

Data Science Diagnostic Test

Successful Data Science Students score at least 24 on this test.

Basics

1. Calculate the expression, giving the answer as a whole number or a fraction in lowest terms.

$$3 + 3 \cdot 2^2.$$

2. Evaluate the expression.

$$8^2 8^{-3} 8^2 8^{-2}.$$

3. Simplify the expression, expressing your answer in positive exponent form.

$$\frac{x^4 y^4}{x^{-1} y}.$$

4. Simplify the expression, expressing your answer in positive exponent form.

$$\left(\frac{x^6 y^{-3} z^0}{xyz} \right)^2.$$

5. Convert the expression $\sqrt{8}$ to power form.

6. Convert the expression $\frac{x}{\sqrt{x}}$ to power form.

7. Convert the expression to power form

$$\frac{\sqrt[5]{x^2}}{3} - \frac{9}{6\sqrt{x^3}}.$$

8. Simplify the expression

$$3^{-1/2} 3^{7/2}.$$

9. Simplify

$$\frac{1}{x} \left[\frac{x-7}{xy} + \frac{1}{y} \right].$$

10. Simplify

$$\frac{1}{\left(\frac{x}{x-9}\right)} + x - 1.$$

Solutions: 1. 15, 2. $1/8$, 3. $x^5 y^3$, 4. $x^{10}/(y^4 z^2)$, 5. $8^{1/2}$, 6. $x^{1/2}$, 7. $(1/3)x^{2/5} - (3/2)x^{-3/2}$, 8. 27 , 9. $(2x-7)/(x^2 y)$, 10. $(x^2-9)/x$

Precalculus

1. Expand $(y + 4)(y + 2)$.
2. Solve $9x + 7x^2 = 0$ for x .
3. Solve $y^2 + 7y + 10 = 0$ for y .
4. Solve $x - \frac{1}{x} = 0$ for x .
5. If $f(x) = 3x^2 + x$, evaluate $f(2 + h)$.
6. $f(x) = 2x - 5$. Evaluate and simplify

$$\frac{f(x + h) - f(x)}{h}.$$

Solutions: 1. $y^2 + 6y + 8$, 2. $0, -9/7$, 3. $-2, -5$, 4. ± 1 , 5. $3(2 + h)^2 + 2 + h$, 6. 2

Exponentials and Logarithms

1. Solve for the exact value of x :

$$2^x = 100.$$

2. Solve for the exact value of x :

$$\log(\log(2x)) = 0.$$

3. Solve for the exact value of x :

$$2^{4+\log_2(x)} = 6x + 1.$$

Solutions: 1. $x = 2 \log_2(25)$, 2. $x = 5$, 3. $x = 1/10$

Statistics

The questions below refer to the data set

$$X = \{1, 2, 3, 3, 4, 4, 4, 5, 6\}.$$

1. Find the mean.
2. Find the median.
3. Find the mode.

Solutions: 1. $3.5\bar{6}$, 2. 4 , 3. 4

Linear Algebra

1. Solve the system of equations

$$3x + 4y = 55$$

$$3x - 2y = -5.$$

2. Solve the system of equations

$$2x - y = 10$$

$$4x + 3y = 20.$$

Solutions: 1. $x = 5, y = 10$, 2. $x = 5, y = 0$

Finite Mathematics

The following questions deal with the sets (note that U is the universal set):

$$A = \{1, 2, 3\}, B = \{2, 3, 4\} \text{ and } U = \{1, 2, 3, 4, 5, 6\}.$$

1. Determine $A \cap B$.
2. Determine $A \cup B$.
3. Determine $A - B$.
4. Determine $|A|$.
5. Determine $|A|/|U|$.
6. Determine A^c .

Solutions: 1. $\{3\}$, 2. $\{1, 2, 3, 4\}$, 3. $\{1\}$, 4. 3, 5. $1/2$, 6. $\{4, 5, 6\}$