

YEAR 12 *Trial Exam Paper*

2015

FURTHER MATHEMATICS

Written examination 1

Reading time: 15 minutes

Writing time: 1 hour 30 minutes

MULTIPLE-CHOICE QUESTION BOOK

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 book 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

- A question book of 43 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.
- 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 and/or any other unauthorised electronic devices into the examination.

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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.

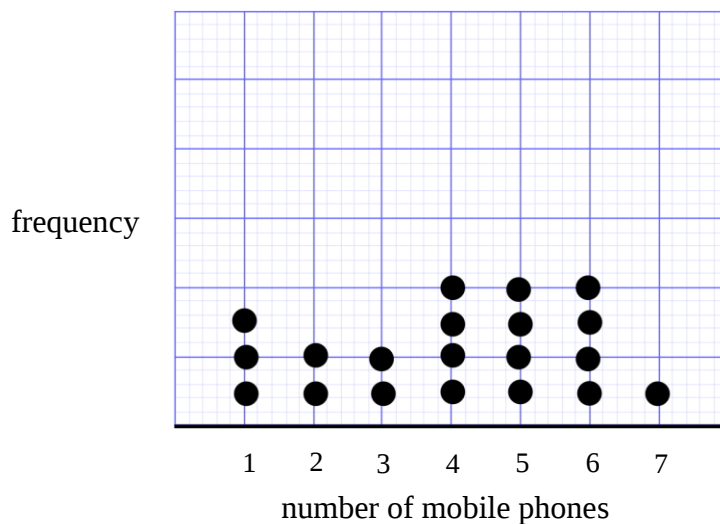
A correct answer scores 1; an incorrect answer scores 0.

Marks will **not** be deducted for incorrect answers.

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

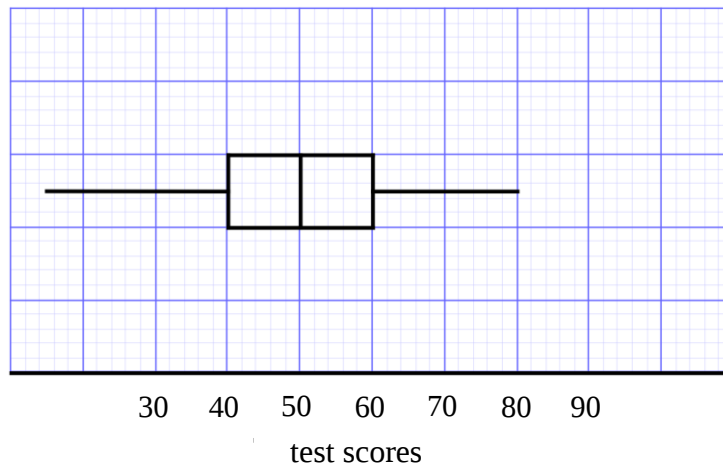
Core: Data analysis**Question 1**

A total of 20 households were surveyed to find out the number of mobile phones owned by each household. The results are displayed in the dotplot below. What percentage of households owned more than 5 mobile phones?



- A. 25%
- B. 45%
- C. 55%
- D. 75%
- E. 85%

Question 2



The boxplot above summarises the test scores of a class on a maths test. There were 20 students in the class. The student with the top score of 80 had her test remarked and subsequently achieved 95. Once the boxplot has been adjusted, which of the following statements will be **correct**?

- A. The median score of 50 will increase.
- B. The boxplot will indicate the top score of 95 as an outlier.
- C. The range will remain the same.
- D. The mean class score will increase by more than 1.
- E. The interquartile range will be reduced.

Question 3

Which of the following statements is **always** correct for any set of univariate data?

- A. The interquartile range is lower than the range.
- B. Increasing the highest value will not affect the median.
- C. The modal value has the highest frequency.
- D. The mean is a more accurate measure of the centre than the median.
- E. Increasing each value by 2 will not change the standard deviation of the data.

Question 4

The weights of eggs produced by Billy Fowler's egg farm are normally distributed with a mean of 90 g and a standard deviation of 4 g. Eggs that weigh less than 86 g or more than 98 g are not sold to the public. What percentage of eggs are sold to the public?

- A. 5%
- B. 18.5%
- C. 50%
- D. 81.5%
- E. 95%

Use the following information to answer Questions 5 and 6.

A survey was conducted to investigate the numbers of male and female Year 12 students who like or dislike external examinations at a large Melbourne high school during 2014. The data collected is displayed below in a 2-way frequency table.

