Mammals

Data Sheet 1

The data given below was compiled by researchers Allison, Truett and Cicchetti and used in their article 'Sleep in Mammals:Ecological and Constitutional Correlates' (1976).

The table below gives typical values of the following variables for small mammals:

- body mass in kilograms
- brain mass in grams
- sleep in hours per day – this includes both paradoxical (dreaming) sleep and slow wave (non-dreaming) sleep
- maximum life span in years
- gestation time in days i.e. the period the young is carried in the womb before birth
- overall danger index – a combined index reflecting levels of predation danger (likelihood of being preyed upon) and sleep exposure
  1 = least danger from other animals 5 = most danger from other animals

An entry of 'NA' means that the information is not available.

Small Mammals (less than 1 kg)	Body Mass (kilograms)	Brain Mass (grams)	Sleep (hours)	Max Life Span (years)	Gestation Time (days)	Overall Danger Index
Arctic Squirrel	0.92	5.7	16.5	NA	25	3
Bat (big brown)	0.023	0.3	19.7	19	35	1
Bat (little brown)	0.01	0.25	19.9	24	50	1
Chinchilla	0.425	6.4	12.5	7	112	4
Galago	0.2	5	10.7	10.4	120	2
Hamster (golden)	0.12	1	14.4	3.9	16	2
Hedgehog (Desert)	0.55	2.4	10.3	NA	NA	2
Hedgehog(European)	0.785	3.5	10.7	6	42	2
Mole (East American)	0.075	1.2	8.4	3.5	42	2
Mole (star nosed)	0.06	1	10.3	3.5	NA	2
Mole Rat	0.122	3	10.6	NA	30	1
Monkey (owl)	0.48	15.5	17	12	140	2
Mouse	0.023	0.4	13.2	3.2	19	3
Rat	0.28	1.9	13.2	4.7	21	3
Rock Hyrax (Hetero b)	0.75	12.3	6.6	7	225	2
Shrew (lesser short tailed)	0.005	0.14	9.1	2.6	21.5	4
Shrew (musk)	0.048	0.33	12.8	2	30	3
Shrew (tree)	0.104	2.5	15.8	2.3	46	2
Squirrel	0.101	4	13.8	9	28	3
Tenrec	0.9	2.6	13.3	4.5	60	2

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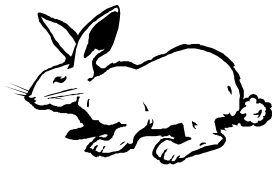
Mammals

Data Sheet 2



The data given below was compiled by researchers Allison, Truett and Cicchetti and used in their article 'Sleep in Mammals:Ecological and Constitutional Correlates' (1976).

The table below gives typical values of the following variables for medium-sized mammals:

- body mass in kilograms
- brain mass in grams
- sleep in hours per day – this includes both paradoxical (dreaming) sleep and slow wave (non-dreaming) sleep
- maximum life span in years
- gestation time in days i.e. the period the young is carried in the womb before birth
- overall danger index – a combined index reflecting levels of predation danger (likelihood of being preyed upon) and sleep exposure
  1 = least danger from other animals 5 = most danger from other animals

An entry of 'NA' means that the information is not available.

Medium Mammals (1 - 10 kg inclusive)	**Body Mass (kilograms)**	**Brain Mass (grams)**	**Sleep (hours)**	**Max Life Span (years)**	**Gestation Time (days)**	**Overall Danger Index**
African Rat (pouched)	1	6.6	8.3	4.5	42	3
Arctic Fox	3.385	44.5	12.5	14	60	1
Armadillo (banded)	3.5	10.8	17.4	6.5	120	1
Beaver	1.35	8.1	11.2	NA	45	3
Cat	3.3	25.6	14.5	28	63	1
Echidna	3	25	8.6	50	28	2
Fox (red)	4.235	50.4	9.8	9.8	52	1
Genet	1.4	17.5	6.1	34	NA	1
Guinea Pig	1.04	5.5	8.2	7.6	68	4
Marmot	4.05	17	NA	13	38	1
Monkey (Patas)	10	115	10.9	20.2	170	4
Monkey (rhesus)	6.8	179	9.6	29	164	2
Opossum (American)	1.7	6.3	19.4	5	12	1
Opossum (water)	3.5	3.9	19.4	3	14	1
Phanlanger	1.6	11.4	13.7	13	17	2
Rabbit	2.5	12.1	8.4	18	31	5
Raccoon	4.288	39.2	12.5	13.7	63	2
Slow Loris	1.4	12.5	11	12.7	90	2
Rock Hyrax (Procravia hab)	3.6	21	5.4	6	225	3
Tree Hyrax	2	12.3	5.4	7.5	200	3
Vervet	4.19	58	10.3	24	210	4

