

# YEAR 12 MATHEMATICS METHODS Test 4 2016

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		(3 marks)	τὸ
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Date: Friday 2nd September		.E:	MAN
m sampling, Sample Proportions	капдот Variable, капдо	Continuous	

What is the minimum sample size that could be chosen, allowing for a margin of error

of no more than 8% with a 90% confidence level?

returned a sample proportion of 0.73.

### Q2 (2 + 4 + 5 = 11 marks)

Consider the following function:

$$f(x) = \begin{cases} 2(1-x)0 \le x \le 1 \\ 0 \text{ elsewhere} \end{cases}$$

(a) Show clearly that f(x) represents a probability distribution function.

- (b) State the EXACT value for each of the following.
  - (i) E(X)
  - (ii) Var(X)
  - (iii) If a continuous random variable Y = 2X 1, use your results from above to determine:

E(Y)

Var(Y)

(c) Represent f(x) as a cumulative distribution function.

$$P(X \leq X) = \mathcal{L}$$

Use this function to calculate

(i)  $P(0.3 \le x \le 0.6)$ 

(ii) P(x>0.8)

#### Q6 (1 + 3 + 2 = 6 marks)

The WA Medical Association conducted a survey to estimate the proportion of adults in the Perth metropolitan area who had visited a GP in the previous year. Of 150 adults surveyed 96 stated that they had been to a doctor during the previous twelve months.

- a) State the sample proportion.
- (b) Calculate a 95% confidence interval for the proportion of people in the Perth metropolitan area who had visited their local GP in the previous year and interpret your answer.

- c) It is decided that a <u>smaller</u> interval from part(b) is required. To achieve this result:
  - The sample size could be (CIRCLE the correct adjustment below).

**INCREASED** 

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DECREASED

 The percentage used on the confidence interval could be (CIRCLE the correct adjustment below).

**INCREASED** 

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#### Q7 (4 marks)

A random variable X is normally distributed such that the mean is 6 times the standard deviation and the probability that X is greater than 21.5 is 0.231. Find the mean and standard deviation of X.

## 63 (5 + 5 + 5 + 5 + 5 = 10 marks)

standard deviation of 9 500 km.
kilometres that a new tyre lasts is normally distributed with a mean of 85 000 km and a
A transport company uses the same type of tyre for all 35 of its trailers. The number of

(a) What percentage of all tyres bought will last more than 100 000 km?

(b) Two tyres are chosen at random. What is the probability that neither tyre will last for more than 100 000 km?

(c) Determine the distance that will be exceeded by 99% of all tyres.

(d) Given that a tyre has already travelled 90 000 km, what is the probability that it will not last another 5 000 km?

A trailer is fitted with 12 randomly chosen new tyres. Calculate the probability that
at least two of these tyres will last more than 100 000 km.

# 62 (3 + 5 = 2 marks)

A recent census found that 42% of the population were over 50 years of age.

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brobability that:

(i) the sample proportion of people over 50 was between 0.35 and 0.4.

(ii) more than 45% of the sample were over 50.

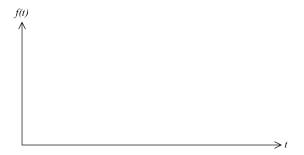
(b) Over what interval should the middle 50% of all sample proportions of people over 50 years of age lie for a sample size of 300.

# Q4 (2 + 3 + 3 + 3 = 11 marks)

As part of a local arts festival, an artist plans to create an installation in which a concealed water cannon blasts a stream of water into the air for a few seconds at random intervals. At the start of each day of the festival, the reservoir for the cannon will be filled with enough water for 15 firings.

The lengths of the intervals between each firing of the cannon can be modelled by the uniformly distributed random variable T, where  $3 \le t \le 14$  minutes.

(a) Sketch the probability density function f(t) for the interval between each firing on the axes below.



- (b) Determine the probability that a randomly chosen interval between firings is
  - (i) at least seven minutes.

(ii) at least six minutes given that it is less than 10 minutes.

- (c) (i) How many intervals will occur during the day?
  - (ii) Determine the probability that, on any one day of the festival, more than four intervals will be less than seven minutes long.

(d) Determine the value of t for which P(T < t) = P(T > 4t).