Second Year Assignment Test 14 Version O

1. At time $t = 0$ a particle P is at rest at a point with position vector $4\boldsymbol{i} - 6\boldsymbol{j}$ m with respect to a fixed origin O.
The acceleration of P at time t seconds (where $t \geq 0$) is $(4t - 3)\boldsymbol{i} - 6t^2\boldsymbol{j}\ ms^{-2}$,
Find:
a) the velocity of P when $t = \frac{1}{2}$
b) the position vector of P when $t = 6$

2. Solve the differential equation $(x - 2)(3x - 8)\frac{dy}{dx} = (8x - 18)y$
given that when $y = 8, x = 3$

3. From the large data set, the daily total rainfall, x mm and the daily total sunshine, y hours were recorded for Camborne on seven consecutive days in May 2015.

Rainfall, x	2.2	tr	1.4	4.4	tr	0.2	0.6
Sunshine, y	5.2	7.7	5.6	0.3	5.1	0.1	8.9

a) Calculate the product moment correlation coefficient for these 7 days, stating clearly how you deal with the entries marked "tr"

b) With reference to your answer to a), comment on the suitability of a linear regression model for these data.

Second Year Assignment Test 14 Version P

1. At time $t = 0$ a particle P is at rest at a point with position vector $4\boldsymbol{i} - 6\boldsymbol{j}$ m with respect to a fixed origin O.
The acceleration of P at time t seconds (where $t \geq 0$) is $(4t - 3)\boldsymbol{i} - 6t^2\boldsymbol{j}\ ms^{-2}$
Find:
a) the velocity of P when $t = 1$
b) the position vector of P when $t = 1$

2. Solve the differential equation $(x - 2)(3x - 8)\frac{dy}{dx} = 2(4x - 9)y$
given that when $y = 8, x = 3$

3. From the large data set, the daily total rainfall, x mm and the daily total sunshine, y hours were recorded for Camborne on seven consecutive days in May 2015.

Rainfall, x	12.2	tr	11.4	14.4	tr	10.2	10.6
Sunshine, y	5.2	7.7	5.6	0.3	5.1	0.1	8.9

a) Calculate the product moment correlation coefficient for these 7 days, stating clearly how you deal with the entries marked "tr"

b) With reference to your answer to a), comment on the suitability of a linear regression model for these data.

Second Year Assignment Test 14 Version Q

1. At time $t = 0$ a particle P is at rest at a point with position vector $4\boldsymbol{i} - 6\boldsymbol{j}$ m with respect to a fixed origin O.
The acceleration of P at time t seconds (where $t \geq 0$) is $(4t - 3)\boldsymbol{i} - 6t^2\boldsymbol{j}\ ms^{-2}$
Find:
a) the velocity of P when $t = 2$
b) the position vector of P when $t = 2$

2. Solve the differential equation $(3x - 6)(3x - 8)\frac{dy}{dx} = (24x - 54)y$
given that when $y = 8, x = 3$

3. From the large data set, the daily total rainfall, x mm and the daily total sunshine, y hours were recorded for Camborne on seven consecutive days in May 2015.

Rainfall, x	2.2	tr	1.4	4.4	tr	0.2	0.6
Sunshine, y	15.2	17.7	15.6	10.3	15.1	10.1	18.9

a) Calculate the product moment correlation coefficient for these 7 days, stating clearly how you deal with the entries marked "tr"

b) With reference to your answer to a), comment on the suitability of a linear regression model for these data.

Second Year Assignment Test 14 Version R

1. At time $t = 0$ a particle P is at rest at a point with position vector $4\boldsymbol{i} - 6\boldsymbol{j}$ m with respect to a fixed origin O.
The acceleration of P at time t seconds (where $t \geq 0$) is $(4t - 3)\boldsymbol{i} - 6t^2\boldsymbol{j}\ ms^{-2}$
Find:
a) the velocity of P when $t = 10$

b) the position vector of P when $t = 3$

2. Solve the differential equation $(x - 2)\left(\frac{3}{2}x - 4\right)\frac{dy}{dx} = (4x - 9)y$
given that when $y = 8, x = 3$

3. From the large data set, the daily total rainfall, x mm and the daily total sunshine, y hours were recorded for Camborne on seven consecutive days in May 2015.

Rainfall, x	22.2	tr	21.4	24.4	tr	20.2	20.6
Sunshine, y	35.2	37.7	35.6	30.3	35.1	30.1	38.9

a) Calculate the product moment correlation coefficient for these 7 days, stating clearly how you deal with the entries marked "tr"

b) With reference to your answer to a), comment on the suitability of a linear regression model for these data.

Answers Version O

1. a) $-\boldsymbol{i} - \frac{1}{4}\boldsymbol{j}\ ms^{-1}$ b) $94\boldsymbol{i} - 654\boldsymbol{j}$ m

2. $y = 8(x-2)(3x-8)^{\frac{5}{3}}$

3. a) -0.473 (3 s.f.) treating "tr" as 0
b) The data shows a weak negative correlation so a linear model may not be best. There may be other variables affecting the relationship or a different model might be a better fit.

Answers Version P

1. a) $-\boldsymbol{i} - 2\boldsymbol{j}\ ms^{-1}$ b) $\frac{19}{6}\boldsymbol{i} - \frac{13}{2}\boldsymbol{j}$ m

2. $y = 8(x-2)(3x-8)^{\frac{5}{3}}$

3. a) -0.413 (3 s.f.) treating "tr" as 0
b) The data shows a weak negative correlation so a linear model may not be best. There may be other variables affecting the relationship or a different model might be a better fit.

Answers Version Q

1. a) $2\boldsymbol{i} - 16\boldsymbol{j}\ ms^{-1}$ b) $\frac{10}{3}\boldsymbol{i} - 14\boldsymbol{j}$ m

2. $y = 8(x-2)(3x-8)^{\frac{5}{3}}$

3. a) -0.473 (3 s.f.) treating "tr" as 0
b) The data shows a weak negative correlation so a linear model may not be best. There may be other variables affecting the relationship or a different model might be a better fit.

Answers Version R

1. a) $170\boldsymbol{i} - 2000\,\boldsymbol{j}\ ms^{-1}$ b) $\frac{17}{2}\boldsymbol{i} - \frac{93}{2}\boldsymbol{j}$ m

2. $y = 8(x-2)(3x-8)^{\frac{5}{3}}$

3. a) -0.385 (3 s.f.) treating "tr" as 0
b) The data shows a weak negative correlation so a linear model may not be best. There may be other variables affecting the relationship or a different model might be a better fit.