NAME: *Key*

DATE: _____ BLOCK: _____

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

Add up

Less than 3 tvs = .69 or 69%

31% or .31

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

So the total probability of homes with at least 3 tvs.

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

#2nd Trace 5 for enter enter

$A = Pe^{rt}$

A = Amount   P = Principal/Initial
r = r   t = time

Zach =
$A = Pe^{rt}$
$900 = 600e^{.065t}$
Put into y_2 =   *Put into y_1 =*
$t = 6.2379$

Anna
put in for t
$A = Pe^{rt}$
$A = 600e^{.105t}$
$A = \$1155.06$

e 2nd $\ln$

$1155.06 - 900 \approx \$255$

3 A solutions pH is given by the function $p(t) = -\log(t)$, where t is the hydronium ion concentration, in moles per liter. As 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

 # Get log alone

pH
$p(t) = -\log(t)$

Base 10

$\dfrac{5.0}{-1} = \dfrac{-\log t}{-1}$

$-5.0 = \log t$

10^{-1} 10

Raise both side with a base of 10

4   A sequence is shown below.

$$1, 0.1, 0.01, 0.001, 0.0001, \ldots$$

What is the sum of the sequence?

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

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

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

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

Handwritten work:

Converge $|r| < 1$

$r = \dfrac{a_2}{a_1} = 0.1$ $0.1 < 1$

$S = \dfrac{a_1}{1-r} = \dfrac{1}{1-0.1} = \dfrac{1}{.9} = 1.\overline{11}$

Converges

5   Which statement is true about the sequence shown below?

$$0, 4.5, 12, 22.5, \ldots$$

A   The series converges because the limit of the sequence as n approaches infinity is infinity.

because r is greater than

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. *converges*

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   *Test / experiment with drug*

B   observational study   *We are not watching*

C   simulation   *Recreate an event that has already*

D   survey   *B/c that is an opinion / No scientic proof*

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

Handwritten notes (left margin): Stat Must Edit → never mean on both L_1, L_2

Handwritten notes: Calc 1 Var Stat

Handwritten notes: Repeat but change to L_2 2nd 2

Handwritten note (right): Find mean for midterm & Final Exam

Midterm	68	78	92	90	88	82	94	83	71	62
Final Exam	62	77	99	87	85	84	95	98	72	64

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?

A   2

B   4

C   6

D   8

Handwritten work:
$$\frac{6+2+5+9+11+4+5+8+6+7+5+\square}{12} = 6$$

12

$$12\left(\frac{68+\boxed{X}}{12}\right) = (6)12 \quad \text{missing run}$$

$$68 + X = 72$$
$$-68 \qquad -68$$
$$X = 4$$

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

Handwritten work:
$P(boy) = 0.52$

AND → MULTIPLY

$P(boy + boy + boy + boy) =$
$(0.52)(0.52)(0.52)(0.52) =$
$(0.52)^4 = 0.731$

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?

Permutation
Juniors   Sophmores   √Combination   ORDER Matters

A   94,830

B   11,628

C   4,320

D   4,248

$_{10}P_4 = 5040$ $_{12}C_5 = 792$

Need 4   # to choose from   # to choose from   Need 5

$\begin{array}{r} 5040 \\ -792 \\ \hline 4,248 \end{array}$

Looking @ President, VP Secretary, Treasure

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?

Combination → Order Doesn't matter

A   132

B   792

C   4,950

D   59,400

$_{11}C_3 \cdot {_6}C_2 \cdot {_2}C_1$

$165 \cdot 15 \cdot 2 = 4950$

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.

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

A $5.67

B $6.52

C $9.57

D $10.02

day →	day 1	day 2	day 3
Profit x	12 - 3.50	8.50 - 3.50	0 - 3.50
	8.50	5.00	-3.50
P(x)	.75	.12	.13

$1 - (.75 + .12) = 0.13$

$EV = X_1 P_1 + X_2 P_2 + X_3 P_3$

$= 8.50(.75) + 5.00(.12) + (-3.50)(.13)$

$EV = \$6.52$

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

Put in stat
Put values in
Put into L_2

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?

