

DATA SCIENCE MATH SKILLS

Offered by DUKE UNIVERSITY THROUGH COURSERA

ISHMAEL HO

WEEK 1 : PRACTICE QUIZ ON SETS

1.

The screenshot shows a browser window with the URL coursera.org/learn/datasciencemathskills/quiz/NYrPt/practice-quiz-on-sets/attempt. The page title is "Practice quiz on Sets". A green banner at the top says "Congratulations! You passed!" with a checkmark icon. Below it, a smaller banner says "TO PASS 75% or higher". On the right, a blue button says "Keep Learning" and a green box says "GRADE 100%".

Practice quiz on Sets

TOTAL POINTS 3

1. Let $A = \{1, 3, 5\}$. Is the following statement: $3 \in A$. True or false? 1 / 1 point

True
 False

Correct
The symbol \in stands for “is an element of” and it is true that 3 is an element of A . The other two elements of A are 1 and 5.

2.

2. Let $E = \{-1, -2, -3\}$. Compute the cardinality $|E|$ of E : 1 / 1 point

0
 E
 -3
 3

Correct
Recall that the cardinality of a set is the number of elements in it. Since E has three elements (which are $-1, -2, -3$), the cardinality of E is $|E| = 3$.

3.

3. Let $A = \{1, 3, 5\}$ and $B = \{3, 5, 10, 11, 14\}$.

1 / 1 point

Which of the following sets is equal to the intersection $A \cap B$?

- $\{3, 5, 10\}$
- $\{3, 5\}$
- $\{1, 3, 5\}$
- $\{3\}$

✓ Correct

The intersection of two sets consists precisely of the elements they share in common. The elements 3 and 5 are in both A and B .

WEEK 1: PRACTICE QUIZ ON THE NUMBER LINE INCLUDING INEQUALITIES

1.

← Practice quiz on the Number Line, including Inequalities
Practice Quiz • 25 min

✓ Congratulations! You passed!
TO PASS 75% or higher

Keep Learning

GRADE
100%

Practice quiz on the Number Line, including Inequalities

TOTAL POINTS 8

1. Which of the following real numbers is not an integer?

1 / 1 point

- 0
- 4.3
- 3
- 7

2.

2. Which of the following is the absolute value $| -7 |$ of the number -7 ?

1 / 1 point

- 1
- 7
- 0
- 7

✓ Correct

The absolute value of a number x is the distance along the number line from x to 0. In this case, -7 is 7 units away from 0, and so $| -7 | = 7$.

3.

3. Suppose I tell you that x and y are two real numbers which make the statement $x < y$ true. Which pair of numbers **cannot** be values for x and y ? 1 / 1 point

- $x = -17.3$ and $y = -17.1$
- $x = 5$ and $y = 3.3$
- $x = 1$ and $y = 7.3$
- $x = -1$ and $y = 0$

Correct

The statement $x < y$ means that x is to the left of y on the real number line. Since 5 is to the right of 3.3, these cannot be values for x and y .

4.

4. Suppose I tell you that w is a real number which makes both of the following statements true: $w > 1$ and $w < 1.2$. Which of the following numbers could be w ? 1 / 1 point

- $w = 1.2$
- $w = 11$
- $w = 0$
- $w = 1.05$

Correct

$1.05 > 1$ is true since 1.05 is to the right of 1 on the real number line, and $1.05 < 1.2$ is also true, since 1.05 is to the left of 1.2 on the real number line.

5.

5. Suppose that x and y are two real numbers which satisfy $x + 3 = 4y + 1$. **Which of the following statements are false?** 1 / 1 point

- $x = 4y$
- $x + 2 = 4y$
- $x = 4y - 2$
- $2x + 6 = 8y + 2$

Correct

The equation $x = 4y$ cannot be derived from the given equation.

6.

6. Which of the following real numbers is in the open interval $(2, 3)$? 1 / 1 point

- 1
- 2
- 3
- 2.1

Correct

Recall that the open interval $(2, 3)$ consists of all real numbers x which satisfy $2 < x < 3$. Since $2.1 > 2$ and $2.1 < 3$, the number 2.1 is in this open interval.

7.

7. Which of the following real numbers are in the open ray $(3.1, \infty)$?

1 / 1 point

- 0
- 3.1
- 4.75
- 5

 Correct

Recall that $(3.1, \infty) = \{x \in \mathbb{R} \mid x > 3.1\}$. Since $4.75 > 3.1$ is true, $4.75 \in (3.1, \infty)$.

8.

8. Which of the following values for x solves the equation $-3x + 2 = -4$

1 / 1 point

- $x = 2$
- $x = \frac{2}{3}$
- All values of x such that $x \leq 2$
- $x = -2$

 Correct

First we subtract 2 from both sides of the given equation, to obtain $-3x = -6$. Finally, to isolate x we divide both sides of the equation by -3 to obtain $x = 2$.

WEEK 1: PRACTICE QUIZ FOR SIMPLIFICATION RULES AND SIGMA NOTATION

1.

◀ Practice quiz on Simplification Rules and Sigma Notation
Practice Quiz • 20 min

Practice quiz on Simplification Rules and Sigma Notation

TOTAL POINTS 6

1. Which of the numbers below is equal to the following summation: $\sum_{i=1}^3 i^2$? 1 / 1 point

30
 14
 1
 9

✓ Correct
We compute $\sum_{i=1}^3 i^2 = 1^2 + 2^2 + 3^2 = 14$

2.

◀ Practice quiz on Simplification Rules and Sigma Notation
Practice Quiz • 20 min

2. Suppose that $A = \sum_{k=1}^{100} k^4$ and $B = \sum_{j=1}^{100} j^4$ 1 / 1 point

Which of the following statements is true?

$B > A$
 $A = B$
 $A > B$
 There is not enough information to do the problem

✓ Correct
A = B. Both summations evaluate to the same number, since k and j are just dummy indices.

3.

◀ Practice quiz on Simplification Rules and Sigma Notation
Practice Quiz • 20 min

3. Which of the numbers below is equal to the summation $\sum_{i=1}^{10} 7$? 1 / 1 point

70
 7
 55
 0

✓ Correct
According to one of our Sigma notation simplification rules, this summation is just equal to 10 copies of the number 7 all added together, and so we get $10 \times 7 = 70$.

4.

Practice quiz on Simplification Rules and Sigma Notation
Practice Quiz • 20 min

4. Suppose that $X = \sum_{i=1}^5 i^3$ and $Y = \sum_{i=1}^5 i^4$. 1 / 1 point

Which of the following expressions is equal to the summation $\sum_{i=1}^5 (2i^3 + 5i^4)$?

2X + 5Y
 7
 X + Y
 3375

✓ **Correct**
To get here, you apply two of our Sigma notation simplification rules $\sum_{i=1}^5 2i^3 + 5i^4 = 2(\sum_{i=1}^5 i^3) + 5(\sum_{i=1}^5 i^4) = 2X + 5Y$.

5.

Practice quiz on Simplification Rules and Sigma Notation
Practice Quiz • 20 min

5. Which of the following numbers is the mean μ_Z of the set $Z = \{-2, 4, 7\}$? 1 / 1 point

9
 3
 4
 $\frac{13}{3}$

✓ **Correct**
To get the mean of a set of numbers, you need to perform two steps: first add them all up (in this case getting $-2 + 4 + 7 = 9$), and then divide by the number of elements in the set (in this case that number is 3).

So you should obtain $\mu_Z = \frac{9}{3} = 3$, which you did!

◀ Practice quiz on Simplification Rules and Sigma Notation

Practice Quiz • 20 min

6. Suppose the set X has five numbers in it: $X = \{x_1, x_2, x_3, x_4, x_5\}$. Which of the following expression represents the mean of the set X ? 1 / 1 point

$\frac{1}{5} [\sum_{i=1}^5 (x_i - \mu_X)^2]$

$\frac{1}{5} [\sum_{i=1}^5 x_i]$

$\frac{1}{N} [\sum_{i=1}^N x_i]$

$\sum_{i=1}^5 x_i$

✓ **Correct**

To obtain the mean of a set of numbers, you first add them all up (which is expressed here by the sigma operation inside the square brackets) and then you divide by the number of numbers in the set (which is expressed here by the $\frac{1}{5}$ outside the square brackets).

WEEK 1: GRADED QUIZ ON SETS, NUMBER LINE, INEQUALITIES, SIMPLIFICATION AND SIGMA NOTATION

1.

◀ Graded quiz on Sets, Number Line, Inequalities, Simplification, and Sigma Notation Due Jul 19, 8:59 AM CEST
Graded Quiz • 35 min

Graded quiz on Sets, Number Line, Inequalities, Simplification, and Sigma Notation

LATEST SUBMISSION GRADE
100%

1. Let $B = \{3, 5, 10, 11, 14\}$. Is the following statement true or false: $3 \notin B$ 1 / 1 point

False
 True

✓ **Correct**
The symbol \notin stands for "is not an element of." Since 3 is in an element of the set B , the given statement is not true.

