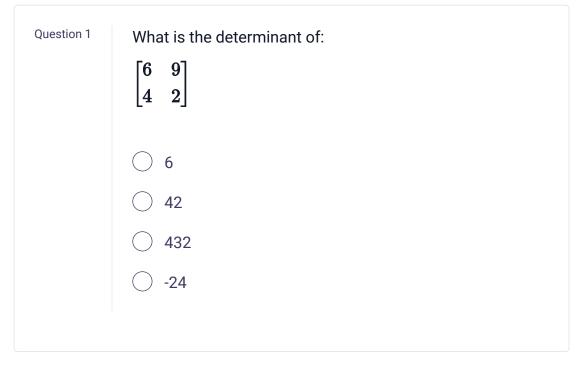
## **Quantitative Proficiency Test**





Time left:

42:49

Which combination of the following statements is true about this dictionary?

- Both statements
- Neither statement
- Statement 1
- Statement 2

Which matrix is linearly independent?

- $\begin{bmatrix}
  1 \\ 2 \\ 3
  \end{bmatrix}
  \begin{bmatrix}
  8 \\ 9 \\ 10
  \end{bmatrix}
  \begin{bmatrix}
  18 \\ 22 \\ 26
  \end{bmatrix}$
- $\bigcirc \quad \begin{bmatrix} -2 \\ 5 \end{bmatrix} \begin{bmatrix} 16 \\ -40 \end{bmatrix}$
- $\begin{bmatrix}
  1 \\
  0 \\
  0
  \end{bmatrix}
  \begin{bmatrix}
  0 \\
  1 \\
  0
  \end{bmatrix}
  \begin{bmatrix}
  0 \\
  1
  \end{bmatrix}$
- $\begin{bmatrix}
  1 \\
  0 \\
  0
  \end{bmatrix}
  \begin{bmatrix}
  0 \\
  0 \\
  0
  \end{bmatrix}
  \begin{bmatrix}
  0 \\
  1 \\
  1
  \end{bmatrix}$

Question 4

For the equation:

$$2xy^2 + 2xy + x^2y = 12$$

what is the slope of the tangent line at (x,y)=(2,1) ?

- $\bigcirc$  1/2
- $\bigcirc$  2
- $\bigcirc$  -1/2
- $\bigcirc$  -2

Question 5

Consider the following partial differential equation:

$$rac{\delta u}{\delta x} - 2rac{\delta^2 u}{\delta y^2} = 0$$

where u=u(x,y) is the unknown function. Define the

following functions:

$$u_1(x,y) = e^{2x-y}, u_2(x,y) = \sin(2x-y), ext{ and } u_3(x,y)$$

Which of these functions are solutions to the partial differential equation?

- All the functions
- $\bigcirc u_1 \text{ and } u_2$
- None of the functions
- $\bigcirc$  Only  $u_1$

$\sim$	uestion	
	HESHON	n

What is the output for this line of code:

- 20
- 452
- 3.75
- 08

Question 7

The Pearson correlation coefficient between 2 variables is:

- ( ) All of these
- Close to 1 if they tend to move in the same direction.
- Close to 0 if they move independently of each other.

Close to -1 if they tend to move in the opposite	
direction.	

Simplify:

$$\sin^2 x + \cos^2 x =$$

- $\bigcirc 2\sin(x)\cos(x)$
- $\bigcirc \tan^2 x$
- None of these

Question 9

Which of the following functions is continuous on all  ${\it x}$ ?

- $\bigcirc y = \tan(x)$
- $\bigcirc y = |x|$
- $\bigcirc \ \ y = \ln(x)$
- $\bigcirc y = 1/x$

Question 10

What is the sum of n integers from 1 to n?

