



INSIGHT

Trial Exam Paper

2009

FURTHER MATHEMATICS

Written examination 1

MULTIPLE-CHOICE QUESTION BOOK

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

Structure of book

<i>Section</i>	<i>Number of questions</i>	<i>Number of questions to be answered</i>	<i>Number of modules</i>	<i>Number of modules to be answered</i>	<i>Number of marks</i>
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.

This trial examination produced by Insight Publications is NOT an official VCAA paper for the 2009 Further Mathematics written examination 1.

This examination paper is licensed to be printed, photocopied or placed on the school intranet and used only within the confines of the purchasing school for examining their students. No trial examination or part thereof may be issued or passed on to any other party including other schools, practising or non-practising teachers, tutors, parents, websites or publishing agencies without the written consent of Insight Publications.

Copyright © Insight Publications 2009

This page is blank

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.

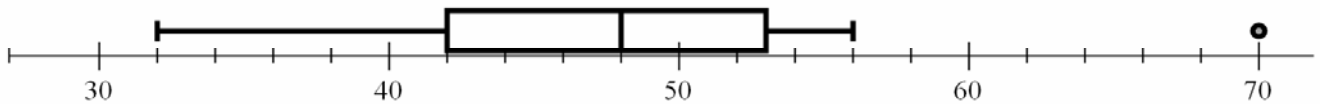
One mark will be awarded for a correct answer; no marks will be awarded for an incorrect answer.

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**Question 1**

For the data represented by the boxplot, the five-figure summary statistics are



- A. 32, 42, 48, 53 and 56
- B. 32, 40, 47, 50 and 56
- C. 35, 40, 47, 53 and 56
- D. 32, 42, 48, 51 and 70
- E. 32, 42, 48, 53 and 70

The following information relates to Question 2 and 3.

The following stem and leaf plots show the distribution of marks for 2 classes sitting the same test.

Class A		Class B
	1	3
0	2	12388
9820	3	34
53	4	9
1	5	2
0	6	
4	7	
0	8	

Question 2

The mean mark for Class B is

- A. 30.3
- B. 3
- C. 8.5
- D. 4.3
- E. 28

Question 3

Which of the following marks would be considered an outlier for a student in Class A?

- A. 51, 60, 74 and 80
- B. 60, 74 and 80
- C. 74 and 80
- D. 80
- E. 20

Question 4

The distribution of scores from a sample of 45 students on an algebra test was found to be normally distributed with a mean of 23 and a standard deviation of 6. The number of students who obtained a mark greater than 29 would be approximately

- A. 16
- B. 34
- C. 7
- D. 15
- E. 3

Question 5

Which one of the following numerical variables is discrete?

- A. The weights of three newly born monkeys at the local zoo
- B. The lengths of a sample of nails are taken
- C. The number of siblings of a group of students
- D. The average time taken for 10 students to complete a writing task
- E. The heights of 3 plant species undergoing an experiment

Question 6

The following table shows the results of Raj's mid-year examinations for 5 subjects. Also given is the class mean and standard deviation for each subject.

Subject	Mean	Standard Deviation	Raj's mark
Science	45	2.5	47
English	33	6	39
French	28	4.4	35
Geography	27	3.8	29
Maths	55	6	55

The subject in which Raj performed the best in relation to his classmates is

- A. Science
- B. English
- C. French
- D. Geography
- E. Maths

The following information relates to Question 7 and 8.

Question 7

The owner of a clothes shop has noticed, over a number of years, that weekly sales exhibit highly seasonal characteristics:

Day	Monday	Tuesday	Wednesday	Thursday	Friday
Seasonal Index	0.55	0.91		1.03	0.64

The seasonal index for Wednesday is

- A. 1.87
- B. -0.23
- C. -1.13
- D. 1.13
- E. Not enough information

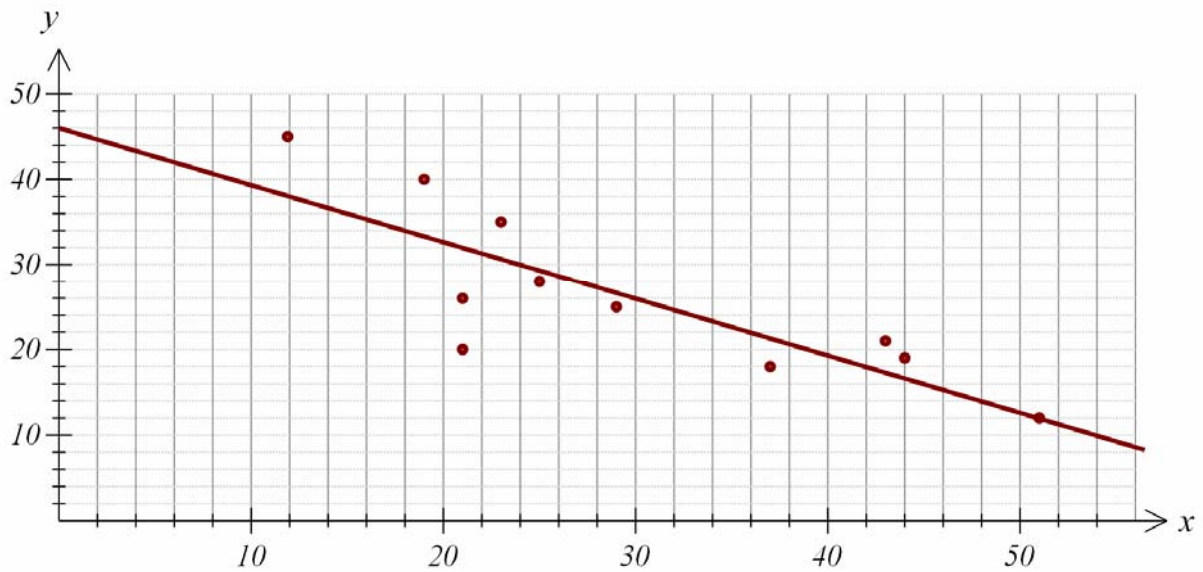
Question 8

If the deseasonalised amount for Monday is \$32 000, then the actual sales for Monday are closest to

- A. \$58 180
- B. \$27 840
- C. \$16 000
- D. \$17 600
- E. \$17 100

The following information relates to Questions 9, 10 and 11.

The scatterplot below shows the relationship between 2 variables, x and y :



The line shown on the graph is the least squares regression line. The equation of this line is:

$$y = 46 - 0.67x$$

The coefficient of determination is 0.8234.