2.

◀ Graded quiz on Sets, Number Line, Inequalities, Simplification, and Sigma Notation Due Jul 19, 8:59 AM CEST
Graded Quiz • 35 min

2. Let $A = \{1, 3, 5\}$ and $B = \{3, 5, 10, 11, 14\}$. Which of the following sets is equal to the union $A \cup B$? 1 / 1 point

$\{1, 10, 18\}$
 $\{3, 5, 10, 11, 14\}$
 $\{1, 3, 5, 10, 11, 14\}$
 $\{1, 3, 5, 3, 5, 10, 11, 14\}$

✓ **Correct**
The union of two sets consists precisely of the elements that are in at least one of the two sets. That is precisely what is listed here.

3.

◀ Graded quiz on Sets, Number Line, Inequalities, Simplification, and Sigma Notation Due Jul 19, 8:59 AM CEST
Graded Quiz • 35 min

3. How many real numbers are there between the integers 1 and 4? 1 / 1 point

2
 Infinitely many
 None
 4

✓ **Correct**
There are in fact infinitely many real numbers between any pair of distinct integers, or indeed any pair of distinct real numbers!

4.

← Graded quiz on Sets, Number Line, Inequalities, Simplification, and Sigma Notation
Graded Quiz • 35 min Due Jul 19, 8:59 AM CEST

4. Suppose I tell you that x and y are two real numbers which make the statement $x \geq y$ true. Which pair of numbers cannot be values for x and y ? 1 / 1 point

- $x = 2$ and $y = 1$
- $x = 10$ and $y = 10$
- $x = -1$ and $y = 0$
- $x = 5$ and $y = 3.3$

✓ **Correct**
Recall that the statement $x \geq y$ means that x is either equal to y or x is to the right of y on the real number line. Since -1 is actually to the left of 0 , these cannot be values for x and y .

5.

← Graded quiz on Sets, Number Line, Inequalities, Simplification, and Sigma Notation
Graded Quiz • 35 min Due Jul 19, 8:59 AM CEST

5. Suppose that z and w are two positive numbers with $z < w$. Which of the following inequalities is false? 1 / 1 point

- $-z > -w$
- $w - 7 > z - 7$
- $-5z < -5w$
- $z + 3 < w + 3$

✓ **Correct**
If we start with $z < w$ and multiply both sides by -5 , we need to flip the less-than sign, which would give $-5z > -5w$. For an example, try $z = 1$ and $y = 2$ and see what happens!

6.

← Graded quiz on Sets, Number Line, Inequalities, Simplification, and Sigma Notation
Graded Quiz • 35 min Due Jul 19, 8:59 AM CEST

6. Find the set of all x which solve the inequality $-2x + 5 \leq 7$ 1 / 1 point

- $x \geq -1$
- $x \leq -1$
- $x = -1$
- $x \geq -6$

✓ **Correct**
Subtracting 5 from both sides of the given inequality gives $-2x \leq 2$. Then we divide both sides by -2 , remembering to flip the inequality sign, and we obtain this answer

7.

← Graded quiz on Sets, Number Line, Inequalities, Simplification, and Sigma Notation
Graded Quiz • 35 min

Due Jul 19, 8:59 AM CEST

7. Which of the following real numbers is not in the closed interval $[2, 3]$

1 / 1 point

- 1
- 2.1
- 2
- 3

✓ Correct

Recall that the closed interval $[2, 3]$ consists of all real numbers x which satisfy $2 \leq x \leq 3$. Since $2 \leq 1$ is false, $1 \notin [2, 3]$

8.

◀ Graded quiz on Sets, Number Line, Inequalities, Simplification, and Sigma Notation
Graded Quiz • 35 min

Due Jul 19, 8:59 AM CEST

8. Which of the following intervals represents the set of all solutions to:

1 / 1 point

- $-5 \leq x + 2 < 10$?
- (7, 8)
 - $[-7, 8]$
 - $[-7, 8)$
 - $[-5, 10)$

✓ Correct

Subtracting 2 from all sides of the inequalities gives $-7 \leq x < 8$, and the set of all real numbers x which make that true is exactly the half-open interval $[-7, 8)$.

9.

◀ Graded quiz on Sets, Number Line, Inequalities, Simplification, and Sigma Notation
Graded Quiz • 35 min

Due Jul 19, 8:59 AM CEST

9. Which of the numbers below is equal to the following summation: $\sum_{k=2}^5 2k$?

1 / 1 point

- 28
- 4
- 10
- 14

✓ Correct

We compute $\sum_{k=2}^5 2k = 4 + 6 + 8 + 10 = 28$.

10.

← Graded quiz on Sets, Number Line, Inequalities, Simplification, and Sigma Notation
Graded Quiz • 35 min Due Jul 19, 8:59 AM CEST

10. Suppose we already know that $\sum_{k=1}^{20} k = 210$. Which of the numbers below is equal to $\sum_{k=1}^{20} 2k$? 1 / 1 point

- 40
- 2
- 420
- 210

✓ **Correct**
 By applying one of our Sigma notation simplification rules, we can rewrite the summation in question as $2 (\sum_{k=1}^{20} k) = 2 \times 210 = 420$.

11.

← Graded quiz on Sets, Number Line, Inequalities, Simplification, and Sigma Notation
Graded Quiz • 35 min Due Jul 19, 8:59 AM CEST

11. Which of the numbers below is equal to the summation $\sum_{i=2}^{10} 7$? 1 / 1 point

- 7
- 48
- 63
- 70

✓ **Correct**
 According to one of our Sigma notation simplification rules, this summation is just equal to 9 copies of the number 7 all added together, and so we get $9 \cdot 7 = 63$.

12.

← Graded quiz on Sets, Number Line, Inequalities, Simplification, and Sigma Notation
Graded Quiz • 35 min Due Jul 19, 8:59 AM CEST

12. Which of the following numbers is the variance of the set $Z = \{-2, 4, 7\}$? 1 / 1 point

- 69
- 42
- $\sqrt{14}$
- 14

✓ **Correct**
 To get the variance of a set of numbers, you need to perform four steps:

 First compute the mean (which is 3)

 Then calculate all the squared differences between the numbers in the set and this mean (here you get 25, 1, 16)

 Then add all these up (here you get 42)

13.

← Graded quiz on Sets, Number Line, Inequalities, Simplification, and Sigma Notation
Graded Quiz • 35 min

Due Jul 19, 8:59 AM CEST

$$= \frac{1}{3} [(-2 - 3)^2 + (4 - 3)^2 + (7 - 3)^2]$$

$$= \frac{1}{3} [25 + 1 + 16] = \frac{42}{3} = 14$$

13. Which of the following sets does *not* have zero variance? (hint: don't do any calculation here, just think!)

1 / 1 point

- {0, 0, 0, 0, 0, 0, 0}
- {5, 5, 5, 5, 5, 5, 5, 5, 5, 5, 5, 5, 5, 5}
- {1, 1, 1, 1}
- {2, 5, 9, 13}

Correct

Intuitively, the numbers in this set are spread out.

WEEK 2: PRACTICE QUIZ ON THE CARTESIAN PLANE

1.

coursera.org/learn/datasciencemathskills/quiz/J03WK/practice-quiz-on-the-cartesian-plane/attempt?redirectToCover=true

← Practice quiz on the Cartesian Plane
Practice Quiz • 15 min

Practice quiz on the Cartesian Plane

TOTAL POINTS 5

1. Which of the following points in the Cartesian Plane is on the y -axis?

(5, 0)
 (0, -5)
 (1, 1)
 (-5, 0)

Correct
The y -axis is defined to be all points in the Cartesian plane with zero as x -coordinate. The point (0, -5) meets that requirement.

2.

coursera.org/learn/datasciencemathskills/quiz/J03WK/practice-quiz-on-the-cartesian-plane/attempt?redirectToCover=true

← Practice quiz on the Cartesian Plane
Practice Quiz • 15 min

2. Find the distance between the points $A = (2, 2)$ and $C = (3, 3)$:

2
 $\sqrt{2}$
 0
 1

Correct
Recall that the distance between points (a, b) and (c, d) is $\sqrt{(c - a)^2 + (d - b)^2}$.
In this case $(a, b) = (2, 2)$ and $(c, d) = (3, 3)$, so the distance is $\sqrt{(3 - 2)^2 + (3 - 2)^2} = \sqrt{2}$.

3.