- $\frac{n(n+1)}{2}$
- n(n-1)

$$\qquad \underline{ \begin{array}{c} (n+1)(n-1) \\ 2 \end{array}}$$

Which of the statements below is the derivative of f(x) at x=a?

$$\bigcirc \lim_{x\to 0} \frac{f(x)+f(a)}{x-a}$$

$$\bigcirc \lim_{x\to 0} \frac{f(x)-f(a)}{x-a}$$

$$\bigcirc \lim_{x \to a} \frac{f(x) - f(a)}{x - a}$$

$$\bigcirc \lim_{x \to a} \frac{f(x) + f(a)}{x - a}$$

Question 12

Factor:

$$2x^3 - 10x^2 - 28x$$

$$\bigcirc (2x^2+4)(x-7)$$

$$\bigcirc \ 2x(x+2)(x-7)$$

$$\bigcirc \ x(2x-4)(x+7)$$

$$(x^3-2)(x^2-10)(x-28)$$

Question 13

Which of the following is the general solution for the differential equation:

$$y'' - 10y' + 25y = 0$$

where A and B are arbitrary constants?

$Ae^{5x}$	+	$Bxe^{-5x}$	_	1
Ae	$\top$	Due	_	-74

$$\bigcirc Ae^{5x} + Be^{-5x} = y$$

$$\bigcirc Ae^{5x} + Be^{5x} = y$$

$$\bigcirc \ Ae^{5x} + Bxe^{5x} = y$$

What z-value is 2 standard deviations below the mean?

-1.96

-1.65

-2.58

Question 15

Python data structures include all of the following items except:

○ Set

Dictionary

Glossary

O Data frame

Question 16

The value of the limit

$$\lim_{x o 0}rac{\sin(2x)}{x}$$

is:

1/2	
1	
2	
$\infty$	

According to the Central Limit Theorem, as a sample size gets large, the sampling distribution of the sample mean can be approximated as the:

Uniform Distribution

Exponential Distribution

Normal Distribution

Student's T Distribution

```
Question 18

What does the following Python code return?

def func(x,y):
    if (x == 0):
        return y
    else:
        return func(x-1, x-y)

func(4,7)

-5
```

An example of a point estimate is:

Mean
All of these
Mode
Median

Question 20 What is the range of:  $y = 3\sin( heta)$ 

 $-\infty \text{ to } \infty$  -3 to 3

 $\bigcirc -\pi$  to  $\pi$ 

-1 to 1

Question 21 What is the output of the following program?

print("Hello World"[:::-1])

Hello worl	
Ч	

What type of copy command is used in the program below?

- Hollow copy
- Cannot be determined
- Shallow copy
- O Deep copy

Question 23

Let  $f:\mathfrak{R} o [0,1]$  and  $g:\mathfrak{R} o [0,\infty)$  be defined by

 $f(x) = \sin x ext{ for every } x \in \mathfrak{R} ext{ and } g(x) = e^x ext{ for every } x \in \mathfrak{R}$ 

Consider the following statements:

- 1.  $\boldsymbol{f}$  is one-to-one
- 2.  $\boldsymbol{f}$  is onto
- 3.  ${\it g}$  is one-to-one
- 4. *g* is onto

Which of the statements are true?

None of the statements
All of the statements
Statement 2
Statements 2 and 3

```
Question 24 What is the output of the following program:

for letter in "Hello there":
    i = letter
    print(i)

The program gives an error
    "e"
    "Hello there"
    "H"
```

```
Python has all of the following characteristics except:

Object-orientated
Interactive
Compiled
Interpreted
```

$\cap$	restion	26
UII	1esiion	/n

Consider the following statements concerning a positive integer  $\boldsymbol{n}$  :

- 1. if n is a multiple of 8, then  $n^2$  is a multiple of 4
- 2. if  $\boldsymbol{n^2}$  is a multiple of 18, then  $\boldsymbol{n}$  is a multiple of 9
- 3. if  $n^2$  is a multiple of 18, then n is a multiple of 2

Which of the statements is true?