	Males	Females
Like external examinations	84	45
Dislike external examinations	36	92

Question 5

The total number of students who were surveyed is

- A. 120
- B. 128
- C. 129
- D. 137
- E. 257

Question 6

Which of the following statements supports the contention that there is a relationship between gender and opinion on external examinations?

- A. Of the students who like external examinations, 35% were female, but of the students who dislike external examinations, 72% were female.
- B. There were uneven numbers of males (120) and females (137) who took part in the survey.
- C. Of the males who completed the survey, 70% like external examinations, whereas of the females surveyed, 33% like external examinations.
- D. Of all students surveyed, 50% like external examinations and 50% dislike external examinations.
- E. Females dislike external examinations more than males do.

SECTION A – continued

Question 7

Data recorded in the table below shows the water temperature at a popular surf coast beach on 10 days during the year and the corresponding mean number of minutes that swimmers spent in the water on those days.

Water temperature (°C)	15	13	17	19	10	18	20	19	12	13
Mean swimming time (min)	23	15	30	40	3	29	45	35	5	9

Based on a regression analysis, which of the following statements is true?

- A. 95% of the variation in temperature can be explained by the variation in swimming time.
- B. 95% of the variation in swimming time can be explained by the variation in temperature.
- C. 96% of the variation in swimming time can be explained by the variation in temperature.
- D. 98% of the variation in temperature can be explained by the variation in swimming time.
- E. 98% of the variation in swimming time can be explained by the variation in temperature.

Question 8

A set of bivariate data with variables x and y has the following properties:

$$r = 0.9362, \quad \bar{x} = 6.3, \quad s_x = 1.1, \quad \bar{y} = 12.7 \quad \text{and} \quad s_y = 1.8$$

The equation of the least squares regression line is nearest to

- A. $y = 1.53 + 3.06x$
- B. $y = 1.53 - 3.06x$
- C. $y = 1.80 + 1.53x$
- D. $y = 3.06 - 1.53x$
- E. $y = 3.06 + 1.53x$

Question 9

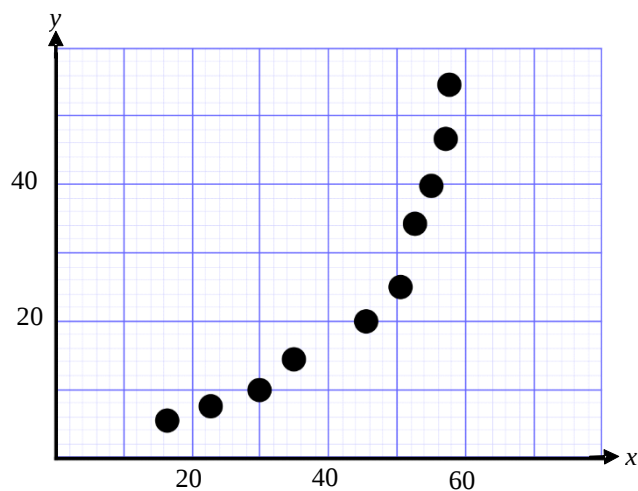
A set of bivariate data with variables x and y has a least squares regression line $y = 2x + 1$. The point $(3, b)$ is in the original data set that was used to find the least squares regression line and has a residual value of 0.75. The value of b is

- A. 6.25
- B. 7.00
- C. 7.75
- D. 8.00
- E. 8.75

Question 10

A table of bivariate data with variables x and y and the corresponding scatterplot are shown below.

x	16	23	30	35	45	50	53	55	57	58
y	7	9	10	15	20	25	34	40	47	54



To linearise the data, a $\log y$ transformation was used. The equation of the least squares regression line of the transformed data is

- A. $y = 1.00x - 16.49$
- B. $\log y = 0.02x + 0.45$
- C. $y = 0.02x + 0.45$
- D. $y = 0.45x + 0.02$
- E. $\log y = 0.45x + 0.02$

Question 11

The number of caravans sold by a surf coast caravan retailer during each month is shown in the table below.

Month	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
Caravan sales	25	28	12	8	6	3	4	8	12	23	34	52

To deseasonalise the data, the seasonal indices were calculated. The seasonal index for February is closest to

- A. 0.63
- B. 0.64
- C. 0.65
- D. 1.56
- E. 1.57

Question 12

Seasonal indices for ice cream sales are given in the table below.