Practice quiz on the Cartesian Plane

Practice Quiz • 15 min

3. Find the point-slope form of the equation of the line that goes between $A = (1, 1)$ and $B = (5, 3)$:

1 / 1 point

- $y - 1 = \frac{1}{2}(x - 5)$
- $y - 1 = \frac{1}{2}(x - 1)$
- $y - 3 = \frac{1}{2}(x - 1)$
- $y = \frac{1}{2}x$

Correct

The point-slope form for the equation of a line with slope m that goes through the point (x_0, y_0) is $y - y_0 = m(x - x_0)$

$$\text{In this case, the slope } m = \frac{3 - 1}{5 - 1} = \frac{1}{2}$$

We can choose either A or B for the point on the line, but in neither case do we get this chosen

4.

Practice quiz on the Cartesian Plane

Practice Quiz • 15 min

4. Which of the following points is on the line with equation:

1 / 1 point

- $y - 1 = 2(x - 2)$?
- (2, 3)
 - (0, 0)
 - (3, 2)
 - (2, 1)

Correct

If we plug in 1 for y and 2 for x in the equation of the line, we make a true statement, $0 = 0$, so this point lies on the line.

5.

← Practice quiz on the Cartesian Plane

Practice Quiz • 15 min

5. Suppose that a line ℓ has slope 2 and goes through the point $(-1, 0)$. What is the y -intercept of ℓ ? 1 / 1 point

1
 -1
 2
 0

✓ **Correct**
Recall that the y -intercept of ℓ is the y -coordinate of where ℓ hits the y -axis.
Since $(-1, 0) \in \ell$, the point on ℓ with $x = 0$ is obtained by running one unit from $(-1, 0)$ while rising two units.
This gives $y = 2$ as the y -intercept.

WEEK 2: PRACTICE QUIZ ON TYPES OF FUNCTIONS

1.

Practice quiz on Types of Functions
Practice Quiz • 20 min

Practice quiz on Types of Functions

TOTAL POINTS 6

1. Suppose that $A = \{1, 2, 10\}$ and $B = \{4, 8, 40\}$. Which of the following formulae do **not** define a function $f : A \rightarrow B$? 1 / 1 point

- $f(a) = 4a$, for each $a \in A$
- $f(1) = 4, f(2) = 4$, and $f(10) = 4$.
- $f(1) = 5, f(2) = 8$, and $f(10) = 40$.
- $f(1) = 4, f(2) = 40$, and $f(10) = 8$.

✓ **Correct**
A function $f : A \rightarrow B$ is a rule which assigns an element $f(a) \in B$ to each $a \in A$. In this case, unfortunately, $f(1) = 5 \notin B$.

2.

Practice quiz on Types of Functions
Practice Quiz • 20 min

2. Suppose that A contains every person in the VBS study (see the second video in the course if you're confused here!). Suppose that $Y = \{+, -\}$ and $Z = \{H, S\}$ 1 / 1 point

Suppose that $T : A \rightarrow Y$ is the function which gives $T(a) = +$ if person a tests positive and $T(a) = -$ if they test negative.

Suppose that $D : A \rightarrow Z$ is the function which gives $D(a) = H$ does not actually have VBS and $D(a) = S$ if the person actually has VBS.

Which of the following must be true of person a if we have a false positive?

- $T(a) = -$ and $D(a) = H$
- $T(a) = -$ and $D(a) = S$
- $T(a) = +$ and $D(a) = S$
- $T(a) = +$ and $D(a) = H$

✓ **Correct**
Recall that a false positive is a positive test result (so $T(a) = +$) which is misleading because the person actually does not have the disease ($D(a) = H$)

3.

◀ Practice quiz on Types of Functions

Practice Quiz • 20 min

3. Consider the function $g : \mathbb{R} \rightarrow \mathbb{R}$ defined by $g(x) = x^2 - 1$. Which of the following points are *not* on the graph of g ?

- (-1, 0)
- (0, -1)
- (2, -1)
- (1, 0)

✓ Correct

Recall that the graph of g consists of all points (x, y) such that $y = g(x)$. Here $g(2) = 3 \neq -1$, so the point $(2, -1)$ is *not* on the graph of g .

4.

◀ Practice quiz on Types of Functions

Practice Quiz • 20 min

4. Let the point $A = (2, 4)$. Which of the following graphs does *not* contain the point A ?

- The graph of $g(x) = x + 2$
- The graph of $h(x) = x - 1$
- The graph of $s(x) = x^2$
- The graph of $f(x) = 2x$

✓ Correct

The graph of h consists of all points (x, y) such that $y = h(x)$. Here $h(2) = 1 \neq 4$, so the point $(2, 4)$ is *not* on the graph of h .

5.

◀ Practice quiz on Types of Functions

Practice Quiz • 20 min

5. Suppose that $h(x) = -3x + 4$. Which of the following statements is true?

- h is neither a strictly increasing function nor a strictly decreasing function.
- h is a strictly increasing function
- h is a strictly decreasing function
- All statements are correct

✓ Correct

A function h is called strictly decreasing if whenever $a < b$, then $h(a) > h(b)$

Since the graph of h is a line with negative slope, this is in fact true!

◀ Practice quiz on Types of Functions

Practice Quiz • 20 min

6. Suppose that $f : \mathbb{R} \rightarrow \mathbb{R}$ is a strictly increasing function, with $f(3) = 15$

1 / 1 point

Which of the following is a possible value for $f(3.7)$?

14.7

17

3

-3

✓ Correct

A function f is called strictly increasing if whenever $a < b$, then $f(a) < f(b)$.

Since $f(3) = 15$ is given and $3 < 3.7$, it must be that $15 < f(3.7)$, and this answer satisfies that.

WEEK 2: GRADED QUIZ ON CARTESIAN PLANE AND TYPES OF FUNCTION

1.

Graded quiz on Cartesian Plane and Types of Function
Graded Quiz • 40 min Due Jul 26, 8:59 AM CEST

1. Which of the following points in the Cartesian Plane have positive x -coordinate and negative y -coordinate? **1 / 1 point**

- (5, 7)
- (0, 0)
- (-4, 5)
- (7, -1)

Correct
The x -coordinate, 7, is positive, and the y -coordinate, -1, is negative.

2.

Graded quiz on Cartesian Plane and Types of Function
Graded Quiz • 40 min Due Jul 26, 8:59 AM CEST

2. Which of the following points is in the first quadrant of the Cartesian Plane? **1 / 1 point**

- (5, -1)
- (7, 11)
- (-4, -7)
- (-5, 1)

Correct
The first quadrant is defined to be all points in the Cartesian plane whose coordinates are both positive.

3.

Graded quiz on Cartesian Plane and Types of Function
Graded Quiz • 40 min Due Jul 26, 8:59 AM CEST

3. Let A, B, C, D be points in the Cartesian Plane, and let the set $S = \{B, C, D\}$ **1 / 1 point**

Suppose that the distances from A to B, C, D are 5.3, 2.1, and 11.75, respectively.

Which of the following points is the nearest neighbor to the point A in the set S ?

- B
- A
- D
- C

Correct
The distance from A to C is 2.1 and that is smaller than the distance from A to any other element of S .

4.

← Graded quiz on Cartesian Plane and Types of Function
Graded Quiz • 40 min

Due Jul 26, 8:59 AM CEST

4. Find the distance between the points $A = (2, 2)$ and $B = (-1, -2)$. 1 / 1 point

-25
 25
 1
 5

✓ **Correct**
Recall that the distance between points (a, b) and (c, d) is $\sqrt{(c-a)^2 + (d-b)^2}$
In this case we have:

$$\sqrt{(-1-2)^2 + (-2-2)^2} = \sqrt{(-3)^2 + (-4)^2} = \sqrt{25} = 5$$

5.

← Graded quiz on Cartesian Plane and Types of Function
Graded Quiz • 40 min

Due Jul 26, 8:59 AM CEST

5. Find the slope of the line segment between the points $A = (0, 1)$ and $B = (1, 0)$. 1 / 1 point

-1
 1
 $\sqrt{2}$
 0

✓ **Correct**
The slope of this line segment is $\frac{0-1}{1-0} = -1$

6.

← Graded quiz on Cartesian Plane and Types of Function
Graded Quiz • 40 min

Due Jul 26, 8:59 AM CEST

6. Find the point-slope form of the equation of the line with slope -2 that goes through the point $(5, 4)$. 1 / 1 point

$y - 5 = -2(x - 4)$
 $y - 4 = -2(x - 5)$
 $y - 4 = 2(x - 5)$
 $(5, 4)$

✓ **Correct**
The point-slope form for the equation of a line with slope m that goes through the point (x_0, y_0) is $y - y_0 = m(x - x_0)$.
In this case, the slope $m = -2$ is given and the point $(5, 4)$ on the line is given.

7.