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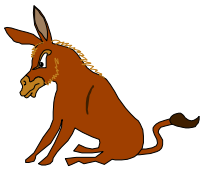
Mammals

Data Sheet 3



The data given below was compiled by researchers Allison, Truett and Cicchetti and used in their article 'Sleep in Mammals:Ecological and Constitutional Correlates' (1976).

The table below gives typical values of the following variables for large mammals:

- body mass in kilograms
- brain mass in grams
- sleep in hours per day – this includes both paradoxical (dreaming) sleep and slow wave (non-dreaming) sleep
- maximum life span in years
- gestation time in days i.e. the period the young is carried in the womb before birth
- overall danger index – a combined index reflecting levels of predation danger (likelihood of being preyed upon) and sleep exposure
  1 = least danger from other animals 5 = most danger from other animals

An entry of 'NA' means that the information is not available.

Large Mammals (more than 10 kg)	Body Mass (kilograms)	Brain Mass (grams)	Sleep (hours)	Max Life Span (years)	Gestation Time (days)	Overall Danger Index
African Elephant	6654	5712	3.3	38.6	645	3
Armadillo (giant)	60	81	18.1	7	NA	1
Asian Elephant	2547	4603	3.9	69	624	4
Baboon	10.55	179.5	9.8	27	180	4
Chimpanzee	52.16	440	9.7	50	230	1
Cow	465	423	3.9	30	281	5
Deer (roe)	14.83	98.2	2.6	17	150	5
Donkey	187.1	419	3.1	40	365	5
Giraffe	529	680	NA	28	400	5
Goat	27.66	115	3.8	20	148	5
Gorilla	207	406	12	39.3	252	1
Horse	521	655	2.9	46	336	5
Jaguar	100	157	10.8	22.4	100	1
Kangaroo	35	56	NA	16.3	33	4
Man	62	1320	8	100	267	1
Okapi	250	490	NA	23.6	440	5
Pig	192	180	8.4	27	115	4
Seal (gray)	85	325	6.2	41	310	1
Sheep	55.5	175	3.8	20	151	5
Tapir	160	169	6.2	30.4	392	4
Wolf (gray)	36.33	119.5	13	16.2	63	1

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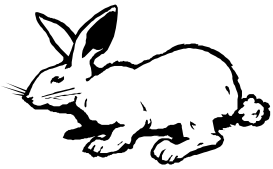
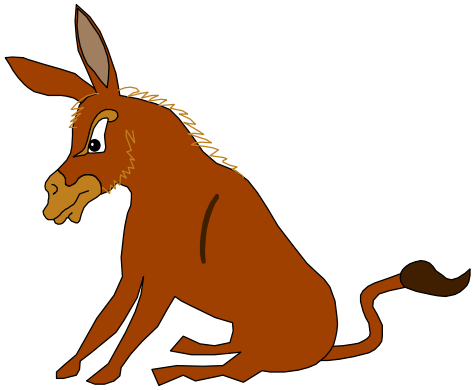
Mammals

Assignment





The data provided includes the body mass, brain mass, sleep, maximum life span, gestation time and a danger index for a variety of mammals.

Choose a pair of variables which you think may be related.
Investigate whether the data provides any evidence to support your theory.

Remember that you should:

- identify clearly the purpose of your investigation
- select and use appropriate statistical measures, diagrams and techniques.

To achieve a high mark you will need to

- show that you can work independently
- produce work which is clear, logical and well-structured
- check your work
- use appropriate, efficient and concise methods
- use mathematics to correctly summarise your work and draw valid, relevant and accurate conclusions
- critically consider how the data available has limited your work and what additional data would improve your study.

