|  | **Explore PT Annotated Sample E - Score 6/8** |  |
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| **Total score** | Row 1 | Row 2 | Row 3 | Row 4 | Row 5 | Row 6 | Row 7 | Row 8 | *This document combines student sample, scoring guidelines and scoring commentary from:* [*Explore PT Sample E*](https://secure-media.collegeboard.org/ap/video_audio/ap18-explore-sample-e-written.pdf) |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Sample: A** | **0** | **1** | **1** | **1** | **1** | **0** | **1** | **1** |

**Computational Artifact**

Your computational artifact must provide an illustration, representation, or explanation of the computing innovation’s intended purpose, its function, or its effect. The computational artifact must not simply repeat the information supplied in the written responses and should be primarily non-textual.

| **Student Response** | **Scoring Guidelines** | |
| --- | --- | --- |
|  | **Row and Task** | **Decision Rules** |
| **Row 1**  **Computational Artifact**  The computational artifact:  • Identifies the computing innovation.  **AND**  • Provides an illustration, representation, or explanation of the computing innovation’s intended purpose, function, or effect. | The written response can be used to aid the understanding of how the computational artifact illustrates, represents, or explains the computing innovation’s intended purpose, function, or effect.  **Do NOT award a point if any one of the following is true:**   * there is no artifact; * the artifact is not a computational artifact; * the innovation identified in the artifact does not match the innovation described in the written response; * the artifact does not identify the innovation clearly; * the artifact does not illustrate, represent or explain the innovation’s intended purpose, function, or effect; * the artifact illustrates a feature of the innovation instead of the purpose, function, or effect; or * the computational artifact doesn’t clearly illustrate, represent, or explain as required in the scoring criteria **AND** the written response describes the innovation’s intended purpose and function without explaining how the computational artifact illustrates, represents, or explains the intended purpose, function, or effect.. |
| **The response DID NOT earn a point for this row.** The artifact does not provide an illustration, representation, or explanation of the computing innovation's intended purpose, function, or effect. | |

**Computational Artifact**

**2a.** Provide information on your computing innovation and computational artifact.

* Name the computing innovation that is represented by your computational artifact.
* Describe the computing innovation’s intended purpose and function.
* Describe how your computational artifact illustrates, represents, or explains the computing innovation’s intended purpose, its function, or its effect.

*(Must not exceed 100 words)*

| **Student Response** | **Scoring Guidelines** | |
| --- | --- | --- |
| Bitcoin is a digital currency that has become highly popular among investors and traders alike. Bitcoins are mined in a series of block chains that include generating hashes to open hatches in order to open a Bitcoin block which gives a reward of a predetermined amount of Bitcoins [4]. The creator’s intended purpose of creating the virtual currency, known as Bitcoin, was to make an international currency that is accepted anywhere in the world without language barriers, currency barriers, or exchange rate [4]. | **Row and Task** | **Decision Rules** |
| **Row 2 - Response 2A**  States a fact about the correctly identified computing innovation’s intended purpose OR function. | **Do NOT award a point if**:   * the identified innovation is not a computing innovation; or * the written statement gives an effect (which is required for the scoring criteria in Row 3, not Row 2). |
| **The response earned a point for this row.** The response states a fact about the computing innovation: "Bitcoin is a digital currency that has become highly popular among investors and traders alike." | |

**2b.** Describe your development process, explicitly identifying the computing tools and techniques you used to create your artifact. Your description must be detailed enough so that a person unfamiliar with those tools and techniques will understand your process.