- None of the statements
- Statements 1 and 3
- All the statements
- Statements 2 and 3

Question 27

Let  $f: \mathfrak{R}^2 o \mathfrak{R}$  be defined by

$$f((x,y))=\sin(xy), ext{ for every}(x,y)\in \mathfrak{R}^2$$

The value of  $f_x((1,0)) + f_y((1,0)) + f_{xx}((1,0))$  is:

- Undefined
- 1
- $\bigcirc$  c

Question 28

Find x:

$$log_3(2x+3) = 5$$

1	
- 1	_
	1

Express as summation:

$$1 - \frac{1}{2} + \frac{1}{4} - \frac{1}{8} + \frac{1}{16} - \frac{1}{32} + \frac{1}{64}$$

$$\bigcirc \sum_{n=1}^6 (-1)^n 2^n$$

$$\bigcirc \sum_{n=0}^{6} (-1)^n 2^{-n}$$

$$\bigcirc \sum_{n=0}^{6} (-1)^n 2^n$$

$$\bigcap \sum_{n=1}^{6} (-1)^n 2^{-n}$$

Question 30

Which of the following integrals can be evaluated?

$$\bigcirc \int_{-1}^{1} \frac{x+1}{x-1} dx$$

$$\bigcirc \int_{-1}^1 \sin^{-1}(x) dx$$

$$\bigcirc \int_{-1}^{1} \frac{1}{x} dx$$

$$\bigcirc \int_0^{\pi} tan(x)dx$$

Question 31

You flip a coin. If you get heads you win \$5, if you get tails you lose \$3. What is the expected payoff of one flip?

1
-1
2

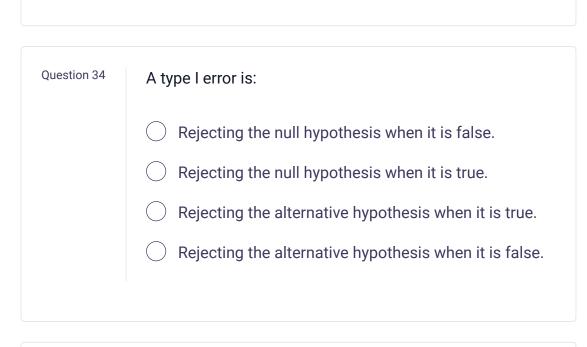
## Question 32 Which of the following is true about Python? Identifiers are case-sensitive, the language is strongly-typed. Identifiers are not case sensitive, the language is not strongly-typed. Identifiers are case-sensitive, the language is not strongly-typed. Identifiers are not case sensitive, the language is strongly-typed.

## Question 33

What is the output of this program?

```
primes = [2, 3, 5, 7, 11, 13, 17, 19]
x = [i for i in primes[1:]] + [j for ]
print(x)
```

- [5, 8, 12, 18, 24, 30, 36]
- [2, 3, 5, 7, 11, 13, 17, 19]
- The program gives an error
- (3, 5,7, 11, 13, 17, 19, 2, 3, 7, 11, 13, 17)



If you have imported the math module using the following statement, how would you call the exponential function (exp(x))?

import math as mt

exp(1)

mt.exp(1)

The exponential function has not been imported

math.exp(1)

Question 36

What is the inverse of:

$$\begin{bmatrix} 1 & 2 \\ 2 & 4 \end{bmatrix}$$

 $egin{pmatrix} 4 & -2 \ -2 & 1 \end{bmatrix}$ 

$\lceil 4 \rceil$	2 ]
2	-1

odoesn't exist

$$\bigcirc \begin{bmatrix} 1 & 2 \\ 2 & 4 \end{bmatrix}$$

Question 37

If 
$$f:(-\pi/6,\pi/6) o\mathfrak{R}$$
 is defined by  $f(x)=2^x\tan(3x)$  for every  $x\in(-\pi/6,\pi/6),$  then  $f'(0)$  is:

 $\bigcirc$  0

**3** 

 $\bigcirc$  ln 2

Ο 2π

Question 38

 $V_1$  is an eigenvector of A. Which of these statements is true?