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Teacher Notes

Unit Advanced Level, Using and applying statistics

Skills which may be used in this assignment:
- drawing scatter diagrams
- finding lines of best fit
- calculating correlation coefficients

Preparation
For the assignment students will need:
- copies of one or more of the data sheets (pages 1 - 3)
- copy of the assignment (page 4)
- graph paper
- Excel spreadsheet Mammals.xls (optional)

Notes on the Assignment
The multiple regression analysis carried out by Allison, Truett and Cicchetti is beyond the scope of this unit, but the data they compiled has been used as the basis of the assignment. You can opt to use either one, two or all three data sheets.
The assignment is very open-ended allowing students to use a variety of approaches. Students are asked to investigate the relationship between a pair of variabes of their choice. There are obviously a large number of possibilities - in many of these there will be little evidence of correlation. It is important that students realise the importance of drawing a scatter diagram to give an indication of whether any relationship exists between two variables, rather than assuming that it does and relying solely on the calculation of correlation coefficients. They will need to decide what to do where no data is available and make decisions on how to deal with outliers (eg elephants and man in the large mammal data).
Pages 6 - 11 give examples of the scatter diagrams, lines of best fit and correlation coefficients which might be produced by students investigating the relationship between brain mass and body mass. These have been done using the Excel spreadsheet, Mammals.xls. This spreadsheet is available for downloading so that students can be given the choice of working by hand or electronically.

Alternatives
One section of the data could be used to illustrate the methods associated with correlation , with students then using other sections for practice. The scatter diagrams could be copied onto OHP transparencies and used for class discussion.
Important discussion points include:
- close grouping of small mammals when all data is used
- the problem of outliers
- values of correlation coefficients and the corresponding scatter diagrams
- the effect grouping data has on scatter diagrams, correlation coefficients and equations of lines of best fit.

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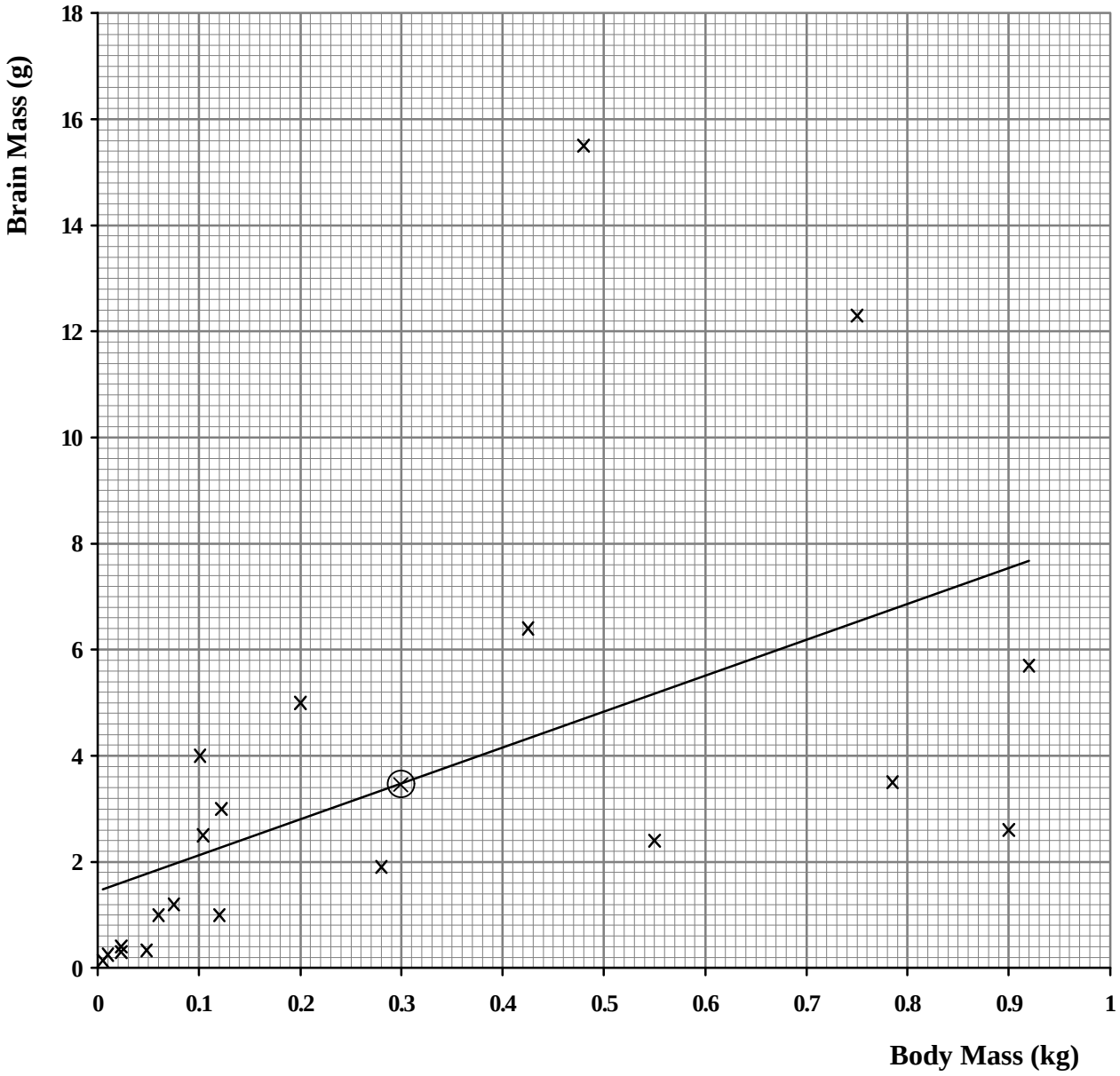
Scatter Diagram of Brain Mass against Body Mass
Small Mammals



