

6M / Classroom answers

Teacher copy. Accept equivalent exact forms and valid alternative reasoning.

1. Negative and zero exponents

$\frac{1}{9}$ and 1.

- $3^{-2} = \frac{1}{3^2} = \frac{1}{9}$; any positive base to power zero gives 1.
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2. Growth, decay and intercepts

Decay; (0, 1).

- The base lies between 0 and 1; $0.4^0 = 1$.
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3. Reciprocal-base reflection

A: 4; B: $\frac{1}{4}$. Reflection across the vertical axis.

- $2^2 = 4$ and $(\frac{1}{2})^2 = \frac{1}{4}$.
 - Replacing x by $-x$ gives $(\frac{1}{2})^x = 2^{-x}$.
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4. Positive outputs

Shared intercept (0, 1); neither crosses the horizontal axis.

- At $x = 0$, both outputs are 1.
 - Every finite input produces a positive output, not zero.
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5. Exponential versus linear

Cycle 3.

- At cycle 2, C has 5 and D has 4.
 - At cycle 3, C has 7 and D has 8; earlier whole cycles do not give D a lead.
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6. Choose a capacity

32 lights; choose the 36-light controller.

- $D(5) = 2^5 = 32$.
 - A capacity of 30 is too small; 36 is the smallest available capacity at least 32.
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6M / Homework answers

Teacher copy. Accept equivalent exact forms and valid alternative reasoning.

1. Negative and zero exponents

$\frac{1}{16}$ and 1.

- $4^{-2} = \frac{1}{4^2} = \frac{1}{16}$ and $4^0 = 1$.
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2. Growth, decay and intercepts

Decay; (0, 1).

- The base lies between 0 and 1; $0.25^0 = 1$.
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3. Reciprocal-base reflection

A: 3; B: $\frac{1}{3}$. Reflection across the vertical axis.

- $3^1 = 3$ and $(\frac{1}{3})^1 = \frac{1}{3}$.
 - The reciprocal-base curve equals 3^{-x} .
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4. Positive outputs

(0, 1); no finite input gives zero.

- Both positive bases raised to zero give 1.
 - Repeated multiplication by a positive fraction stays positive.
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5. Exponential versus linear

Cycle 3.

- At cycle 2, C has 11 and D has 9.
 - At cycle 3, C has 16 and D has 27; earlier whole cycles do not give D a lead.
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6. Choose a capacity

81 lights; choose the 90-light controller.

- $D(4) = 3^4 = 81$.
 - A capacity of 70 is too small; 90 is the smallest suitable capacity.
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