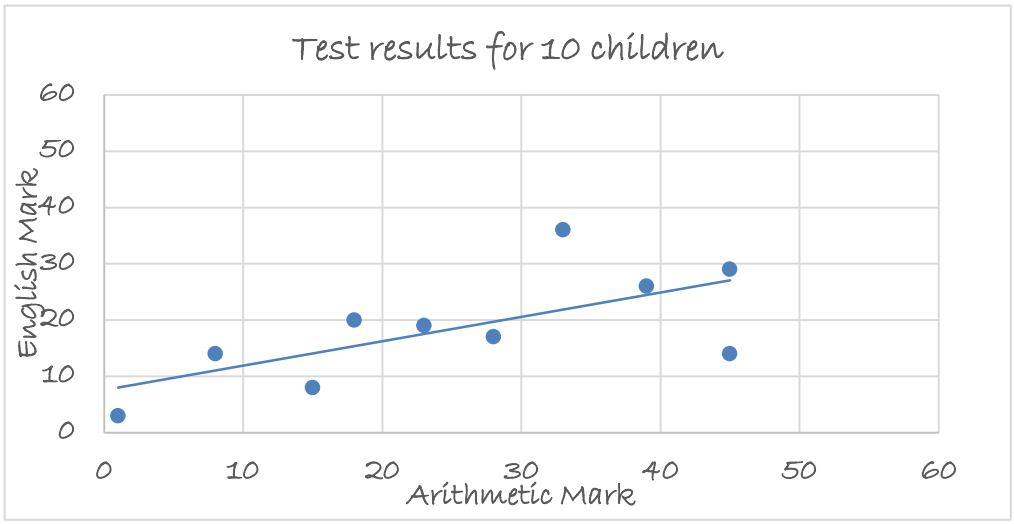
Section 2: Testing for correlation

Exercise level 1 solutions

1. A

Child	A	B	C	D	E	F	G	H	I	J
Arithmetic Mark x	1	8	15	18	23	28	33	39	45	45
English Mark y	3	14	8	20	19	17	36	26	14	29

(i)



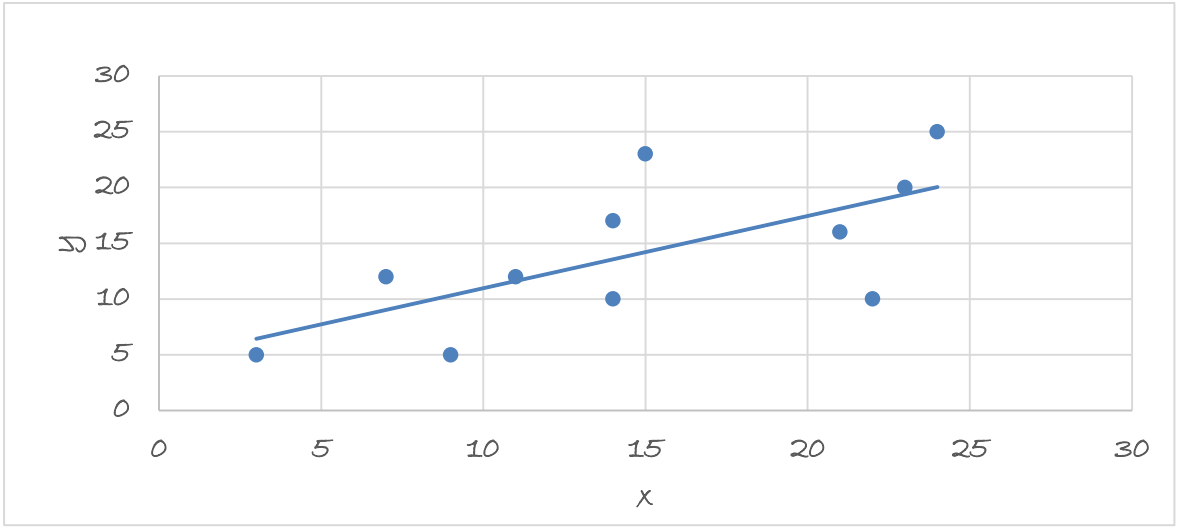
(ii) Fairly strong positive correlation.

(iii) $\bar{x} = 25.5, \bar{y} = 18.6$

B

x	3	7	9	11	14	14	15	21	22	23	24
y	5	12	5	12	10	17	23	16	10	20	25

(i)



