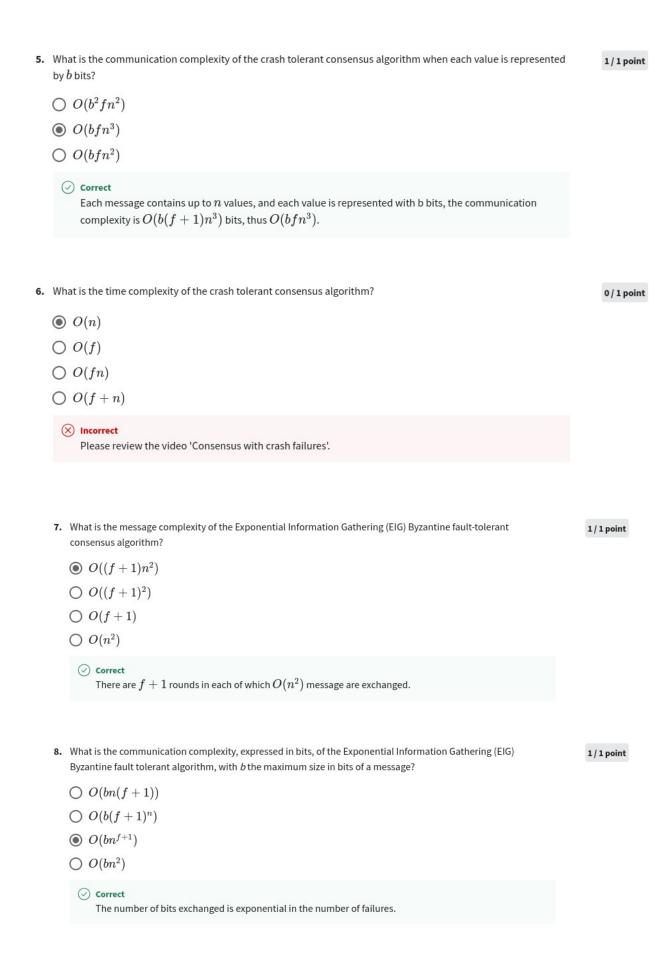1. What is the message complexity of the consensus algorithm that works in the absence of failures?

   1 / 1 point

   ○ $O(n)$

   ◉ $O(n^2)$

   ✓ **Correct**

   Each node broadcasts to all other nodes so that they are $n(n-1)$ messages.

2. What is the communication complexity of the consensus algorithm that works in the absence of failures where b is the number of bits to encore a value?

   1 / 1 point

   ○ $O(bn)$

   ◉ $O(bn^2)$

   ✓ **Correct**

   Each message contains a single integer encoded with b bits and there are $bn(n-1)$ messages exchanged.

3. What is the time complexity of the consensus algorithm that works in the absence of failures?

   1 / 1 point

   ◉ $O(1)$

   ○ $O(n)$

   ✓ **Correct**

   It only takes $O(1)$ message delay to send all messages as they can all be broadcast in parallel.

4. What is the message complexity of the crash tolerant consensus algorithm?

   1 / 1 point

   ◉ $O(fn^2)$

   ○ $O(f^2)$

   ○ $O(n^2)$

   ○ $O(nf^2)$

   ✓ **Correct**

   There are $f+1$ rounds where $f < n$. The number of messages is at most $O(n^2)$ in each round. The total number of messages is thus $O((f+1)n^2)$, or more simply $O(fn^2)$.

5. What is the communication complexity of the crash tolerant consensus algorithm when each value is represented by b bits?

- ○ $O(b^2 f n^2)$
- ◉ $O(bfn^3)$
- ○ $O(bfn^2)$

1 / 1 point

> ✓ **Correct**
>
> Each message contains up to n values, and each value is represented with b bits, the communication complexity is $O(b(f+1)n^3)$ bits, thus $O(bfn^3)$.

6. What is the time complexity of the crash tolerant consensus algorithm?

- ◉ $O(n)$
- ○ $O(f)$
- ○ $O(fn)$
- ○ $O(f+n)$

0 / 1 point

> ⊗ **Incorrect**
>
> Please review the video 'Consensus with crash failures'.

7. What is the message complexity of the Exponential Information Gathering (EIG) Byzantine fault-tolerant consensus algorithm?

- ◉ $O((f+1)n^2)$
- ○ $O((f+1)^2)$
- ○ $O(f+1)$
- ○ $O(n^2)$

1 / 1 point

> ✓ **Correct**
>
> There are $f+1$ rounds in each of which $O(n^2)$ message are exchanged.

8. What is the communication complexity, expressed in bits, of the Exponential Information Gathering (EIG) Byzantine fault tolerant algorithm, with b the maximum size in bits of a message?

- ○ $O(bn(f+1))$
- ○ $O(b(f+1)^n)$
- ◉ $O(bn^{f+1})$
- ○ $O(bn^2)$

1 / 1 point

> ✓ **Correct**
>
> The number of bits exchanged is exponential in the number of failures.

9. What is the time complexity of the Exponential Information Gathering (EIG) Byzantine fault tolerant algorithm?

- ○ $O(f+1)$
- ○ $O(n^2)$
- ○ $O((f+1)n^2)$
- ◉ $O(f+n)$

⊗ **Incorrect**
Please review the video 'Consensus with Byzantine failures'.

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10. True or False?

One cannot solve consensus with synchrony (and without authentication) if $n = 9$ and the number of Byzantine failures is $f = 3$.

- ◉ True
- ○ False

⊘ **Correct**
There should be $n > 3f$ for consensus to be solvable in this model.

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11. True or False?

One cannot solve consensus with synchrony (and without authentication) if $n = 7$ and $f = 2$.

- ◉ True
- ○ False

⊗ **Incorrect**
Please review the video 'Consensus with Byzantine failures'.

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12. What is the number n of nodes that should run a consensus algorithm to tolerate f Byzantine nodes in a synchronous network (without authentication)?

- ◉ $f+1$
- ○ $2f+1$
- ○ $3f+1$

⊗ **Incorrect**
Please review the video 'Consensus with Byzantine failures'.

13. True or False?

One cannot solve consensus with synchrony (and without authentication) if $n = 100$ and $f = 30$.

○ True

◉ False

1 / 1 point

14. Given that the bandwidth is a limited resource, which communication complexity would allow a consensus algorithm to scale better:

◉ $O(bn^2)$

○ $O(bn^{f+1})$

○ $O(bfn^3)$

1 / 1 point

15. Why is the bit complexity of EIG increasing particularly fast with the number of participants compared to other algorithms?

◉ Mainly because one participant needs to send messages to all participants.

○ Mainly because participants relay the information they received previously.

0 / 1 point