

**Started on** Monday, 11 March 2024, 1:04 PM**State** Finished**Completed on** Monday, 11 March 2024, 2:15 PM**Time taken** 1 hour 10 mins**Marks** 65.75/81.50**Grade** 80.67 out of 100.00**Question 1**

Correct

Mark 0.50 out of 0.50

If  $x$  is 3 and  $y$  is 1. What is  $x+y$  ?Answer:  ✓**Question 2**

Correct

Mark 0.50 out of 0.50

If  $x$  is 8 and  $y$  is 0. What is  $x*y$  ?Answer:  ✓**Question 3**

Correct

Mark 0.50 out of 0.50

If  $x$  is 9 and  $y$  is 1. What is  $x-y$  ?Answer:  ✓**Question 4**

Correct

Mark 0.50 out of 0.50

If  $x=1.7$  and  $y=5.9$  what is the value of  $x+y$  ?Answer:  ✓

**Question 5**

Correct

Mark 1.00 out of 1.00

If  $x=3$  and  $y=2.8$  what is the value of  $x/y$  ?

Answer:  ✓

**Question 6**

Correct

Mark 0.50 out of 0.50

If  $x=6.4$  and  $y=3.2$ . What is  $x*(y+2)$  ?

Answer:  ✓

**Question 7**

Correct

Mark 0.50 out of 0.50

If  $x=9.3$  and  $y=9.1$ . What is  $2*(x-2)*(y+2)$  ?

Answer:  ✓

**Question 8**

Correct

Mark 0.50 out of 0.50

If  $x=2.7$  and  $y=1.5$  what is the value of  $x*y$  ?

Answer:  ✓

**Question 9**

Correct

Mark 0.50 out of 0.50

If  $x=3$  and  $y=2.8$  what is the value of  $x-y$  ?

Answer:  ✓

**Question 10**

Correct

Mark 1.00 out of 1.00

Compute  $1 + \frac{2}{3}$  as a decimal rounded to 2 places.

Answer:  ✓

**Question 11**

Correct

Mark 0.50 out of 0.50

Compute  $\frac{1}{3} + \frac{2}{3}$  as a decimal rounded to 2 places.

Answer:  ✓

**Question 12**

Correct

Mark 0.75 out of 0.75

Compute  $\frac{2}{3} + \frac{2}{3}$  as a decimal rounded to 2 places.

Answer:  ✓

**Question 13**

Correct

Mark 0.75 out of 0.75

Compute  $\frac{4}{6} + \frac{2}{3}$  as a decimal rounded to 2 places.

Answer:  ✓

**Question 14**

Incorrect

Mark 0.00 out of 0.75

Compute  $\frac{3}{4} + \frac{2}{3}$  as a decimal rounded to 2 places.

Answer:  ✗

**Question 15**

Correct

Mark 0.75 out of 0.75

Compute  $\frac{3}{4} + \frac{3}{2}$  as a decimal rounded to 2 places.

Answer:  ✓

**Question 16**

Correct

Mark 0.50 out of 0.50

Compute  $\frac{3}{4} * \frac{3}{2}$  as a decimal rounded to 2 places.

Answer:  ✓

**Question 17**

Correct

Mark 0.50 out of 0.50

Compute  $\frac{1}{4} * \frac{9}{3}$  as a decimal rounded to 2 places.

Answer:  ✓

**Question 18**

Incorrect

Mark 0.00 out of 1.00

Compute  $\frac{1}{4} / \frac{9}{3}$  as a decimal rounded to 3 places.

Answer:  ✗

**Question 19**

Incorrect

Mark 0.00 out of 1.00

Compute  $\frac{3}{2} / \frac{4}{3}$  as a decimal rounded to 3 places.

Answer:  ✗

**Question 20**

Correct

Mark 0.50 out of 0.50

If  $2x + 3y = 26$  and  $x=8$ , what is the value of  $y$ ?

- ☒ a. 3.33 ✓
- ☐ b. 1.00
- ☐ c. 8.00
- ☐ d. 26
- ☐ e. -14.00

**Question 21**

Not answered

Marked out of 0.50

If  $x^2 + y^2 = 25$  and  $x=2$ , what is the value of  $y$ ?

