Mathematics
Support
Capsules

1. A Cornell student walked six miles to class and was 1/4 hour late.
If he had walked two miles per hour faster he would have been on time.
What was his original speed?

2. A motorist drove 280 miles. If he had gone 5 m.p.h. faster he could
have made his trip in 1 hr. less time, how fast did he drive?

3. If 1 1/2 chickens lay 1 1/2 eggs in 1 1/2 days, how many eggs do
6 ·chickens lay in 7 days?

4. A bridge looks like the graph of $y = -3x^2 + 12x + 8$. You have a
10 ft. high truck with a load 8 ft. wide. Can you make it under the
bridge?

5. A bamboo 18 ft. high was broken by the wind. Its top bent over and
touched the ground 6 ft. from the root. At what point along the length
of the bamboo did the break occur?

6. Diophantus lived 1/6 of his life in childhood, 1/12 in youth, 1/7
more as a bachelor. 5 years after his marriage was born a son who died
4 years before his father, at half his father's final age. How old was
Diophantus when he died? How old was his son when his son died?

7. At noon, a bus leaves Boston and travels due north at 40 m.p.h.
At 2:00 p.m. a train leaves Boston and travels due west at 60 m.p.h.
When are the bus and the train 200 miles apart?

<u>Solution:</u>

$d = rt$ $\quad \rightarrow 6 = r(t + \frac{1}{4})$
$\qquad\qquad \searrow 6 = (r+2)(t)$

$t =$ time necessary to be on time $=$ (boxed) $\frac{3}{4}$ hour
$r =$ original rate $=$ (boxed) 6 mph

2 eqns. with 2 unknowns:
solve first for r in terms of t, then substitute for r in second & get an equation for t alone.

$r = \frac{6}{t + \frac{1}{4}}$ $\Rightarrow$ $6 = \left(\frac{6}{t + \frac{1}{4}} + 2\right)t$ $\Rightarrow$ (multiply out) $t = -1$ or $t = \frac{3}{4}$.
$\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad$ <u>~~no help in~~ ~~this~~ problem</u>

Then when you have t you can find $r = \frac{6}{t + \frac{1}{4}}$.

? $\quad d = rt$ $\quad \rightarrow 280 = vt$
$\qquad\qquad \searrow 280 = (v+5)(t-1)$ $\qquad \rightarrow$ (boxed) $t = 8$, $v = 35$

? if 1½ hens lay 1½ eggs in 1½ days
then 1½ hens lay 1 eggs in 1 day
1½ hens lay 7 eggs in 7 days
$\frac{6}{1\frac{1}{2} \times 4}$ hens lay $\underbrace{7 \times 4}$ eggs in 7 days
$\qquad\qquad\qquad$ (circled) 28

this is just one of many ways to do this — it's important to note that all 3 quantities do <u>not</u> change together

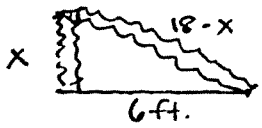Graph the curve, $y = -3x^2 + 12x + 8$, which is a parabola:

x	y
0	8
	0

x-intercepts, by quadratic formula
$\frac{-12 \pm \sqrt{144 + 96}}{-6} \approx$ $\qquad 4\frac{2}{3}$
$\qquad\qquad\qquad\qquad\qquad -\frac{2}{3}$
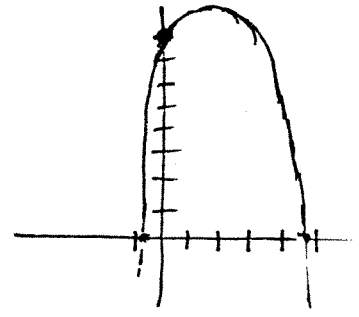
and just these 2 points are <u>not</u> spaced widely enough for the truck to pass between.

x ▨ $18-x$, 6 ft. $\quad$ by Pythagorean Theorem, $(18-x)^2 = x^2 + 6^2$ $\qquad \Rightarrow$ (boxed) $x = 8$ ft.

Let $x =$ Diophantus' age at death. Then

$\frac{x}{6} + \frac{x}{12} + \frac{x}{7} + 5 + \frac{x}{2} + 4 = x$ $\qquad$ and (boxed) $x = 84$ yrs.
childhood + youth + bachelor + married + son + years survived son. $=$ lifetime
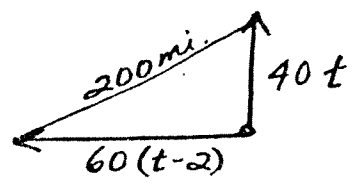
7. 200 mi, $40t$, $60(t-2)$ $\qquad$ Pythagorean Theorem, again.
$\qquad\qquad\qquad\qquad 200^2 = (40t)^2 + 60(t-2)^2$
$\qquad\qquad\qquad$ solution: (boxed) $t = 4$ hours $= 4:00$ PM

$t =$ time after noon