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1.2: Measuring correlation

(1) a) Approximately 0.7 b) Approximately 0.3 c) Approximately −0.9

(2) a) The type and strength of linear correlation between x and y

b) $r = 0.9783$ (4dp)

(3) a) $r = -0.9355$ (4dp) b) It has a strong negative correlation. The parts of channel with larger depth have a lower current velocity.

(4)

x:	0	0.3010	0.4771	0.6021	0.6990	0.7782	0.8451	0.9031	0.9542	1
R	1	2	3	4	5	6	7	8	9	10
P	1137	785	578	561	546	535	524	496	492	459
y:	3.0559	2.8949	2.7619	2.7488	2.7372	2.7284	2.7193	2.6955	2.6919	2.6621

$r = -0.954$ (3sf)

(5) a)

Population, P (1000s)	87	9	73	62	7	44	53	98	29	35
Waste, W (tonnes 1000s)	95	19	58	41	14	37	47	82	24	26
$\log W$	1.98	1.28	1.76	1.61	1.15	1.57	1.67	1.91	1.38	1.41

b) $r = 0.975$ (3sf)

c) There is a strong positive linear correlation with data in the form $\log W$ against P, which suggests an exponential model is a good fit.

d) $y = 1.15 + 0.0085x \Rightarrow \log W = 1.15 + 0.0085P \Rightarrow W = 10^{1.15} \times 10^{0.0085P}$

$a = 10^{1.5} = 14.1$ $\quad b = 10^{0.0085} = 1.02$ (3sf)

(6) a)

Engine size, E (litres)	3.2	3.2	2.8	2.5	2.8	1.8	5	6	2.3	3.5
Fuel economy, M (mpg)	24	26	26	27	26	29	21	19	30	23
$\log E$	0.505	0.505	0.447	0.398	0.447	0.255	0.669	0.778	0.362	0.544
$\log M$	1.38	1.41	1.41	1.43	1.41	1.46	1.32	1.28	1.48	1.36

b) $r = -0.962$

c) There is a strong negative linear correlation with data in the form $\log M$ against $\log E$, which suggests a model of the form $y = kx^n$ is a good fit.

a) $y = 1.59 - 0.383x \Rightarrow \log M = 1.59 - 0.383(\log E) \Rightarrow 10^{\log M} = 10^{1.59} \times 10^{\log E^{-0.383}}$

$\Rightarrow M = 10^{1.59} \times E^{-0.383} \Rightarrow K = 10^{1.59} = 38.9$, $n = -0.383$ (3sf)

⑦ a) $r = -0.852$

b) -0.852 is close to -1, so the data values show a strong to moderate negative correlation. A linear regression model is suitable for these data.

⑧ a) n/a :→ Data on daily maximum gust is not available for this day.

b) $r = -0.0549$; The n/a data entry is omitted when calculating r.

c) Jamie's statement is not valid because there may be a non-linear relationship between the two variables or the sample size is too small to draw this conclusion.