*(Must not exceed 100 words)*

| **Student Response** | **Scoring Guidelines** | |
| --- | --- | --- |
| Through a few hours of research and asking around, I could gather enough information about Bitcoins in the real world. A common misconception about Bitcoins is that many people cannot wrap their heads around the idea of a virtual currency that society agrees upon to be worth more or less currency [1]. I used YouTube as a resource while fact checking the information that was provided through videos. I also used and fact checked Wikipedia in order to come to a definition and history of the currency. I then created a PowerPoint with all of the new information I had gathered. | **Row and Task** | **Decision Rules** |
| **--** | ***---*** |
| **NOTE: This response is not officially scored,** but you can use this section to cite any sources used in the creation of your computational artifact. This section may also be referenced if there is any suspicion of plagiarism. Do not skip!   * All images, diagrams, or information that appears in your computational artifact and that you yourself did not make should appear both in your citations and within this response. * Also, by briefly describing the tool used to make the artifact and how you went about it can further help verify that you are the author of your artifact and did not merely submit someone else’s work. | |

**Computing Innovation**

**2c**. Explain at least one beneficial effect and at least one harmful effect the computing innovation has had, or has the potential to have, on society, economy, or culture.

*(Must not exceed 250 words)*

| **Student Response** | **Scoring Guidelines** | |
| --- | --- | --- |
| One benefit of Bitcoin is that it can be used internationally and, with its recent popularity, can be used in many online retailers [2]. This is a fantastic trait for currency to have because of the many language barriers across the world and with all of the exchange rates including currency barriers in each and every country [3]. Economically this makes investors have another way to invest besides in the stock market. Drawing similarities to the stock market, Bitcoin has had exponential grown in the past month growing almost to $20,000 USD [4]. This has many people predicting the crash of the stock market along with the crash of the Bitcoin’s acclaimed cost. This is a major downfall and defect of the system because as the price goes up, so does the difficulty of mining Bitcoins. With there only being a limited amount of Bitcoins in the market, this is cause for exponential price increases [1]. Another harmful effect of Bitcoin is that there are other more affordable legitimate virtual currencies within the marketplace now [1]. This is making Bitcoin look overpriced, although the other virtual currencies aren’t as widely accepted as Bitcoin. Bitcoin’s harmful effect to the investment market and stock market may cause a crash because of how fast the price has grown and how many investors have joined the cause [4]. If Bitcoin’s value were to crash, there would be a large crisis among investors and it could lead to the stock market crashing along with it [1]. | **Row and Task** | **Decision Rules** |
| **Row 3 - Response 2C**  Identifies at least ONE effect of the identified or described computing innovation. | The effect does not need to be specifically identified as beneficial or harmful. The effect must be identified, but it doesn’t have to be described to earn the point.  **Do NOT award a point if any one of the following is true:**   * the described innovation is not a computing innovation; or * the identified effect is actually a purpose for using the computing innovation (e.g., allows me to make videos to share with my family); or * the identified effect is actually a function or use of the computing innovation (e.g., self-driving cars can drive me to work); or * the identified effect is not a result of the use of the innovation as intended (e.g., a self-driving car is not intended to crash, therefore, its exposure to hacking is not an effect of its intended use). |
| **The response earned a point for this row.** The response identifies an effect of the innovation as it "makes investors have another way to invest besides in the stock market," because it can be used internationally and doesn't have a language or exchange rate barriers. | |
| **Row 4 - Response 2C**  ● Identifies a beneficial effect of the identified or described computing innovation.  AND  ● Identifies a harmful effect of the identified or described computing innovation. | Responses that earn this point will also earn the point for Row 3. Responses should be evaluated on the rationale provided in the response not on the interpretation or inference on the part of the scorer.  **Do NOT award a point if any one of the following is true**:   * the described innovation is not a computing innovation; or * the response is missing the adjectives harmful or beneficial (or synonyms thereof); or * the response is missing a plausible beneficial effect; or * the response is missing a plausible harmful effect; or * the identified effect is actually a purpose for using the computing innovation (e.g., allows me to make videos to share with my family); or * the identified effect is actually a function or use of the computing innovation (e.g., self-driving cars can drive me to work); or * the identified effect is not a result of the use of the innovation as intended (e.g., a self-driving car is not intended to crash, therefore, its exposure to hacking is not an effect of its intended use). |
| **The response earned a point for this row.** The response identifies a beneficial effect of the innovation as, "makes investors have another way to invest besides in the stock market," because it can be used internationally and doesn't have a language or exchange rate barriers. The response identifies a harmful effect of the innovation as "if Bitcoin's value were to crash, there would be a large crisis among investors and it could lead to the stock market crashing along with it." | |
| **Row 5 - Response 2C**  Explains how ONE of the identified effects relates to society, economy, or culture. | Responses that earn the point for this row must have earned the point for Row 3.  Responses should be evaluated on the rationale provided in the response not on the interpretation or inference on the part of the scorer.  **Do NOT award a point if any one of the following is true:**  ● the described innovation is not a computing innovation; or  ● the explanation does not connect one of the effects to society, economy, or culture |
| **The response earned a point for this row.** The response connects the beneficial effect: "Economically this makes investors have another way to invest besides in the stock market." | |

