Memorize:  
\[ H = -16T^2 + VT + S \]

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51. \( \text{KI} \)  
\[ \begin{align*} 
V &= 11 \text{ ft/sec} \\
S &= 0 \text{ ft} \\
H &= 0 \text{ ft} 
\end{align*} \]

\[ 0 = -16T^2 + 11T + 0 \]

\[ 0 = -T(16T + 11) \]

\[ \begin{align*} 
-T &= 0 \\
T &= 0 \\
T &= \frac{11}{16} \approx 0.69 \text{ sec} 
\end{align*} \]

Cat will land on the ground in about 0.69 sec.

52. \( \text{KI} \): \( V = 10 \text{ ft/sec} \)
\[ S = 0 \text{ ft} \]

\( \text{a) Write an equation to model the function:} \]
\[ H = -16T^2 + 10T \]

\( \text{b) Given time is } 0.3125 \text{ seconds} \)

\[ H = h(0.3125) = -16(0.3125)^2 + 10(0.3125) \]

\[ H = 1.5625 \text{ ft} \]

The maximum height the bug can jump is 1.5625 ft or about 1.56 ft.

53. \( \text{KI} \):
\[ \begin{align*} 
V &= 4.5 \text{ ft/sec} \\
h &= -16 + 2 + 4.5t 
\end{align*} \]

\[ 0 = -t(16T - 4.5) \]

\[ \begin{align*} 
-t &= 0 \\
16T - 4.5 &= 0 \\
t &= 0.28 \text{ sec} 
\end{align*} \]

EXPLAIN: There are 2 solutions (mean zeroes)

1. \( t = 0 \) seconds is when the penguin leaps out of the water.

2. \( t = 0.28 \) seconds is when the penguin lands back in the water.
a) Model for equation: \[ h = -16T^2 + 72T + 3 \] or \[ h(t) = -16T^2 + 72T + 3 \]

b) More KI \( H = 84 \text{ ft} \)

\[ 84 = -16T^2 + 72T + 3 \]

\[ -84 \]

\[ 0 = -16T^2 + 72T + 81 \]

\[ 0 = -1(16T^2 - 72T + 81) \]

\[ 0 = -1(4T - 9)(4T - 9) \]

\[ 0 = -(4T - 9)^2 \]

\[ 4T - 9 = 0 \]

\[ T = \frac{9}{4} = 2.25 \text{ seconds} \]

It will take 2.25 seconds before the ball is 84 ft above the ground.
**149**  
**KI:**  
\[ V = 46 \text{ ft/sec} \]  
\[ H = 0 \text{ ft} \]  
\[ S = 6 \text{ ft} \]  
\[ h = -16T^2 + VT + S \]  
\[ O = -16T^2 + 46T + 6 \]  
\[ O = -2(8T^2 - 23T - 3) \]  
\[ O = -2(8T + 1)(T - 3) \]  
\[ -2x \quad 8T + 1 = 0 \quad T - 3 = 0 \]  
\[ T = -\frac{1}{8} \quad T = 3 \]  
*The bell will land on the ground in 3 seconds.*

**157**  
**KI:**  
\[ S = 16 \text{ ft} \]  
\[ H = 0 \text{ ft} \]  
\[ V = 0 \text{ ft/sec} \]  
\[ O = -16T^2 + VT + 16 \]  
\[ O = -16(T^2 - 1) \]  
\[ O = -16(T - 1)(T + 1) \]  
\[ T - 1 = 0 \quad T + 1 = 0 \]  
\[ T = 1, \quad T = -1 \]  
*The penney will land on the ground in 1 second.*
CH 9 PRACTICE TEST  Pg 621  #32

V = 4 ft/sec

\[ S = 0 \text{ ft} \]

\[ \text{Swoop} \]

\[ \text{Cricket} \]

\[ h = 0 \text{ ft} \]

\[ \text{Lands} \]

(a) \[ H = -16T^2 + VT + S \]

WRITE EQUATION TO MODEL THIS FUNCTION

\[ H = -16T^2 + 4T \]

OR \[ h(t) = -16T^2 + 4T \]

(b) Solve for \( H = 0 \text{ ft} \)

\[ 0 = -16T^2 + 4T \]

0 = \(-4T(4T - 1)\)

-4T = 0 \quad 4T - 1 = 0

\[ T = 0 \quad T = \frac{1}{4} \]

(Answer in Words) THE CRICKET WILL LAND ON THE GROUND AT 25 SECONDS.