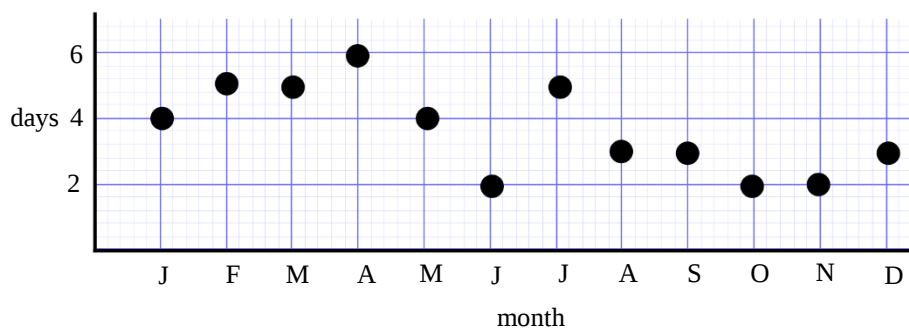
Month	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
Seasonal index	1.2	1.3	1.1	1.0		0.8	0.7	0.9	0.9	1.0	1.0	1.2

The deseasonalised number of ice cream sales for May was 25 120. The actual number of ice cream sales for May is closest to

- A. 20 096
- B. 22 608
- C. 23 656
- D. 25 120
- E. 27 911

Question 13

The time series plot below shows the number of cloud-free days recorded in the seaside town of Lornesea each month during 2014.



Using five-median smoothing, the number of cloud-free days for the month of June would be

- A. 2
- B. 3
- C. 4
- D. 5
- E. 6

END OF SECTION A – continued

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
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Module 1: Number patterns**Question 1**

The first 4 terms of a sequence are 37, 33, 29 and 25. The first term that will be negative will be term number:

- A. -3
- B. 5
- C. 7
- D. 10
- E. 11

Question 2

Ken is a new employee at a factory making wooden pallets. On the first day he makes 80 pallets, and as he gets more experienced he makes 10 more pallets each day than he made the previous day. How many pallets will he make in total during his first 12 working days?

- A. 960
- B. 1260
- C. 1500
- D. 1620
- E. 1800

Question 3

Which of the equations below represents an arithmetic sequence?

- A. $t_{n+1} = 3t_n$
- B. $t_{n+1} = 3 - t_n$
- C. $t_{n+1} = t_n - 3$
- D. $t_{n+1} = 3t_n + 3$
- E. $t_{n+1} = 3 - 3t_n$

Question 4

The difference equation $t_{n+1} = 5t_n - b$, $t_1 = 2$ generates the sequence 2, 14, 74, 374 ...

The value of b is

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

Question 5

The sum of the first 9 terms of the geometric sequence 2, 0.5, 0.125 ... is closest to

- A. 26.67
- B. 2.67
- C. 2.63
- D. 2.60
- E. -2.63

Question 6

A new drug called Arrestaheadache has been developed to treat migraine sufferers. The first dose contains 12 mg of active ingredient. Each subsequent dose contains only 90% of the active ingredient in the previous dose.

The total amount of active ingredient, in mg, that a patient who takes the full course of this drug will be

- A. 120
- B. 130
- C. 132
- D. 133
- E. 140

Question 7

The following numbers are part of a sequence 5, 8, 13, 21, 34 ...

Which of the following statements is **false**?

- A. Each term is the sum of the previous 2 terms
- B. The sequence can be generated by the difference equation $t_n = t_{n-2} + t_{n-1}$.
- C. The numbers could be part of a Fibonacci sequence.
- D. The sequence is generated by a second-order difference equation.
- E. $t_1 = t_2 = 1$

Question 8

Chelsea is preparing solutions for the next Chemistry SAC. She has a 2 L bottle of a 50% sodium chloride solution. She wants to make up a 3 L bottle of a 10% sodium chloride solution. The volume, in L, of the 50% solution she will need to use will be

- A. 0.4
- B. 0.6
- C. 0.8
- D. 1.2
- E. 1.4

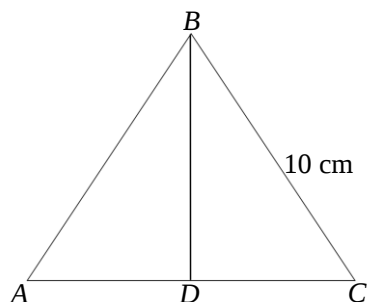
Question 9

Adrianna bequeathed her inheritance to her 3 grandchildren, Axel, Barry and Christine, in the ratio of 3:2:1 respectively. Christine is unhappy with this and tells the executor of the will that Axel and Barry can split her part of the inheritance between them evenly as well as taking their own share. If Axel now inherits \$52 500, Barry will inherit

- A. \$30 000
- B. \$35 000
- C. \$37 500
- D. \$42 500
- E. \$52 500

Module 2: Geometry and trigonometry

The following diagram relates to Questions 1 and 2. Triangle ABC is an equilateral triangle.

