30. Lorna earned $99 last week. If her hourly rate had been 90¢ less, she would have had to work an additional $5\frac{1}{2}$ hours to earn the same pay. What was her hourly rate of pay, and how many hours did she work?

31. Paul works 20% slower than Marko. So Marko works _____% (fill in the blank) faster than Paul.

32. If Ezekiel's age is doubled and Thelma's age is divided by three, and if the two results are added, the answer is the mean average of their ages. If Thelma's age is doubled and Ezekiel's age is divided by three, and if the two results are added, the answer is five years less than twice the sum of their ages. How old is each one?

33. When Abe, Ben, and Carl all work together, they can do a job in ten hours. If Abe works for four hours and then Ben works for nine hours, half the job is done. If Abe works for three hours and then Carl works for eleven hours, one-third of the job is done. How long does it take each person working alone to do the job?

a. 12 min. $m(\frac{5}{4}) = 15$

b. 40 min. $m(\frac{5}{4}) = 50$

c. 72 min. $m(\frac{5}{4}) = 90$

30. \$4.50; 22. $rh = 99$

$(r - .90)(h + 5\frac{1}{2}) = 99$

31. 25. Paul works at 80% of Marko's rate, so $\frac{1}{P} = .80(\frac{1}{M}) = \frac{4}{5}(\frac{1}{M})$, and so $\frac{1}{M} = (\frac{5}{4})(\frac{1}{P}) = 1.25(\frac{1}{P})$ = 25% more than $\frac{1}{P}$. It is simpler here to put P, M = Paul's and Marko's rates of work, and then we have $P = .80M = \frac{4}{5}M$, so $M = \frac{5}{4}P = 1.25P$.

32. Ezekiel is 3; Thelma is 27.

$2E + \frac{T}{3} = \frac{E + T}{2}$

$2T + \frac{E}{3} = 2(E + T) - 5$

33. Abe, 20 hr; Ben, 30 hr; Carl, 60 hr

$\frac{1}{A} + \frac{1}{B} + \frac{1}{C} = \frac{1}{10}$

$\frac{4}{A} + \frac{9}{B} = \frac{1}{2}$

$\frac{3}{A} + \frac{11}{C} = \frac{1}{3}$

34. a–b. $j + s = 30$. $s = \frac{2}{3}j$

a. 18 **b.** 12

c–d. $m + f = 30$. $m = f - 4$

c. 17 **d.** 13

e–f. $f + m = 12$. $m = f + 2$

e. 5 **f.** 7

g. 12. $f = 17 - 5$ **h.** 6. $m = 13 - 7$

35. Given: n is a real number, $n > 0$.

Prove: $n + \frac{1}{n} \geq 2$.

Proof: Suppose $n + \frac{1}{n} < 2$. Then $n^2 + 1 < 2n$, so $n^2 - 2n + 1 < 0$. But $n^2 - 2n + 1 = (n - 1)^2$, so $(n - 1)^2 < 0$, which is impossible, since the square of any real number is never negative. Therefore, the supposition has to be wrong, and so $n + \frac{1}{n} \geq 2$.

36. No. Lanham had them in sight for only one second, and that's a very short time to see two people for the first time and be able to identify them positively afterward. Also, their distance from Lanham was more than 77 feet at the beginning of the second and at least 40 feet at the end of the second, not to mention that he was seeing them through a windshield for part of the second. The car traveled 66 feet at 45 mph while Lanham watched.

$t = \frac{D}{r} = \frac{\text{66 feet x 3,600 sec per hour}}{\text{45 mph x 5,280 ft per mile}} =$

$\frac{66(3{,}600 \text{ sec})}{45(5{,}280)} = 1 \text{ sec}$

(Credit for the idea for this problem goes to a Perry Mason book, "The Case of the Waylaid Wolf," by Erle Stanley Gardner.)

37. 100; \$11. $md = 1{,}100$

$(m - 12)(d + 1.50) = 1{,}100$

38. $-\frac{2}{3}$ **or** $\frac{3}{2}$. $\frac{n}{d} = \frac{d}{n} + \frac{5}{6}$

39. $3b + 2m + e = 5.44$

$6b + m + e = 7.12$

$2b + 2m + 3e = 6.13$

a. 89¢ **b.** 99¢

c. 79¢

40. $me = 14.40$

$(m + 6)(e - .12) = 14.40$

a. 24 **b.** 60¢

41. 121 and 16. $a + b = 137$

$\sqrt{a} - \sqrt{b} = 7$