Pearson's product moment correlation coefficient 0.534

Line of Best Fit $y = 6.77x + 1.45$
Mean values (0.299, 3.47) shown as ⊗

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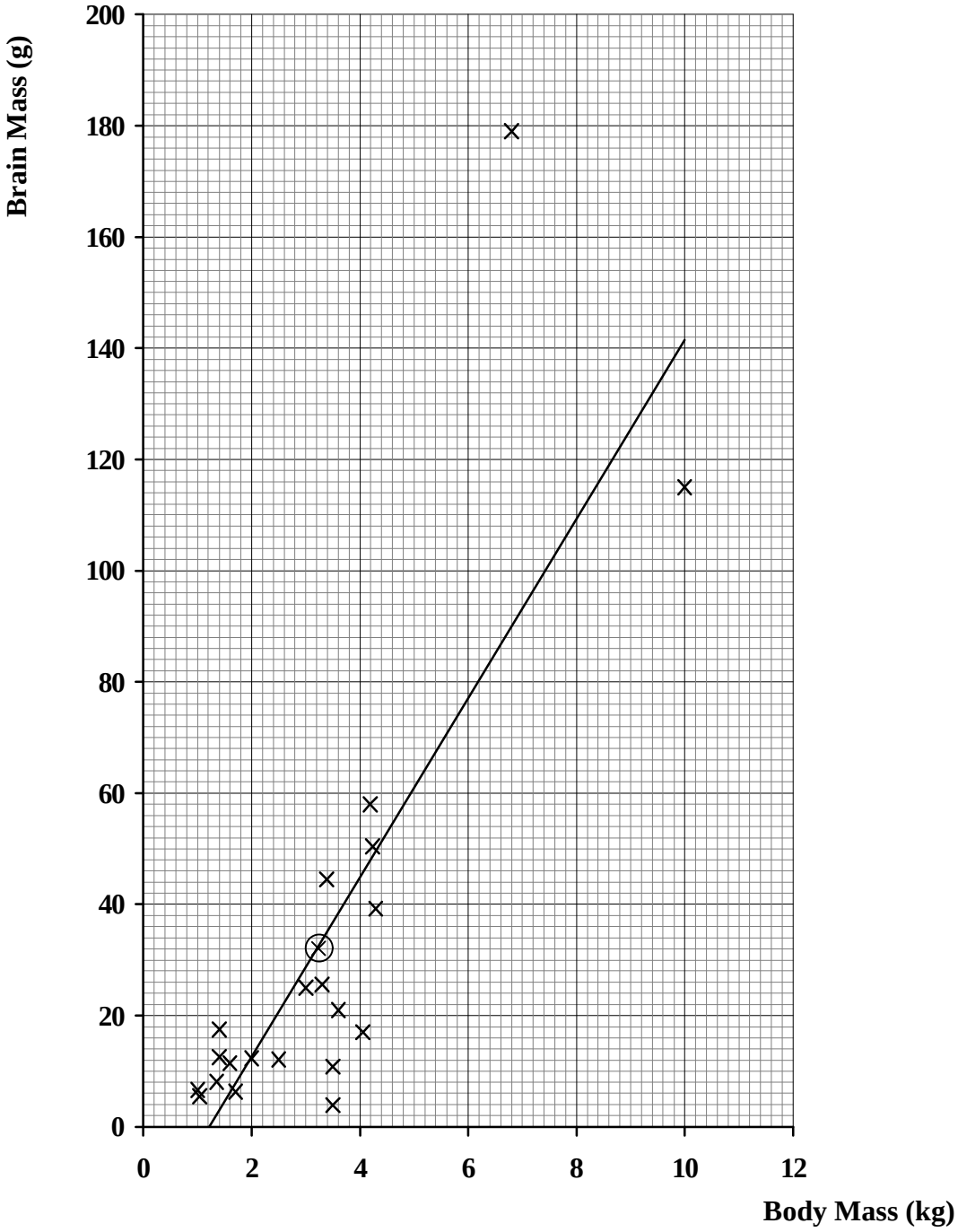
Scatter Diagram of Brain Mass against Body Mass
Medium Mammals