**Question 1**

The angle at vertex A is closest to

- A. 30°
- B. 45°
- C. 60°
- D. 73°
- E. 90°

Question 2

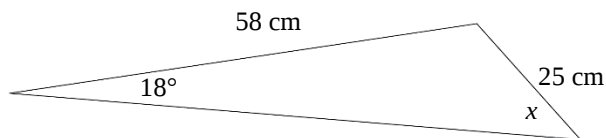
The line BD is a perpendicular bisector of the side AC . The length of BD , in cm, is closest to

- A. 5.00
- B. 8.36
- C. 8.66
- D. 8.67
- E. 10.00

Question 3

The angle of depression from the balcony of the 15th floor apartment in a resort building on the Gold Coast to the water's edge of the ocean is 35° . The balcony is 50 m above the front entrance of the building, which is at ground level. The distance, in m, to the water's edge from the front door is closest to

- A. 29
- B. 35
- C. 61
- D. 71
- E. 87

Question 4

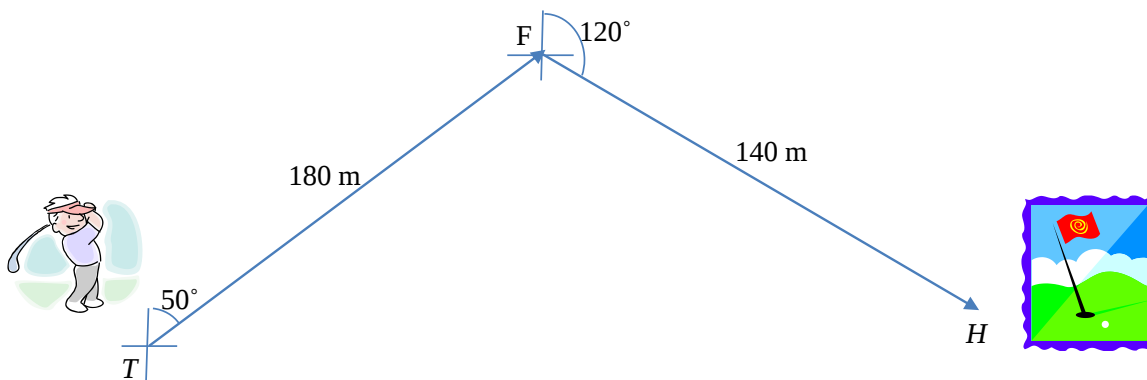
The magnitude of angle x is closest to

- A. 45°
- B. 46°
- C. 47°
- D. 48°
- E. 49°

Question 5

Pedro's peach jam is available in 2 different sized cylindrical cans. The cans are similar in shape. The height of the large can is 150 cm. The volume of the large can is $12\,000\text{ cm}^3$, and the volume of a small can is 1500 cm^3 . The height, in cm, of a small can is

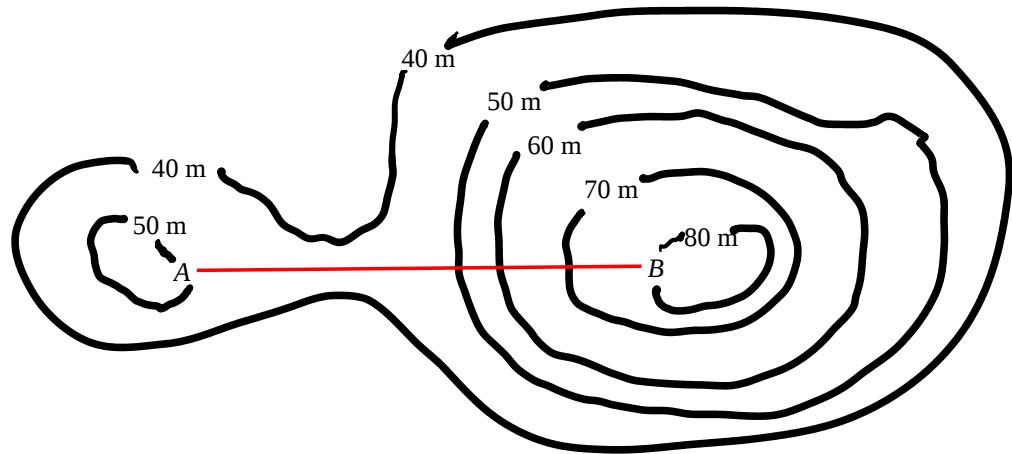
- A. 50
- B. 60
- C. 65
- D. 70
- E. 75

Question 6

Pedro the golfer plays a par four dogleg. His tee shot (T) is hit on a bearing of $050^\circ T$ a distance of 180 m to the fairway (F). His second shot to the hole (H) is hit on a bearing of $120^\circ T$ a distance of 140 m.

