

Q1 Notation.

3 Points

Select all true statements (using the conventions in this class). For this question, all subparts are **multi-select**, which means that there may be more than one correct answer, and you must select all correct answers to receive credit. No partial credit will be given for selecting a subset of the correct answers.

Q1.1

1 Point

☒ $\mathbb{Z}$ is the set of integers, $\{\dots, -2, -1, 0, 1, 2 \dots\}$.

☒ $\mathbb{N}$ is the set of natural numbers, $\{0, 1, 2, \dots\}$.

☐ None of the other options

Explanation

See Note 0 page 2

Q1.2

1 Point

☐ $d|x$ means $d = kx$ for some $k \in \mathbb{Z}$

☐ $d|x$ means $d = kx$ for some $k \in \mathbb{N}$

☒ $d|x$ means $x = kd$ for some $k \in \mathbb{Z}$

☐ None of the other options

Explanation

See Note 1 page 2

Q1.3

1 Point

☒ 2 is prime

☐ -2 is prime

☐ ALL natural numbers that are divisible by only 1 and itself are prime.

☒ A number x is odd if and only if $2k + 1 = x$ for some $k \in \mathbb{Z}$.

☐ None of the other options

Explanation

See page 2 of note 2 for discussion of primes, as well as a formulation for even numbers, which can be extrapolated for odd numbers.

Q2 Proven statements or not.

2 Points

Q2.1

1 Point

For a 3-digit number, if the sum of the digits is divisible by 9, then the number is divisible by 3.

☒ True

☐ False

Explanation

If the sum of digits is divisible by 9, then the number is divisible by 9 as well (see page 2 of Note 2). If the number is divisible by 9, then it is divisible by 3 as well.

Q2.2

1 Point

For any proposition P , $P \wedge \neg P$ is false.

☒ True

☐ False

Explanation

Either P or $\neg P$ is false, and thus their conjunction must be false as well.

Q3 Proof type

4 Points

Label each of the following as either direct, contrapositive, or contradiction, if it is an outline of the corresponding proof frame. If the outline does not result in a valid proof, select "wrong".

Q3.1

1 Point

To prove $P \implies Q$, assume P and make an argument to prove Q .

- ☒ Direct
- ☐ Contrapositive
- ☐ Contradiction
- ☐ Wrong

Explanation

See Note 2

Q3.2

1 Point

To prove $P \implies Q$, assume $\neg P$ and make an argument to prove $\neg Q$.

- ☐ Direct
- ☐ Contrapositive
- ☐ Contradiction
- ☒ Wrong

Explanation

See Note 2. This would be the inverse, which is a different implication than the original.

Q3.3**1 Point**

To prove P , assume $\neg P$ and make an argument to prove $\neg R$ and R .

- ☐ Direct
- ☐ Contrapositive
- ☒ Contradiction
- ☐ Wrong

Explanation

See Note 2

Q3.4**1 Point**

To prove $P \implies Q$, assume $\neg Q$ and make an argument to prove $\neg P$.

- ☐ Direct
- ☒ Contrapositive
- ☐ Contradiction
- ☐ Wrong

Explanation

See Note 2.