Question 9

The Pearson's product moment correlation co-efficient is closest to

- A. 0.82
- B. 0.91
- C. -0.94
- D. -0.91
- E. -0.82

Question 10

Fitting this regression line to the data, the value of the residual of the point (37, 18) is

- A. -4.5
- B. 3.21
- C. 4.5
- D. -3.21
- E. 0.82

Question 11

The rate of decrease of y compared to x is

- A. -0.67
- B. 46
- C. -46
- D. -45.33
- E. 0.67

Question 12

The number of hoses sold at the local hardware store for each month in 2008 is shown below:

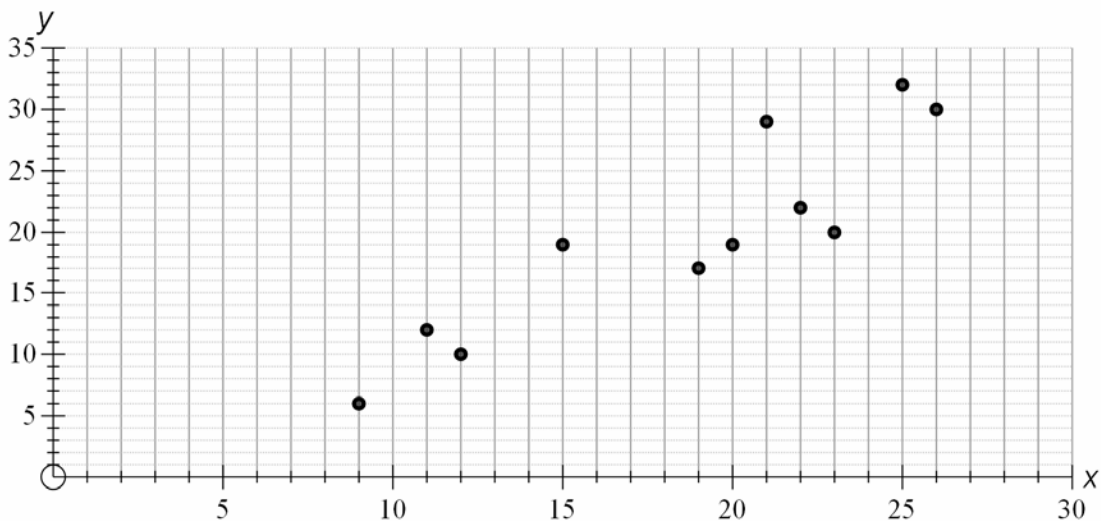
Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Number of hoses	41	15	19	25	35	38	44	32	30	18	32	39

If a 4-point moving-mean smoothing with centring is applied, the number of hoses sold for the month of September is

- A. 29
- B. 28
- C. 31
- D. 29.5
- E. 28.5

Question 13

The gradient of the 3 median regression line for the following scatterplot is closest to



- A. 1.29
- B. 1.2
- C. 1.1
- D. -1.2
- E. -1.29

END OF SECTION A

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.

Marks **are not** deducted for incorrect answers.

No marks will be awarded if more than one answer is completed for any question.

Module	Page
Module 1: Number patterns	10
Module 2: Geometry and trigonometry	13
Module 3: Graphs and relations	18
Module 4: Business-related mathematics	25
Module 5: Networks and decision mathematics	28
Module 6: Matrices	34

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

The first 4 terms of a sequence are 4, 6, 9, and 13. The next 3 terms, in order, are

- A. 17, 21, 25
- B. 18, 24, 31
- C. 19, 25, 32
- D. 18, 25, 32
- E. 18, 23, 30

Question 2

Given that an arithmetic sequence had a first term of 100 and a common difference of -15 , the term which is first negative is

- A. 8th
- B. 9th
- C. 10th
- D. 11th
- E. 12th

Question 3

The first and third terms of a geometric sequence are 27 and 12 respectively. The sum of the first 5 terms of this sequence is

- A. $70\frac{1}{3}$
- B. $52\frac{1}{3}$
- C. 39
- D. 65
- E. 56

Question 4

An athlete's training regime has the following conditions. During the first week, she is required to run 6 km. Each week the distance is increased by 2.5 km. An expression for the **total** distance run in n weeks is

- A. $n(2.5n + 9.5)$ km
- B. $\frac{n(2.5n + 4.5)}{2}$ km
- C. $\frac{(2.5n + 9.5)}{2}$ km
- D. $\frac{n(2.5n + 9.5)}{2}$ km
- E. $4.5 + 2.5n$ km

Question 5

The first term of a geometric sequence is 26. Each term is $\frac{2}{3}$ of the previous term. The sum of the infinite sequence is

- A. $17\frac{1}{2}$
- B. 39
- C. 78
- D. $43\frac{1}{3}$
- E. 31

Question 6

The 10th term of an arithmetic sequence which had a first term of 1.7 and the sum of its first 6 terms being 30 is

- A. 13.58
- B. 9.62
- C. 51
- D. 12.8
- E. 12.26

Question 7

The first 4 terms of a sequence of numbers are

0.2, 1.64, 2.648, 3.3536...

The difference equation that describes this sequence is

- A. $t_{n+1} = 0.2t_n + 1.44; t_1 = 0.2$
- B. $t_{n+1} = 0.7t_n + 1.5; t_1 = 0.2$
- C. $t_{n+1} = 0.8t_n + 1.2; t_1 = 0.2$
- D. $t_{n+1} = 0.9t_n + 1.5; t_1 = 0.2$
- E. $t_n = 0.8t_{n-1} + 1.2; t_1 = 0.2$

Question 8

How many of the following first order difference equations rules form a geometric sequence?

$$t_{n+1} = 5t_n - 2$$

$$t_{n+1} = t_n + 5$$

$$t_{n+1} = -4t_n$$

$$t_n = t_{n-1} + 4$$

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

Question 9

Two animals are introduced into a nature reserve. The first, a Spotted Yap, will increase its numbers from an initial value of 85, with a population increase of 25 each year. The second, a Striped Yap, will increase its numbers by 9.8% each year with 65 in the first year. Assuming that all animals survive, the year in which there will be double the number of Striped Yaps as Spotted Yaps is the

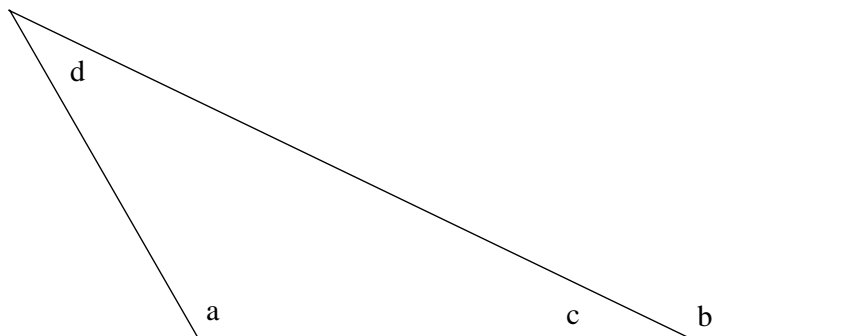
- A. 42nd
- B. 31st
- C. 50th
- D. 38th
- E. 54th

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

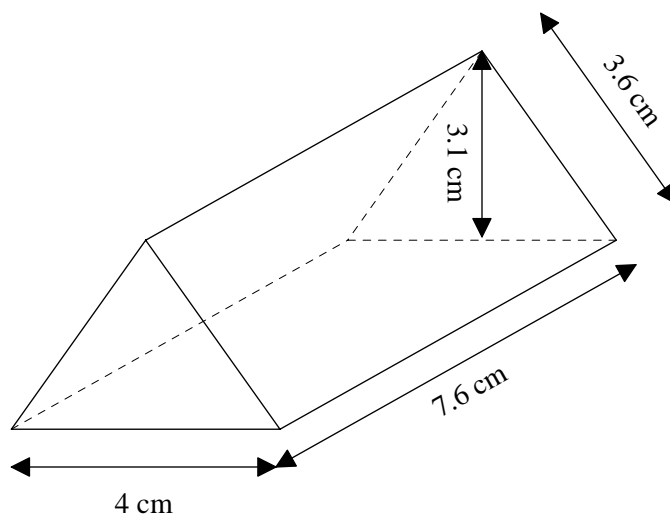
For the diagram below, the statement which is always true is