$$\bigcirc \ AV_1 = \lambda_1 V_1$$

$$\bigcirc \ AV_1 = A^TV_1$$

$$\bigcirc AV_1 = I$$

$$\bigcirc AV_1=0$$

Find the solution to the following differential equation:

$$y'' + 16y = 0$$
,  $y(0) = 2$ ,  $y'(0) = 8$ 

$$\bigcirc \ y(t)=2e^{4t}$$

$$\bigcirc \ \ y(t)=e^{-4t}+e^{4t}$$

$$\bigcirc y(t) = 2\cos 4t$$

$$\bigcirc \ y(t) = 2\cos 4t + 2\sin 4t$$

Question 40

Find a particular solution to the differential equation:

$$y' = 6x^2 - 2$$
 at  $(2, 22)$ 

$$\bigcirc y = 2x^2 + 6x + 8$$

$$\bigcirc y = 2x^3 - 2x + 10$$

$$\bigcirc \ \ y = 2x^3 + 6x^2 + 6x - 12$$

$$\bigcirc y = 4x^2 + 6$$

Question 41

Given the first two terms in the Taylor series, what is the third term?

$$f(x) = f(a) + f'(a)(x-a) + ____ + ...$$

$$\bigcirc \frac{f''(a)}{2}(x-a)^2$$

$$\bigcirc \frac{f''(a)}{2}(x-a)$$

$$\bigcirc f''(a)(x-a)^2$$

$$\bigcap f''(a)(x-a)$$

What is the output of the following code?

- {1, 2, 3}
- $\bigcirc \{1,3\}$
- (1, 2, 3, 5, 7)
- (1, 2, 3, 4, 5, 7)

Question 43

Let  $x_0\in(0,\infty)$  be the value of  $x\in(0,\infty)$  that minimizes the function  $f:(0,\infty) o\mathfrak{R}$  defined by

$$f(x)=x^2+x^{-2} ext{ for every } x\in(0,\infty)$$

and  $y_0=f(x_0)$  be the value of this minimum.

Then  $x_0 + y_0$  is:

- $\bigcirc$  3/2
- $\bigcirc$  3
- 2
- $\bigcirc$  1/2

Which of the following is the inverse function of:

$$\sin(x^3+1)$$

- $\bigcirc \ \ {}^3\sqrt{\sin^{-1}(x)}-1$
- $\bigcirc \sin^{-1}(\sqrt[3]{x}-1)$
- $\bigcirc \sin^{-1}(\sqrt[3]{x-1})$
- $\bigcirc \ \ {}_3\sqrt{\sin^{-1}(x)-1}$

Question 45

Find the equivalent statement.

$$P(A|B)P(B) =$$

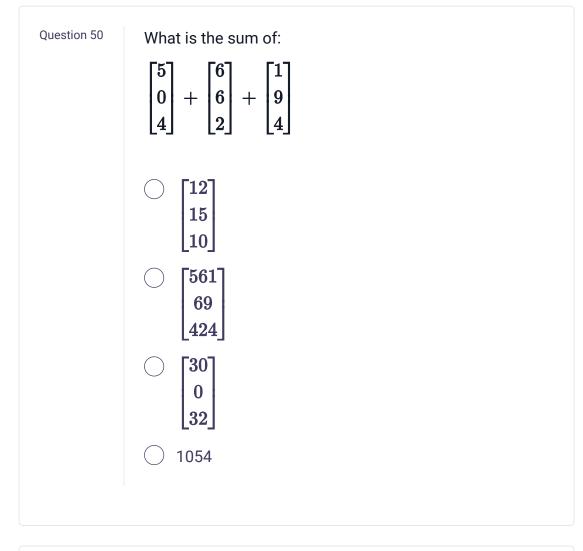
- $\bigcirc P(A)$
- $\bigcirc \quad \frac{P(B|A)}{P(A)}$
- $\bigcirc P(B|A)P(A)$
- $\bigcirc P(A) + P(B)$

Question 46

How many permutations are there of the letters in the string "ABCD"?