Pearson's product moment correlation coefficient 0.806

Line of Best Fit $y = 16.1x - 19.6$
Mean values (3.23, 32.5) shown as $\otimes$

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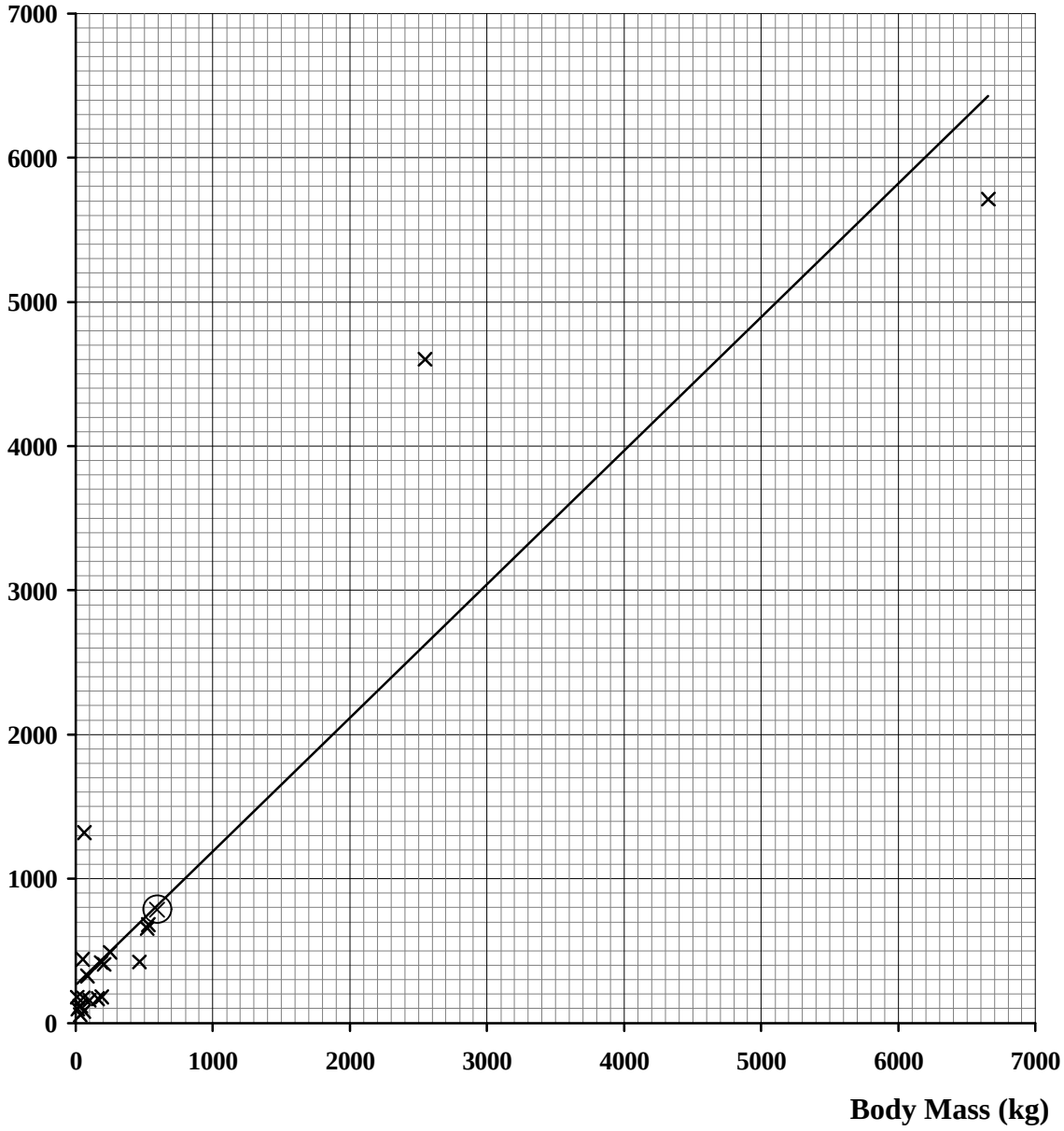
Scatter Diagram of Brain Mass against Body Mass
Large Mammals