- A. $a + b + c = 180$
- B. $a + b + c + d = 360$
- C. $d + c = b$
- D. $a + d = b$
- E. $a + c = b$

Question 2

A new chocolate bar, in the shape of a triangular prism, has been introduced to the market. The amount of wrapping that will be required to cover all faces, assuming no overlap, is closest to



- A. 85 cm^2
- B. 12.4 cm^2
- C. 61 cm^2
- D. 67 cm^2
- E. 98 cm^2

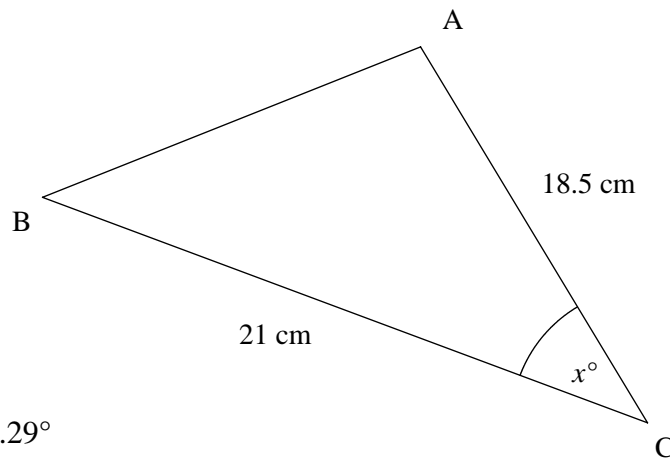
Question 3

An isosceles triangle has a base length of 14 cm and equal sides of 20 cm. The magnitude of the smallest angle, correct to 1 decimal place is

- A. 20.4°
- B. 20.5°
- C. 40.8°
- D. 41.0°
- E. 0.4°

Question 4

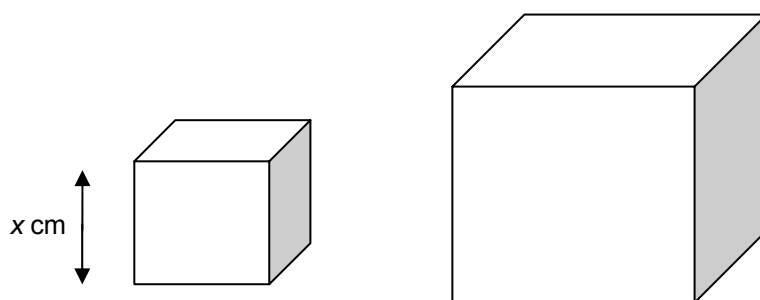
Given that the area of triangle ABC is 56 cm^2 the value of angle x is



- A. 0.29°
- B. 18°
- C. 16.8°
- D. 21.4°
- E. Not enough information

Question 5

A child has two similar rectangular blocks.

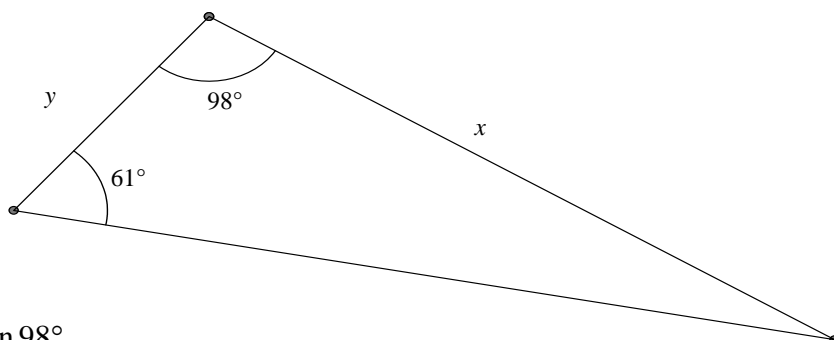


The volume of the small block is 27 cm^3 and the volume of the large block is 64 cm^3 . The height of the small block is $x \text{ cm}$. An expression for the height of the large block is

- A. $\frac{3}{4}x$
- B. $\frac{8}{3}x$
- C. $\frac{64}{27}x$
- D. $\frac{4}{3}x$
- E. $\frac{27}{64}x$

Question 6

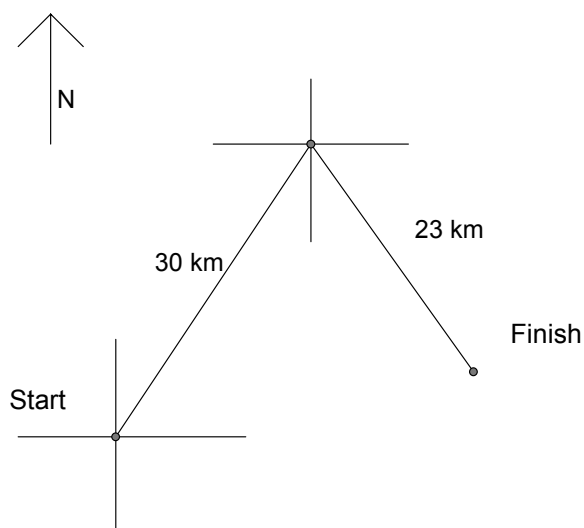
The length of the side marked x in the given triangle, in centimetres, is



- A. $\frac{y \times \sin 98^\circ}{\sin 21^\circ}$
- B. $\frac{y \times \sin 61^\circ}{\sin 61^\circ}$
- C. $\frac{\sin 61^\circ}{\sin 21^\circ}$
- D. $\frac{y \times \sin 61^\circ}{\sin 98^\circ}$
- E. $\frac{y \times \sin 61^\circ}{\sin 21^\circ}$

The following information relates to Question 7 and 8.

A plane flies on a bearing of 046°T for 30 km and then changes direction flying for 23 km on a bearing of 149°T , as indicated in the diagram.



Question 7

The distance from the plane's final position to its starting point is closest to

- A. 33 km
- B. 421 km
- C. 1119 km
- D. 51 km
- E. 32 km

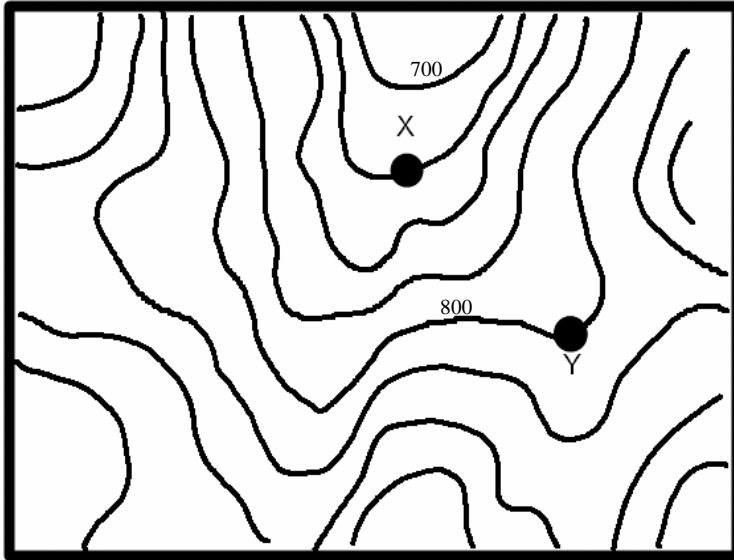
Question 8

The total area enclosed by the pilot's journey, having returned to the starting point is closest to