A   2.43

B   2.89 *(circled)*

C   3.17

D   4.50

$EV = X_1 P_1 + X_2 P_2 + X_3 P_3 + \ldots + X_7 P_7 + X_8 + P_8$

*After you put both sets of #s into stat
Go over to CALC ↓ to #2 (2-vars stats)
Enter until List pops up go down to*

$\Sigma xy = 2.89$

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

Remember there is always 1 extra term for a total of 13. Middle term = 7th

A $729x^{12}$

B $924x^{12}$

C $673,596x^{12}$ *(circled)*

D $665,280x^{12}$

7th term =
$(a+b)^n = {}_nC_k (a)^{n-k} (b)^k$

$= {}_{12}C_6 (x^2)^6 (3)^6$ OR
$= 924(x^{12})(729)$
$= 673,596 x^{12}$

1 – $_{12}C_0 (x^2)^{12} (3)^0$
2 – $_{12}C_1 (x^2)^{11} (3)^1$
3 – $_{12}C_2 (x^2)^{10} (3)^2$
4 – $_{12}C_3 (x^2)^9 (3)^3$
5 – $_{12}C_4 (x^2)^8 (3)^4$
6 – $_{12}C_5 (x^2)^7 (3)^5$
7 – $_{12}C_6 (x^2)^6 (3)^6$

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?

A   P = 0.089

B   P = 0.240

C   P = 0.311 *(circled)*

D   P = 0.623

*Note: 0.75 is for correctly answering the questions.
Since I know if I got 2 wrong, I must have gotten 6 right.*

binompdf (8, 0.75, 6) = 0.311
total #/2wrong
OR
$({}_8C_2)(.25)^2$ $(.75)^6$ = (28)(0.0625)(0.178)
% wrong 2 wrong   % right # right
≈ 0.1335

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

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

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

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

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

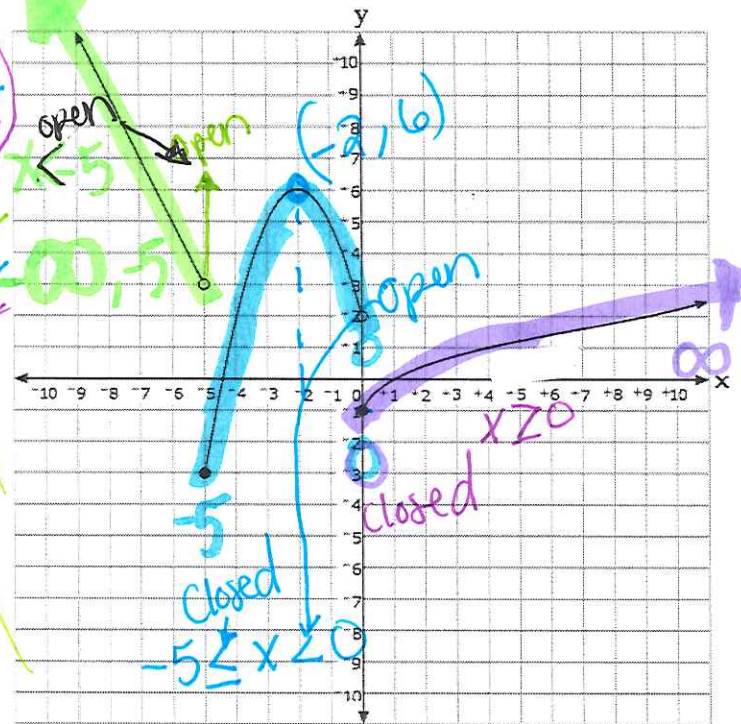*$y = \ln(x+3) - 6$*
-3
+4
$y = \ln(x+7) - 9$

17   Which piecewise function is graphed below?

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

(handwritten: open, x<-5, open, (-2,6), (-2,6))

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

(handwritten: (∞,-5), √0-7=√-1 DNE, vertex (2,6))

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

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

(handwritten on graph: open, open, (-2,6), open, x≥0, closed, closed, -5≤x<0, -5, -5≤x<0)

18   The function, f(x), is shown below?

(handwritten: Remember only use brackets for closed circles are included values.)

$f(x) = \begin{cases} x - 4 & \text{for} \\ x^2 - 3x + 4 & \text{for} \\ 5 & \text{for} \end{cases}$ $\boxed{\begin{array}{l} 0 \le x < 2 \\ 2 \le x < 4 \\ 4 \le x < 7 \end{array}}$ ← # change

