Insight Publications

INSIGHT

Trial Exam Paper

2008

FURTHER MATHEMATICS

Written examination 1

MULTIPLE-CHOICE QUESTION BOOK

Reading time: 15 minutes
Writing time: 1 hour 30 minutes

Structure of book

Section	*Number of questions*	*Number of questions to be answered*	*Number of modules*	*Number of modules to be answered*	*Number of marks*
A	13	13			13
B	54	27	6	3	27
					Total 40

- Students are permitted to bring the following items into the examination: pens, pencils, highlighters, erasers, sharpeners, rulers, one bound reference that may be annotated (can be typed, handwritten or a textbook), one approved graphics calculator (memory DOES NOT have to be cleared) and, if desired, one scientific calculator.
- Students are NOT permitted to bring blank sheets of paper or white out liquid/tape into the examination.

Materials provided

- The question and answer book of 39 pages, with an answer sheet for the multiple-choice questions.
- A separate sheet with miscellaneous formulas.
- Working space is provided throughout the question book.

Instructions

- Write your **name** in the box provided on the multiple-choice answer sheet.
- Remove the formula sheet during reading time.
- Unless otherwise indicated, diagrams in this book are **not** drawn to scale.

At the end of the examination

- You may keep this question book.

Students are NOT permitted to bring mobile phones or any other electronic devices into the examination.

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Working space

SECTION A

Instructions for Section A

Answer **all** questions in pencil on the answer sheet provided for multiple-choice questions.
Choose the response that is **correct** for the question.
One mark will be awarded for a correct answer; no marks will be awarded for an incorrect answer.
Marks **are not** deducted for incorrect answers.
No marks will be awarded if more than one answer is completed for any question.

Core – Data Analysis

Questions 1 and 2 refer to the following information.

A dice was rolled 20 times with the following results shown on a frequency table.

Number on die	Frequency
1	2
2	5
3	3
4	2
5	4
6	4

Question 1

The percentage of rolls that resulted in an even number was

A. 9%
B. 11%
C. 24%
D. 50%
E. 55%

Question 2

The mode and mean respectively for this data was

A. 4 and 3.65
B. 4 and 3.5
C. 2 and 3.65
D. 2 and 3.5
E. 3.5 and 4

Question 3

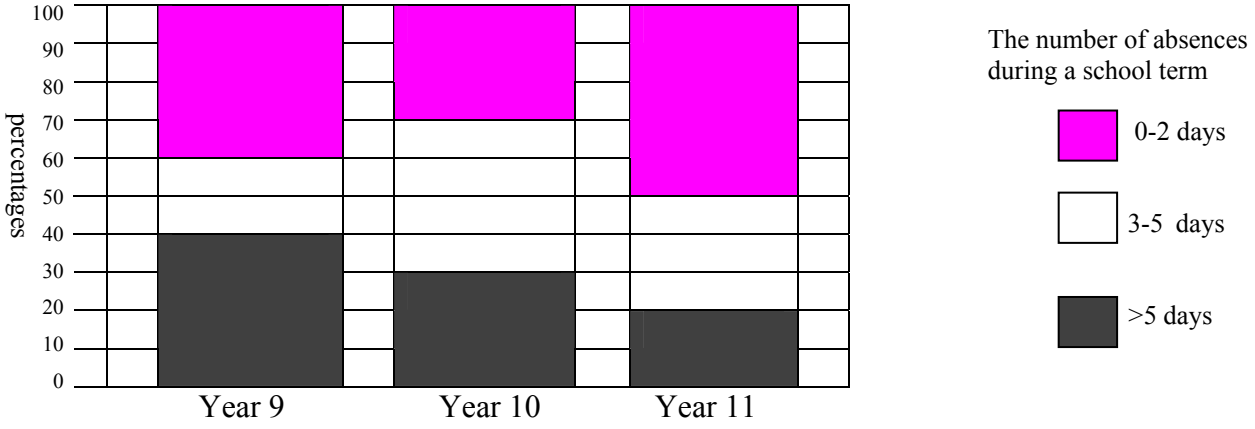
A statistically minded athlete has evaluated her 400 metre efforts. She has noticed that the data shows a bell shaped distribution with a mean of 65.2 seconds and a standard deviation of 1.3 seconds.

If she then runs a time of 66.8 seconds, which of the following statements is closest to summarising her effort?

A. This time is in the top 16% of her efforts.
B. This time is in the bottom 16% of her efforts.
C. This time is close to the average of her efforts.
D. This time is in the top 2% of her efforts.
E. This time is in the bottom 2% of her efforts.

Question 4

The segmented bar chart below shows the distribution of the number of days absent over one term for secondary students at particular year levels.



From these results, the percentage of Year 11 students who were absent for at least 3 days in the term is

A. 20
B. 30
C. 50
D. 70
E. 100

Question 5

Joan received a test score of 72. The class standard deviation for this test was 12. If Joan's z-score was 1, the class average was

A. 13
B. 73
C. 84
D. 60
E. 71

Questions 6 and 7 refer to the following information.

A group of 14 people were given a page to type and the number of errors they had was recorded in the PRE column below.

After an extensive two hour program on keyboard skills the group were given another page to type, similarly these errors were also recorded, in the POST column below.

PRE	Stem	POST
7, 6, 3	0	1, 4, 5, 8, 8, 9
7, 7, 3, 0	1	0, 0, 5, 8
8, 5, 1, 1, 0	2	1, 2, 4
4, 0	3	0

Question 6

From this back to back stem leaf plot summary, which of the following observations is true?

	PRE		POST	
	Median	Inter-quartile range	Median	Inter-quartile range
A.	13	17	10	17
B.	18.5	15	10	13
C.	17	31	8	29
D.	17	17	13.2	13
E.	18.5	15	8	17

Question 7

The data for PRE and POST results respectively can be summarised as

A. both are continuous variables with symmetrical and negative skewing.
B. both are continuous variables with symmetrical and positive skewing.
C. both are discrete variables with symmetrical and negative skewing.
D. both are discrete variables with symmetrical and positive skewing.
E. both are categorical data sets with symmetrical and positive skewing.