- A. 344 km^2
- B. 340 km^2
- C. 348 km^2
- D. 347 km^2
- E. 336 km^2

Question 9

For the following contour map, the distance on the map between X and Y is 4.5 cm. The direct distance joining these points is closest to



Scale:

1:10 000

Contours in metres

- A. 20.8 km
- B. 456 m
- C. 4.56 km
- D. 450 m
- E. 9.46 m

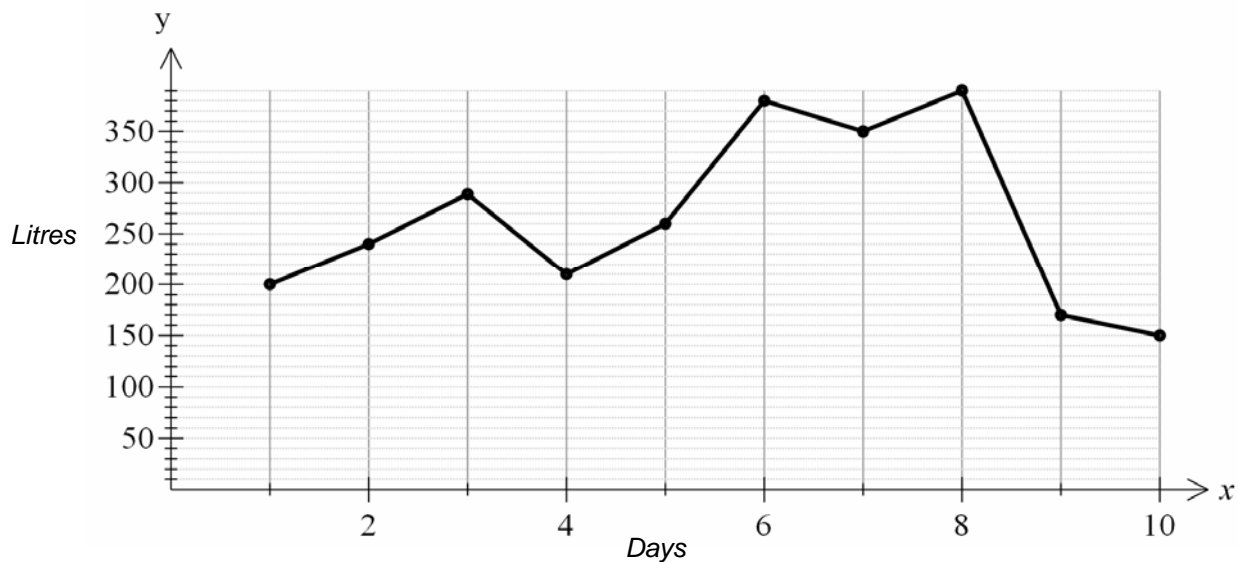
SECTION B – continued
TURN OVER

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 graph below shows the amount of water (in litres) in a water tank over a period of 10 days.

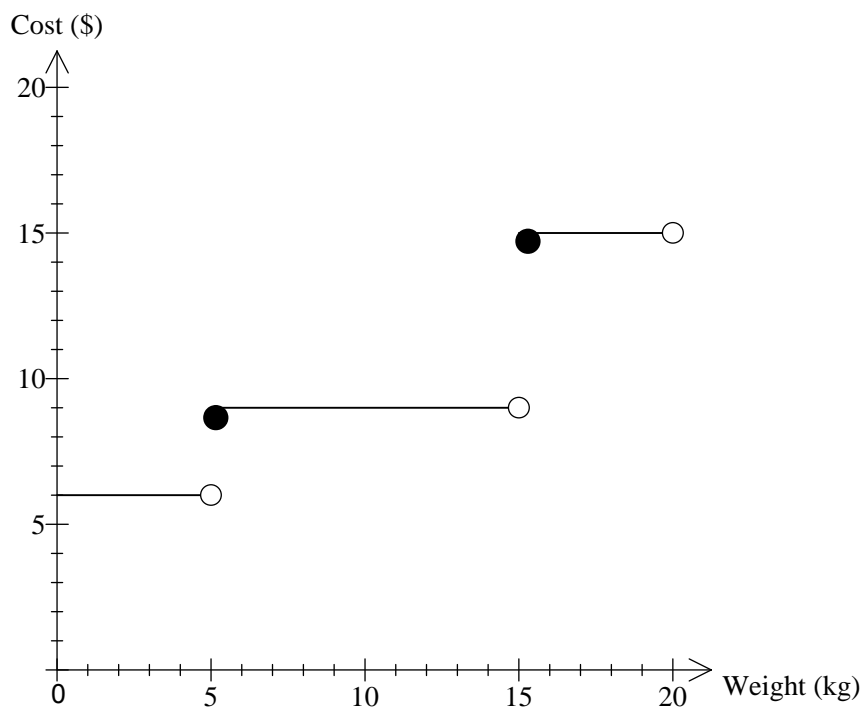


Between which 2 days did the greatest increase occur?

- A. Day 2 and day 3
- B. Day 4 and day 5
- C. Day 5 and day 6
- D. Day 8 and day 9
- E. Day 1 and day 2

Question 2

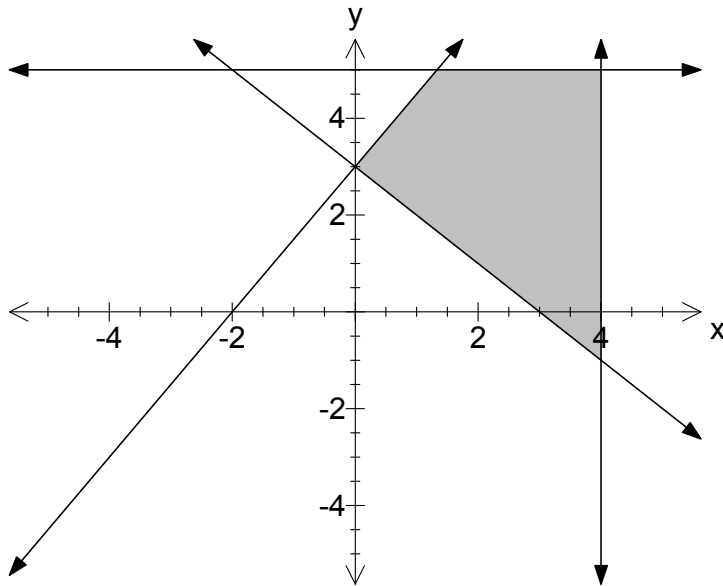
The fee for sending parcels interstate with a certain courier company is determined by the weight according to the graph shown.



If parcel A weighs 8.5 kg and parcel B weighs 15 kg, then the total cost of the 2 parcels will be

- A. \$18
- B. \$9
- C. \$24
- D. \$25
- E. \$30

The following information is related to Questions 3 and 4.



Question 3

The shaded region on the graph is defined by $y \leq 5$, $2y \leq 3x + 6$,

- A. $x \leq 4$ and $x + y \leq 3$
- B. $x \leq 4$ and $x + y \geq 3$
- C. $x \geq 4$ and $2x + y \leq 3$
- D. $x \geq 4$ and $x + y \leq 3$
- E. $x \geq 4$ and $x + y \geq 3$

Question 4

An objective function, F , where $F = 2x + 4y$, has been formed. The maximum value of F to the above constraints is

- A. 16
- B. 30
- C. 32
- D. 28
- E. 25

The following information relates to Question 5 and 6.