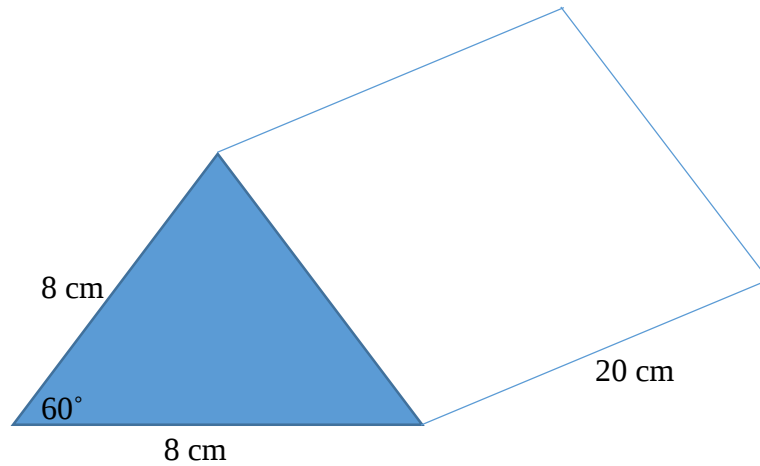
The next time Pedro plays the hole he considers hitting his tee shot straight at the green. The distance, in m, he needs to hit his tee shot to reach the hole in one shot would be

- A. 263
- B. 264
- C. 265
- D. 278
- E. 279

**Question 7**

A flying fox cable runs from close to the top of one hill at point B 80 m above sea level to close to the top of another hill at point A 50 m above sea level. The cable is strained so tight that it is perfectly straight. The length of the cable is 120 m. The gradient of the cable is

- A. 0.25
- B. 0.26
- C. 0.27
- D. 0.28
- E. 0.29

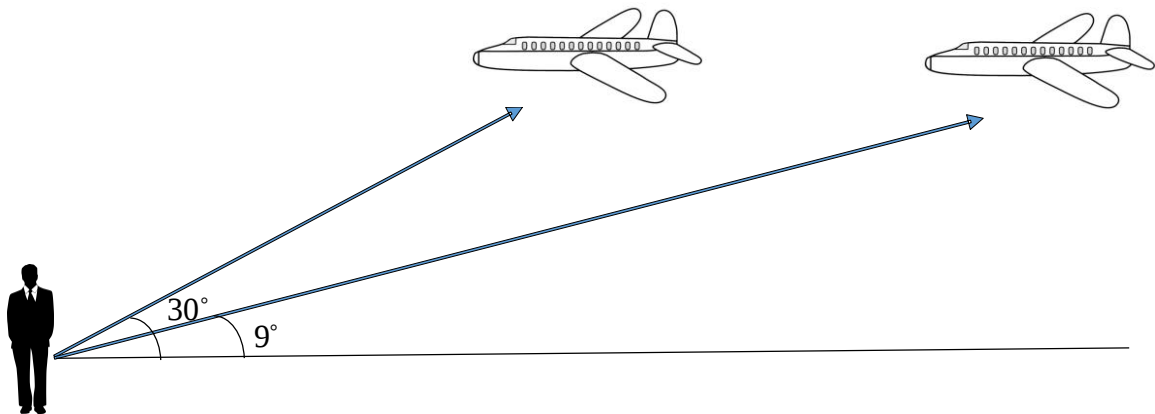
**Question 8**

The solid illustrated above is a prism of length 20 cm. The prism has a triangular cross-section of an equilateral triangle with side lengths 8 cm. The volume of the solid, to the nearest cm^3 , is

- A. 27
- B. 32
- C. 320
- D. 554
- E. 640

Question 9

Billy is at the airport waiting for his girlfriend to arrive home from overseas. He spots two planes in the distance. The closer plane is at an angle of elevation of 30° . The plane further away is at an angle of elevation of 9° . Both planes are flying at the same altitude. Billy calculates the direct distance (along the line of sight) from him to each of the planes. The



ratio of the direct distance from Billy to each of the planes is closest to

- A. 1:3.0
- B. 1:3.2
- C. 1:3.4
- D. 1:3.6
- E. 1:3.8

Module 3: Graphs and relations**Question 1**

The equation of the straight line joining the 2 points $(-2, 8)$ and $(8, -2)$ is

