 9$      $n = 9$  (b/c there are 9 circles)  
 $\therefore 9 \text{ more tiles} \rightarrow d = 9$

total tiles  $\rightarrow$  find the sum!

$$S_n = \frac{n}{2}(a_1 + a_n)$$

This is the end of the multiple-choice portion of the test.

$$S_9 = \frac{9}{2}(9 + a_9)$$

\*go back to sequence formula for the # of tiles in the 9<sup>th</sup> circle\*

$$a_9 = 9 + (9-1)(9)$$

$$a_9 = 81$$

$$S_9 = \frac{9}{2}(9 + 81)$$