Graded quiz on Cartesian Plane and Types of Function
Graded Quiz • 40 min

Due Jul 26, 8:59 AM CEST

7. Which of the following equations is for a line with the same slope as $y = -3x + 2$? 1 / 1 point

$y = -3x - 8$
 $y = 5x + 2$
 $y = 8x - 3$
 $y = 5x$

✓ **Correct**
The slope-intercept formula for a line is $y = mx + b$, where m is the slope and b is the y -coordinate of the point where the line hits the y -axis.
This line has slope $m = -3$ which is the same slope as the given line.

8.

Graded quiz on Cartesian Plane and Types of Function
Graded Quiz • 40 min

Due Jul 26, 8:59 AM CEST

8. Which of the following equations is for a line with the same y -intercept as $y = -3x + 2$? 1 / 1 point

$y = 5x + 2$
 $y = -3x - 8$
 $y = 5x$
 $y = 8x - 3$

✓ **Correct**
The slope-intercept formula for a line is $y = mx + b$, where m is the slope and b is the y -coordinate of the point where the line hits the y -axis. This line has a y -intercept of 2 which is the same as the given line.

9.

Graded quiz on Cartesian Plane and Types of Function
Graded Quiz • 40 min

Due Jul 26, 8:59 AM CEST

9. How many lines contain both the point $A = (1, 1)$ and the point $B = (2, 2)$? 1 / 1 point

infinitely many
 2
 None
 1

✓ **Correct**
The line with equation $y = x$ is the one and only line that meets the stated requirements.

10.

← Graded quiz on Cartesian Plane and Types of Function
Graded Quiz • 40 min

Due Jul 26, 8:59 AM CEST

10. Suppose that we have two sets, $A = \{a, b\}$ and $Z = \{x, y\}$. How many different functions $F : A \rightarrow Z$ are possible?

- 1
- 4
- There are none
- There are infinitely many



Correct

A function $F : A \rightarrow Z$ is a rule which assigns an element $F(a) \in Z$ to each element $a \in A$.

There are two elements in A ; namely, a and b . For each of these elements, there are two assignment choices we could make: x and y .

Here are the four possible functions:

$$F(a) = x, F(b) = y, \text{ OR}$$

$$F(a) = y, F(b) = x, \text{ OR}$$

$$F(a) = x, F(b) = x, \text{ OR}$$

$$F(a) = y, F(b) = y.$$

11.

← Graded quiz on Cartesian Plane and Types of Function
Graded Quiz • 40 min

Due Jul 26, 8:59 AM CEST

11. How many graphs contain both the point $A = (0, 0)$ and the point $B = (1, 1)$

1 / 1 point

- Infinitely many
- None
- 2
- 1



Correct

The graphs of $f(x) = x, g(x) = x^2, h(x) = x^3, s(x) = x^4, \dots$ all contain both A and B

12.

◀ Graded quiz on Cartesian Plane and Types of Function
Graded Quiz • 40 min

Due Jul 26, 8:59 AM CEST

12. Suppose that $g : \mathbb{R} \rightarrow \mathbb{R}$ is a continuous function whose graph intersects the x -axis more than once.
Which of the following statements is true?

- g is strictly increasing.
- g is strictly decreasing.
- g is neither strictly increasing nor strictly decreasing.
- All of the above.

✓ Correct

The function g fails the horizontal line test, so it can neither be strictly increasing nor strictly decreasing.

13.

◀ Graded quiz on Cartesian Plane and Types of Function
Graded Quiz • 40 min

Due Jul 26, 8:59 AM CEST

✓ Correct

The function g fails the horizontal line test, so it can neither be strictly increasing nor strictly decreasing.

13. Find the slope of the line segment between the points $A = (1, 1)$ and $B = (5, 3)$.

1 / 1 point

- 4
- $\frac{1}{2}$
- 2
- $\sqrt{20}$

✓ Correct

The slope of this line segment is $\frac{3 - 1}{5 - 1} = \frac{1}{2}$, where $3 - 1$ is the rise and $5 - 1$ is the run.

WEEK 3: PRACTICE QUIZ ON TANGENT LINES TO FUNCTIONS

1.

◀ Practice quiz onTangent Lines to Functions
Practice Quiz • 10 min

Practice quiz onTangent Lines to Functions

TOTAL POINTS 2

1. Suppose that $f : \mathbb{R} \rightarrow \mathbb{R}$ is a function. Which of the following expressions corresponds to $f'(2)$, the slope of the tangent line to the graph of $f(x)$ at $x = 2$? 1 / 1 point

$f'(2) = \lim_{h \rightarrow 0} \frac{f(2+h)-f(2)}{h}$

$f'(2) = mx + b$

$f'(2) = \lim_{h \rightarrow 0} \frac{f(a+h)-f(a)}{h}$

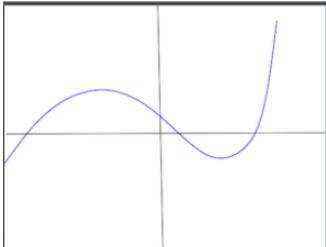
$f'(2) = 2$

✓ Correct
This expression can be obtained from the first screen of our video by plugging in 2 for a .

2.

◀ Practice quiz onTangent Lines to Functions
Practice Quiz • 10 min

2. Suppose that $h : \mathbb{R} \rightarrow \mathbb{R}$ is a function whose graph is shown as the blue curve in the figure. For how many values of a is $h'(a) = 0$? 1 / 1 point



3

Never

Always

2

✓ Correct
 $h'(a)$ gives the slope of the tangent line to the graph of h at the point $x = a$.
When $h'(a) = 0$, this means that the tangent line is horizontal.
There are two places (one on each side of the y -axis) where this tangent line is horizontal, so this answer is correct.

WEEK 3: PRACTICE QUIZ ON EXPONENTS AND LOGARITHMS

1.

← Practice quiz on Exponents and Logarithms
Practice Quiz • 40 min

1. Re write the number $784 = 2 \times 2 \times 2 \times 2 \times 7 \times 7$ using exponents. 1 / 1 point

(2⁶)(7⁶)
 (2⁴)(7²)
 (16⁴)(49²)
 (2 × 7)⁶

✓ **Correct**
For this type of problem, count the number of times each relevant factor appears in the product. That number is the exponent for that factor.

2.

← Practice quiz on Exponents and Logarithms
Practice Quiz • 40 min

2. What is $(x^2 - 5)^0$? 1 / 1 point

1
 -4
 $(x^2) - 5$
 (x^2)

✓ **Correct**
Any real number (except zero) raised to the "zeroith" power = 1.

3.

← Practice quiz on Exponents and Logarithms
Practice Quiz • 40 min

3. Simplify $((x - 5)^2)^{-3}$ 1 / 1 point

$(x - 5)^{-5}$
 $(x - 5)^{-6}$
 $(x - 5)$
 $(x - 5)^{-1}$

✓ **Correct**
By Rule 2, "Power to a Power," multiply the exponents and get:
$$(x - 5)^{(2 \times -3)} = (x - 5)^{-6}$$

By the definition of negative exponents, this is equal to $\frac{1}{(x - 5)^6}$

4.

← Practice quiz on Exponents and Logarithms
Practice Quiz • 40 min

4. Simplify $(\frac{8^2}{8^7})^2$ 1 / 1 point

8⁻¹⁰
 8⁻⁴
 8⁻¹
 8⁻⁵

✓ **Correct**

We can first simplify what is inside the parenthesis to 8^{-5} using the Division and Negative Powers Rule.

Then apply division and negative powers-- the result is the same. $\frac{8^4}{8^{14}} = 8^{-10}$

5.

← Practice quiz on Exponents and Logarithms
Practice Quiz • 40 min

5. $\log 35 = \log 7 + \log x$ 1 / 1 point

Solve for x

28
 5
 4
 7

✓ **Correct**

$\log(x) = \log 35 - \log 7$

$\log(x) = \log(\frac{35}{7})$

By the Quotient Rule $\log x = \log 5$

6.

← Practice quiz on Exponents and Logarithms
Practice Quiz • 40 min

6. $\log_2(x^2 + 5x + 7) = 0$

1 / 1 point

Solve for x

- x = -2 or x = -3
- x = 3
- x = 2
- x = 2 or x = 3

✓ Correct

We use the property that $b^{\log_b a} = a$

Use both sides as exponent for 2.

$$2^{\log_2 x^2 + 5x + 7} = 2^0$$

$$x^2 + 5x + 7 = 1$$

$$x^2 + 5x + 6 = 0$$

$$(x + 3)(x + 2) = 0$$

$$x = -3 \quad \text{OR}$$

$$x = -2$$

7.

← Practice quiz on Exponents and Logarithms
Practice Quiz • 40 min

7. Simplify $\log_2 72 - \log_2 9$

1 / 1 point

- $\log_2 63$
- 3
- $\log_2 4$
- 4

✓ Correct

By the quotient rule, this is $\log_2 \frac{72}{9} = \log_2 2^3 = 3$

8.

