

Structure of this paper

Section	Number of questions available	Number of questions to be answered	Working time (minutes)	Marks available	Percentage of exam
Section One: Calculator-free	7	7	50	50	33
Section Two: Calculator-assumed	13	13	100	100	67
Total			150	100	

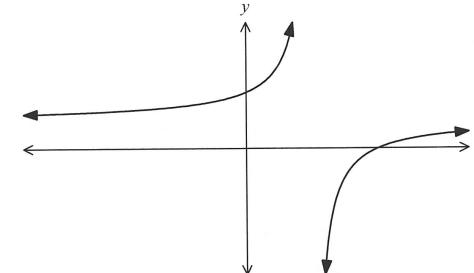
Instructions to candidates

- The rules for the conduct of Western Australian external examinations are detailed in the *Year 12 Information Handbook 2013*. Sitting this examination implies that you agree to abide by these rules.
- Write your answers in the spaces provided in this Question/Answer Booklet. Spare pages are included at the end of this booklet. They can be used for planning your responses and/or as additional space if required to continue an answer.
 - Planning: If you use the spare pages for planning, indicate this clearly at the top of the page.
 - Continuing an answer: If you need to use the space to continue an answer, indicate in the original answer space where the answer is continued, i.e. give the page number. Fill in the number of the question(s) that you are continuing to answer at the top of the page.
- Show all your working clearly. Your working should be in sufficient detail to allow your answers to be checked readily and for marks to be awarded for reasoning. Incorrect answers given without supporting reasoning cannot be allocated any marks. For any question or part question worth more than two marks, valid working or justification is required to receive full marks. If you repeat an answer to any question, ensure that you cancel the answer you do not wish to have marked.
- It is recommended that you do not use pencil, except in diagrams.

See next page

Question 20

(8 marks)

The graph of the function $y = f(x)$ is shown, with a root at $(4, 0)$ and y -intercept at $(0, 2)$.The hyperbola has asymptotes with equations $x = 2$ and $y = 1$.

Determine the

- (a) coordinates of the root of the graph
- $y = f(x - 2)$
- . (2 marks)

Was $(4, 0)$
Becomes $(6, 0)$ ✓✓

- (b) equation of the horizontal asymptote for the graph of
- $y = f(x - 2) + 3$
- . (2 marks)

Was $y = 1$
Becomes $y = 1 + 3 \Rightarrow y = 4$ ✓✓

- (c) equation of the vertical asymptote for the graph of
- $y = f(2(x + 3))$
- . (2 marks)

Was $x = 2$
Becomes $x = \frac{1}{2} \times 2 - 3 \Rightarrow x = -2$ ✓✓
(✓x for $x = -\frac{1}{2}$)

- (d) coordinates of the
- y
- intercept of the graph
- $y = 3 - f(x + 4)$
- . (2 marks)

Need to consider known root at $(4, 0)$
Becomes $(4, 0) \rightarrow (0, 0) \rightarrow (0, 3)$ ✓✓

End of questions

Question 19
Section Two: Calculator-assumed
(100 Marks)

This section has thirteen (13) questions. Answer all questions. Write your answers in the spaces provided.

A loan of \$2300 is to be repaid by monthly payments of \$220. Interest, of 9.6% p.a of the balance is added at the end of each month, just before the repayment is made. The table below shows the balance of the loan at the start and end of each month, together with the monthly interest and repayment for the first few months.

Month	Balance (Start of month)	Interest	Repayment	Balance (End of month)
1	2300.00	18.40	220.00	2098.40
2	2098.40	16.79	220.00	1895.19
3	1895.19	15.16	220.00	1690.35

Question 8
Section One: Calculator-assumed
(7 marks)

Working time for this section is 100 minutes.

A sample of 179 cats brought to a veterinary clinic over the course of one month were categorised on the basis of breed and gender as follows:

Total	Female	Male	Ragdoll	Siamese	Other	Total
179	87	92	22	28	19	179

(a) Complete the missing entries in the table above. *1 each missing/incorrect* (2 marks)

(b) What is the probability that a cat chosen at random from the sample is female Siamese?
Follow through (1 mark)

(c) How much interest is paid over the life of this loan?
Final repayment is \$211.53 (2 marks)

(d) Show that the total interest over the life of the loan approximately doubles when the repayment is halved to \$110 per month.
Now takes 23 months, with final payment of \$106.99, which is just over double previous figure. (3 marks)

(e) If the repayment was repeatedly halved, would you expect the interest to roughly double each time? Explain your answer.
No. Once the repayment has been halved three more times, it is less than the first month's interest, and so the loan would never be paid off, with interest accruing for ever. (2 marks)