- ☐ a. 2.00
- ☐ b. 10.00
- ☐ c. 26
- ☐ d. 4.58
- ☐ e. -10.00

**Question 22**

Correct

Mark 0.50 out of 0.50

If  $x = 2$  what is the value of  $x^3 + 2^x$ ?

Select one:

- ☐ a. 35
- ☐ b. 6
- ☒ c. 12 ✓
- ☐ d. 31
- ☐ e. 56

**Question 23**

Correct

Mark 0.50 out of 0.50

If  $x = 4$  what is the value of  $x^2 - 2^x$ ?

Select one:

- ☐ a. 4
- ☒ b. 0 ✓
- ☐ c. -8
- ☐ d. 2
- ☐ e. 32

**Question 24**

Correct

Mark 0.50 out of 0.50

If  $x = 144$  what is the positive square root of  $x$ ?

Select one:

- ☐ a. 12.5
- ☐ b. The question is not well defined.
- ☐ c. The square.
- ☐ d. The neutral element.
- ☒ e. 12 ✓

**Question 25**

Correct

Mark 0.50 out of 0.50

If  $x = 27$  what is the positive cubic root of  $x$ ?

Select one or more:

- ☐ a. The root must be negative.
- ☐ b. 9 because 27 is 3 time 9
- ☐ c. A third of x by definition
- ☒ d. 3 because  $3 \cdot 3 \cdot 3$  is 27 ✓
- ☐ e. -3

**Question 26**

Correct

Mark 1.00 out of 1.00

If  $A=\{2, 4, 6\}$  and  $B=\{6, 8, 10\}$ . What is the Union of A and B ?

- ☐ a. (2 4 6 6 8 10)
- ☒ b.  $\{2, 4, 6, 8, 10\}$  ✓
- ☐ c.  $\{2, 4, 6, 6, 8, 10\}$
- ☐ d. (2, 4, 6, 8, 10)
- ☐ e.  $\{2, 4, 6, 6, 8, 10\}$

**Question 27**

Correct

Mark 1.00 out of 1.00

If  $A=\{2, 4, 6\}$  and  $B=\{6, 8, 10\}$ . What is the Intersection of A and B ?

- ☐ a. (6)
- ☐ b. The empty set.
- ☐ c. B
- ☐ d.  $\{2, 4, 6\}$
- ☒ e.  $\{6\}$  ✓

**Question 28**

Incorrect

Mark 0.00 out of 1.00

If  $A=\{2, 4, 6\}$  and  $B=\{6, 8, 10\}$ . What is  $A-B$  and  $B-A$ , if - is the Set difference.

- ☐ a.  $A-B=\{2,4,6\}$  and  $B-A=\{6,8,10\}$
- ☐ b.  $A-B=B-A=\{6\}$
- ☐ c.  $\{2, 4, 8, 10\}$
- ☐ d.  $A-B = \{2,4\}$  and  $B-A = \{10, 8\}$
- ☒ e. None of the other options. ✗

**Question 29**

Incorrect

Mark 0.00 out of 2.00

If  $A = \{+, -, *, /\}$  and  $B = \{6, -, \text{error}\}$ . What is the complement of A relative to the Union of A and B?

- ☐ a.  $\{6, \text{error}\}$
- ☐ b.  $\{+, *, /\}$
- ☒ c.  $\{+, *, /\}$  ✖
- ☐ d. The empty set.
- ☐ e.  $\{\text{error}, 6, +, -, *, /\}$

**Question 30**

Incorrect

Mark 0.00 out of 2.00

If  $A = \{+, -, *, /\}$  and  $B = \{6, -, \text{error}\}$ . What is the symmetric difference of A and B ?

- ☐ a. The elements are too different to be comparable.
- ☐ b.  $\{\text{error}, 6, +, *, /\}$
- ☐ c.  $\{+, *, /\}$
- ☒ d.  $\{+, *, /\}$  ✖
- ☐ e.  $\{+, *, /\}$

**Question 31**

Incorrect

Mark 0.00 out of 0.50

If a set has  $n=10$  elements, compute how many elements its power set has.