- A. $y + x + 6 = 0$
- B. $y - x + 6 = 0$
- C. $y + x - 6 = 0$
- D. $y - x - 6 = 0$
- E. $-y - x - 6 = 0$

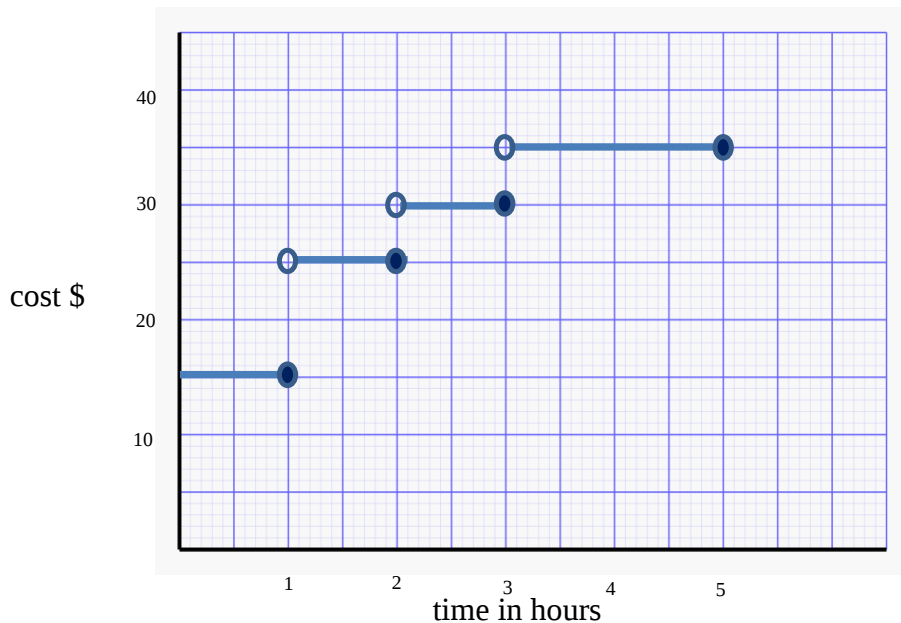
Question 2

If $y = kx^2$ and x and y have values as shown in the table below

x	0	2	4	6
y	0	4.8	19.2	43.2

then the value of k is

- A. 1.0
- B. 1.2
- C. 1.4
- D. 1.6
- E. 1.8



Question 3

The cost of surfboard hire on the Gold Coast during November and December is shown on the graph above. Jennifer hired a surfboard on 3 separate days during her end of school year holiday and paid a total of \$80.

Which one of the following statements could be true?

- A. Jennifer surfed for 1.5 hours each day.
- B. Jennifer surfed for 1 hour the 1st day, 2 hours the 2nd day and 3 hours the 3rd day.
- C. Jennifer surfed for 2 hours the 1st day, 2.5 hours the 2nd day and 4 hours the 3rd day.
- D. Jennifer surfed for 2 hours the 1st day, 0.5 hours the 2nd day and 3 hours the 3rd day.
- E. Jennifer surfed for 5 hours the 1st day, 0.5 hours the 2nd day and 2.5 hours the 3rd day.