Pearson's product moment correlation coefficient 0.930

Line of Best Fit $y = 0.927x + 260$
Mean values (583, 800) shown as ⊗

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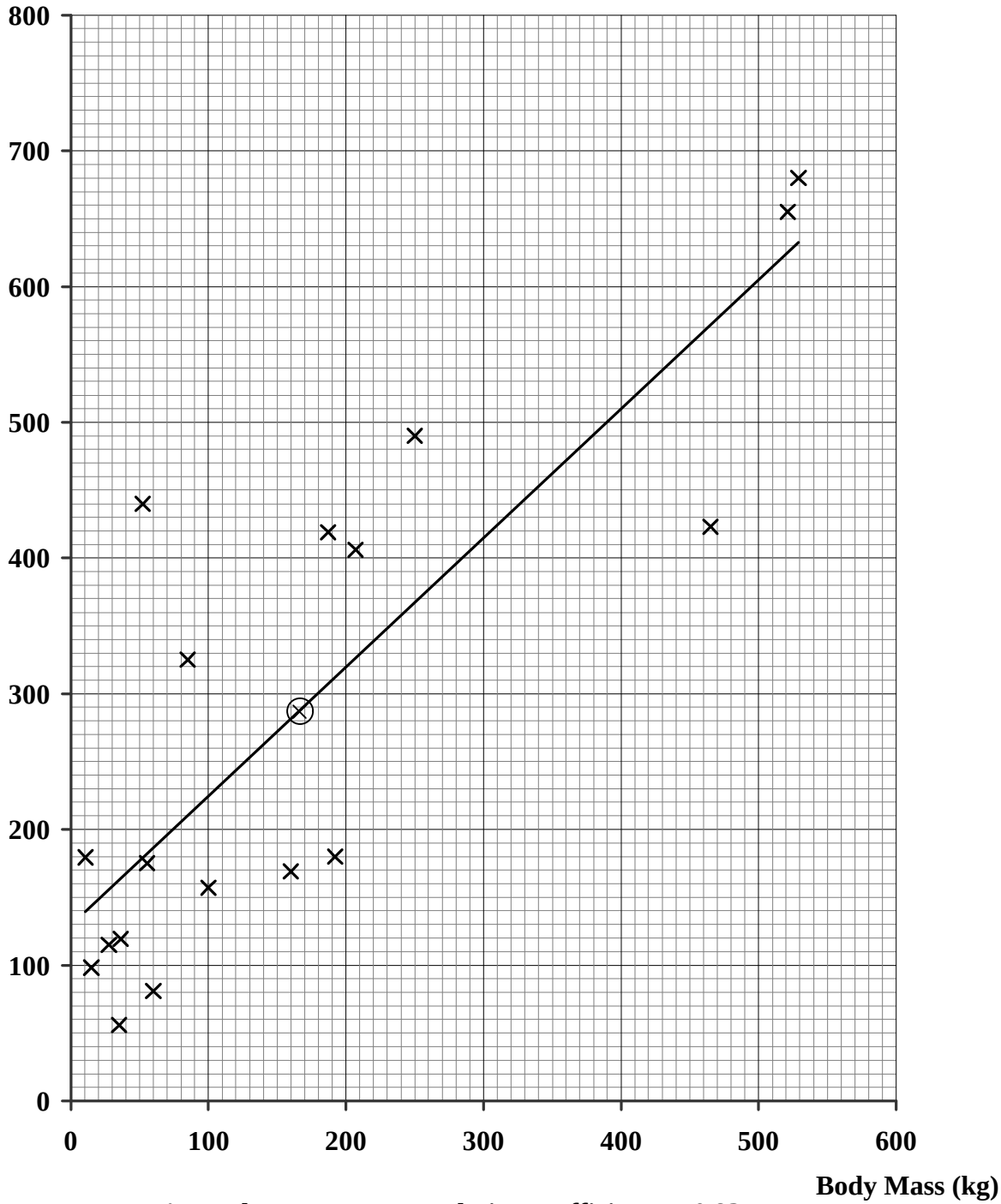
Scatter Diagram of Brain Mass against Body Mass
Large Mammals without elephants and man



