

Name: .....

School: .....



# TONBRIDGE SCHOOL

## Scholarship Examination 2016

### Science I

Monday, 25<sup>th</sup> April 2016

2.15 pm

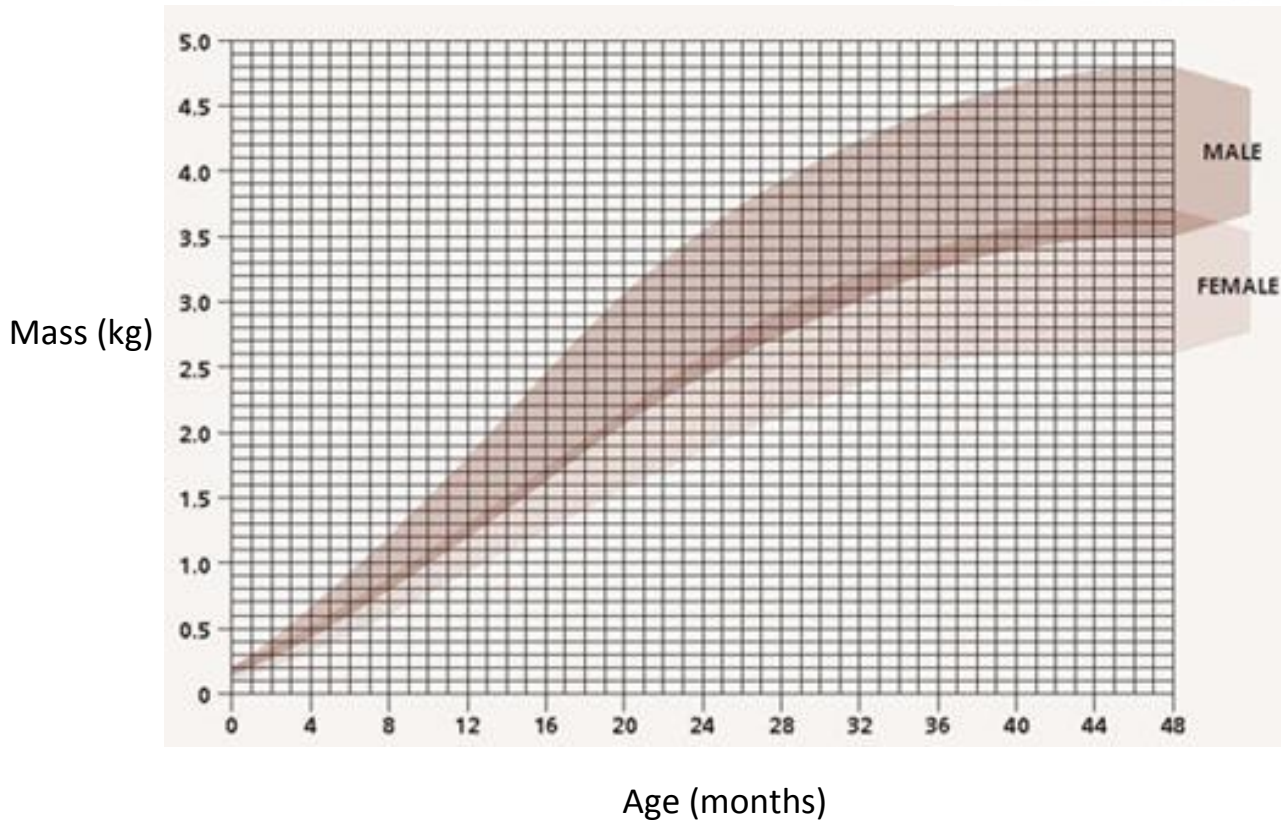
**Time allowed: 45 minutes**

*Answer all the Questions*

*You may use a calculator*

*The entire paper is worth 40 marks and the number of marks for each question is shown in brackets.*

1. The chart below can be used to record the growth of cats. The shaded regions show the typical range of masses of healthy cats of both sexes during the first 4 years of life. This was based on data from many cats.



This table shows the age and mass of one particular female cat, called Penny, who was weighed every four months between the age of four months and three years. During that time she missed one appointment due to a change of ownership.