Question 8

The goals scored by a soccer team in a month are shown in the table below:

Month	May	June	July	August	Sept	Oct	Nov	Dec
Total Goals	12	15	12	13	8	19	11	14

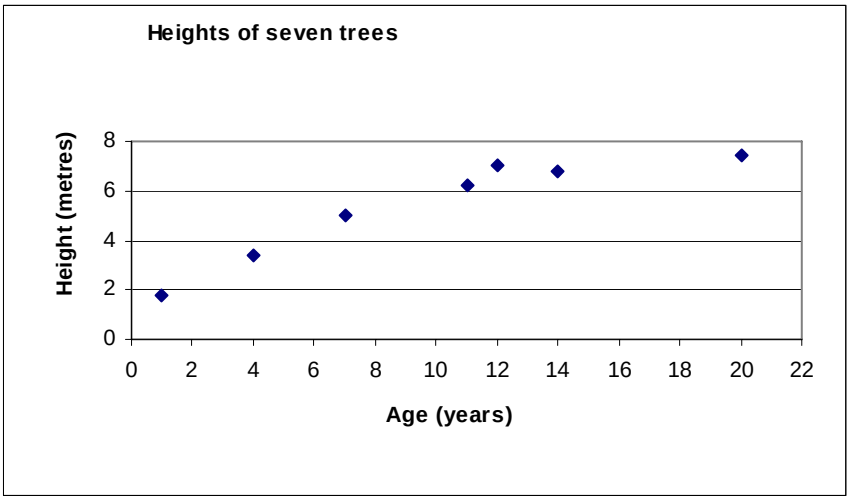
Using 4 point moving medians, the smoothed centred value for Sept is

A. 8
B. 12.875
C. 12
D. 12.5
E. 12.25

Question 9

The ages and heights of seven exotic species of trees were recorded in the table and shown on the scatterplot below.

Age (years)	1	4	7	11	12	14	20
Height (metres)	1.8	3.4	5.0	6.2	7.0	6.8	7.4



It was found that an error was transcribed for the **11 year old** tree. The actual height of the 11 year old tree is more than 7.5 metres.

Knowing that it had the **largest** height of all these trees what effect would this new value have on the previously calculated values of the 3-median regression line?

A. The regression line would not be affected.

B. The gradient will increase but the vertical intercept remains the same.

C. The gradient and the vertical intercept both increase.

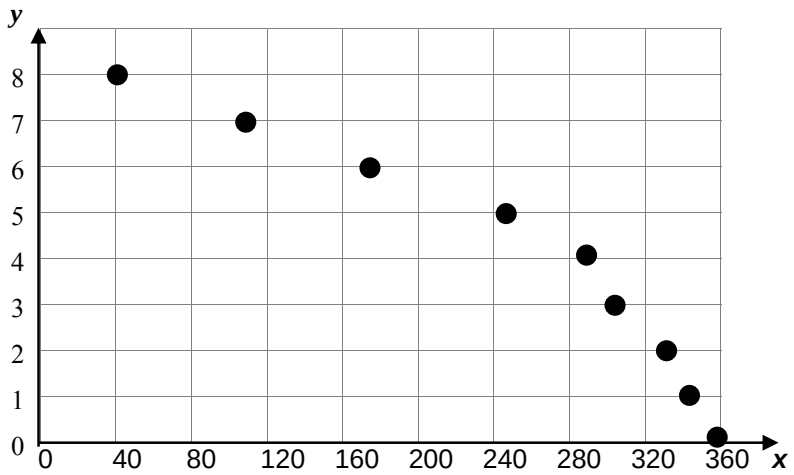
D. The gradient remains the same but the vertical intercept increases.

E. Impossible to calculate because of missing data.

Questions 10 and 11 refer to the following data.

Nathan uses the following data to construct a scatterplot as shown below.

x	360	345	330	304	285	245	172	110	40
y	0	1	2	3	4	5	6	7	8



Question 10

To linearise the data a y^2 transformation is applied. The least squares regression line is closest to

A. $y^2 = 71.88 - 0.20x$

B. $y^2 = 9.68 - 0.02x$

C. $y^2 = 8.04 - 0.01x$

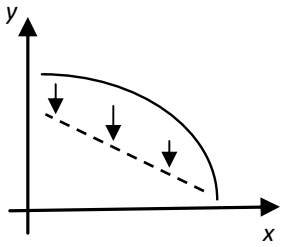
D. $y^2 = 400.78 - 35.33x$

E. $y^2 = 355.11 - 4.53x$

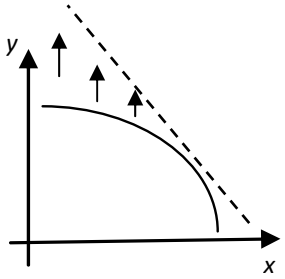
Question 11

Which of the following best describes why Nathan chose to use the y^2 transformation?

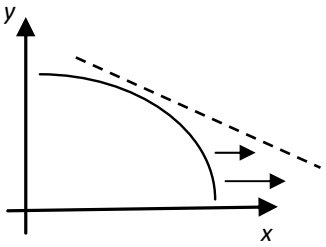
A. y^2 compresses the vertical scale, intending to linearise the data.



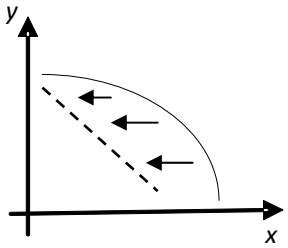
B. y^2 expands the vertical scale, intending to linearise the data.



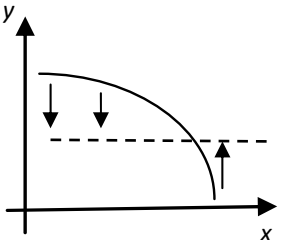
C. y^2 expands the horizontal scale, intending to linearise the data.



D. y^2 compresses the horizontal scale, intending to linearise the data.

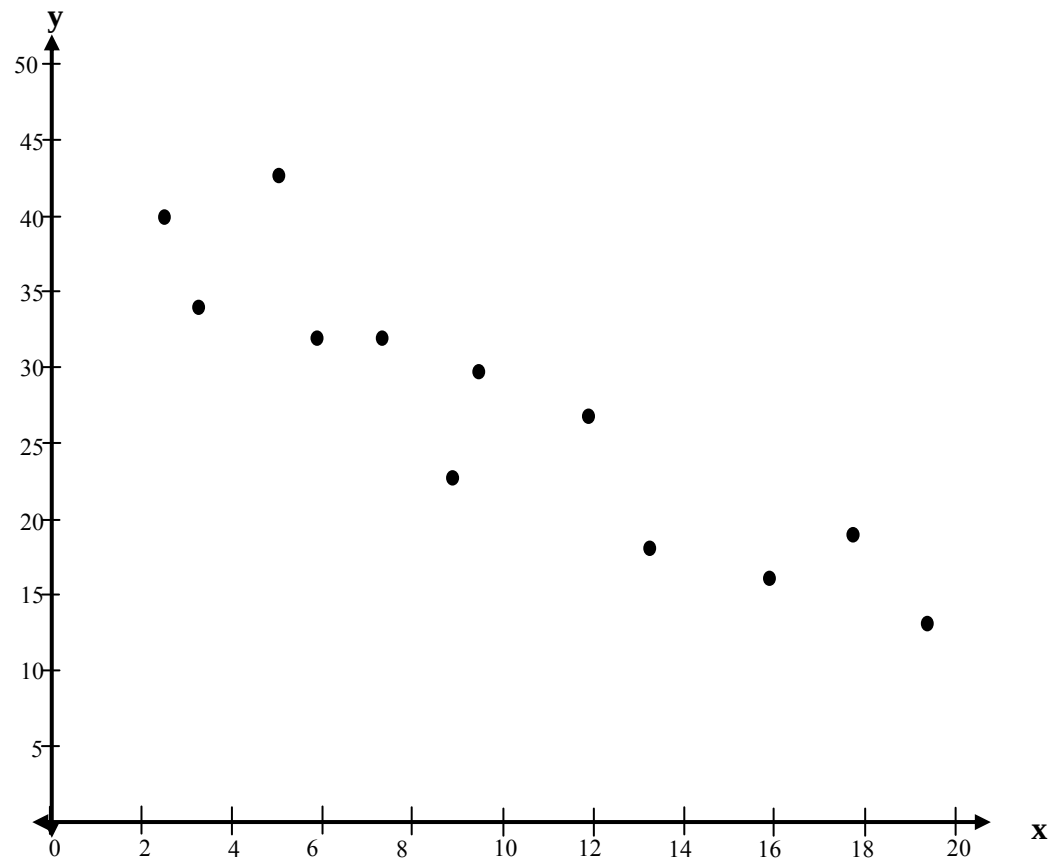


E. y^2 both expands and compresses along the median of the vertical scale, intending to linearise the data.



Question 12

Data collected has been summarised on the following graph.