The hire company 'Company A', loans out trailers during January for a special deal. The cost is \$25.40 per hour plus an initial charge of \$40. A second company, 'Company B' offers a competing deal on its trailers, which has an hourly rate of \$29 plus an initial charge of \$25.

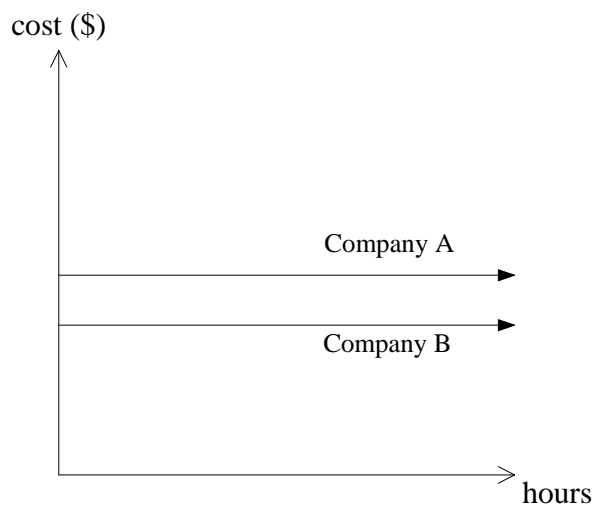
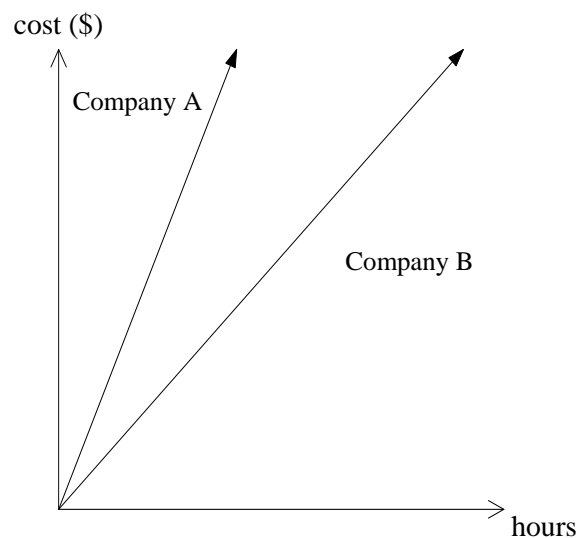
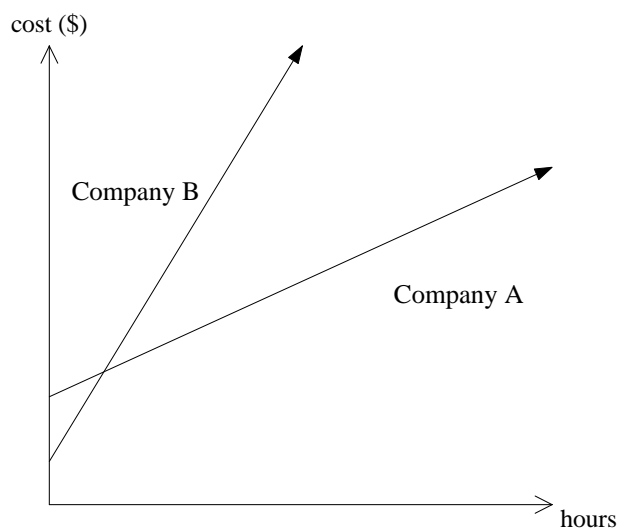
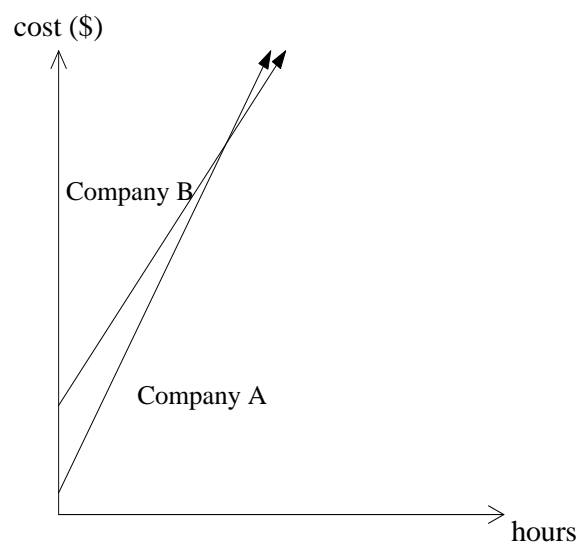
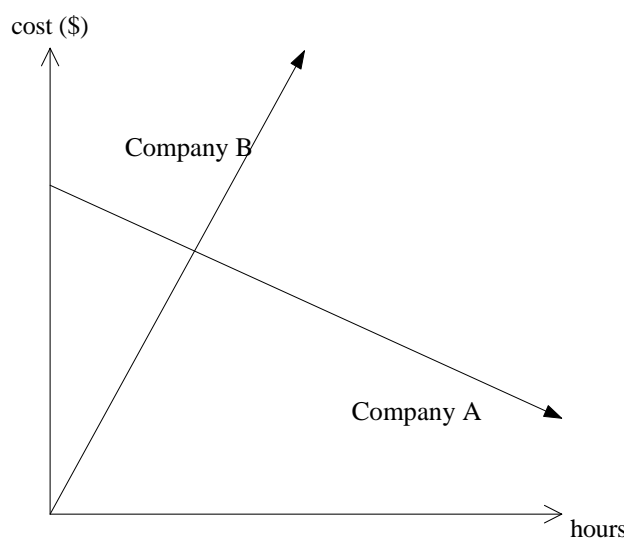
Question 5

If Nigel budgets for only \$200 for the hire of a trailer from Company A, the number of whole hours he will be able to use the trailer is

- A. 5
- B. 6
- C. 7
- D. 8
- E. 9

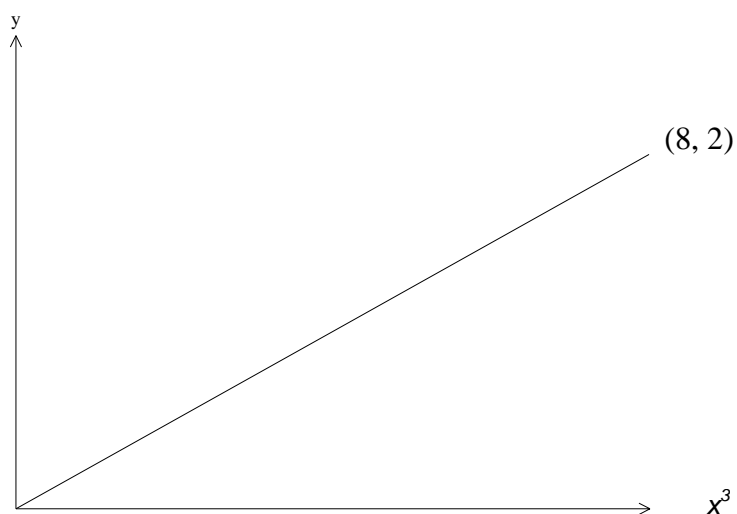
Question 6

The graph which best describes the fees charged by these companies for x hours is

