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External assessment 2021


## Question and response book

## General Mathematics SEE

## SEE 1

## Time allowed

- Planning time - 15 minutes
- Working time - 180 minutes


## General instructions

- Answer all questions in this question and response book.
- Write using black or blue pen.
- QCAA-approved scientific calculator permitted.
- Ruler required.
- QCAA formula sheet provided.
- Planning paper will not be marked.


## Section 1 (60 marks)

- 4 short response questions


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## Section 1

## Instructions

- Questions worth more than one mark require mathematical reasoning and/or working to be shown to support answers.
- If you need more space for a response, use the additional pages at the back of this book.
- On the additional pages, write the question number you are responding to.
- Cancel any incorrect response by ruling a single diagonal line through your work.
- Write the page number of your alternative/additional response, i.e. See page ...
- If you do not do this, your original response will be marked.


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## QUESTION 1 (20 marks)

Use the data in Stimulus 1 in the stimulus book to construct two models showing the association between the production budget and worldwide box office income.
a) For Model 1, construct a scatterplot and draw a line of best fit on the scatterplot.

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Note: If you make a mistake in the scatterplot, cancel it by ruling a single diagonal line through your work and use the additional response space on page 25 of this question and response book.

[^0]b) Determine the slope and $y$-intercept of the line of best fit from Question 1a).
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c) Use the results from Question 1b) to state the equation of the line of best fit.
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d) For Model 2, develop a linear relationship by fitting a least-squares line to all the production budget and worldwide box office income data from Stimulus 1 .
e) Use the results from Questions 1c) and 1d) to develop a residual plot for each model. [10 marks]

## Model 1

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Note: If you make a mistake on the graph, cancel it by ruling a single diagonal line through your work and use the additional response space on page 26 of this question and response book.

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## Model 2

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f) Use the results from Question 1e) to evaluate which model is the more valid representation of the data from Stimulus 1.
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## QUESTION 2 (10 marks)

a) Sketch the more valid model for the data from Question 1 on the Cartesian plane. Add a corresponding label to the key.


## Key

-_ Marvel Cinematic Universe
$y=7.0982 x-416.0061$
$\mathrm{R}^{2}=0.7565$
------- All other movies
$y=3.1346 x-13.4680$ $\mathrm{R}^{2}=0.4809$

Note: If you make a mistake on the Cartesian plane, cancel it by ruling a single diagonal line through your work and use the additional response space on page 27 of this question and response book.

[^1]b) Use simultaneous equations to determine the point at which MCU movies are more profitable than Star Wars movies, based on production budget and worldwide box office income.
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c) Evaluate the reasonableness of the solution in Question 2b). In your response, include a relevant strength and a relevant limitation of the solution.
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## QUESTION 3 (15 marks)

a) Use Stimulus 2 in the stimulus book to construct a table to determine the five-point moving average of the number of MCU movies for each year of release.
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b) Use the results from Question 3a) to develop an appropriate model for the five-point moving average. Provide a graph as part of your reasoning for the choice of model.
[2 marks]
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Note: If you make a mistake on the graph, cancel it by ruling a single diagonal line through your work and use the additional response space on page 28 of this question and response book.

[^2]c) Assuming the model you developed in Question 3b) continues to be valid in the future, predict the total number of MCU movies likely to be released between 2024 and 2028 inclusive.
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d) Use Stimulus 2 to develop a model to predict the total production budget for all MCU movies likely to be released between 2024 and 2028 inclusive.
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Note: If you make a mistake on the graph, cancel it by ruling a single diagonal line through your work and use the additional response space on page 29 of this question and response book.

[^3]
## QUESTION 4 (15 marks)

a) Use the models developed in Question 3 and the information in Stimulus 3 and 4 in the stimulus book to predict the average number of people attending an opening weekend for MCU movies likely to be released between 2024 and 2028 inclusive.
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b) An entertainment critic says movies have 'broken the box office' if they achieve these targets on opening weekend:

- $\geq \$ 150$ million is spent on tickets
- $\geq 12$ million people see the movie.

Evaluate the reasonableness of using these as targets for 'breaking the box office' for
MCU movies likely to be released between 2024 and 2028 inclusive.
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## ADDITIONAL PAGE FOR STUDENT RESPONSES

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## ADDITIONAL RESPONSE SPACE FOR QUESTION 1a)

If you want this scatterplot to be marked, rule a single diagonal line through the scatterplot on page 2 .


[^5]
## ADDITIONAL RESPONSE SPACE FOR QUESTION 1e)

If you want one of these graphs to be marked, rule a single diagonal line through the graph on pages 4 or 5 .


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[^6]
## ADDITIONAL RESPONSE SPACE FOR QUESTION 2a)

If you want this Cartesian plane to be marked, rule a single diagonal line through the Cartesian plane on page 7.


## Key

Marvel Cinematic Universe
$y=7.0982 x-416.0061$
$\mathrm{R}^{2}=0.7565$
------- All other movies
$y=3.1346 x-13.4680$
$\mathrm{R}^{2}=0.4809$

[^7]
## ADDITIONAL RESPONSE SPACE FOR QUESTION 3b)

If you want this diagram to be marked, rule a single diagonal line through the diagram on page 11.

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ADDITIONAL RESPONSE SPACE FOR QUESTION 3d)
If you want this graph to be marked, rule a single diagonal line through the graph on page 15 .

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