The coefficient of determination for the above data is 0.8118. This would indicate that the linear association between both variables has a Pearson coefficient value of

A. 0.9010
B. -0.9010
C. 0.6590
D. -0.6590
E. 2.0000

Question 13

The table below shows the number of sales for a particular firm during 2007.

Quarter	1	2	3	4
Sales for 2007	630	840	1 005	980
Seasonal Index	0.67	0.95	1.18	1.20

Using all data including previous years` sales, the regression line was found to be:

$y = 560 + 120x$ where y is the Number of Sales
and x is the Number of Quarters from end of 2006

(Note: Quarter 1 in 2007 will mean $x = 1$)

The predicted deseasonalised figure for Quarter 1 in 2008 would be

A. 1 160
B. 780
C. 1 164
D. 3 400
E. 1 731

END OF SECTION A
TURN OVER

SECTION B

Instructions for Section B

Select **three** modules and answer **all** questions within the modules selected on the answer sheet provided.
Indicate the modules you are answering by shading the matching boxes on your multiple-choice answer sheet.
Choose the response that is **correct** for the question.
One mark will be awarded for a correct answer; no marks will be awarded for an incorrect answer.
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SECTION B

Module 1: Number Patterns

Before you answer these questions you must **shade** the Number patterns box on the answer sheet for multiple-choice questions.

Question 1

An arithmetic sequence is

36 32 28 …

Which term would give a value of -4?

A. 7
B. 9
C. 10
D. 11
E. 12

Question 2

The first four terms of a geometric sequence are { -12, x, -3, 1.5 … }.

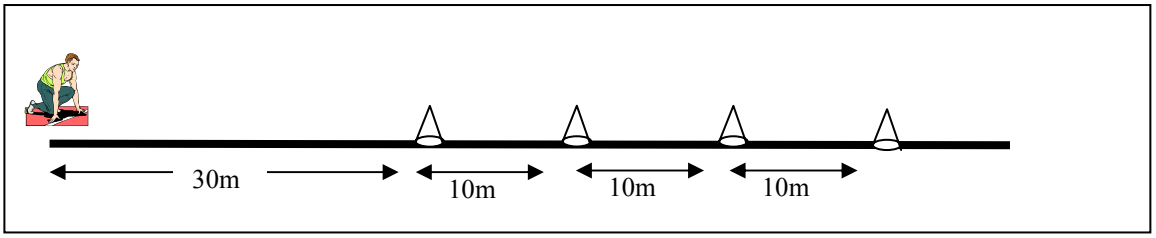
The value of x for this sequence is

A. 7.5
B. -7.5
C. 9
D. 6 or -6
E. 6

The following information relates to questions 3, 4 and 5.

As part of his stamina training, Nic places 4 cones in a straight line, each 10 metres apart. Nic starts 30 metres from the first cone.

He runs to the first cone then returns back to the start before then running to the second, then third and finally fourth. Each time he returns to the start before running to the next cone.



Question 3

The sequence to show the distance to and from the n^{th} cone would be best described as

A. An arithmetic sequence with a = 60 and d = 20
B. An arithmetic sequence with a = 60 and d = 10
C. An arithmetic sequence with a = 30 and d = 10
D. A geometric sequence with a = 60 and r = 4/3
E. A geometric sequence with a = 60 and r = 3/4

Question 4

If A_n is the distance from the start to the n^{th} cone and back to the start, a difference equation that can be used to model the distance is

A. $A_{n+1} = 40 + 20n$ where $A_1 = 60$
B. $A_{n+1} = 2A_n + 20$ where $A_1 = 30$
C. $A_{n+1} = 2A_n + 10$ where $A_1 = 30$
D. $A_n+1 = A_n + 20$ where $A_1 = 60$
E. $A_{n+1} = A_n + 10n$ where $A_1 = 60$

Question 5

More cones are added at intervals of 10 metres. Find the minimum number of cones needed so that the total distance he runs is at least 2 kilometres.

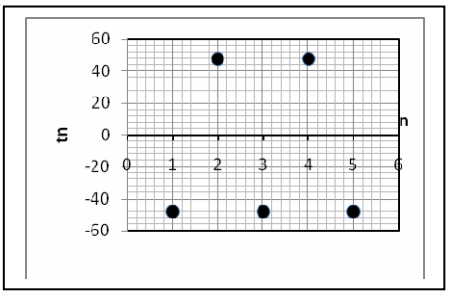
A. 9
B. 10
C. 11
D. 12
E. 13

Question 6

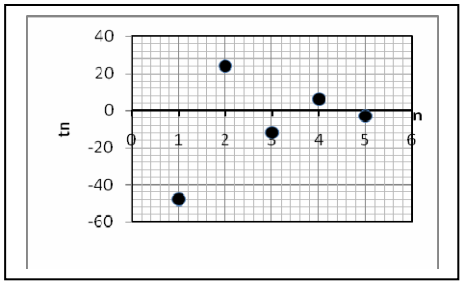
A geometric sequence follows the rule $t_n = 96\left(\frac{-1}{2}\right)^n$

A graph that represents the first five terms of this sequence is

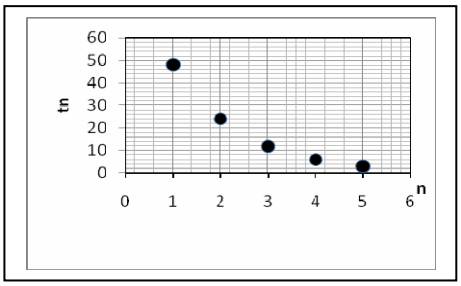
A.



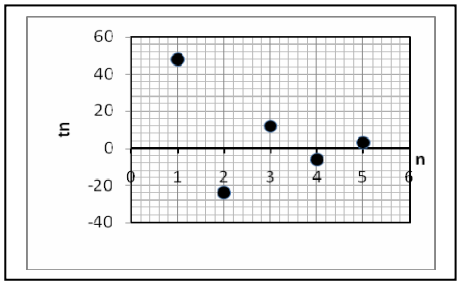
B.



