PCM Bit-Depth Lab

Compare amplitude codes in a simplified digital-audio model.

Name _____ Date _____

For integer PCM, N bits allow 2 to the power N distinct amplitude codes per sample. The 2-, 3-, and 4-bit examples are teaching models, not recommended recording settings. Keep sample rate fixed.

Model	Bits per sample	Example code words
A	2	00, 01, 10, 11
B	3	000 through 111
C	4	0000 through 1111

Use the model above. Write a brief answer for each item.

1. How many distinct codes does A allow?

2. How many distinct codes does B allow?

3. How many distinct codes does C allow?

4. Which model has the most amplitude codes?

5. Add one bit. How does the number of possible codes change?

6. Does a higher bit depth mean more samples per second?

7. Does changing an already damaged recording to more bits recover its original missing detail?

8. At the same amplitude range, do more codes mean finer or coarser steps?

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A	2	00, 01, 10, 11
B	3	000 through 111
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Use the model above. Write a brief answer for each item.

1. How many distinct codes does A allow?

4: 2 x 2.

2. How many distinct codes does B allow?

8: 2 x 2 x 2.

3. How many distinct codes does C allow?

16: 2 x 2 x 2 x 2.

4. Which model has the most amplitude codes?

C

5. Add one bit. How does the number of possible codes change?

It doubles.

6. Does a higher bit depth mean more samples per second?

No. Sample rate controls that.

7. Does changing an already damaged recording to more bits recover its original missing detail?

No. More storage precision does not restore lost detail.

8. At the same amplitude range, do more codes mean finer or coarser steps?

Finer steps between representable levels.