- 120
- **16**
- 24
- 0 6

Question 47	Which of the following statements is true about a population?
	The population is a subset of a sample.
	A measurable quality of a population is a statistic.
	Reports of a population have a margin of error.
	A population contains all members of a specified group.
Question 48	Which library is used when creating a data frame?
	<ul> <li>DataFrame</li> </ul>
	Numpy
	<ul><li>Pandas</li><li>Data.Frame</li></ul>
Question 49	Which of the following is an independent event?
	Picking a king given the first card was a queen.
	Pick a card. Then pick another card.
	None of these



Question 51	What is the range of this data set? $[11,2,3,3,6]$
	<ul><li>5</li><li>9</li><li>3</li><li>11</li></ul>

What is the probability of drawing 4 cards of the same suit from a 52 card deck?

- $\bigcirc \ (\frac{12}{51})(\frac{11}{50})(\frac{10}{49})$
- $\bigcirc \ (\frac{3}{4})(\frac{3}{4})(\frac{3}{4})(\frac{3}{4})$
- $\bigcirc \ (\frac{1}{4})(\frac{1}{4})(\frac{1}{4})(\frac{1}{4})$
- $\bigcirc \ (\frac{13}{52})(\frac{12}{51})(\frac{11}{50})(\frac{10}{49})$

The value of the integral

$$\int_1^\infty x e^{-x^2} dx$$

is:

- $\bigcirc$  -1/2
- $\bigcirc \infty$
- 1/2e
- $\bigcirc e/2$

Question 54

If rank A = N, then

 ${\rm rank}A^T =$ 

- $\cap$  N
- $\frac{1}{N}$
- $\bigcap \frac{N}{N+1}$
- None of these

Evaluate:

$$\int x^2 e^x dx$$

$$\bigcirc (x^2+2x+2)e^x+C$$

$$\bigcirc (x^2-2x+2)e^x+C$$

$$\bigcirc x^2 + 2x + e^x + C$$

$$\bigcirc x^2 - 2x + 2e^x + C$$

Question 56

If f(x) is continuous on [a,b] and  $F(x)=\int_a^x f(t)dt$  then which of the following is equivalent to:

$$\int_a^b f(x)dx$$

$$\bigcirc \frac{d}{dx}F(b) - \frac{d}{dx}F(a)$$

$$\bigcirc F(b) - F(a)$$

$$\bigcirc b-a$$

$$\bigcirc \quad \frac{F(b)-F(a)}{b-a}$$

Question 57

For each  $n=1,2,3,\ldots$ , define

$$f_n(X) = rac{nx^2}{1+n} ext{for every } x \in \mathfrak{R}$$

Then the function f defined by

$$f(x) = \lim_{n o \infty} f_n(x)$$

exists for each  $x\in\mathfrak{R}$  and is equal to:

$$\bigcap f(x) = x$$

	f	(x)	=	0
$\bigcirc$	J	$(\sim)$		_

$$\bigcap f(x)=2x$$

$$\bigcirc f(x) = 2x$$
  $\bigcirc f(x) = x^2$ 

What is the probability of getting no prime numbers if 2 dice are thrown?

Question 59

How many combinations are there of choosing 7 items from 9?

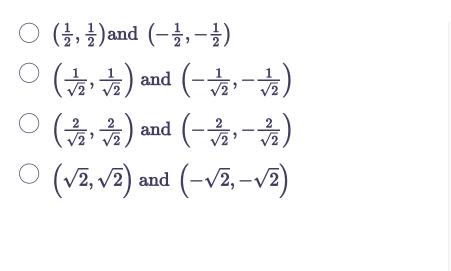
- 36
- 72
- 63

Question 60

Given the function:

$$f(x,y) = x + y$$

with the constraint that  $x^2+y^2=1$ , at which points do the maximum and minimum of f(x,y) occur?



**SUBMIT**