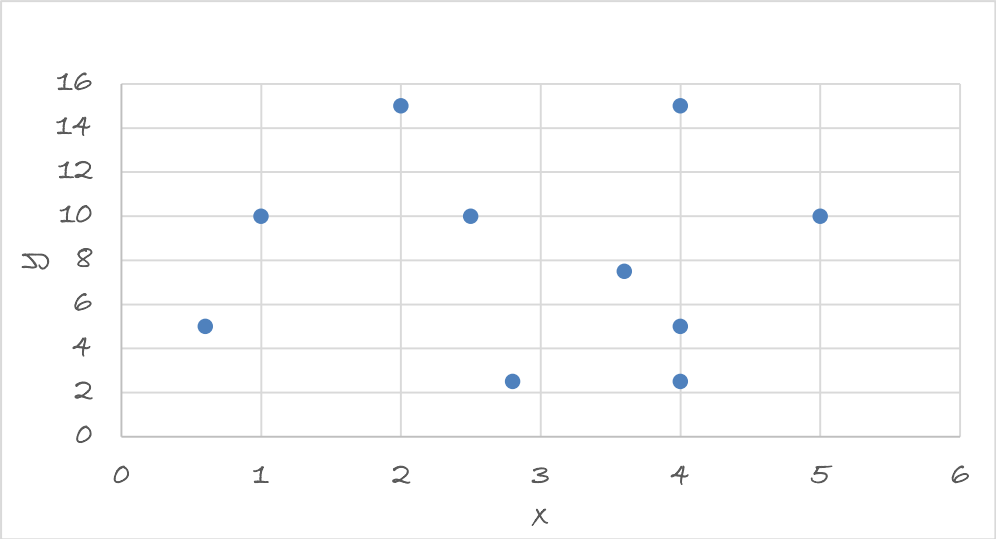
(ii) Fairly strong positive correlation

(iii) $\bar{x} = 14.8, \bar{y} = 14.1$

c

x	0.6	1	2	2.5	2.8	3.6	4	4	4	5
y	5	10	15	10	2.5	7.5	2.5	5	15	10

(i)



(ii) No correlation

(iii) $\bar{x} = 2.95, \bar{y} = 8.25$
It is not appropriate to draw a line of best fit

2. (i) $x = 35$ $y \approx 22$ or 23

(ii) $x = 120 - 100 = 20$ $y \approx 17$ or 18
Maths mark is about 37 or 38.

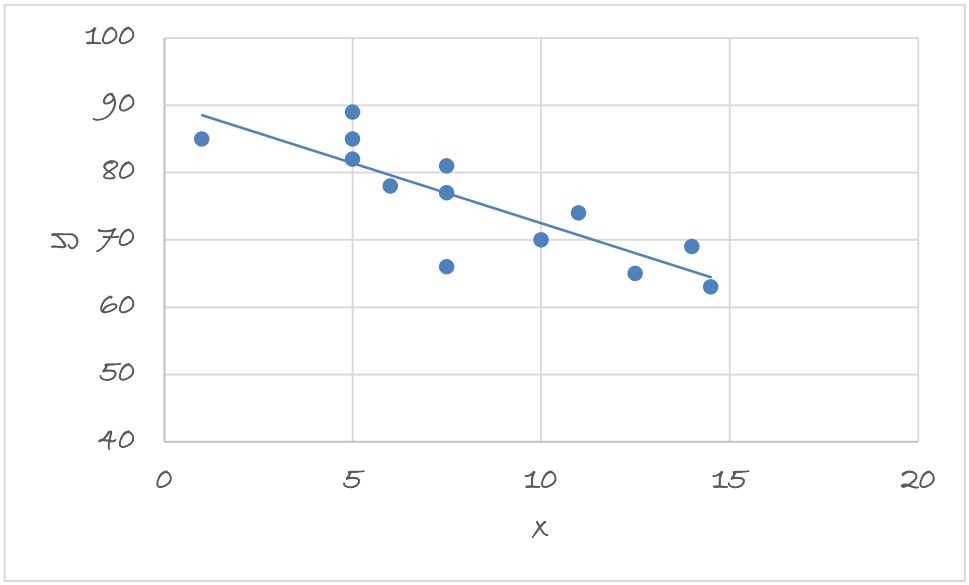
IQ of 140 gives $x = 40$ which is outside the range of the data/would require extrapolation, so should not be attempted.

(iii) Do not attempt to estimate anything from data with no correlation.

3. (i) $x = 68, y = 16$ is an outlier. Probably readings have been reversed.
Best practice is to remove the reading from analysis unless it can be checked and

corrected.

(ii)



Strong negative correlation.
$\bar{x} = 8.19, \bar{y} = 75.69$

4. Using calculator or spreadsheet.
   A $r = 0.6704$
   B $r = 0.6743$
   C $r = -0.02338$
   D $r = -0.8356$

5. 1-tail test.
   For a 1-tail test at the 5% significance level with $n = 20$, critical value $= 0.3783$.
   Acceptance region: $r \leq 0.3783$
   Critical region: $r > 0.3783$
   Test correlation coefficient, $r = 0.4$
   $0.4 >$ c.v. So significant result. Reject H_0
   There is sufficient evidence to suggest there is a positive correlation between x and y.

6. 2-tail test.
   For a 2-tail test at the 2% significance level with $n = 20$, critical value $= 0.5155$.
   Acceptance region: $-0.5155 \leq r \leq 0.5155$
   Critical region: $r < -0.5155, r > 0.5155$
   Test correlation coefficient, $r = 0.5$
   $0.5 <$ c.v. So the result is not significant. Accept H_0.
   There is insufficient evidence to suggest there is any correlation between x and y.

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7. 1-tail test

For a 1-tail test at the 5% significance level with $n = 15$, critical value $= 0.4409$.

Acceptance region: $r \geq -0.4409$

Critical region: $r < -0.4409$

Test correlation coefficient $r = -0.6$

Either $-0.6 < -0.4409$ (or $0.6 > 0.4409$). So the result is significant. Reject H_0.

There is sufficient evidence to suggest there is a negative correlation between x and y.

8. 2-tail test

For a 2-tail test at the 5% significance level with $n = 28$, critical value $= 0.3739$

Acceptance region: $-0.3739 \leq r \leq 0.3739$

Critical region: $r < -0.3739$, $r > 0.3739$

Test correlation coefficient $r = -0.45$

$-0.45 < -0.3739$ (or $0.45 > 0.3739$). So the result is significant. Reject H_0.

There is sufficient evidence to suggest there is some correlation between x and y.