Age (months)	Mass (kg)
4	0.3
8	0.7
12	1.1
16	1.4
20	No data
24	3.1
28	3.7
32	4.1
36	4.3

- a. Plot the data carefully onto the chart. (2)
- b. Join the points with straight lines. (1)
- c. Estimate the mass of the cat at 20 months. Answer: ..... kg (1)

d. Apart from the change of ownership, suggest what may have changed about the cat's environment between 16 and 24 months. Explain your answer. (2)

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e. A student vet examined the chart and made this statement : “Male cats are heavier than female cats”. Discuss this statement with reference to information from the chart. (3)

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f. The same vet looked at Penny's data and made this statement; “Penny is obese and needs to lose weight”. Can you trust this diagnosis? Explain your answer. (3)

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g. If Penny was obese, how could her owner help her achieve a healthier mass? (2)

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**[Total 14 marks]**

2. Feral cats are wild cats which are descended from domestic pets. The graphic on the page opposite shows the range of animals caught and eaten by one feral cat on one night in Australia. There are an estimated 20 million feral cats in Australia.

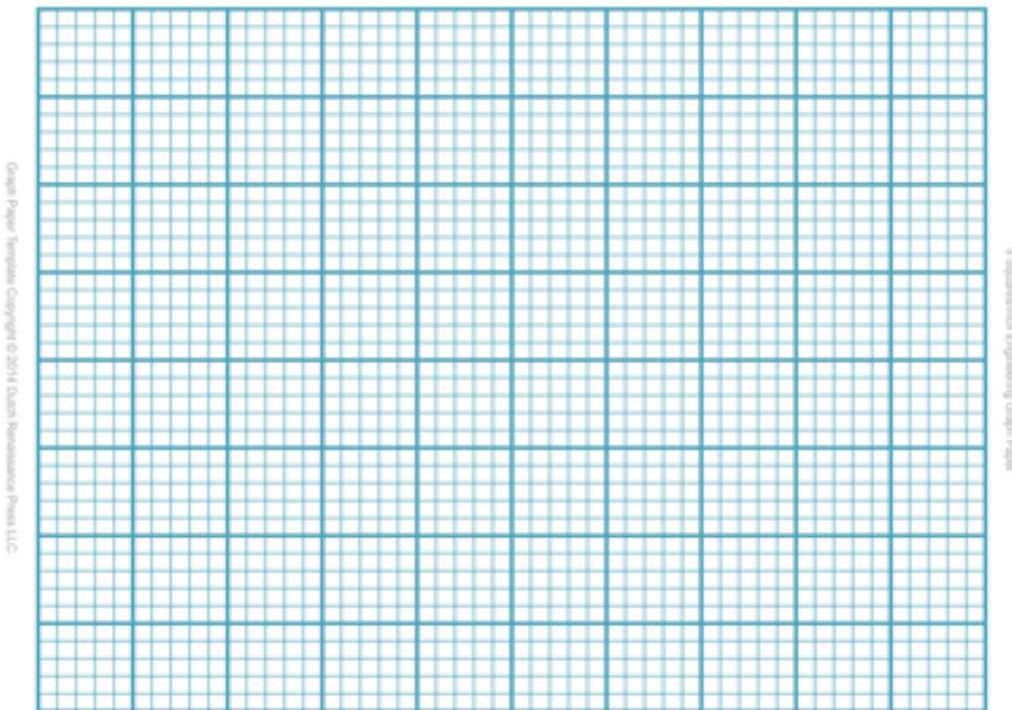
a. Use the figures provided to estimate the number of arthropods eaten by feral cats in Australia in a year. Show your working. (2)

Answer: ..... arthropods

b. What percentage of your answer to part a. (above) are scorpions? (2)

Answer: .....%

c. Draw a suitable graph or chart to compare the number of different types of dragons eaten by a single cat in one night. (3)