A.**B.****C.****D.****E.**

Question 7

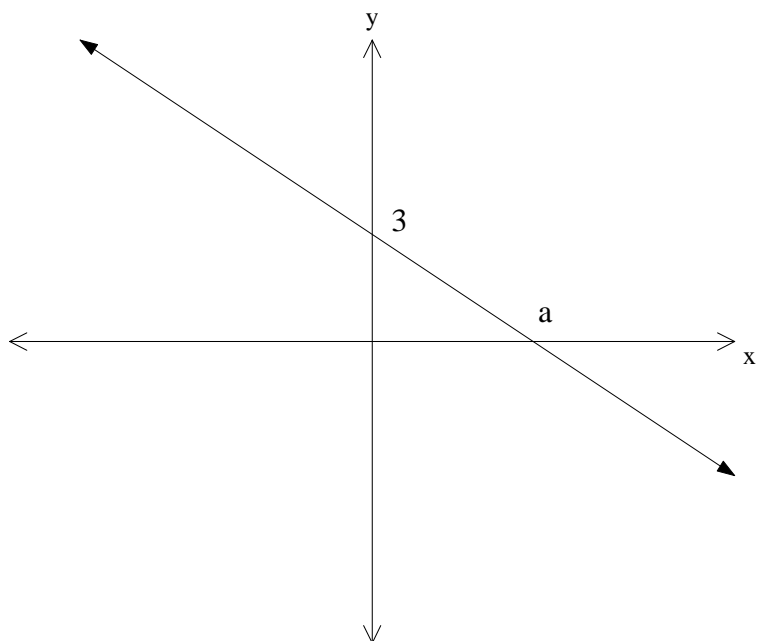
The graph of y against x^3 is shown. The rule connecting x and y is



- A. $y = \frac{1}{4}x$
- B. $y = 4x^3$
- C. $y = \frac{x^3}{4}$
- D. $y = 4x$
- E. $y = \frac{1}{4}$

Question 8

The equation of the straight line below is



- A. $y = \frac{3}{a}x + 3$
- B. $y = -\frac{ax}{3} + 3$
- C. $y = \frac{ax}{3} + 3$
- D. $y + 3 = \frac{3}{a}x$
- E. $y = -\frac{3x}{a} + 3$

Question 9

The number of solutions for the set of simultaneous equations $\begin{matrix} 2y = 2mx + 18 \\ -mx + y = 9 \end{matrix}$ is

- A. 0
- B. 1
- C. 2
- D. Infinite
- E. 3

Module 4: Business Mathematics

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

Question 1

An account paid interest of \$382 over a period of 6 years on a principal of \$3 490. The annual rate of simple interest correct to one decimal place is

- A. 7.1%
- B. 18.5%
- C. 9.1%
- D. 1.8%
- E. 4.2%

Question 2

Find the value of the pronumerals in the following bank statement:

Date	Debit	Credit	Balance
12 th March			\$1 540
13 th March		\$200	x
18 th March	\$340		y
28 th March		z	\$1 775

- A. $x = \$1740$, $y = \$1400$, $z = \$375$
- B. $x = \$1740$, $y = \$2080$, $z = \$375$
- C. $x = \$1340$, $y = \$1400$, $z = \$375$
- D. $x = \$1740$, $y = \$1400$, $z = \$275$
- E. $x = \$1340$, $y = \$1400$, $z = \$375$

Question 3

Madeline's investment of \$2000 is earning interest at a rate of 8% p.a. compounding monthly. In 5 years, Madeline's investment will be worth

- A. \$202 514
- B. \$2 468
- C. \$3 100
- D. \$2 980
- E. \$2 101

Question 4

If a hire purchase agreement offers a flat rate of interest of 9% over 180 repayments, then the effective rate of interest (correct to 1 decimal place), is

- A. 17.9%
- B. 18%
- C. 18.2%
- D. 17.8%
- E. 17.5%

Question 5

The average price of 1L of milk in Victoria during 2008 was \$2.45. The price of the same product in 15 years' time, assuming the annual inflation rate is 1.8%, will be

- A. \$3.76
- B. \$29.45
- C. \$4.25
- D. \$3.20
- E. \$1.70

Question 6

A shirt in a sale offering a 30% discount is priced at \$35.20. The original cost of the shirt was

- A. \$24.64
- B. \$45.76
- C. \$59.84
- D. \$65.20
- E. \$50.29

Question 7

A heavy vehicle bought for \$28 900 has a book value of \$13 500 after 6 years of reducing balance depreciation. The depreciation rate is closest to

- A. 9.8%
- B. 11.9%
- C. 9.2%
- D. 5.6%
- E. 7.7%

Question 8

Jennifer takes out a loan of \$150 000 and will repay the loan over 25 years paying an interest rate of 4.8% on the reducing balance of the loan compounded monthly. If she wants to repay the loan in 25 years, her monthly repayments will be

- A. \$6 317.00
- B. \$288.50
- C. \$859.50
- D. \$1 250.40
- E. \$731.60

Question 9

Jill borrows \$15 000 to finance an extension to her house. She plans to make monthly repayments of \$220 with an interest rate of 9.5% calculated monthly on the reducing balance of the loan. What is the total interest that she will have paid after 4 years, to the nearest dollar?

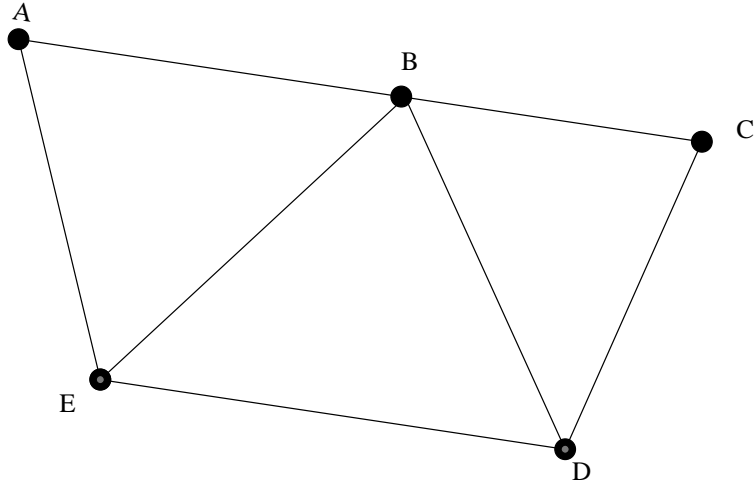
- A. \$4 676
- B. \$5 134
- C. \$9 116
- D. \$4 400
- E. \$10 560