(iv) a Ragdoll, given that they are female? (1 mark)

$$\frac{28}{87}$$

(iii) a Persian or a male? (1 mark)

$$\frac{111}{179}$$

(ii) a male? (1 mark)

$$\frac{92}{179}$$

(i) a female Siamese? (1 mark)

$$\frac{22}{179}$$

(a) Complete the missing entries in the table above. *1 each missing/incorrect* (2 marks)

(b) What is the probability that a cat chosen at random from the sample is female Siamese?
Follow through (1 mark)

(c) How much interest is paid over the life of this loan? (2 marks)

(d) Show that the total interest over the life of the loan approximately doubles when the repayment is halved to \$110 per month.
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(e) If the repayment was repeatedly halved, would you expect the interest to roughly double each time? Explain your answer.
No. Once the repayment has been halved three more times, it is less than the first month's interest, and so the loan would never be paid off, with interest accruing for ever. (2 marks)

(iv) a Ragdoll, given that they are female? (1 mark)

$$\frac{28}{87}$$

Question 9

(6 marks)

The number of page views of a website per day, following a TV advertising campaign, is shown in the table below.

Day (n)	1	2	3	4
Views (T_n)	275 562	91 854	30 618	10 206

Assume that this pattern continues over the next few weeks.

- (a) How many page views are expected on day five?

(1 mark)

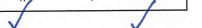
$$10206 \div 3 = 3402 \text{ views}$$



- (b) Write a recursive rule for the number of page views per day.

(2 marks)

$$T_{n+1} = T_n \div 3 \quad T_1 = 275562$$



- (c) What is the total number of page views of the website after one week?

(1 mark)

$$S_7 = 413154$$



- (d) Will the total number of page views reach half a million? Justify your answer.

(2 marks)

No. From the rule, $T_{12} = 0.5$ and so after day 12 the rule predicts no-one is viewing the website. At this time $S_{12} \approx 413343$ so 500000 will never be reached.

✓ No

✓ reason

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Question 18

(5 marks)

Using the digits 1, 2, 3, 4 and 5, with no digit used more than once, how many integers between 1000 and 9999 can be made if

R/W

- (a) there are no other restrictions?

$$5 \times 4 \times 3 \times 2 = 120$$



(1 mark)

- (b) the number must begin with the digit 5?

$$1 \times 4 \times 3 \times 2 = 24$$



(1 mark)

- (c) the number must be even?

$$2 \times 4 \times 3 \times 2 = 48$$



(1 mark)

- (d) the number must begin with the digit 5 and be even?

$$1 \times 2 \times 3 \times 2 = 12$$



(1 mark)

- (e) the number must begin with the digit 5 or be even?

$$24 + 48 - 12 = 60$$



(1 mark)

See next page

(7 marks)

Question 11Let the universal set $U = \{1, 2, 3, 4, 5, 6, 7, 8, 9\}$.Two subsets, R and Q, are such that $R = \{2, 3, 5, 7\}$ and $Q = \{1, 3, 5, 7, 9\}$.

(a) Determine

(i) $R \cap Q$

No need
for brackets

(1 mark)

(ii) $n(R \cup Q)$



(1 mark)

(b) If a number is chosen at random from the universal set, determine

(i) $P(R \cap \bar{Q})$



(1 mark)

(ii) $P(Q | \bar{R})$



(2 marks)

(c) A third subset A is such that $A \cap Q = \emptyset$, $n(A \cap R) = 1$ and $n(A) = 2$. List all such possible subsets for A.

(2 marks)

✓ for 2 subsets

✓ for 3rd subset

-1 for each additional
subset

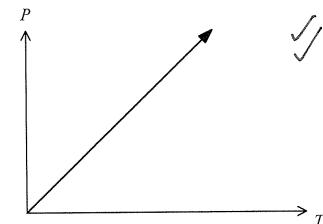
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Question 16(a) In a science experiment, quantity P was observed to be related to the another quantity T by the equation $P = \frac{T}{255}$.(i) Describe the relationship between P and T .

P is directly proportional to T



(1 mark)

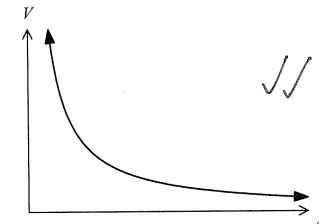
(ii) Sketch the relationship between P and T .