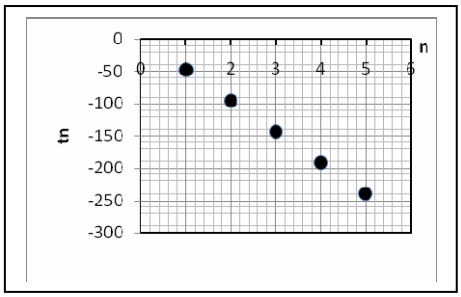
C.



D.



E.



Question 7

The sum of an infinite geometric series is $243/5$.

If the first term is 81, the common ratio value is

A. $2/3$

B. $-2/3$

C. $2/5$

D. $-8/3$

E. $-2/5$

Question 8

In the first year of its operation, an investment company has five properties on its portfolio. The aim of the company each year is to double the previous year's number of property investments minus one.

Let P_n represent the number of investment properties the company has in the *n*th year. The difference equation that describes the company's aims is

A. $P_n = 2P_{n+1} + 5$ where $P_1 = 5$

B. $2P_n = P_{n-1} - 1$ where $P_1 = 5$

C. $P_{n+1} = 2P_n - 1$ where $P_1 = 5$

D. $2P_{n+1} = 5P_n - 1$ where $P_1 = 5$

E. $P_{n+1} = 2P_n + 1$ where $P_1 = 5$

Question 9

A difference equation is defined by

$$t_n = t_{n-2} + 2t_{n-1}$$

Given that $t_9 = 746$ and $t_{10} = 1081$, the twelfth term (t_{12}) of this sequence is

A. 6897

B. 4344

C. 7332

D. 3293

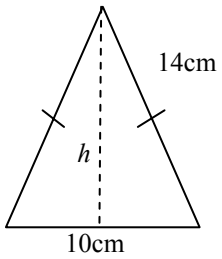
E. 2908

Module 2: Geometry and trigonometry

Before you answer these questions you must **shade** the Geometry and trigonometry box on the answer sheet for multiple-choice questions.

Question 1

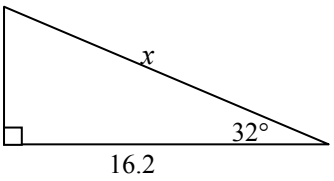
The isosceles triangle beside has a slant height of 14cm with a base of 10 cm.



The vertical height, h, to two decimal places is

A. 14.87 cm
B. 14.86 cm
C. 13.07 cm
D. 13.08 cm
E. 9.80 cm

Question 2



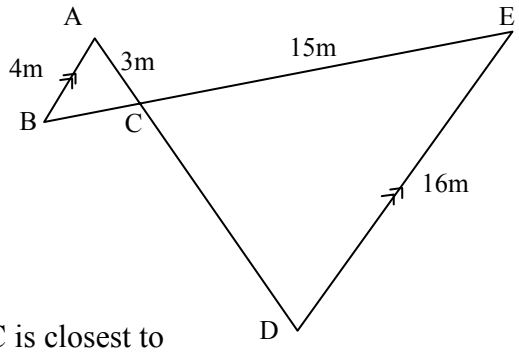
The value of x to one decimal place is

A. 8.5 m
B. 8.6 m
C. 13.7 m
D. 19.1 m
E. 30.6 m

Question 3

Beside are two similar triangles:

ABC and CDE

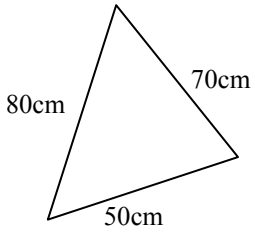


The area of ΔCDE is 84 m^2, the area of ΔABC is closest to

A. 5.25 m^2
B. 9.33 m^2
C. 21 m^2
D. 336 m^2
E. 1344 m^2

Question 4

A piece of carpet has the form of a scalene triangle with dimensions as shown beside.

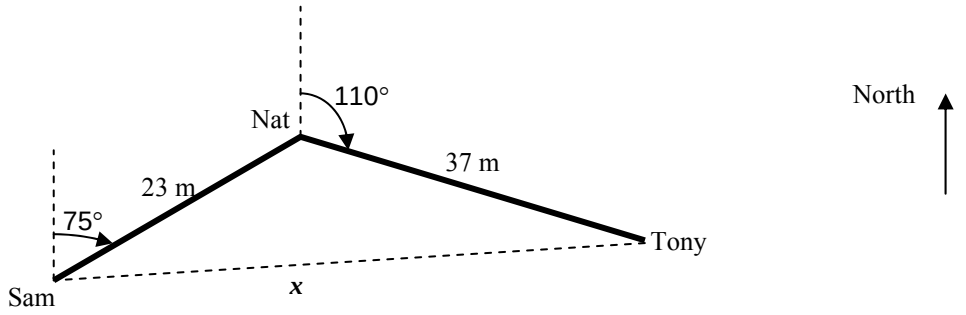


The area in square metres correct to two decimal places is

A. 1732.05 m^2
B. 0.17 m^2
C. 2.16 m^2
D. 17.32 m^2
E. 216.33 m^2

The following information relates to questions 5 and 6.

Sam, the hockey goalie, hits the ball to Nat 23 metres away at a bearing of 075°T. Nat then hits the ball downfield to Tony who is 37 metres away at 110°T.



Question 5

The true bearing of Sam from Nat is

A. 075°T
B. 075°T
C. 115°T
D. 075°T
E. 255°T

Question 6

The distance from Tony to Sam, ***x***, can be found correctly by using which formula?

A. $x^2 = 23^2 + 37^2 - 2 \times 23 \times 37 \cos(250^\circ)$

B. $x^2 = 23^2 + 37^2 - 2 \times 23 \times 37 \cos(145^\circ)$

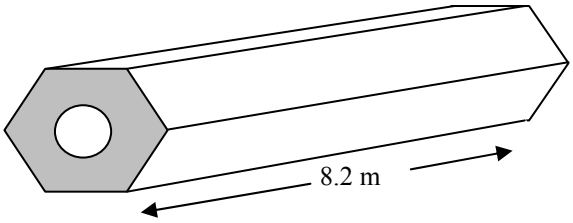
C. $x = 60 \times \cos(15^\circ)$

D. $x = \dfrac{\sin(145)}{\sin(15)} \times 37$

E. $x = \dfrac{\sin(145)}{\sin(75)} \times 23$

Question 7

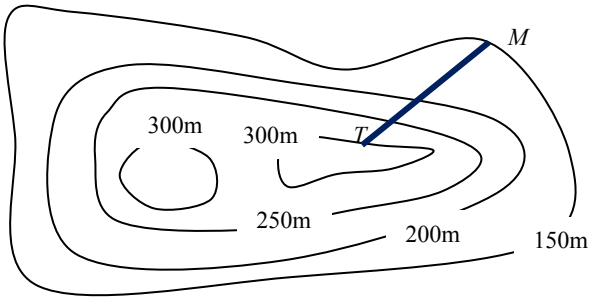
A steel hexagonal pipe is used as part of a modern art construction. The **volume** of this prism is 2.05 m^3, and it is 8.2 m long.