Module 5 – Networks and decision mathematics

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

Question 1

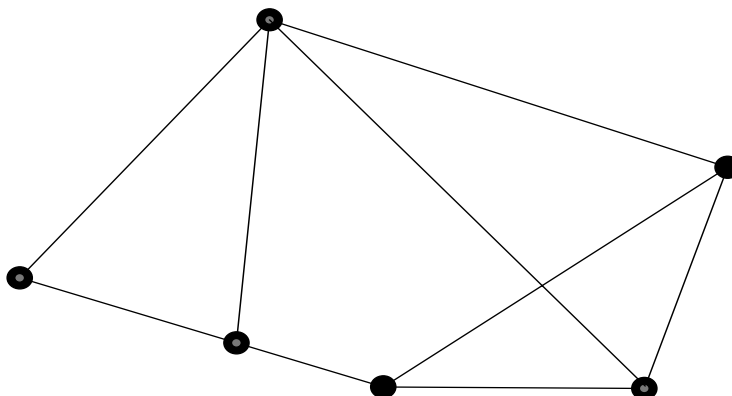
The degree of Vertex B is



- A. 1
- B. 2
- C. 3
- D. 4
- E. 5

Question 2

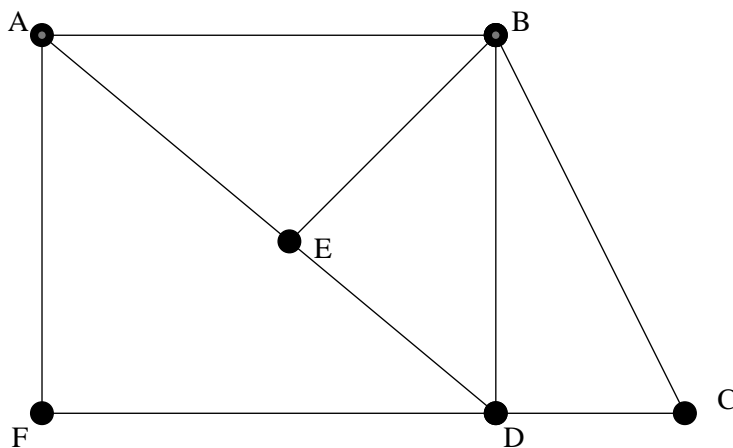
If the graph below was a connected planar graph, the number of edges, vertices and faces is respectively



- A. 9, 6 and 6
- B. 9, 7 and 5
- C. 9, 6 and 5
- D. 9, 7 and 4
- E. 8, 7 and 5

Question 3

A suitable Euler path for the planar graph below is



- A. A-B-A
- B. A-F-D-C-B-D-E-B-A-E
- C. A-F-D-C-B-E
- D. C-B-D-F-A-E-B-A
- E. E-B-C-D-B-A-F-D

Question 4

Four jobs – planning, researching, writing and filing – are to be done by 4 people – Paul (P), Therese (T), David (D) and Jennifer (J). The times taken to perform the various tasks are shown in the matrix below.

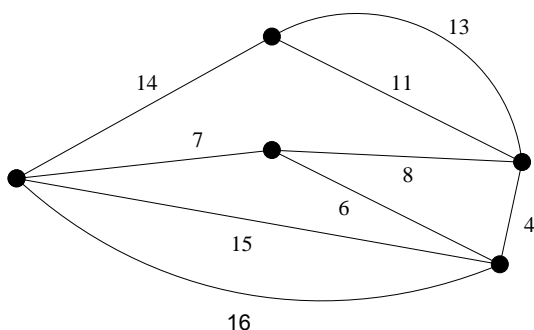
	P	T	D	J
Planning	25	30	40	30
Researching	85	80	90	95
Writing	100	125	135	130
Filing	20	20	25	15

If an allocation has been made that will take the shortest amount of time to complete all tasks, the people allocated to Writing and Researching will, respectively, be

- A. Jennifer and Paul
- B. Paul and Jennifer
- C. Therese and Paul
- D. Paul and Therese
- E. Therese and David

Question 5

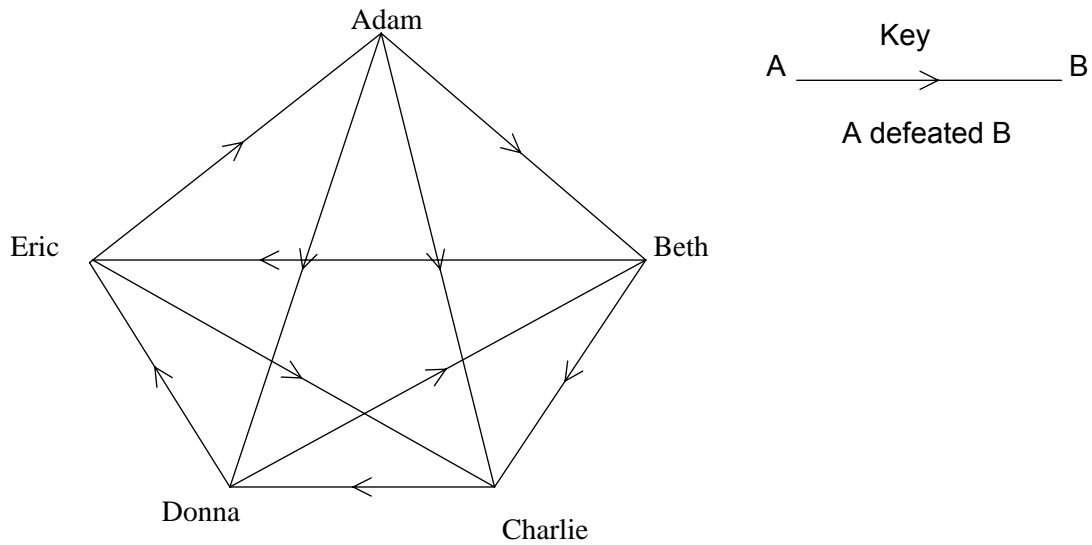
The length of the maximal spanning tree for the following network is



- A. 51
- B. 48
- C. 68
- D. 50
- E. 31

Question 6

Five friends, Adam, Beth, Charlie, Donna and Eric, play a game of chess against each other. The results of the game are summarised in the complete graph below.



Which of the following statements is true?

- A. Donna beat Charlie
- B. Beth has a two step dominance over Eric
- C. Adam's only loss was to Charlie
- D. Beth won more games than Charlie
- E. Donna lost 3 games

The information below relates to Question 7 and 8.

Task	Predecessor	Activity Time (weeks)
A	-	5
B	-	7
C	A	4
D	B	6
E	C, D	3
F	B	1
G	E, F	2
H	E, F	6
J	G	1
K	H, J	5

Question 7

The table above lists the 10 activities in a project, the immediate predecessor and the activity time. The latest start time for activity F is

- A. 8
- B. 10
- C. 16
- D. 9
- E. 15

Question 8

The project is modified and the following changes are made:

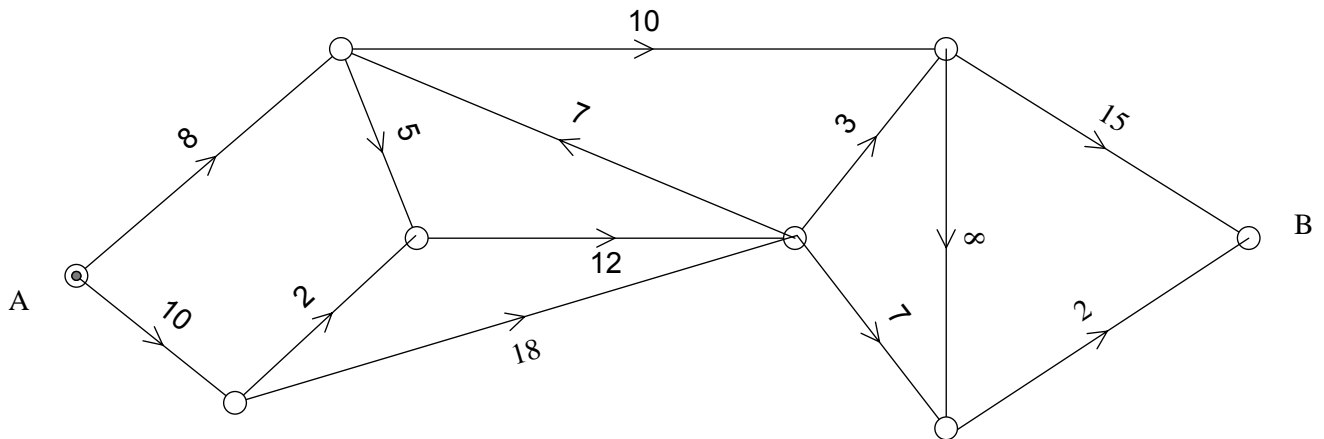
Activity A is delayed by 5 weeks, Activity F is delayed by 5 weeks and Activity G is delayed by 4 weeks.