(2 marks)

(b) In another experiment, the quantity V was observed to be related to the another quantity A by the equation $VA = 110$.(i) Calculate A when $V = 215$.

(2 marks)

$$\begin{aligned} A &= \frac{110}{V} \\ &= \frac{110}{215} \\ &= 0.512 \end{aligned}$$

(ii) Sketch the relationship between V and A .

(2 marks)

See next page

(6 marks)

- (a) A machine fills bags of sugar so that the weights of the bags are normally distributed with a mean of 526 g and a standard deviation of 11 g.

(i) Determine the probability that a randomly selected bag weighs more than 545 g.

$$P(X > 545) = 0.042$$

(1 mark)

(iii) between 520 and 530 g.

$$P(520 < X < 530) = 0.349$$

- (c) The sugar is packed onto pallets which can hold 440 bags. How many bags on a full pallet would be expected to weigh less than 500 g?

(2 marks)

$$P(X < 500) = 0.0905$$

$$0.0905 \times 440 = 3.98 \approx 4 \text{ bags}$$

Must round to second mark

Answers we
should use
for S.F.s

the only
figures

✓ 3sf
✓ $w = 507.906$

$$P(X < w) = 0.05$$

$$w = 507.906$$

(2 marks)

(b) 5% of the bags weigh less than w grams. Find the value of w , correct to three significant figures.

✓ 3sf
✓ $w = 507.906$

(2 marks)

(1 mark)

(iii)

(1 mark)

(1 mark)

- (a) Determine the probability that a randomly selected bag weighs more than 545 g.

(6 marks)

(6 marks)

Question 12

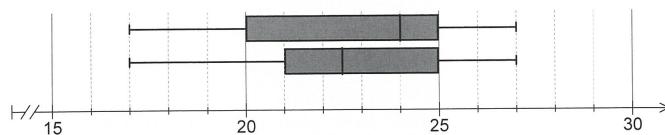
(6 marks)

(10 marks)

Question 13

37 students in a school sat a Chemistry test that had a maximum possible score of 40.

The scores of the 19 students in Class M are summarised in this boxplot.



- (a) State the interquartile range for the scores of Class M. (1 mark)

5 marks ✓

- (b) One student in Class M scored 27 out of 40. If they had scored an extra five marks, would their score be considered an outlier for the class? Justify your answer. (2 marks)

$$1.5 \times 5 = 7.5 \\ 25 + 7.5 = 32.5$$

Score of $27 + 5 = 32$ is below $1.5 \times \text{IQR}$ above Q_3 , so not outlier.

✓ Not
✓ any reasonable explanation

The scores of the remaining students, in Class P, are listed below in ascending order.

17	18	19	20	21	21
22	22	22	23	24	25
25	25	26	26	26	27

- (c) Construct a boxplot for these 18 scores on the above diagram, next to that for Class M. (3 marks)

✓ 0, 0.5
✓ median
✓ whiskers
see above

- (d) Explain which class

- (i) performed better in the test (2 marks)

Class M - had a higher median of 24 compared to 22.5 for Class P.
✓ or other reasonable explanation

- (ii) had the least skewed marks (2 marks)

Class P - its quartiles are fairly equal in width, but Class M has positive skew - width of upper half much less than width of lower half of boxplot.

✓ P
✓ reason

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(8 marks)

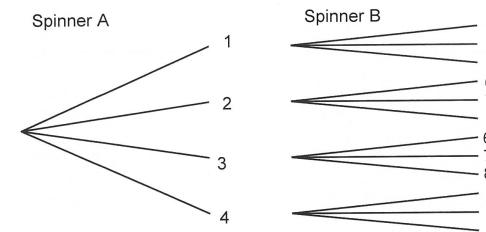
Question 14

Two spinners, A and B, are marked with both odd and even numbers.

Spinner A has sides marked 1, 2, 3 and 4 and each score has an equal chance of occurring.

Spinner B has sides marked 6, 7 and 8 and again, each score has an equal chance of occurring.

- (a) Draw a tree diagram to show all the ways spinner A and spinner B could stop. (3 marks)



✓ ✓ -1 each error/bias/solution

- (b) Determine the probability that

follow through

- (i) both spinners stop on even numbers. (1 mark)

$\frac{4}{12}$



- (ii) one spinner stops on an even and the other stops on an odd number. (1 mark)

$\frac{6}{12}$



- (iii) spinner A or spinner B stops on an even number. (1 mark)

$\frac{10}{12}$



- (iv) both spinners stop on an odd number, given that at least one spinner has stopped on an odd number. (2 marks)

$\frac{2}{8}$



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