In square metres, the shaded cross-sectional area is closest to

A. 4.1 m^2
B. 0.0625 m^2
C. 0.25 m^2
D. 16.81 m^2
E. 70.644 m^2

Question 8



Scale 1: 20000

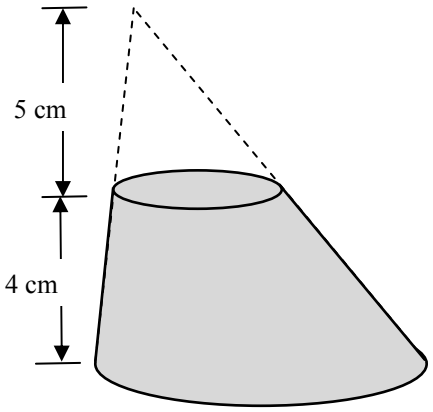
For the contour map above, the segment *MT* has a length of 2.5 cm on the map.

With aid of the scale the average gradient of the segment is

A. $\frac{2}{5}$
B. $\frac{1}{60}$
C. $\frac{3}{1000}$
D. $\frac{3}{10}$
E. $\frac{10}{3}$

Question 9

A skewed cone has the top sliced off in such a way that the top is parallel to the base.



The perpendicular height of the removed section is 5cm and the perpendicular height of the remaining section is 4cm.

The ratio of the **volumes** of the removed section to the remaining section is

A. 125 : 729
B. 125 : 604
C. 125 : 64
D. 5 : 9
E. 5 : 4

Module 3: Graphs and relations

Before you answer these questions you must **shade** the Graphs and relations box on the answer sheet for multiple-choice questions.

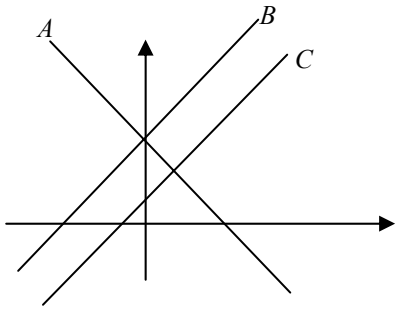
Question 1

The equation $2y - 3x = -12$ has intercept(s) of

A. (-6, 0) and (0, 4)
B. (2, 0) and (0, -3)
C. (4, 0) and (0, -6)
D. (-4, 0) and (0, -6)
E. (4, -6)

Question 2

Below is a graph with three lines *A, B* and *C* sketched. Unfortunately most labels and numerals have been omitted.



It is known that these lines belong to the following three equations:

i. $y = 2x + 4$
ii. $y - 2x = 1$
iii. $y + 2x = 4$

The correct match-up with equations and lines is

A. i $\rightarrow$ A; ii $\rightarrow$ B; iii $\rightarrow$ C
B. i $\rightarrow$ B; ii $\rightarrow$ C; iii $\rightarrow$ A
C. i $\rightarrow$ B; ii $\rightarrow$ A; iii $\rightarrow$ C
D. i $\rightarrow$ C; ii $\rightarrow$ B; iii $\rightarrow$ A
E. i $\rightarrow$ C; ii $\rightarrow$ A; iii $\rightarrow$ B

Question 3

Nic, an endurance athlete runner, starts at 200 km from his destination. He maintains a constant pace throughout his run and completes the distance in 25 hours of running.

The distance, D km, that Nic is from his destination at anytime t hours can be found according to the rule

A. $D = 8t$

B. $D = 200 - 25t$

C. $D = 200 - 8t$

D. $D = 25t$

E. $D = 200 + 25t$

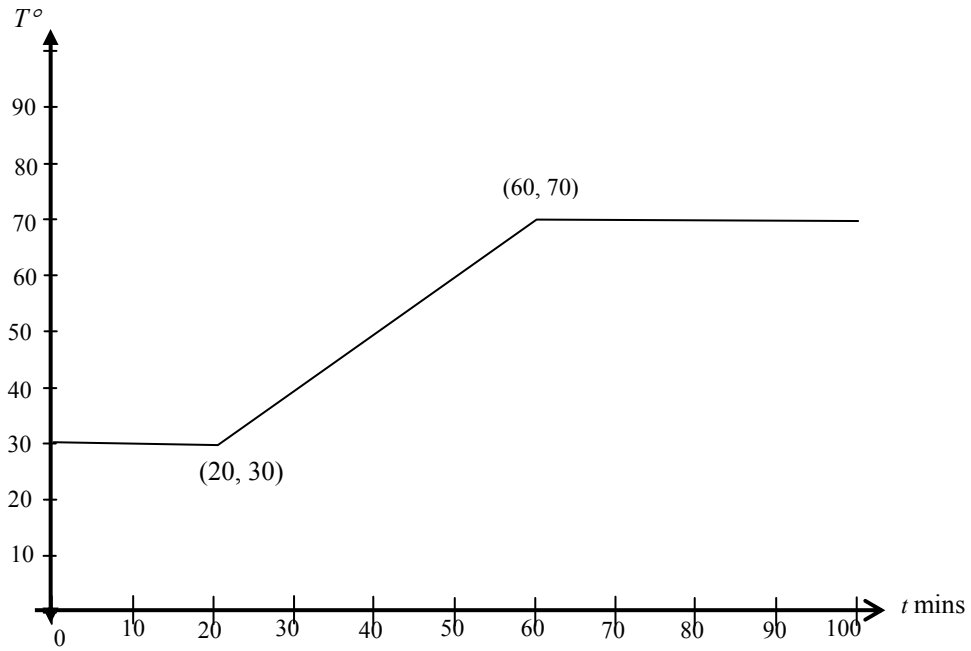
The following graph relates to Questions 4 and 5.

The temperature, *T° Celsius*, of an oven is regulated over a normal working day.

For the first 20 minutes it is maintained at a constant temperature of 30°. For the next forty minutes it is gradually heated until it reaches a maximum temperature of 70°.

It maintains this temperature for the remainder of the working day.

The graph of temperature, T, versus time, t, is shown below.



Question 4

Which of the following statements is NOT true?

A. The rate of heating from 20 to 60 mins is 1° per min.

B. The temperature after 1.5 hours is 70°.

C. The maximum temperature for the working day is 70°.

D. In the first 80 minutes, the average gradient is 0.5° per min.

E. After 100 mins the oven is cooled.

Question 5

Which of the following rules best describes the graph above?