[coursera.org/learn/datasciencemathskills/quiz/E2uwh/practice-quiz-on-exponents-and-logarithms/attempt?redirectToCover...](#)

← Practice quiz on Exponents and Logarithms
Practice Quiz • 40 min

8. Simplify $\log_3 9 - \log_3 3 + \log_3 5$

1 / 1 point

- $\log_3 8$
- 8
- $\log_3 15$
- 15

✓ Correct

By the Quotient and Product Rules, this is $\log_3 \frac{9 \times 5}{3} = \log_3 15$

9.

[coursera.org/learn/datasciencemathskills/quiz/E2uwh/practice-quiz-on-exponents-and-logarithms/attempt?redirectToCover...](#)

← Practice quiz on Exponents and Logarithms
Practice Quiz • 40 min

9. Simplify $\log_2(3^8 \times 5^7)$

1 / 1 point

- $15 \times \log_2 56$
- $(8 \times \log_2 3) + (7 \times \log_2 5)$
- $(5 \times \log_2 3) + (8 \times \log_2 5)$
- $56 \times \log_2 15$

✓ Correct

We first apply the Product Rule to convert to the sum: $\log_2(3^8) + \log_2(5^7)$. Then apply the power and root rule.

10.

[coursera.org/learn/datasciencemathskills/quiz/E2uwh/practice-quiz-on-exponents-and-logarithms/attempt?redirectToCover...](#)

← Practice quiz on Exponents and Logarithms
Practice Quiz • 40 min

10. If $\log_{10} y = 100$, what is $\log_2 y = ?$

1 / 1 point

- 301.03
- 500
- 332.19
- 20

✓ Correct

Use the change of base formula, $\log_a b = \frac{\log_x b}{\log_x a}$

Where the "old" base is x and the "new" base is a .

$$\text{So } \frac{100}{\log_{10}(2)} = \frac{100}{0.30103} = 332.19$$

11.

← Practice quiz on Exponents and Logarithms
Practice Quiz • 40 min

11. A tree is growing taller at a continuous rate. In the past 12 years it has grown from 3 meters to 15 meters. What is its rate of growth per year? 1 / 1 point

10.41%
 12.41%
 13.41%
 11.41%

✓ Correct

$$\frac{\ln \frac{15}{3}}{12} = 0.1341$$

12.

← Practice quiz on Exponents and Logarithms
Practice Quiz • 40 min

12. Bacteria can reproduce exponentially if not constrained. Assume a colony grows at a continually compounded rate of 400% per day. How many days before a colony with initial mass of 6.25×10^{-10} grams weights 1000 Kilograms? 1 / 1 point

0.875 days
 87.5 days
 875 days
 8.75 days

✓ Correct

$$6.25 \times 10^{-10} \times e^{4t} = 10^6$$

$$4t = \ln \left(\frac{10^6}{(6.25 \times 10^{-10})} \right) = 35.00878$$

$$t = \ln \frac{10^6}{6.25 \times 10^{-10}} = 8.752195$$

WEEK 3: GRADED QUIZ ON TANGENT LINES TO FUNCTIONS, EXPONENTS AND LOGARITHMS

1.

Graded quiz on Tangent Lines to Functions, Exponents and Logarithms
Graded Quiz • 45 min Due Aug 2, 8:59 AM CEST

1. Convert $\frac{1}{49}$ to exponential form, using 7 as the factor. **1 / 1 point**

7^{-2}
 $\frac{7}{7^3}$
 49^{-1}
 (7^2)

Correct
The rule for a factor to a Negative exponent is to divide by the same factor to a positive exponent with the same absolute value.

2.

Graded quiz on Tangent Lines to Functions, Exponents and Logarithms
Graded Quiz • 45 min Due Aug 2, 8:59 AM CEST

2. A light-year (the distance light travels in a vacuum in one year) is 9,460 trillion meters. Express in scientific notation. **1 / 1 point**

9.46×10^{15} meters.
 9460×10^{12} meters
 0.946×10^{16}
 9.46×10^{15} kilometers

Correct
9,460 is (9.4×10^3) meters and one trillion meters is 10^{12} meters. $(9.4 \times 10^3)(10^{12}) = 9.4 \times 10^{15}$. A kilometer is 1000 meters.

3.

Graded quiz on Tangent Lines to Functions, Exponents and Logarithms
Graded Quiz • 45 min Due Aug 2, 8:59 AM CEST

3. Simplify $(x^8)(y^3)(x^{-10})(y^{-2})$ **1 / 1 point**

$(x^{-2})(y)$
 $(x^{-80})(y^{-6})$
 $(x)(y^{-2})$
 $(x^2)(y)$

Correct
By the Division and Negative Powers Rule, this is $(x^{(8-10)})(y^{(3-2)})$

4.

Graded quiz on Tangent Lines to Functions, Exponents and Logarithms
Graded Quiz • 45 min

4. Simplify $[(x^4)(y^{-6})]^{-1}$

1 / 1 point

- $\frac{(x^{-4})}{(y^6)}$
- $\frac{(x^4)}{(y^{-6})}$
- $(x^3)(y^{-7})$
- $(x^{-4})(y^6)$

 Correct

By the Power to a Power Rule, each of the exponents is multiplied by (-1)

5.

Graded quiz on Tangent Lines to Functions, Exponents and Logarithms
Graded Quiz • 45 min

Due Aug 2, 8:59 AM CEST

5. Solve for x :

1 / 1 point

$$\log_2(39x) - \log_2(x - 5) = 4$$

- $\frac{39}{23}$
- $\frac{23}{80}$
- $\frac{-80}{23}$
- $\frac{80}{38}$

 Correct

$$\log_2 \frac{39x}{(x - 5)} = 4 \text{ by the Quotient Rule.}$$

Since both sides are equal, we can use them as exponents in an equation.

$$\frac{\log_2 \frac{39x}{(x - 5)}}{2} = 2^4$$

$$\frac{39x}{(x - 5)} = 16$$

$$39x = 16 \times (x - 5)$$

$$39x = 16x - 80$$

$$23x = -80$$

$$x = \frac{-80}{23}$$

6.

Graded quiz on Tangent Lines to Functions, Exponents and Logarithms
Graded Quiz • 45 min

Due Aug 2, 8:59 AM CEST

6. Simplify this expression:

1 / 1 point

$$(x^{\frac{1}{2}})^{\frac{-3}{2}}$$

- $x^{\frac{1}{3}}$
- $x^{-\frac{3}{4}}$
- $x^{\frac{4}{3}}$
- x^{-1}

✓ Correct

We use the Power to a Power Rule -- multiply exponents:

$$x^{\frac{1}{2} \times -\frac{3}{2}} = x^{-\frac{3}{4}}$$

7.

Graded quiz on Tangent Lines to Functions, Exponents and Logarithms
Graded Quiz • 45 min

Due Aug 2, 8:59 AM CEST

7. Simplify $\log_{10} 1000 + \log_{10} \frac{1}{10000}$

1 / 1 point

- 1
- $\frac{1}{10}$
- 1
- $\log_{10} -10$

✓ Correct

By the Product Rule, this is:

$$\log_{10}\left(\frac{1000}{10000}\right) = \log_{10}\left(\frac{1}{10}\right) = -1$$

8.

← Graded quiz on Tangent Lines to Functions, Exponents and Logarithms
Graded Quiz • 45 min Due Aug 2, 8:59 AM CEST

8. If $\log_3 19 = 2.680$, what is $\log_9 19$? 1 / 1 point

- 1.304
- 0.8934
- 0.4347
- 5.216

✓ **Correct**
To convert from \log_3 to \log_9 , divide by $\log_3 9$. Which is equal to 2, so the answer is 1.34

9.

← Graded quiz on Tangent Lines to Functions, Exponents and Logarithms
Graded Quiz • 45 min Due Aug 2, 8:59 AM CEST

9. If $\log_{10} b = 1.8$ and $\log_a b = 2.5752$, what is a ? 1 / 1 point

- 3
- 6
- 5
- 4

✓ **Correct**
To solve for a in the formula;

$$\log_a b = \frac{\log_x b}{\log_x a}$$

$\log_a b = 2.5752$ and $\log_{10} b = 1.8$

$$\log_a b = \frac{\log_x b}{\log_x a}$$

$\log_a b = 2.5752$ and $\log_{10} b = 1.8$

Therefore, $\log_{10} a$ must equal to $\frac{1.8}{2.5752} = 0.69897$

Treating both sides of equation $\log_{10} a = 0.69897$ as exponents of 10 gives $a = 10^{0.69897} = 5$

10.

