Ex. 10, 1

a)

	Sum of Squares	DF	Mean Square	F	Sig	R-Square
Regression	813.3	k = 5	813.3/5 = 162.66	162.66/49 = 3.3196	0.0103*	813.3/3753.3 = 0.2167
Residual	2940.0	65-5 = 60	2940/60 = 49			Root MSE
Total	3753.3	N-1 = 65				$\sqrt{49}$ = 7

Variable	Parameter Estimate	Standard Error	t	Sig
Intercept	70.0000			
x1	0.1000	0.0450	0.1000/0.0450 = 2.22	0.03*
x2	-0.1500	0.0750	-2	0.050033 •
x3	0.1000	0.2000	0.5	0.619
x4	-0.0400	0.0500	-0.8	0.426
x5	0.1200	0.0500	2.4	0.0195*

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Example ~~5~~.1

Step-by-step explanation

a. SS model = SS total - SS residual
SS model = 3753.3 - 2940
SS model = 813.3

df model = number of dependent variables = k = 5
df residual = N-k-1 = 66-5-1 = 60
df total = N-1 = 66-1 = 65

MS model = SS model/df model = 813.3/5 = 162.66
MS residual = SS residual/df residual
MS residual = 2940/60 = 49

Number of obs = 5
F = MS model/MS residual
F = 162.66/49 = 3.3196

~~Prob>F = 0.0103~~
~~R squared = SS model/SS total~~
~~R squared = 813.3/3753.3~~

Prob>F = 0.0103
R squared = SS model/SS total
R squared = 813.3/3753.3
R squared = 0.2167

Root MSE = $\sqrt{49} = 7$

d. For the global test of $H: \beta_1 = \cdots = \beta_5 = 0$
vs. A: At least 1 $\beta_i \neq 0$, $i = 1, \ldots, 5$
Ici, $P_{obs} < 0.05 \Rightarrow$ Reject H

e. For the test of $H: \beta_1 = 0$ vs. $A: \beta_1 \neq 0$
$P_{obs} < 0.05 \Rightarrow$ Reject H

b. equation from the coefficients is
Y = 70 + 0.1X1 -0.15X2 + 0.1X3 - 0.04X4 -0.12X5
INterpretation of X1: A 1% increase of adult residents owning homes with all other variables held constant results to an increase of 0.10% in adult residents who are registered to vote.

c. Since only p values of X1, X2, and X5 are less than 0.05 alpha level, only these variables are significant in explaining Y

~~d~~ f. C.I. interval is expressed as
C.I. = X1 coefficient +/- t crit* se
t crit at 0.05 alpha level and df = 60 is equal to 2
C.I. = 0.1 +/- 2*0.045
C.I. = (0.01, 0.19)

~~e~~ g. CI: (50 x 0.01, 50 x 0.19) → (0.05, 9.5)

Ex. 10.2

Source	df	SS	MS	F
Treatments	4-1	1520.88	506.96	16.848
Residuals	36-4	962.86	30.09	
Total	36-1	2483.74		

```
> anova(lm(strength ~ mortar.type))
Analysis of Variance Table

Response: strength
            Df  Sum Sq Mean Sq F value    Pr(>F)
mortar.type  3 1520.88  506.96  16.848 9.576e-07 ***
Residuals   32  962.86   30.09
```

MS (CM) Trts: 506.96 = SS(SC) / df ⇒ SS(SC)

= 506.96 × 3 ≈ 1520.88

SS (SC) Resid = SST − SSTrts = 2483.74 − 1520.88

= 962.86

MS (CM) Resid = SS / df = 962.86 / 32 = 30.09

F_{obs} = MS (CM) Trts / MS(CM) Resids = 506.96 / 30.09

= 16.848

Pobs ≈ 9.6×10^{-7}