A. $T = \begin{cases} 30 & \text{for } 0 \le t \le 20 \\ t + 10 & \text{for } 20 < t \le 60 \\ 70 & \text{for } t > 60 \end{cases}$

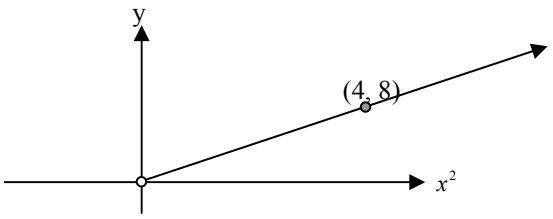
B. $T = \begin{cases} 20 & \text{for } 0 \le t \le 30 \\ t + 10 & \text{for } 30 < t \le 70 \\ 60 & \text{for } t > 70 \end{cases}$

C. $T = \begin{cases} 30 & \text{for } 0 \le t \le 20 \\ t - 10 & \text{for } 20 < t \le 60 \\ 70 & \text{for } t > 60 \end{cases}$

D. $T = \begin{cases} 30 & \text{for } 0 \le t \le 20 \\ \frac{7}{6}t & \text{for } 20 < t \le 60 \\ 70 & \text{for } t > 60 \end{cases}$

E. $T = \begin{cases} 30 & \text{for } 0 \le t \le 30 \\ t + 10 & \text{for } 30 < t \le 70 \\ 70 & \text{for } t > 70 \end{cases}$

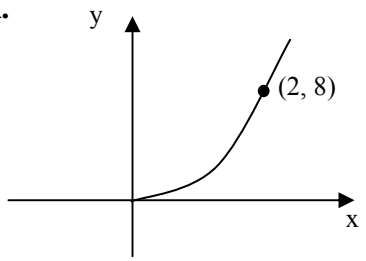
Question 6



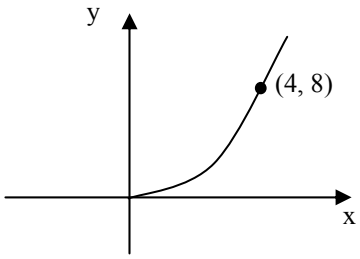
The graph connecting y and x^2 is shown above.

The graph that shows the same relationship between y and x is

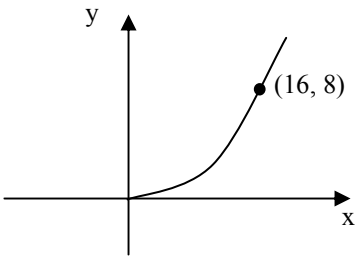
A.



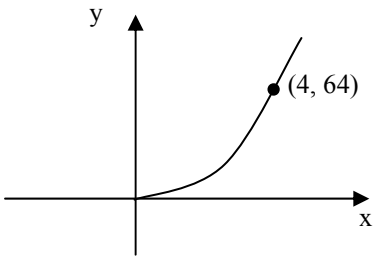
B.



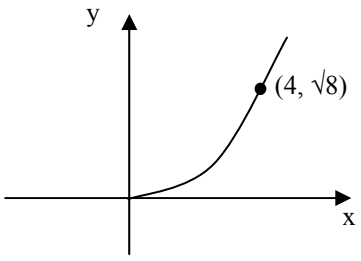
C.



D.



E.



Question 7

A freight container can take a maximum weight of 600 kg. It is to be loaded with two varieties of boxes. Box A weighs 20 kg and box B weighs 35 kg.

Due to the size of the container the maximum number of boxes it can hold is 25.

If A is the number of Box A, and B is the number of box B, the inequalities that best show the constraints are

A. $A + B \leq 55$; $A + B \leq 25$

B. $A + B \leq 545$; $A + B \leq 25$

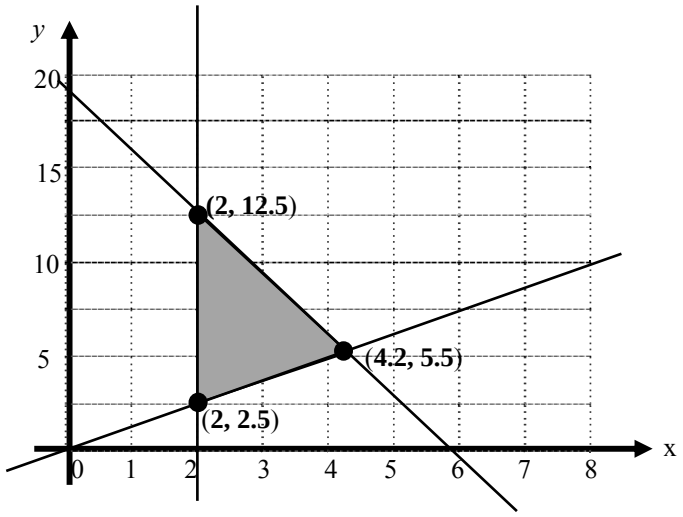
C. $A + B \leq 600$; $20A + 35B \leq 25$

D. $20A + 35B \leq 600$; $A + B \leq 25$

E. $20A + 35B \geq 600$; $A + B \geq 25$

Question 8

The shaded area below shows the feasible region.



The objective function, z, is given by the equation

$$z = 1.5x - 2y$$

Using the feasible region above the maximum value of z is

A. -22

B. -2

C. -4.7

D. 28

E. 22

Question 9

A linear programming problem has the following constraints.

$$y + 2x \leq 12$$
$$3y - 2x \geq 6$$
$$x \geq 3, y \geq 0$$

A point that lies in the feasible region is

A. (2, 5)

B. (2, 3)

C. (4, 0)

D. (3, 2)

E. (3, 5)

Module 4: Business-related mathematics

Before you answer these questions you must **shade** the Business-related mathematics box on the answer sheet for multiple-choice questions.

Question 1

$5000 is invested at a simple interest rate of 4% per annum.

The total amount after 30 months is

A. $5 515.10
B. $5 500
C. $600
D. $500
E. $375

Question 2

In April, Lyn received the following statement from her bank showing all the transactions from her savings for the month of March.

Date	Transaction	$ Debit	$ Credit	$ Balance
1 Mar	Balance forward			985.90
9 Mar	Withdrawal	234.00		751.90
18 Mar	Deposit		400.00	1 151.90

Interest is calculated on the minimum monthly balance. If the amount of interest Lyn received for March was $1.50; the rate of interest, correct to 1 decimal place, was

A. 0.2% p.a.
B. 1.6% p.a.
C. 1.9% p.a.
D. 2.4% p.a.
E. 28.8% p.a.

Question 3

Furniture is valued at $12 000. On a hire purchase plan, it can be purchased with a deposit of $1 000.

The total paid for the furniture over 4 years on this plan is $16 000 which includes the deposit.

The flat rate of interest p.a. charged on hire purchase correct to 2 decimal places is

A. 33.33%
B. 36.36%
C. 10.00%
D. 8.33%
E. 9.09%

Question 4

Lyn invested $15 5000 in an ordinary perpetuity. The interest rate for the investment is 7.4% per annum.

The amount of pension she receives monthly from this perpetuity is closest to

A. $3 600
B. $621
C. $956
D. $11 470
E. $13 870

Question 5

Nic needs $4 500 in two years' time. He invests into an account that is advertised at 7.8%p.a. with interest compounded **daily**.

The original amount he needs to invest to the nearest dollar is

A. $3 850
B. $3 872
C. $3 889
D. $5 229
E. $5 260

Question 6

For tax purposes a person uses reducing balance depreciation of 15% to calculate the book value of a photocopier. After 2 years the book value of the copier is $4 600.