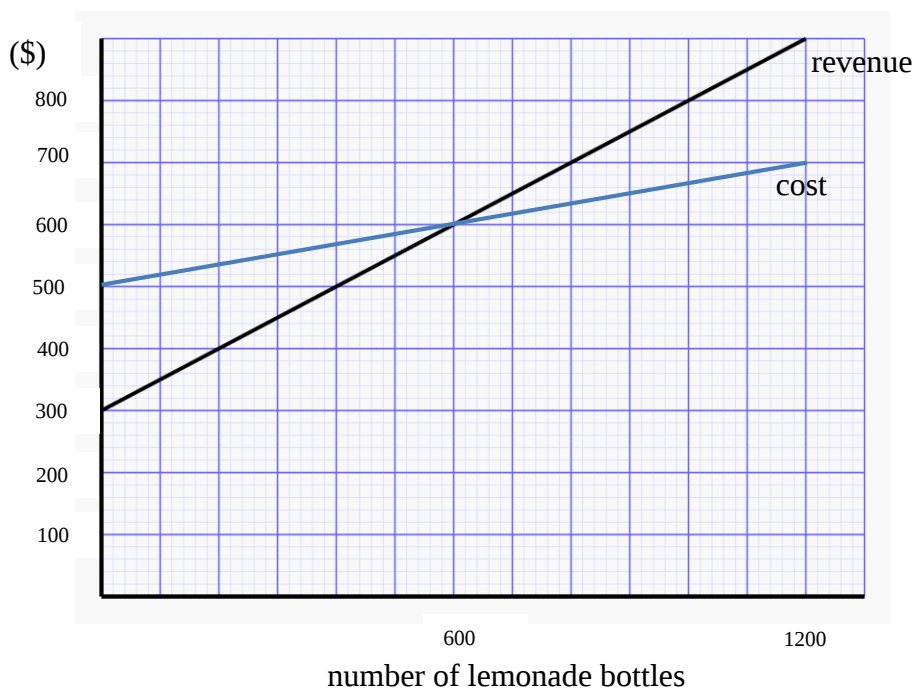
Question 4

If $4x + 2y = 7$ and $3x - 2y - 14 = 0$ are drawn on the same set of axes, the only point that lies on both lines is

- A. $(2, -0.5)$
- B. $(3, 4)$
- C. $(3, 2)$
- D. $(3, -2.5)$
- E. $(2, -2.5)$

Question 5

The graph below shows the cost and revenue functions for a lemonade manufacturer.



Which of the following statements is incorrect?

- A. The manufacturer must make and sell more than 600 bottles to make a profit.
- B. Costs include \$300 before any lemonade bottles are manufactured.
- C. The gradient of the cost equation is lower than the gradient of the revenue equation.
- D. If the manufacturer sells 1200 bottles, the profit will be \$200.
- E. The profit equation is $P = \frac{1}{3} \times (\text{number of bottles}) - 200$

Question 6

Bruce is an athletics track and field coach. Bruce's athletes always do at least 40 minutes of track work and at least 30 minutes of field work during each training session. The athletes spend a maximum of 120 minutes training in any session and must do track work for at least twice as long as they do field work.

If x and y are the number of minutes of track training and field training, respectively, the constraints for a training session are

A. $x \geq 40$
 $y \geq 30$
 $x + y \leq 120$
 $x \geq 2y$

B. $x \geq 40$
 $y \geq 30$
 $x + y \leq 120$
 $x \leq 2y$

C. $x \leq 40$
 $y \leq 30$
 $x + y \geq 120$
 $x \leq 2y$

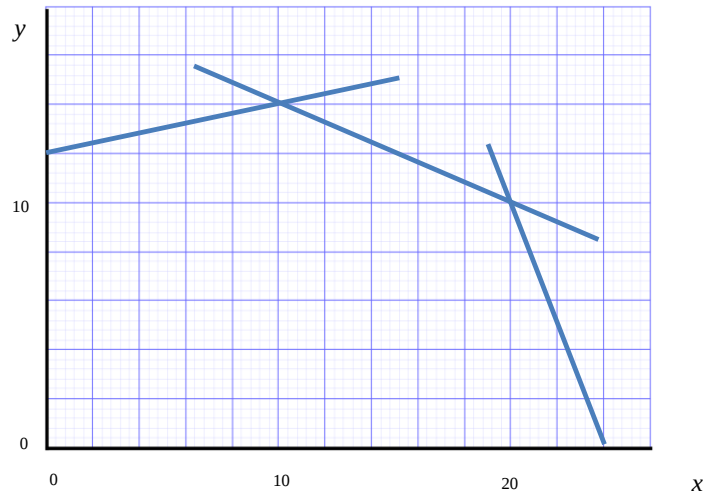
D. $x \leq 40$
 $y \leq 30$
 $x + y \geq 120$
 $x \leq 2y$

E. $x \geq 40$
 $y \geq 30$
 $x + y \geq 120$
 $x \leq 2y$

Question 7

The set of inequations that describe a feasible region are

$$x \geq 0, y \geq 0, 5y - x \leq 60, 5y + 2x \leq 90 \text{ and } 2y + 5x \leq 120$$



The objective function is $P = 3x + 2y$.

The maximum value of P occurs at

- A. (10, 14)
- B. (14, 10)
- C. (20, 10)
- D. (10, 20)
- E. (24, 0)

Question 8

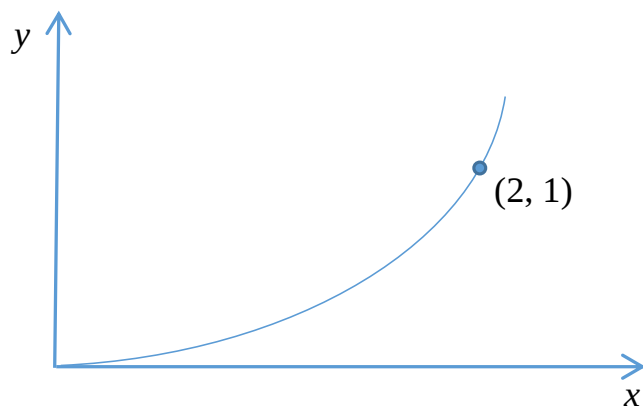
The Dinkum pie company has weekly fixed costs of \$200 plus \$0.50 for each pie it makes and sells. The Aussie pie company has weekly fixed costs of \$300 plus \$0.40 for each pie it makes and sells. Both pie companies sold their pies for the same price, and both made a profit of \$2000 in a particular week after making and selling the same number of pies.