A   [-4, 5) *(crossed out)*

B   [-4, 8) *(crossed out)*

C   [-4, -2) ∪ [2, 5) *(crossed out)*

D   [-4, -2) ∪ [2, 8) *(circled)*

*(handwritten number lines and: range, -4 -2 2 5 8, [-4,2) ∪ [2,8))*
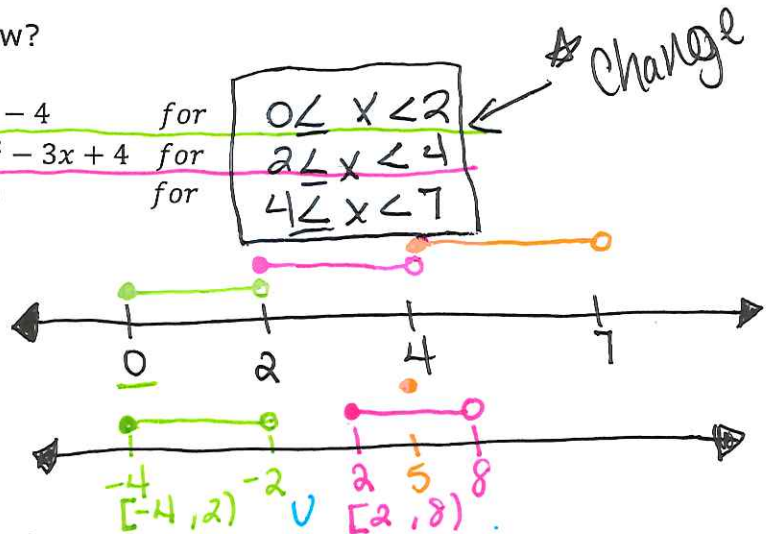
19   A water tower is located 410 feet from a building. From a window in the building, it is observed that the angle of elevation to the top of the tower is 42 degrees and the angle of depression to the bottom of the tower is 25 degrees. Approximately how tall is the water tower?

A   191 feet

B   369 feet

C   448 feet

D   560 feet *(circled)*

(handwritten: 410ft, 42°, 25°, x, y)
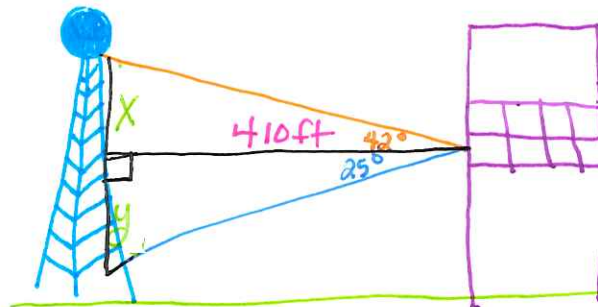
(handwritten work:
$\tan 42° = \dfrac{x}{410}$
$x \approx 369 \text{ ft}$

$\tan 25° = \dfrac{y}{410}$
$y \approx 191 \text{ ft}$

total height = x + y
= 369 + 191
= 560 ft *)*

20   Given the table below:

x	$\dfrac{\pi}{2}$	$\dfrac{3\pi}{4}$	π	$\dfrac{5\pi}{4}$	$\dfrac{3\pi}{2}$
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 $y = 0.5\cos\left(2x + \dfrac{\pi}{2}\right)$

D $y = \cos\left(2x + \dfrac{\pi}{2}\right)$

Handwritten notes:
$y = a\cos(bx - c) + d$
Put in Stat → Calc
look @ sin reg

21   A Ferris wheel has a diameter of 80 feet. Riders enter the Ferris wheel at its lowest point, 5 feet above the ground, at time t = 0 seconds. One complete rotation takes 65 seconds.
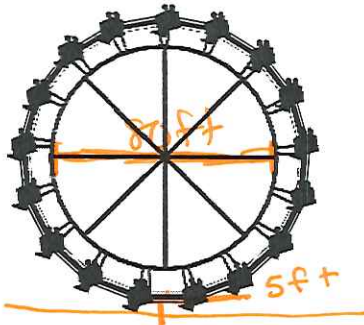
Handwritten notes: when t=0 height=5

Which function models a rider's vertical height, h(t), at t seconds?

A $h(t) = -80\cos\left(\dfrac{2\pi}{65}t\right) + 5$

B $h(t) = -40\cos\left(\dfrac{2\pi}{65}t\right) + 45$

C $h(t) = -45\cos\left(\dfrac{65}{2\pi}t\right) + 40$

D $h(t) = -5\cos\left(\dfrac{65}{2\pi}t\right) + 80$

Handwritten notes:
If t=0
$h(t) = -40\cos\left(\dfrac{2\pi}{65}(0)\right) + 45$
$h(t) = -40\cos(0) + 45$
$h(t) = 5$

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

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.

Handwritten notes:
$y = a\cos(bx - c) + d$
Amp = $|a|$ period = $\dfrac{2\pi}{|b|}$
Amp = $|0.5| = 0.5$ period = $\dfrac{2\pi}{1} = 2\pi$
Amp = $|1| = 1$ period = $\dfrac{2\pi}{2} = \pi$

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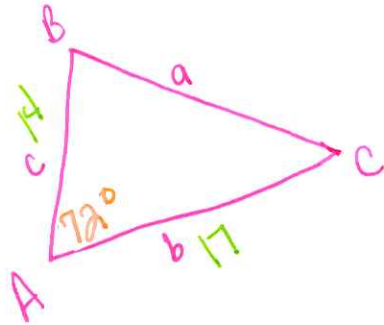
$$a^2 = 17^2 + 14^2 - 2(17)(14)\cos 72°$$

$$\sqrt{a^2} = \sqrt{337.9079}$$

$$a \approx 18.4$$

24   In a geometric sequence, $a_1 = 12$ and $r = \sqrt{2}$. What the approximate sum of the first
     20 terms of the sequence? use this formula because it is a finite series or
     ↓ it ends at 20 terms.