Pearson's product moment correlation coefficient 0.831

Line of Best Fit $y = 0.951x + 129$
Mean values (166, 287) shown as ⊗

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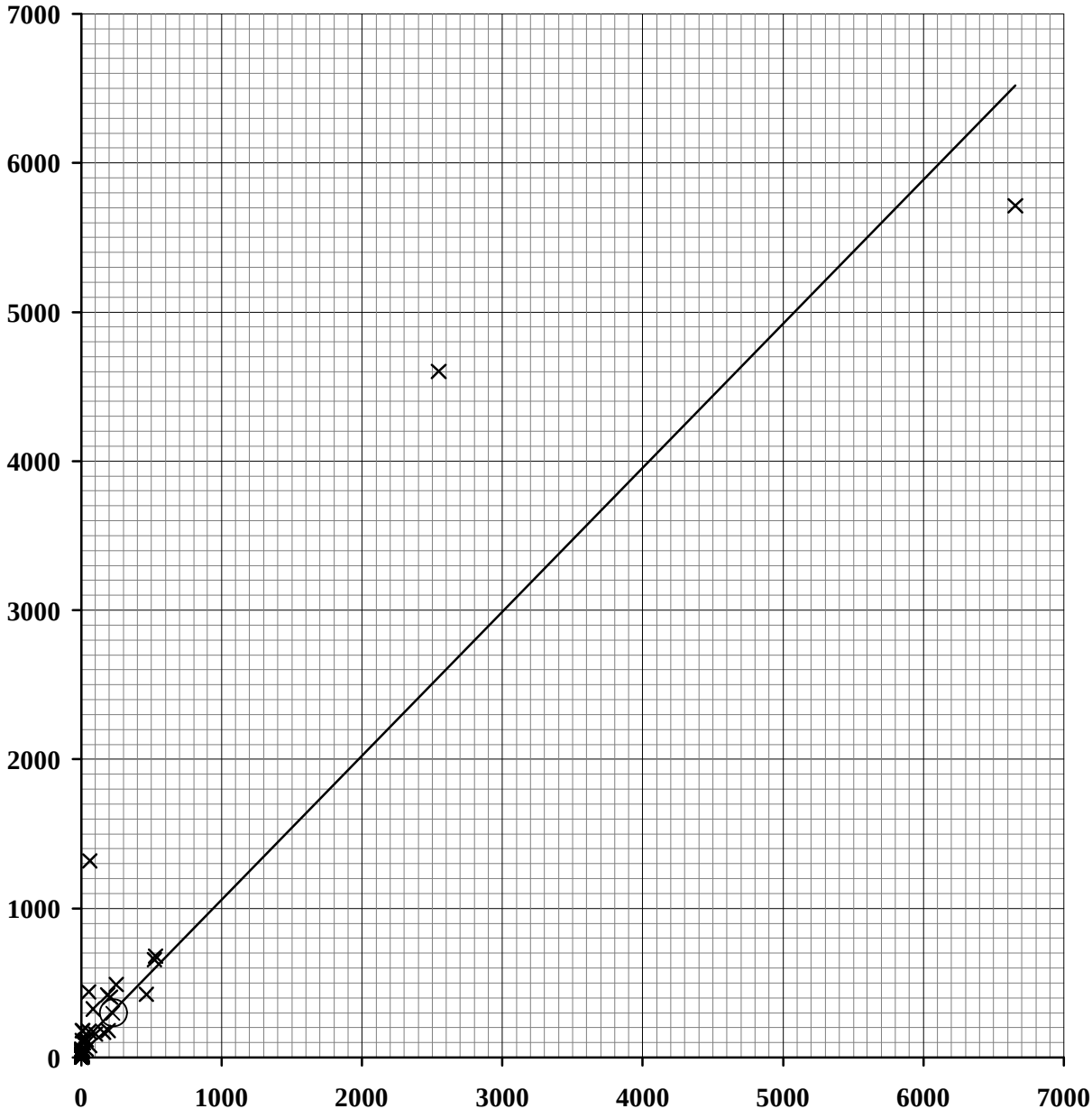
Scatter Diagram of Brain Mass against Body Mass
All Mammals



