UNIVERSITY OF TORONTO SCARBOROUGH

Department of Computer and Mathematical Sciences

STAC67H3F: Regression Analysis

Quiz 1: written part

TUT0002 · Wednesday September 30, 2026

Instructions

- **Quiz 1 has two parts.** This **written part** (25 minutes, 12 points) comes first, on paper. The **Quercus part** (25 minutes, 8 points) follows, on your laptop, once this paper has been collected. Quiz 1 is marked out of 20.
- **Keep your laptop closed and your phone away** until this paper has been collected. A non-programmable calculator is permitted; no other aids.
- Answer in the space provided on pages 2 and 3. This booklet is scanned: anything written elsewhere is not marked. **Do not write on the QR codes** at the top of the pages.
- Show your work: a number with no supporting work receives no credit.
- Round *final* answers to 2 decimal places; do not round intermediate quantities.

Good luck!

1. A courier company records, for each of $n = 22$ deliveries made from the same depot, the **distance** x travelled (in km) and the **delivery time** Y (in minutes). The distances range from 2.9 to 15.2 km. A simple linear regression of time on distance, under the usual assumptions with normal errors, gives the following R output.

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Call:
lm(formula = time ~ distance)

Coefficients:
            Estimate Std. Error t value Pr(>|t|)
(Intercept)   15.263      1.621   9.418 8.58e-09 ***
distance       1.900      0.182  10.435 1.54e-09 ***
```

Quantiles $t(p;\,\nu)$ of the Student distribution, where $P\big(T \le t(p;\,\nu)\big) = p$ for $T \sim t_\nu$:

$\nu \setminus p$	0.95	0.97	0.975	0.985	0.99
20	1.725	1.994	2.086	2.336	2.528
21	1.721	1.988	2.080	2.328	2.518
22	1.717	1.983	2.074	2.320	2.508
23	1.714	1.978	2.069	2.313	2.500
24	1.711	1.974	2.064	2.307	2.492
25	1.708	1.970	2.060	2.301	2.485

(a) Interpret the estimated slope $\hat{\beta}_1$ in the context of these data. [2]

(b) Give a 97% confidence interval for β_1. [3]

(c) The (unbiased) sample variance of the 22 distances is $s_x^2 = 15.75$. Use it, together with the output above, to compute $\hat{\sigma}^2$, the unbiased estimator of σ^2. [4]

(d) If S_{xx} were larger, with n and $\hat{\sigma}$ unchanged, would the confidence interval in part (b) be wider or narrower? Justify your answer. [3]