Graded quiz on Tangent Lines to Functions, Exponents and Logarithms
Graded Quiz • 45 min

Due Aug 2, 8:59 AM CEST

10. An investment of 1,600 is worth 7,400 after 8.5 years. What is the continuously compounded rate of return of this investment? 1 / 1 point

18.02%
 19.01%
 17.01%
 20.01

✓ Correct

$$\frac{\ln \frac{7400}{1600}}{8.5} = 0.18017$$

11.

Graded quiz on Tangent Lines to Functions, Exponents and Logarithms
Graded Quiz • 45 min

Due Aug 2, 8:59 AM CEST

11. A pearl grows in an oyster at a continuously compounded rate of .24 per year. If a 25-year old pearl weighs 1 gram, what did it weigh when it began to form? 1 / 1 point

0.2478
 0.0002478
 0.002478
 0.02478

✓ Correct

$$e^{(0.24 \times 25)} = \frac{1}{x}$$

$$x = \frac{1}{(e^{0.24 \times 25})}$$

$$x = \frac{1}{403.4288}$$

$$x = 0.002478$$

12.

← Graded quiz on Tangent Lines to Functions, Exponents and Logarithms
Graded Quiz • 45 min Due Aug 2, 8:59 AM CEST

12. $\log_2 z = 6.754$. What is $\log_{10}(z)$? 1 / 1 point

2.03316
 1.3508
 0.82956
 0.49185

✓ **Correct**

$$\frac{\log_2 z}{\log_2 10} =$$

$$(\log_{10} z) \times (\log_2 10) = 3.321928$$

 Therefore, $\log_{10} z = \frac{6.754}{3.321928} = 2.03316$

13.

← Graded quiz on Tangent Lines to Functions, Exponents and Logarithms
Graded Quiz • 45 min Due Aug 2, 8:59 AM CEST

3.321928

13. Suppose that $g : \mathbb{R} \rightarrow \mathbb{R}$ is a function, and that $g(1) = 10$. Suppose that $g'(a)$ is negative for every single value of a . Which of the following could possibly be $g(1.5)$? 1 / 1 point

$g(1.5) = 11$
 $g(1.5) = 103.4$
 $g(1.5) = 10.1$
 $g(1.5) = 9.7$

✓ **Correct**
 Since the slope of the tangent line to the graph of g is negative everywhere on the graph, we know that g is *decreasing* function! And therefore we must have $g(1.5) < g(1)$. That is the case here, so this value is at least possible.

WEEK 4 : PRACTICE QUIZ ON PROBABILITY CONCEPTS

1.

◀ Practice quiz on Probability Concepts
Practice Quiz • 25 min

Practice quiz on Probability Concepts

TOTAL POINTS 9

1. If x = "It is raining," what is $\sim (\sim x)$? 1 / 1 point

- "It is not raining"
- "It is never raining"
- "It is raining"
- "It is always raining"

✓ **Correct**
The second negation cancels out the first one.
Similarly $\sim (\sim (\sim x)) = \sim x$

2.

◀ Practice quiz on Probability Concepts
Practice Quiz • 25 min

2. If the statement "I am 25 years old" is assigned probability 0, what probability is assigned to the statement "I am not 25 years old"? 1 / 1 point

- Unknown
- 1
- 0
- 1

✓ **Correct**
It is always the case that $p(x) + p(\sim x) = 1$.

3.

◀ Practice quiz on Probability Concepts
Practice Quiz • 25 min

3. If I assign to the statement x = "it will rain today" a probability of $p(x) = 0.35$, what probability must I assign to the statement "it will not rain today"? 1 / 1 point

- .5
- 0
- .35
- .65

✓ **Correct**
 $p(x) + p(\sim x) = 1$

4.

← Practice quiz on Probability Concepts
Practice Quiz • 25 min

4. Is the following collection of statements a probability distribution? 1 / 1 point

1. I own a Toyota pickup truck
2. I do not own a Toyota pickup truck
3. I own a non-Toyota pickup truck
4. I do not own a non-Toyota pickup truck

Yes
 No

✓ **Correct**
The statements are not *exclusive*: 1 and 4 could both be true, 2 and 3 could both be true, 2 and 4 could both be true, and even (1) and (3) could both be true (if I owned more than one pickup truck).

5.

← Practice quiz on Probability Concepts
Practice Quiz • 25 min

5. I don't know what it means to be "ingenuous." What probability would I assign to the statement, "I am ingenuous OR I am not ingenuous"? 1 / 1 point

0
 1
 .5
 -1

✓ **Correct**
It is always the case, regardless of the content of the statement x , that $p(x \text{ or } \sim x) = 1$

6.

← Practice quiz on Probability Concepts
Practice Quiz • 25 min

6. A friend of mine circumscribes a circle inside a square, so that the diameter of the circle and the edge of the square are the same length. He asks me to close my eyes and pick a point at random inside the square. He says the probability that my point will also be inside the circle is $\frac{\pi}{4}$

1 / 1 point

Is this correct?

Yes
 No

Correct

Probabilities can be any real number between 0 and 1. They do not need to be rational numbers – a numerator that is a transcendental number like Pi is acceptable.

Note that the correct probability does not depend on the length r of the circle's radius. For a circle with any radius r to be circumscribed inside a square, the square must have sides each of length $2r$. The area of the circle is πr^2 and the area of the square is $(2r)^2 = 4r^2$. The probability of landing in a circle of area πr^2 when it is known that one is in the area of the square is equal to the ratio of the area of the circle to the area of the square in which it is circumscribed, or $\pi r^2 / 4r^2$, which equals $\pi/4$.

7.

← Practice quiz on Probability Concepts
Practice Quiz • 25 min

7. The probability of drawing a straight flush (including a Royal Flush) in a five-card poker hand is 0.0000153908

1 / 1 point

What is the probability of **not** drawing a straight flush?

.9996582672
 .9967253809
 .9999846092
 .9999745688

Correct

$p(\sim x) = 1 - p(x)$

8.

← Practice quiz on Probability Concepts
Practice Quiz • 25 min

8. What is the probability that a fair, six-sided die will come up with a prime number? (Recall that prime numbers are positive integers other than 1 that are divisible only by themselves and 1)

$\frac{1}{3}$

$\frac{1}{2}$

$\frac{1}{6}$

$\frac{2}{3}$

 **Correct**
The faces with 2, 3 and 5 satisfy the condition – which makes 3 relevant outcomes out of the “universe” of 6 outcomes = $\frac{3}{6} = \frac{1}{2}$

9.

← Practice quiz on Probability Concepts
Practice Quiz • 25 min

9. The joint probability p (the die will come up 5, the next card will be a heart) is equal to the joint probability:

p (the next card will be a heart, the die will come up 5)

p (the next card will be a heart, the die will **not** come up 5)

p (the next card will **not** come up 5, the next card will be a heart)

p (the die will **not** come up 5, the next card will **not** be a heart)

 **Correct**
In joint probabilities, the order does not change the probability: $p(A, B) = p(B, A)$

WEEK 4: PRACTICE QUIZ ON PROBLEM SOLVING

1.

Practice quiz on Problem Solving
Practice Quiz • 25 min

1. I am given the following 3 joint probabilities:

$p(\text{I am leaving work early, there is a football game that I want to watch this afternoon}) = .1$

$p(\text{I am leaving work early, there is not a football game that I want to watch this afternoon}) = .05$

$p(\text{I am not leaving work early, there is not a football game that I want to watch this afternoon}) = .65$

What is the probability that there is a football game that I want to watch this afternoon?

.35
 .3
 .2
 .2
 .1

 **Correct**

Getting the answer is a two-step process. First, recall that the sum of probabilities for a probability distribution must sum to 1. So the “missing” joint distribution

$p(\text{I am not leaving work early, there is a football game I want to watch this afternoon})$ must be $1 - (0.1 + 0.05 + 0.65) = 0.2$

By the sum rule, the marginal probability $p(\text{there is a football game that I want to watch this afternoon})$ = the sum of the joint probabilities

$P(\text{I am leaving work early, there is a football game that I want to watch this afternoon}) + P(\text{I am not leaving work early, there is a football game I want to watch this afternoon}) = .1 + .2 = .3$

2.

Practice quiz on Problem Solving
Practice Quiz • 25 min

2. The joint probability of my sumitting Mt. Baker in the next two years AND publishing a best-selling book in the next two years is .05. If the probability of my publishing a best-selling book in the next two years is 10%, and the probability of my sumitting Mt. Baker in the next two years is 30%, are these two events dependent or independent?

Independent
 Dependent

 **Correct**

We know this because the joint distribution of 5% does not equal the product distribution of $(0.1) \times (0.3) = 3\%$. If I summit Mt. Baker, I am more likely to publish a best-selling book, and vice versa.

3.