**2d**. Using specific details, describe:

* the data your innovation uses;
* how the innovation consumes (as input), produces (as output), and/or transforms data; and
* at least one data storage concern, data privacy concern, or data security concern directly related to the computing innovation.

*(Must not exceed 250 words)*

| **Student Response** | **Scoring Guidelines** | |
| --- | --- | --- |
| Bitcoin uses a hash generation system which leads users to unlock hatches. The hash is a randomly generated code that increases difficulty the more hatches that are opened. The user must generate this code before opening a hatch and receiving a reward in Bitcoin. The system of mining is a hard hobby to break into because of the difficulty of hashes now. The system puts out an output which is the randomly generated hash and the user must test many hashes before they ultimately guess the exact hash that the system created [4, 1]. A data privacy concern includes the user’s names. There is a large ledger that is kept on an open server that can only be changed by transactions. A user makes an account and a username that will be seen on the transaction ledger. This ledger will include every transaction ever made with a Bitcoin. This ledger tracks every Bitcoin ever found and shows which users are in possession of them. The ledger also Explore Sample E 1 of 12 shows which user lost the Bitcoin and which user gained the Bitcoin in the transaction. The ledger is text but has a file size near 2 gigabytes [4]. The storage of this ledger is not a concern, nor is the security because of the level of encryption on the ledger itself. Privacy is an issue because there was a discovery of the federal government using Bitcoin to make transactions on the black market [4, 1]. The privacy of users rises an issue within the community. | **Row and Task** | **Decision Rules** |
| **Row 6**  **Response 2D**  ● Identifies the data that the identified or described computing innovation uses  AND  ● Explains how that data is consumed, produced, OR transformed. | Responses should be evaluated on the rationale provided in the response not on the interpretation or inference on the part of the scorer.  **Do NOT award a point if any one of the following is true:**   * the described innovation is not a computing innovation; or * the response does not state the specific name of the data or simply says “data”; or * the response confuses or conflates the innovation with the data: response fails to explain what happens to the data; or * the response confuses the source of the data with the data. |
| **The response DID NOT earn the point for this row.** The response does not identify the data and explain how that data is consumed, produced, or transformed. The response describes how Bitcoin functions rather than the data and its use of the data. | |
| **Row 7**  **Response 2D**  ● Identify one data storage, data privacy,  OR  ● data security concern related to the identified or described computing innovation. | Responses should be evaluated on the rationale provided in the response not on the interpretation or inference on the part of the scorer. Responses can earn this point even if they refer to the data in a general without specifically identifying the data being used.  **Do NOT award a point if any one of the following is true**:  ● the described innovation is not a computing innovation; or  ● the response identifies or describes a concern that is not related to data |
| **The response earned a point for this row.** The response raises a data privacy concern that username data is maintained on "a large ledger that is kept on an open server that can only be changed by transactions. A user makes an account and a username that will be seen on the transaction ledger. This ledger will include every transaction ever made with a Bitcoin." | |

**References**

**2e.** Provide a list of at least three online or print sources used to create your computational artifact and/or support your responses through in-text citation to the prompts provided in this performance task.

