2.4 QUIZ QUESTION 1 (1/1 point)

Consider a biased die, where the probabilities of the six outcomes, X, are given by probabilities, p[X], shown below.

```
X   p[X]
=   ====
1   0.1
2   0.2
3   0.3
4   0.2
5   0.15
6   0.05
```

What is the entropy of a single toss of this die? Give your answer to two significant digits (e.g. 1.00).

2.41 ✔ **Answer:** 2.41

2.41

EXPLANATION

Compute the entropy according to the formula

$$H = -\sum_{X=1}^{6} p[X] log_2(p[X])$$

You have used 1 of 3 submissions

2.4 QUIZ QUESTION 2 (1/1 point)

In comparison with the entropy of a single toss of a fair die (i.e. where all outcomes are equally likely), the entropy of the biased die above is

- ○ Greater
- ◉ Smaller ✔

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- [ ] Equal

EXPLANATION

A discrete random variable where all N possible values are equally likely has the maximum entropy among all discrete random variables with N possible outcomes. This entropy is $H = log_2(N)$. When $N = 2, H \approx 2.585$.

You have used 1 of 2 submissions

2.4 QUIZ QUESTION 3 (1/1 point)

Consider two discrete random variables, X and Y. X can assume integer values from 1 to 4 with the probabilities p(X) shown below.

```
X    p(X)
=    ====
1    0.4
2    0.3
3    0.2
4    0.1
```

Y can assume integer values from 5 to 8 with the probabilities p(Y) shown below.

```
Y    p(Y)
=    ====
5    0.1
6    0.2
7    0.3
8    0.4
```

The entropy of X is

- [ ] greater than the entropy of Y.
- [ ] less than the entropy of Y.
- [x] equal to the entropy of Y. ✔

EXPLANATION

The entropy depends only upon the probabilities of the possible outcomes, not upon their values (which do not even need to be numerical). Both X and Y have four possible outcomes with probabilites 0.1, 0.2, 0.3 and 0.4. Thus, they have the same entropy.

You have used 1 of 2 submissions

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