**1 female feral cat. 1 night**



**ate:**



**1 webbed toed gecko**



**2 painted dragons**



**2 barred wedgesnout ctenotus skinks**



**3 mallee dragons**



**4 regal striped skinks**



**5 lined earless dragons**



**5 wedgesnout ctenotus skinks**



**5 crickets, 2 centipedes, 1 grasshopper and 1 scorpion**

d. Explain why your answer to part a. (previous pages) is likely to be unreliable. (2)

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e. There were no cats in Australia prior to the arrival of European settlers in the 19<sup>th</sup> Century. Explain why the presence of feral cats in Australia may be a problem. (2)

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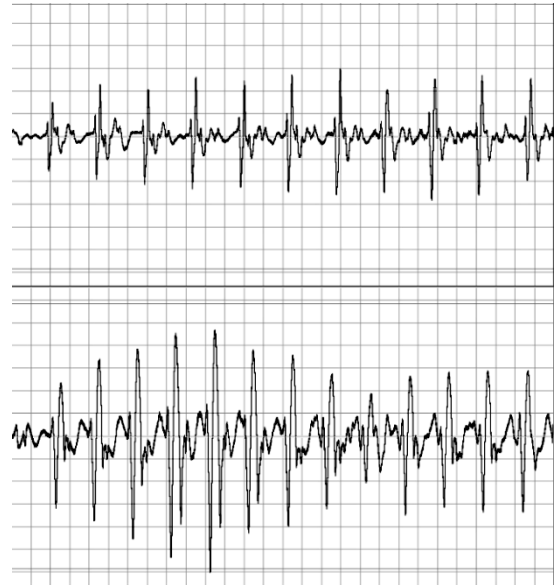
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**[Total 11 marks]**

3. Cats purr for a variety of reasons including to show pleasure or anxiety. This graph shows a 0.5 second recording of sound waves from a cheetah (top) and a domestic cat (bottom) whilst they were purring. Both graphs are to the same scale.



a. What is the frequency of the largest sound waves produced by the cheetah? (2)

Answer: ..... Hz

b. Explain how you can tell that the cheetah has a deeper purr than the domestic cat. (2)

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c. Suggest why the cheetah produces a deeper purr. (2)

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d. Which of the two cats has the louder purr? Explain your answer. (2)

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**[Total 8 marks]**

4. It has been claimed that owning a cat can be good for your health. Some of these claims can seem a bit hard to believe, such as this example from the internet.

**CAT PURRS HEALING POWER**  
stepintomygreenworld.com

**CATS CREATE PURR VIBRATIONS WITHIN A RANGE 20-140 Hz ARE MEDICALLY THERAPEUTIC FOR MANY DISEASES.**

- STRESS RELIEVER**  
Petting a purring cat calms down & lowers stress
- HEART HEALTH**  
Cats owners have 40% less risk of heart attacks
- WOUND HEALING**  
The vibrations are helpful for healing tendons and muscles
- MUSCLES HEALING**  
Cat's purr can heal infections and swelling
- DISPONEA**  
Cat's purr lowers dyspnea symptoms
- BONE HEALTH**  
Frequencies of 25 & 50 Hz are the best and 100 Hz & 200 Hz the second best frequencies for promoting bone strength.
- BLOOD PRESSURE**  
Lowers blood pressure by interacting with the cat & hearing the purring sound.

Source: gemmabusquets.com

Imagine you are a scientist who has been asked to design an investigation into whether owning a cat is good for your health. For a full scale clinical trial you will need about 3000 people, half of whom will be given a cat.

- a. Choose **one** of the claims from the graphic above which you would like to investigate. Give **TWO** reasons for your choice. (2)

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b. Suggest a good way to split the 3000 participants into two groups, so as to avoid any accidental bias in the results. (1)

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c. For the trial to be a 'fair test' you need to control as many other factors as you can. Suggest TWO factors that need to be kept the same in your trial. (2)

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Normal clinical trials will include a group of patients who take a "placebo". This is a dummy pill that contains no medicine, to make sure that patients don't just feel better because they have seen a doctor and feel they are getting some kind of treatment. The patients do not know whether they are getting the real medicine or the placebo.

d. Suggest why it would be very difficult to placebo control the effect of cats. If you can think of a way to do it, write that down too! (2)

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**[Total 7 marks]**

**End of Questions**

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