Pearson's product moment correlation coefficient 0.934

Line of Best Fit $y = 0.967x + 91.0$
Mean values (199, 283) shown as ⊗

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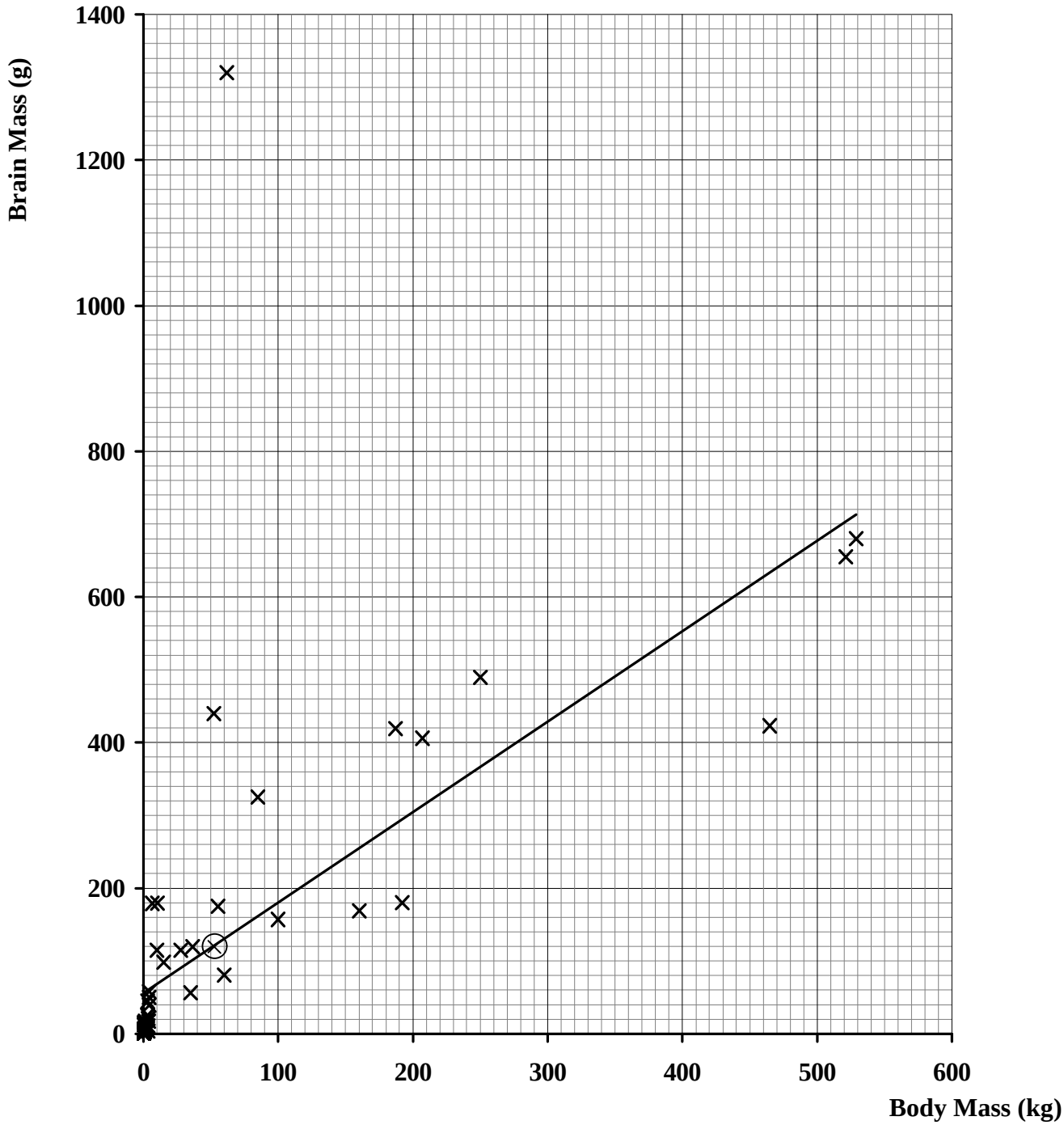
Scatter Diagram of Brain Mass against Body Mass
All Mammals without outliers (elephants)



Pearson's product moment correlation coefficient 0.651

Line of Best Fit $y = 1.24x + 56.0$
Mean values (52.1, 121) shown as ⊗

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