← Practice quiz on Problem Solving

Practice Quiz • 25 min

3. The joint probability of my summing Mt. Baker in the next two years AND my publishing a best-selling book in the next two years is .05.

1 / 1 point

If the probability of my publishing a best-selling book in the next two years is 10%, and the probability of my summing Mt. Baker in the next two years is 30%, what is the probability that (sadly) in the next two years I will neither summit Mt. Baker nor publish a best-selling book?

- .65
- .9
- .25
- .95

Correct

Set A = I will summit Mt. Baker in the next two years

Set B = I will publish a best-selling book in the next two years.

Since $p(A) = 0.3$ and $p(A, B) = 0.05$, by the SUM RULE we know that $p(A, \sim B) = (0.3 - 0.05) = 0.25$

Since $p(B) = 0.1$, $p(\sim B) = 0.9$

Since $p(\sim B) = 0.9$ and $p(A, \sim B) = 0.25$ and again by the SUM RULE, $p(\sim A, \sim B) = 0.9 - 0.25 = .65$

4.

← Practice quiz on Problem Solving

Practice Quiz • 25 min

4. I have two coins. One is fair, and has a probability of coming up heads of .5. The second is bent, and has a probability of coming up heads of .75. If I toss each coin once, what is the probability that *at least* one of the coins will come up heads?

1 / 1 point

- .875
- .625
- 1.0
- .375

Correct

We apply the rule $p(A \text{ or } B \text{ or both})$

$$= 1 - (p(\sim A)p(\sim B))$$

$$= 1 - ((1 - .5)(1 - .75))$$

$$= 1 - .125$$

$$=.875$$

5.

← Practice quiz on Problem Solving
Practice Quiz • 25 min

5. What is $\frac{11!}{9!}$?

554,400
 110,000
 4,435,200
 110

 **Correct**

$$\frac{11!}{9!} = 11 \times 10 = 110$$

6.

← Practice quiz on Problem Solving
Practice Quiz • 25 min

6. What is the probability that, in six throws of a die, there will be exactly one each of “1” “2” “3” “4” “5” and “6”?

.01543210
 .00187220
 .01432110
 .01176210

 **Correct**

There are $6! = 720$ permutations where each face occurs exactly once.

There are $6 \times 6 \times 6 \times 6 \times 6 \times 6 = 46656$ total permutations of 6 throws.

The probability is therefore $\frac{720}{46656} = 0.01543210$

Practice quiz on Problem Solving

Practice Quiz • 25 min

7. On 1 day in 1000, there is a fire and the fire alarm rings. 1 / 1 point

On 1 day in 100, there is no fire and the fire alarm rings (false alarm)

On 1 day in 10, 000, there is a fire and the fire alarm does not ring (defective alarm).

On 9, 889 days out of 10, 000, there is no fire and the fire alarm does not ring.

If the fire alarm rings, what is the (conditional) probability that there is a fire?

Written $p(\text{there is a fire} \mid \text{fire alarm rings})$

1.12%

1.1%

90.9%

9.09%

✓ **Correct**

10 days out of every 10, 000 there is fire and the fire alarm rings.

100 days out of every 10, 000 there is no fire and the fire alarm rings.

110 days out of every 10, 000 the fire alarm rings.

The probability that there is a fire, given that the fire alarm rings, is $\frac{10}{110} = 9.09\%$

8.

← Practice quiz on Problem Solving
Practice Quiz • 25 min

8. On 1 day in 1000, there is a fire and the fire alarm rings. 1 / 1 point

On 1 day in 100, there is no fire and the fire alarm rings (false alarm)

On 1 day in 10,000, there is a fire and the fire alarm does not ring (defective alarm).

On 9,889 days out of 10,000, there is no fire and the fire alarm does not ring.

If the fire alarm does not ring, what is the (conditional) probability that there is a fire?

$p(\text{there is a fire} \mid \text{fire alarm does not ring})$

.01000%

0.01011%

.10011%

1.0001%

✓ Correct
On $(1 + 9,889) = 9,890$ days out of every 10,000 the fire alarm does not ring.

On 1 of those 10,000 days there is a fire.

$$\frac{1}{9890} = 0.01011\%$$

9.

← Practice quiz on Problem Solving
Practice Quiz • 25 min

9. A group of 45 civil servants at the State Department are newly qualified to serve as Ambassadors to foreign governments. There are 22 countries that currently need Ambassadors. How many distinct groups of 22 people can the President promote to fill these jobs? 1 / 1 point

8.2334×10^{12}

$\$4.1167 \times 10^{12}$

$= 2.429 \times 10^{13}$

$= 1.06 \times 10^{35}$

✓ Correct

$$\binom{45}{22}$$

 $= 45!/(23!)(22!)$
 $= \frac{45!}{23! \times 22!}$

WEEK 4: PRACTICE QUIZ APPLYING BAYES THEOREM

1.

Practice quiz on Bayes Theorem and the Binomial Theorem
Practice Quiz • 25 min

1 / 1 point

1. A jewelry store that serves just one customer at a time is concerned about the safety of its isolated customers.

The store does some research and learns that:

- 10% of the times that a jewelry store is robbed, a customer is in the store.
- A jewelry store has a customer on average 20% of each 24-hour day.
- The probability that a jewelry store is being robbed (anywhere in the world) is 1 in 2 million.

What is the probability that a robbery will occur while a customer is in the store?

$\frac{1}{500000}$

$\frac{1}{2000000}$

$\frac{1}{4000000}$

$\frac{1}{5000000}$

 **Correct**

What is known is:

A : "a customer is in the store," $P(A) = 0.2$

B : "a robbery is occurring," $P(B) = \frac{1}{2,000,000}$

$P(\text{a customer is in the store} \mid \text{a robbery occurs}) = P(A \mid B)$

$P(A \mid B) = 10\%$

What is wanted:

$P(\text{a robbery occurs} \mid \text{a customer is in the store}) = P(B \mid A)$

By the product rule:

$$P(B \mid A) = \frac{P(A, B)}{P(A)}$$

and $P(A, B) = P(A \mid B)P(B)$

2.

◀ Practice quiz on Bayes Theorem and the Binomial Theorem
Practice Quiz • 25 min

2. If I flip a fair coin, with heads and tails, ten times in a row, what is the probability that I will get exactly six heads? 1 / 1 point

0.021
 0.187
 0.2051
 0.305

✓ **Correct**
By Binomial Theorem, equals

$$\binom{10}{6} (0.5^{10})$$

$$= \left(\frac{10!}{4! \times 6!} \right) \left(\frac{1}{1024} \right)$$

$$= 0.2051$$

3.

◀ Practice quiz on Bayes Theorem and the Binomial Theorem
Practice Quiz • 25 min

3. If a coin is bent so that it has a 40% probability of coming up heads, what is the probability of getting *exactly* 6 heads in 10 throws? 1 / 1 point

0.0974
 0.1045
 0.1115
 0.1219

✓ **Correct**
 $\binom{10}{6} \times 0.4^6 \times 0.6^4 = 0.1115$

4.

← Practice quiz on Bayes Theorem and the Binomial Theorem
Practice Quiz • 25 min

4. A bent coin has 40% probability of coming up heads on each independent toss. If I toss the coin ten times, what is the probability that I get at least 8 heads? 1 / 1 point

0.0213
 0.0132
 0.0312
 0.0123

✓ **Correct**
The answer is the sum of three binomial probabilities:

$$\left(\binom{10}{8} \times (0.4^8) \times (0.6^2)\right) + \left(\binom{10}{9} \times (0.4^9) \times (0.6^1)\right) + \left(\binom{10}{10} \times (0.4^{10}) \times (0.6^0)\right)$$

5. Suppose I have a bent coin with a 60% probability of coming up heads. I throw the coin ten times and it comes up heads 8 times. 1 / 1 point

What is the value of the “likelihood” term in Bayes’ Theorem -- the conditional probability of the data given the parameter.

0.122885
 0.120932
 0.168835
 0.043945

✓ **Correct**
Bayesian “likelihood” --- the $p(\text{observed data} | \text{parameter})$ is

$$p(8 \text{ of } 10 \text{ heads} | \text{coin has } p = .6 \text{ of coming up heads})$$

$$\binom{10}{8} \times (0.6^8) \times (0.4^2) = 0.120932$$

Practice quiz on Bayes Theorem and the Binomial Theorem
Practice Quiz • 25 min

6. We have the following information about a new medical test for diagnosing cancer. 1 / 1 point

Before any data are observed, we know that 5% of the population to be tested actually have Cancer.

Of those tested who do have cancer, 90% of them get an accurate test result of "Positive" for cancer. The other 10% get a false test result of "Negative" for Cancer.

Of the people who do not have cancer, 90% of them get an accurate test result of "Negative" for cancer. The other 10% get a false test result of "Positive" for cancer.