     A   339.4

     B   8,688.9

     C   29,624.9

     D   29,636.9

$$S = \frac{a_1(1-r^n)}{1-r} = \frac{12(1-(\sqrt{2})^{20})}{1-(\sqrt{2})} = 29,636.89$$

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
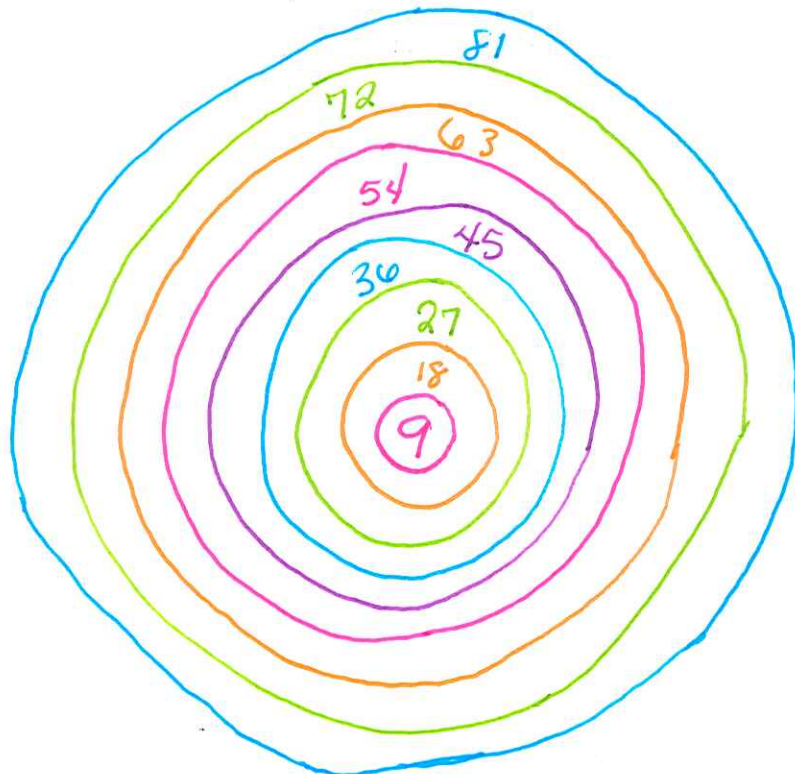
Add the value
for each circle to
get the total.

$9 + 18 + 27 + 36 + 45 +$
$54 + 63 + 72 + 81 = 405$

CONSTRUCTED RESPONSE

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

Years since 2002 L_1	Hours L_2
0	71
1	80
2	82
3	78
4	80
5	91
6	107
7	121
8	125
9	131
10	142

Put into Stat Plot

y=
Go up 2 Plot 1
Hit Enter
Zoom 9

- Write an equation for the best fit exponential model for the data.

Stat
→ Calc 0
Enter

$$y = 68.486(1.074)^x$$

$$y = b^x$$

- What is the meaning of the base of the model in the context of the problem?

base = b = 1.074 That the # of hours of game play are increasing exponentially.

- What is the meaning of the coefficient of the model in the context of the problem?

Number of hours → Initial # of hours played

2   Students are told that attending class regularly will help improve their scores in that class. Below are the scores for students who did attend class regularly and scores for those who did not.

Attended Class Regularly					Did Not Attend Class Regularly			
241	261	271	282	296	185	195	195	228
243	262	272	284	296	250	256	225	261
254	267	278	292	308	274	277	308	233
252	264	276	290	310				

med= 274 $\bar{x}$ =274.95   med = 241.5 $\bar{x}$ = 240.5833

- Which group of students has a larger mean score and by how much?

Larger mean for the students who attended regularly by 34.4 points.

- Which group of students has a larger median score and by how much?

Larger median for those who attended regularly by 32.5 points.

3   Write an equation for the power function, in y = ax^b form, that passes through the points (2, 1) and (5, 6).

- Use your power function to predict the value of y when x = 9.

① put into stat

L_1	L_2
2	1
5	6

go over to calc go down to 0 Exp Reg

② Put equation into y_1=
$y = .2578 x^{1.955}$

③ Go down and see where x = 9 then y = 18.938

OR

② use formula $y = .2578 x^{1.955}$
③ Plug in 9
④ Simplify
$y = .2578 x^{1.955}$
$= .2578 * (9)^{1.955}$
$y = 18.938$