The original value of the photocopier was approximately

A. $5 980
B. $6 080
C. $6 370
D. $6 570
E. $204 440

Question 7

Stamp Duty is payable to the state government on a property transaction according to the following rate schedule.

Transfer of Real Property rates	
Range	**Rate**
\$0 – \$20 000	1.4 per cent of the price of the property
\$20 001 – \$115 000	\$280 plus 2.4 per cent of the price in excess of \$20 000
\$115 001 – \$870 000	\$2 560 plus 6 per cent of the price in excess of \$115 000
More than \$870 000	5.5 per cent of the price value

An owner pays stamp duty of \$18 000.

The price of the property lies within the range

A. \$0 – \$20 000
B. \$20 001 – \$115 000
C. \$115 001 – \$870 000
D. More than \$870 000
E. Over \$1 million

Question 8

Joan borrows \$12 000 and makes monthly repayments of \$400.

The interest rate is 8% p.a. calculated monthly on the reducing balance of the loan.

Find the total amount of interest Joan has paid, immediately after making her **tenth** payment, to the nearest dollar.

A. \$16
B. \$702
C. \$800
D. \$824
E. \$4 947

Question 9

Torie invests a sum of \$3 200 into an account earning an interest rate of 7.2%p.a. compounded monthly. Into the same account she also decides to make monthly installments of \$60.

After 2 years the **total** Torie has in her account is closest to

A. \$2 150
B. \$3 359
C. \$5 134
D. \$5 178
E. \$5 238

Module 5: Networks and decision mathematics

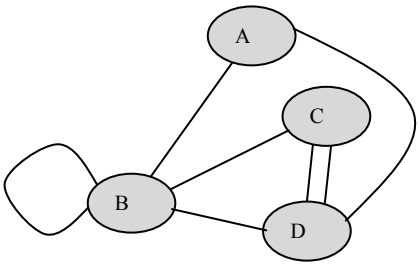
Before you answer these questions you must **shade** the Networks and decisions mathematics box on the answer sheet for multiple-choice questions.

Question 1

The number of edges on a COMPLETE network with six vertices is

A. 5
B. 12
C. 15
D. 21
E. 25

Question 2



An adjacency matrix to represent the network is:

A.
$$\begin{bmatrix} 0 & 1 & 0 & 1 \\ 1 & 1 & 2 & 1 \\ 0 & 2 & 0 & 1 \\ 0 & 1 & 1 & 0 \end{bmatrix}$$

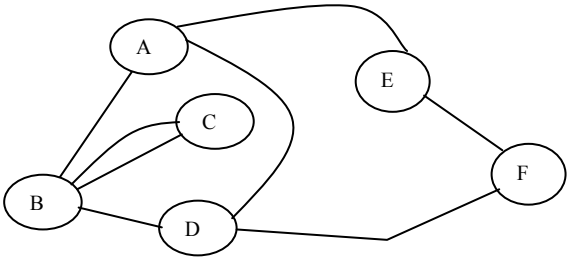
B.
$$\begin{bmatrix} 0 & 1 & 0 & 0 \\ 0 & 0 & 2 & 0 \\ 1 & 1 & 0 & 1 \\ 0 & 1 & 0 & 0 \end{bmatrix}$$

C.
$$\begin{bmatrix} 0 & 1 & 1 & 0 \\ 1 & 2 & 1 & 1 \\ 0 & 1 & 0 & 0 \\ 0 & 1 & 1 & 0 \end{bmatrix}$$

D.
$$\begin{bmatrix} 0 & 1 & 0 & 1 \\ 1 & 1 & 1 & 1 \\ 0 & 1 & 0 & 2 \\ 1 & 1 & 2 & 0 \end{bmatrix}$$

E.
$$\begin{bmatrix} 0 & 1 & 0 & 1 \\ 1 & 2 & 1 & 1 \\ 0 & 1 & 0 & 3 \\ 1 & 1 & 2 & 0 \end{bmatrix}$$

Question 3

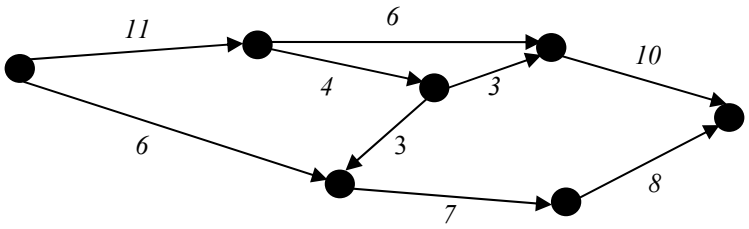


To make this Network contain an Euler circuit, an edge needs to be added connecting the following vertices:

A. A to D
B. A to F
C. B to D
D. B to F
E. C to D

Question 4

The following directed graph shows the weight of each edge.

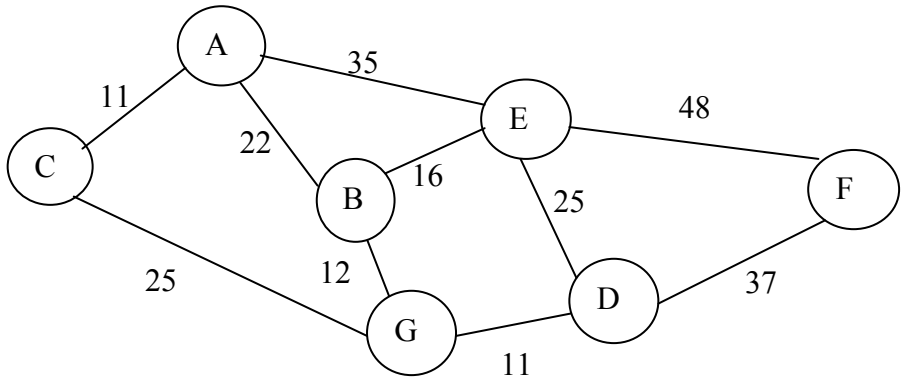


The minimum cut for this directed graph is

A. 18
B. 17
C. 16
D. 15
E. 14

Questions 5 and 6 refer to the following network.

For a shire, the graph below shows the major towns A, B…G connected by the main roads. All distances are in kilometres.



Question 5

The sporting board for this shire wishes to organise a bike road race to be completed in a circuit. The minimum distance a circuit could be raced is

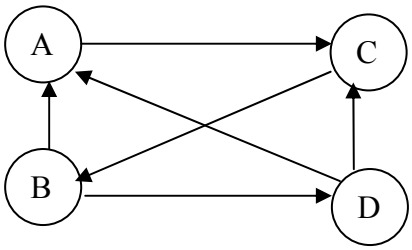
A. 73 km
B. 58 km
C. 71 km
D. 69 km
E. 64 km

Question 6

The distance for the minimum spanning tree for this network is

A. 109 km
B. 112 km
C. 118 km
D. 93 km
E. 73 km

Question 7



In a round robin competition 4 teams A, B, C and D play each other once.