What is the conditional probability that I have Cancer, if I get a "Positive" test result for Cancer?

**Formulas in the feedback section are very long, and do not fit within the standard viewing window. Therefore, the font is a bit smaller and the word "positive test" has been abbreviated as PT.

67.9%

32.1% probability that I have cancer

9.5%

4.5%

✓ **Correct**

I still have a more than $\frac{2}{3}$ probability of not having cancer

Posterior probability:

$$p(\text{I actually have cancer} \mid \text{receive a "positive" Test})$$

By Bayes Theorem:

$$= \frac{(\text{chance of observing a PT if I have cancer})(\text{prior probability of having cancer})}{(\text{marginal likelihood of the observation of a PT})}$$

$$= \frac{p(\text{receiving positive test} \mid \text{has cancer})p(\text{has cancer} \mid \text{before data is observed})}{p(\text{positive} \mid \text{has cancer})p(\text{has cancer}) + p(\text{positive} \mid \text{no cancer})p(\text{no cancer})}$$

$$= (90\%)(5\%) / ((90\%)(5\%) + (10\%)(95\%))$$

$$= 32.1\%$$

Practice Quiz • 25 min

7. We have the following information about a new medical test for diagnosing cancer.

1 / 1 point

Before any data are observed, we know that 8% of the population to be tested actually have Cancer.

Of those tested who do have cancer, 90% of them get an accurate test result of "Positive" for cancer.

The other 10% get a false test result of "Negative" for Cancer.

Of the people who do not have cancer, 95% of them get an accurate test result of "Negative" for cancer.

The other 5% get a false test result of "Positive" for cancer.

What is the conditional probability that I have cancer, if I get a "Negative" test result for Cancer?

- .80%
- 99.1%
- 88.2%
- 0.9%

✓ Correct

$$p(\text{cancer} \mid \text{negative test}) =$$

$$\frac{p(\text{negative test} \mid \text{Cancer}) p(\text{Cancer})}{p(\text{negative test} \mid \text{cancer}) p(\text{cancer}) + p(\text{negative test} \mid \text{no cancer}) p(\text{no cancer})}$$

$$\frac{(10\%)(8\%)}{(10\%)(8\%) + (95\%)(92\%)}$$

$$\frac{0.8\%}{0.8\% + 87.4\%}$$

8.

← Practice quiz on Bayes Theorem and the Binomial Theorem

Practice Quiz • 25 min

8. An urn contains 50 marbles – 40 blue and 10 white. After 50 draws, exactly 40 blue and 10 white are observed.

1 / 1 point

You are not told whether the draw was done "with replacement" or "without replacement."

What is the probability that the draw was done with replacement?

- 13.98%
- 87.73%
- 12.27%
- 1

✓ Correct

p(40

blue and 10 white | draws without replacement) = 1 [this is the only possible outcome when 50 draws are made without replacement]

p(40 blue and 10 white | draws with replacement)

S = 40

N = 50

P = .8 [for draws with replacement] because 40 blue of 50 total means p(blue) = 40/50 = .8

$$\left(\binom{50}{40}\right)(0.8^{40})(0.2^{10})$$

$$= 13.98\%$$

By Bayes' Theorem:

p(draws with replacement | observed data) =

$$\frac{13.98\%(.5)}{(13.98\%)(.5)+(1)(.5)}$$

$$= \frac{0.1398}{1.1398}$$

$$= 12.27\%$$

← Practice quiz on Bayes Theorem and the Binomial Theorem
Practice Quiz • 25 min

9. According to Department of Customs Enforcement Research: 99% of people crossing into the United States are not smugglers.

1 / 1 point

The majority of all Smugglers at the border (65%) appear nervous and sweaty.

Only 8% of innocent people at the border appear nervous and sweaty.

If someone at the border appears nervous and sweaty, what is the probability that they are a Smuggler?

- 7.92%
- 92.42%
- 7.58%
- 8.57%

If someone at the border appears nervous and sweaty, what is the probability that they are a Smuggler?

- 7.92%
- 92.42%
- 7.58%
- 8.57%

Correct

By
Bayes' Theorem, the answer is

$$\frac{(.65)(.01)}{((.65)(.01) + (.08)(.99))}$$

$$= 7.58\%$$

WEEK 4: PROBABILITY(BASIC AND NTERMEDIATE)GRADED QUIZ

1.

Probability (basic and Intermediate) Graded Quiz
Graded Quiz • 50 min Due Aug 9, 8:59 AM CEST

1. What additional statement, added to the three below, forms a probability distribution?

1 / 1 point

(1) I missed only my first class today
(2) I missed only my second class today
(3) I missed both my first and second class today

✓ Correct

2.

Probability (basic and Intermediate) Graded Quiz
Graded Quiz • 50 min Due Aug 9, 8:59 AM CEST

2. My friend takes 10 cards at random from a 52-card deck, and places them in a box. Then he puts the other 42 cards in a second, identical box. He hands me one of the two boxes and asks me to draw out the top card. What is the probability that the first card I draw will be the Ace of Spades?

1 / 1 point

✓ Correct

3.

Probability (basic and Intermediate) Graded Quiz
Graded Quiz • 50 min Due Aug 9, 8:59 AM CEST

3. I will go sailing today if it does not rain. Are the following two statements independent or dependent?

1 / 1 point

(1) "I will go sailing today"
(2) "It will not rain today"

✓ Correct

4.

Probability (basic and Intermediate) Graded Quiz
Graded Quiz • 50 min Due Aug 9, 8:59 AM CEST

4. The probability that I will go sailing today AND the fair six-sided die will come up even on the next roll is .3.

1 / 1 point

If these events are independent, what is the probability that I will go sailing today?

✓ Correct

5.

Probability (basic and Intermediate) Graded Quiz
Graded Quiz • 50 min

Due Aug 9, 8:59 AM CEST

5. I have two coins. One is fair, and has a probability of coming up heads of .5. The second is bent, and has a probability of coming up heads of .75. If I toss each coin once, what is the probability that at least one of the coins will come up tails?

1 / 1 point

✓ Correct

6.

Probability (basic and Intermediate) Graded Quiz
Graded Quiz • 50 min

Due Aug 9, 8:59 AM CEST

6. What is the probability, when drawing 5 cards from a fair 52-card deck, of drawing a "full house" (three of a kind and a pair) in the form AAABB?

1 / 1 point

✓ Correct

7.

Probability (basic and Intermediate) Graded Quiz
Graded Quiz • 50 min

Due Aug 9, 8:59 AM CEST

7. If it rains, I do not go sailing. It rains 10% of days; I go sailing 3% of days.

If it does not rain, what is the (conditional) probability that I go sailing?

Written "p(I go sailing | it does not rain)"?

1 / 1 point

✓ Correct

8.

Probability (basic and Intermediate) Graded Quiz
Graded Quiz • 50 min

Due Aug 9, 8:59 AM CEST

8. I am at my office AND not working 2% of the time. I am at my office 10% of the time. What is the conditional probability that I am not working, if I am at my office?

1 / 1 point

✓ Correct

9.

Probability (basic and Intermediate) Graded Quiz
Graded Quiz • 50 min

Due Aug 9, 8:59 AM CEST

9. The factory quality control department discovers that the conditional probability of making a manufacturing mistake in its precision ball bearing production is 4% on Tuesday, 4% on Wednesday, 4% on Thursday, 8% on Monday, and 12% on Friday. 1 / 1 point

The Company manufactures an equal amount of ball bearings (20%) on each weekday. What is the probability that a defective ball bearing was manufactured on a Friday?

✓ Correct

10.

Probability (basic and Intermediate) Graded Quiz
Graded Quiz • 50 min

Due Aug 9, 8:59 AM CEST

10. An Urn contains two white marbles and one black marble. A marble is drawn from the Urn without replacement and put aside without my seeing it. Then a second marble is drawn, and it is white. 1 / 1 point

What is the probability that the unknown removed marble is white, and what is the probability that it is black?

✓ Correct

11.

Probability (basic and Intermediate) Graded Quiz
Graded Quiz • 50 min

Due Aug 9, 8:59 AM CEST

11. What is the probability, if I flip a fair coin with heads and tails ten times in a row, that I get at least 8 heads? 1 / 1 point

✓ Correct

12.

12. Suppose I have either a fair coin or a bent coin, and I don't know which. The bent coin has a 60% probability of coming up heads. 1 / 1 point

I throw the coin ten times and it comes up heads 8 times. What is the probability I have the fair coin vs. the probability I have the bent coin?

Assume at the outset there is an equal (.5, .5) prior probability of either coin.

*Please note that in order to fit the entire formula in the feedback, probability has been abbreviated to "prob."

✓ Correct

COMPLETED: 15.07/2021

ISHMAEL HO