Answer:  ✖

**Question 32**

Correct

Mark 0.50 out of 0.50

The complement of the complement of a set is the same as the set.

Select one:

- ☒ True ✔
- ☐ False



**Question 33**

Correct

Mark 3.00 out of 3.00

If  $C$  is the complement of the union of two sets, then  $C$  is the same as the union of the complements of the sets.

Select one:

- ☐ True
- ☒ False ✓

**Question 34**

Incorrect

Mark 0.00 out of 3.00

If one takes two elements out of a set  $A$  and puts them into a set  $B$ , and then puts  $B$  back into the first set, one always has the same set  $A$  again.

Select one:

- ☒ True ✗
- ☐ False

**Question 35**

Correct

Mark 3.00 out of 3.00

If a function  $f(x)$  is zero for all real  $x$  it cannot be a polynomial.

Select one:

- ☐ True
- ☒ False ✓

**Question 36**

Correct

Mark 3.00 out of 3.00

The product of two polynomials is always a polynomial, too.

Select one:

- ☒ True ✓
- ☐ False

## Question 37

Correct

Mark 3.00 out of 3.00

If  $f(x) = x^2$  and the domain of  $f$  is the real axis. Which of the following statements are correct?

(Wrong answers attract negative marks.)

Select one or more:

- ☐ a. The function is larger than zero everywhere.
- ☒ b. When  $x$  gets larger and larger,  $f(x)$  gets larger and larger. ✓
- ☐ c. The function is nowhere zero.
- ☒ d.  $f(3) = 9$  ✓
- ☒ e. The function goes to infinity if  $x$  goes to minus infinity. ✓
- ☐ f.  $f(-2) = -4$
- ☐ g. The function can return every real number as a value.
- ☒ h. The function can take every real number as an argument. ✓

## Question 38

Correct

Mark 3.00 out of 3.00

If  $f(x) = \sqrt{x}$  and the domain of  $f$  are the non-negative integers. Which of the following statements are correct?

(Wrong answers attract negative marks.)

Select one or more:

- ☒ a. The function can not return every positive integer number as a value. ✓
- ☒ b.  $f(-1)$  is undefined. ✓
- ☐ c. The function is larger than zero everywhere on its domain.
- ☐ d. The function is nowhere zero.
- ☐ e. The function can take every real number as an argument.
- ☒ f. The function goes to infinity when  $x$  goes to infinity. ✓
- ☐ g. When  $x$  goes towards minus infinity,  $f(x)$  gets smaller and smaller.
- ☒ h.  $f(4) = 2$  ✓

**Question 39**

Incorrect

Mark 0.00 out of 4.00

$$\neg(p \vee q) \leftrightarrow (\neg p \wedge \neg q)$$

Consider the formula above. For which assignments of truth values to the Boolean variables (propositions) p and q is this formula FALSE?

Hint: Use a truth table if necessary.

Select one or more:

- ☐ a. p=TRUE and q=TRUE
- ☒ b. p=FALSE and q=TRUE ✖
- ☐ c. p=TRUE and q=FALSE
- ☐ d. The formula is never FALSE.
- ☐ e. p=FALSE and q=FALSE

**Question 40**

Correct

Mark 4.00 out of 4.00

Consider the formula (p AND q) implies NOT p. For which assignments of truth values to the Boolean variables (propositions) p and q is this formula FALSE?

Hint: Use a truth table if necessary.

Hint: The question is not the same than any on the Logic worksheet.

Select one or more:

- ☐ a. p=FALSE and q=TRUE
- ☐ b. p=FALSE and q=FALSE
- ☐ c. The formula is a tautology and therefore never FALSE.
- ☒ d. p=TRUE and q=TRUE ✔
- ☐ e. p=TRUE and q=FALSE

**Question 41**

Correct

Mark 3.00 out of 3.00

We are picking cards from a regular deck of 52 cards. What is the probability of picking a black seven?