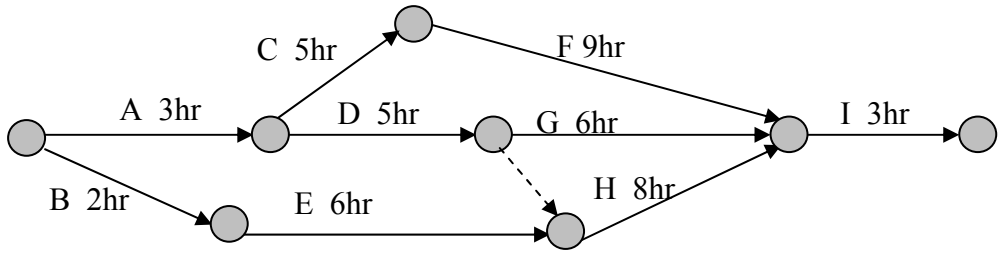
An arrow from A to C indicates that A defeated C.

Based on 1-step and 2-step reachability matrix for this network, state the winning team and their dominance value.

A. Team B, 4
B. Team B, 5
C. Team D, 4
D. Team D, 5
E. Team B and D, both 4

Questions 8 and 9 refer to the following critical path.

For a particular project there are nine activities to be completed and the time taken to complete each activity is shown in hours.



Note: GH is a dummy activity

Question 8

The critical path and completion time for this project is

A. BEHI, 19 hours
B. ADGI, 17 hours
C. ACFI, 20 hours
D. ADGHI, 19 hours
E. AEHF, 26 hours

Question 9

The project is to be crashed by reducing the completion time to a time of 18 hours.

This can be done in the minimum number of hours by reducing the following activities:

A. F by 2 hours

B. F by 2 hours and H by 1 hour

C. A by 2 hours

D. A by 2 hours and F by 1 hour

E. No reduction but increase D by 1 hour making it the quickest time

Module 6: Matrices

Before you answer these questions you must **shade** the Matrices box on the answer sheet for multiple-choice questions.

Question 1

Given that $A = \begin{bmatrix} 2 \\ -2 \end{bmatrix}$ and $B = \begin{bmatrix} 3 \\ -1 \end{bmatrix}$

The value of $A^2 + 2B$ is

A. $\begin{bmatrix} 7 \\ 3 \end{bmatrix}$ **B.** $\begin{bmatrix} 10 \\ 2 \end{bmatrix}$

C. $\begin{bmatrix} 10 \\ -6 \end{bmatrix}$ **D.** $\begin{bmatrix} 9 \\ -5 \end{bmatrix}$

E. Impossible, no solutions

Question 2

Let $C = \begin{bmatrix} 2 & 1 \\ 2 & -1 \end{bmatrix}$ and $I = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$

Which of the following is **NOT** true?

A. I raised to any power is always I.
B. There is no inverse matrix of C.
C. C + I = I + C
D. CI = C
E. 2C – I gives a 2 × 2 matrix

Question 3

Let $R = \begin{bmatrix} 1 & m \\ 0 & n \end{bmatrix}$ and $T = \begin{bmatrix} 1 & 4 \\ 2 & -1 \end{bmatrix}$

If the matrix $RT = \begin{bmatrix} -1 & 5 \\ 4 & -2 \end{bmatrix}$,

the values of *m* and *n* respectively must be

A. 1 and -1
B. 2 and 1
C. 2 and $5/4$
D. -1 and 2
E. -1 and -2

Question 4

Nathan decided to plan a course for his class to visit five locations A, B, C, D and E in the area near his school, by using the following transition matrix:

Present Location

Next Location	A	B	C	D	E
A	0	0	1	0	0
B	1	0	0	0	0
C	0	0	0	1	0
D	0	0	0	0	1
E	0	1	0	0	0

If the class know that they start from location C, the correct order of the course to visit each location using the transition matrix is

A.

C	D	E	B	A

B.

C	A	B	D	E

C.

C	A	B	E	D

D.

C	D	E	A	B

E.

C	A	C	A	B

Question 5

A company produces a four cylinder car (F) and a six cylinder car (X). Each type of car comes in three styles: Economy (E), Sport (S) and Luxury (L).

The price of each make of car, in thousands of dollars, is listed in a price matrix P, where

$$P = \begin{matrix} \\ E \\ S \\ L \end{matrix} \begin{matrix} \begin{matrix} F & X \end{matrix} \\ \begin{bmatrix} 21 & 31 \\ 28 & 34 \\ 32 & 40 \end{bmatrix} \end{matrix}$$

Due to inflation and extra taxes, a new price matrix generating the new price of cars can be found by the product PQ where Q is the matrix:

$$\begin{bmatrix} 1.05 & 0 \\ 0 & 1.08 \end{bmatrix}$$

This new pricing scale is best summarised as

A. Economy cars increase by 5%, Sport cars increase by 8%, Luxury stay fixed

B. Economy cars increase by 5%, Luxury cars increase by 8%, Sport stay fixed

C. Four cylinder cars increase by 5% and six cylinder cars increase by 8%

D. Four cylinder cars increase by 1.05% and six cylinder cars increase by 1.08%

E. All cars increase by 5% and a further 8% on top of this

Question 6

How many of the following four sets of simultaneous linear equations have a unique solution?

Set A	Set B	Set C	Set D
$x - y = 3$ $x + y = 1$	$2x + 2y = 12$ $2x - y = 6$	$x - 2y = 0$ $-2x + 4y = 10$	$x + y = 5$ $5x = 10$

A. 0
B. 1
C. 2
D. 3
E. 4

Question 7

The order of matrix A is (3×2); and the number of columns of matrix B is 3.

If the result of A(B + C) is a 3×3 matrix, then the order of matrix C must be

A. (2×3)
B. (3×2)
C. (2×2)
D. (3×3)
E. (1×3)

Question 8

The solution to the following simultaneous equations

$$-2x + y = -7$$
$$x - 2y = 5$$

is:

A. $x = 19$ and $y = -17$
B. $x = 3$ and $y = -1$
C. $x = 2$ and $y = -3$
D. $x = 1$ and $y = -2$
E. $x = 9$ and $y = -3$

Question 9

A snack company specialises in making a chocolate bar (*B*) and a herbal flavoured bag of chips (*C*).

Research has found that 85% of the people that buy the chocolate bar (*B*) return to buy it again the following day and the rest decide to buy the bag of chips (*C*).

Of those who buy the bag of chips (*C*), 80% of people return to buy it again the following day and the rest decide to buy the chocolate bar (*B*).

Originally the company made 300 chocolate bars and 400 bags of chips daily.

If the research is correct and the people's buying patterns are maintained, the number of each product that the company should make in the **long term** is

A. 300 of *B* and 400 of *C*
B. 335 of *B* and 365 of *C*
C. 350 of *B* and 350 of *C*
D. 380 of *B* and 320 of *C*
E. 400 of *B* and 300 of *C*

END OF QUESTION AND ANSWER BOOK