The new critical path for the project is

- A. A – C – E – H – K
- B. B – F – H – K
- C. B – D – E – G – J – K
- D. B – F – H – K
- E. A – C – E – G – J – K

Question 9

Water flows from a source at point A to a sink at Point B. Measurements are in litres. Find the maximum amount of water that is able to travel from Point A to Point B.



- A. 18 litres
- B. 17 litres
- C. 20 litres
- D. 15 litres
- E. 23 litres

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 $A = \begin{bmatrix} 2 & 3 \\ 1 & 3 \end{bmatrix}$ and that $B = \begin{bmatrix} 2 & -5 \\ 1 & 2 \end{bmatrix}$

The value of $A^2 + B$ is

A. $\begin{bmatrix} 6 & 4 \\ 2 & 11 \end{bmatrix}$

B. $\begin{bmatrix} 9 & 10 \\ 6 & 14 \end{bmatrix}$

C. $\begin{bmatrix} 1 & -5 \\ 2 & 2 \end{bmatrix}$

D. $\begin{bmatrix} 4 & -2 \\ 2 & 5 \end{bmatrix}$

E. $\begin{bmatrix} 7 & 15 \\ 5 & 12 \end{bmatrix}$

Question 2

If the order of matrix CD is (3×4) and the order of matrix D is (2×4) then the order of matrix C is

A. (2×4)

B. (3×2)

C. (3×4)

D. (4×4)

E. (4×2)

Question 3

Which statement is **false** relating to the matrices X , Y and Z ?

$$X = \begin{bmatrix} 1 & -1 \\ 1 & 1 \end{bmatrix} \quad Y = \begin{bmatrix} -1 & -2 \\ 0 & 0 \end{bmatrix} \quad Z = \begin{bmatrix} 3 \\ 1 \\ 2 \end{bmatrix}$$

- A. XY is defined
- B. Z is a column matrix
- C. The order of X is (2×2)
- D. The inverse of X is $\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$
- E. The value of $2X$ is $\begin{bmatrix} 2 & -2 \\ 2 & 2 \end{bmatrix}$

Question 4

The matrix that has a determinant of 5 is

- A. $\begin{bmatrix} 5 & 5 \\ 0 & 0 \end{bmatrix}$
- B. $\begin{bmatrix} 1 & -1 \\ 2 & 2 \end{bmatrix}$
- C. $\begin{bmatrix} 3 & 1 \\ 0 & 3 \end{bmatrix}$
- D. $\begin{bmatrix} 2 & -1 \\ 0 & 2 \end{bmatrix}$
- E. $\begin{bmatrix} 2 & 1 \\ 1 & 3 \end{bmatrix}$

Question 5

Which of the following represents the solution to the simultaneous equation?

$$2x + 5y = 9$$

$$-x - y + 2 = 0$$

A. $\begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 2 & 5 \\ -1 & -1 \end{bmatrix}^{-1} \begin{bmatrix} 9 \\ 0 \end{bmatrix}$

B. $\begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 2 & 9 \\ -1 & -2 \end{bmatrix}$

C. $\begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 2 & -1 \\ 5 & -1 \end{bmatrix}^2 \begin{bmatrix} 9 \\ 2 \end{bmatrix}$

D. $\begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 2 & 5 \\ -1 & -1 \end{bmatrix}^{-1} \begin{bmatrix} 9 \\ -2 \end{bmatrix}$

E. $\begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 2 & 5 \\ -1 & -1 \end{bmatrix}^{-1} \begin{bmatrix} 9 \\ 0 \end{bmatrix}$

Question 6

The matrix that is equivalent to $\begin{bmatrix} 1 & 4 & 2 \\ 2 & -6 & 0 \end{bmatrix}$ is

A. $\begin{bmatrix} 1 & 4 & 0 \\ 2 & -6 & 2 \end{bmatrix}$

B. $2\begin{bmatrix} 0.5 & 2 & 1 \\ 1 & -3 & 0 \end{bmatrix}$

C. $\frac{1}{2}\begin{bmatrix} 2 & 8 & 4 \\ 4 & 3 & 0 \end{bmatrix}$

D. $\begin{bmatrix} 1 & 1 & 4 \\ 2 & 3 & 3 \end{bmatrix} + \begin{bmatrix} 0 & 3 & -2 \\ 0 & -3 & 3 \end{bmatrix}$

E. $\begin{bmatrix} 2 & -6 & 0 \\ 1 & 4 & 2 \end{bmatrix}^{-1}$

Question 7

A fieldtrip counting 2 species of birds, A and B at 3 separate locations, X, Y and Z can be summarised by the matrix, P.

$$P = \begin{bmatrix} 52 & 61 & 21 \\ 40 & 32 & 24 \end{bmatrix}$$

It is predicted that in the next 3 years there will be a 15% increase in the numbers of species A and an 18% decrease in the numbers of species B. The matrix calculation that best describes this situation is

A. $\begin{bmatrix} 15 \\ 82 \end{bmatrix} \begin{bmatrix} 52 & 61 & 21 \\ 40 & 32 & 24 \end{bmatrix}$

B. $\begin{bmatrix} 52 & 61 & 21 \\ 40 & 32 & 24 \end{bmatrix} \begin{bmatrix} 1.15 \\ 0.82 \end{bmatrix}$

C. $\begin{bmatrix} 1.15 & 0.82 \\ 0 & 0 \end{bmatrix} \begin{bmatrix} 52 & 61 & 21 \\ 40 & 32 & 24 \end{bmatrix}$

D. $\begin{bmatrix} 1.15 & 0 \\ 0 & 0.82 \end{bmatrix} \begin{bmatrix} 52 & 61 & 21 \\ 40 & 32 & 24 \end{bmatrix}$

E. $1.15 \begin{bmatrix} 52 & 61 & 21 \\ 40 & 32 & 24 \end{bmatrix} + 0.82 \begin{bmatrix} 52 & 61 & 21 \\ 40 & 32 & 24 \end{bmatrix}$

The following information is related to question 8 and 9.

Three theatres in the same town compete for a fixed number of patrons. The matrix below shows the movements of patrons from one month to the next.

A particular month

$$\begin{array}{l} \text{A} \\ \text{B} \\ \text{C} \end{array} \begin{bmatrix} \text{A} & \text{B} & \text{C} \\ 0.38 & 0.41 & 0.3 \\ 0.26 & 0.5 & 0.24 \\ 0.36 & 0.09 & 0.46 \end{bmatrix} \text{The following month}$$

There are 180 patrons who regularly attend the theatres. Initially, half of these patrons attend Venue C, and the other half attends either Venue A or Venue B. Twice as many patrons attend Venue A as attend Venue B.

Question 8

The number of patrons that will attend Venue A in the 3rd month is closest to

- A. 66
- B. 53
- C. 54
- D. 47
- E. 78

Question 9

If this pattern continues, the number of patrons at venue C in the long term will be closest to

- A. 53
- B. 50
- C. 52
- D. 51
- E. 54