- ☐ a. 0.0345
- ☐ b. 0.0192
- ☐ c. 0.0111
- ☒ d. 0.0385 ✔
- ☐ e. 0.0577

**Question 42**

Correct

Mark 3.00 out of 3.00

We remove from a regular deck of 52 cards all spades, kings and 9s. What is the probability of picking a 7 given that it is a heart?

- ☐ a. 0.0769
- ☐ b. 0.0833
- ☒ c. 0.0909 ✓
- ☐ d. 0.111
- ☐ e. 0.1

**Question 43**

Correct

Mark 3.00 out of 3.00

If  $x=(1,2)$  and  $y=(2,0)$  are vectors. What is  $2*x - y$  ?

- ☐ a. (0,2)
- ☐ b. (4,0)
- ☐ c. (4,4)
- ☐ d. (0,0)
- ☒ e. (0,4) ✓

**Question 44**

Correct

Mark 3.00 out of 3.00

If  $a=2.4$  and  $v=(a, 3, -1)$ . What is the length of  $v$ ?

Answer:  ✓

**Question 45**

Correct

Mark 3.00 out of 3.00

If  $a=2.9$  and  $v=(a, 3, -1)$ . What is the dot-product of  $v$  with itself?

Answer:  ✓

**Question 46**

Correct

Mark 3.00 out of 3.00

If  $a=5.3$ ,  $b=7.8$ ,  $v=(a, 3, -1)$  and  $w=(1, b, 0)$ . What is the dot product of  $v$  and  $w$ ?

Answer:  ✓

**Question 47**

Correct

Mark 3.00 out of 3.00

If  $a=3$  and  $A$  is the matrix  $A = \begin{bmatrix} a & 1 \\ 2 & 3 \end{bmatrix}$ . What is the determinant of  $A$ ?

Answer:  ✓

**Question 48**

Correct

Mark 3.00 out of 3.00

If  $a=5.3$ ,  $A$  is the matrix  $A = \begin{bmatrix} a & 1 \\ 2 & 3 \end{bmatrix}$  and  $v=(1,0)$ . What is the length of the vector  $Av$ ?

Answer:  ✓

**Question 49**

Correct

Mark 4.00 out of 4.00

Which language does the regular expression  $a+b^*$  describe?

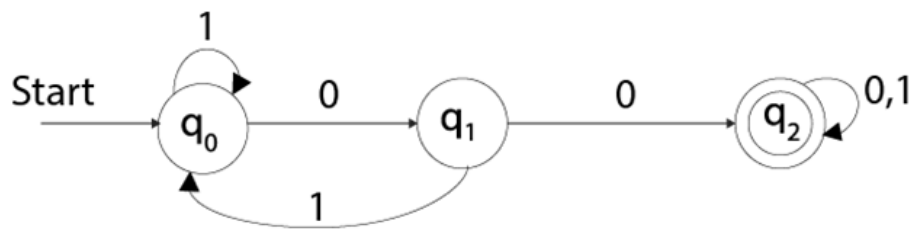
- ☒ a. All strings that start with  $n>0$  a's followed by  $m \geq 0$  b's, where  $m$  and  $n$  are integers. ✓
- ☐ b. All strings of a's and b's that start with at least one a.
- ☐ c. All strings starting with a's followed by b's.
- ☐ d. All strings consisting of an arbitrary number (including zero) of triples  $a+b$ , for example,  $a+b$ ,  $a+ba+b$ ,  $a+ba+ba+b$ , etc.
- ☐ e. All strings of a's and b's that have at least one a.

**Question 50**

Correct

Mark 4.00 out of 4.00

Consider the DFA below. Which of the statements a to f are true?



Select one or more:

- ☐ a. The accepting states are  $\{q_1, q_2\}$
- ☒ b. None of the words the DFA accepts is shorter than two symbols, but all are finite in length. ✓
- ☐ c. The alphabet is  $\Sigma = \{q_1, q_2, q_0\}$
- ☐ d. None of the other options.
- ☐ e. The set of states is  $Q = \{0, 1\}$ .
- ☐ f. The DFA accepts the empty word.