* At least two of the sources must have been created after the end of the previous academic year.
* For each online source, include the complete and permanent URL. Identify the author, title, source, the date you retrieved the source, and, if possible, the date the reference was written or posted.
* For each print source, include the author, title of excerpt/article and magazine or book, page number(s), publisher, and date of publication.
* If you include an interview source, include the name of the person you interviewed, the date on which the interview occurred, and the person’s position in the field.
* Include in-text citations for the sources you used.
* Each source must be relevant, credible, and easily accessed.

| **Student Response** | **Scoring Guidelines** | |
| --- | --- | --- |
| [1] “m0E TV,” “Moe’s Intro To Bitcoin And Cryptocurrency,” “YouTube, CoinBase, BitConnect, Numivcoin, Steneum,” 12/17/17, 12/2/17, https://www.youtube.com/watch?v=CijcNgLsCyg  [2] “m0E TV,” “Bitcoin Talk (Lending Platforms? Are They SCAMS?),” “YouTube, CoinBase, BitConnect, Numivcoin, Steneum,” 12/17/17, 12/4/17, https://www.youtube.com/watch?v=- 9vsnq42vMM  [3] “m0E TV,” “How To Buy Bitcoin!” “YouTube, CoinBase, BitConnect, Numivcoin, Steneum,” 12/17/17, 12/7/17, https://www.youtube.com/watch?v=FdgzdXh3\_lg  [4] “Wikipedia,” “History of bitcoin,” “Wikipedia, Satoshi Nakamoto,” 12/17/17, 12/15/17, https://en.wikipedia.org/wiki/History\_of\_bitcoin  WIKIPEDIA’S REFERENCES: References[edit]  Jump up ^ Jerry Brito; Andrea Castillo (2013). "Bitcoin: A Primer for Policymakers" (PDF). Mercatus Center. George Mason University. Retrieved 22 October 2013.  Jump up ^ Chaum, David (1983). "Blind signatures for untraceable payments" (PDF). Advances in Cryptology Proceedings of Crypto. 82 (3): 199–203. doi:10.1007/978-1-4757-0602-4\_18.  Chaum, David; Fiat, Amos; Naor, Moni. "Untraceable Electronic Cash" (PDF). Lecture Notes in Computer Science.  Jump up ^ Dai, W (1998). "b-money". Archived from the original on 2011-10-04. Retrieved 5 December 2013.  Jump up ^ Szabo, Nick. "Bit Gold". Unenumerated. Blogspot. Archived from the original on 2011-09-22. Retrieved 5 December 2013.  ^ Jump up to: a b Tsorsch, Florian; Scheuermann, Bjorn (15 May 2015). "Bitcoin and Beyond: A Technical Survey of Decentralized Digital Currencies" (PDF). Retrieved 24 June 2015. Jump up ^ "Reusable Proofs of Work". Archived from the original on December 22, 2007.  ^ Jump up to: a b "Satoshi Nakamoto is (probably) Nick Szabo". LikeInAMirror. WordPress. Archived from the original on 2014-04-13. Retrieved 5 December 2013. | **Row and Task** | **Decision Rules** |
| **Row 8**  **Response 2E & Artifact**  References, through in-text citation, at least 3 different sources. | The in-text citations can be in either the artifact or the written response. The in-text citations may be oral in the computational artifact.  **Do NOT award a point if any one of the following is true**:  ● the response contains a list of sources only, no in-text citations;  ● the response contains less than three in-text citations; or  ● there are not three in-text citations with corresponding references. |
| **The response earned the point for this row.** The response contains three in-text citations that refer to references provided in the response.  [1] Referenced in 2b, 2c, and 2d  [2] Referenced in 2c  [3] Referenced in 2c  [4] Referenced in 2a, 2c, and 2d | |