The price of a pie was

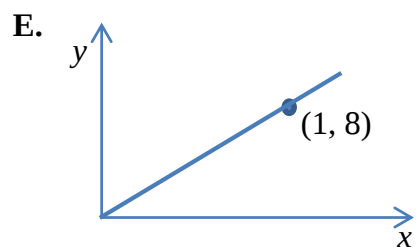
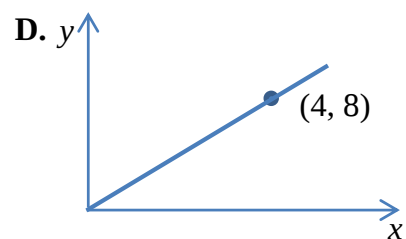
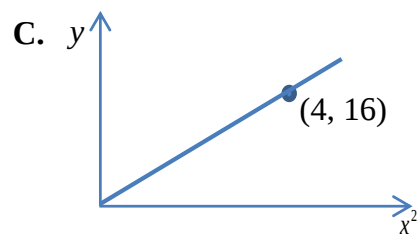
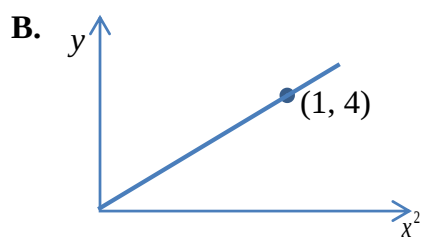
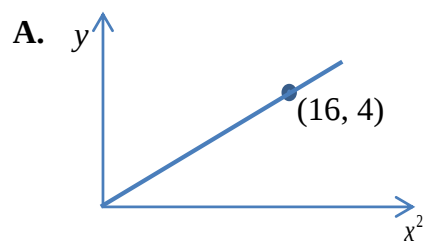
- A. \$2.40
- B. \$2.50
- C. \$2.60
- D. \$2.70
- E. \$2.80

Question 9

The diagram below shows a graph of a function of the form $y = kx^2$.



Which of the following graphs represents the same function?



Module 4: Business-related mathematics**Question 1**

Sally invested \$5000 in a 6-month term deposit that pays interest at the rate of 7.6% per annum. If the interest is credited at the end of the term then the value of Sally's investment at the end of the 6 months, to the nearest dollar, will be

- A. \$180
- B. \$190
- C. \$380
- D. \$5190
- E. \$5380

Question 2

Alex invests \$2500 in a compound interest account at the rate of 3.7% per annum, compounding weekly.

The interest earned on this investment after 3 years will be

- A. \$287.89
- B. \$293.01
- C. \$293.38
- D. \$2793.01
- E. \$2793.38

Question 3

Mikkis department store had a stocktake sale and reduced all items on 1 June by 25% in an attempt to clear stock. Sales were still slow so they reduced prices by an extra 15% of their already reduced price on 10 June. On 11 June, Sally bought a dress for \$76.50. The original price of the dress before the reductions was

- A. \$107.10
- B. \$109.97
- C. \$120.00
- D. \$127.50
- E. \$130.50

Question 4

A bank statement for June 2014 is shown below, but the balance column after each transaction is incomplete.

Date	Transaction details	Credit	Debit	Balance
1 June 2014	Opening balance			\$ 1256.50
8 June 2014	Withdrawal		\$87.50	
15 June 2014	Deposit	\$76.00		
30 June 2014				

Interest is credited at the rate of 0.35% of the minimum monthly balance. Interest earned for June 2014 was

- A. \$0.34
- B. \$4.09
- C. \$4.34
- D. \$4.36
- E. \$4.40

Question 5

Ella receives \$2000 from her parents on her 16th birthday. She decides she wants to buy a car on her 18th birthday so she invests the \$2000 into an account compounding monthly at the rate of 4.45% per annum. She knows she will need \$5000 for the car she wants to buy. The amount that Ella needs to deposit into her account each month for 2 years so that her savings reach \$5000 is closest to

- A. \$112.00
- B. \$122.00
- C. \$132.00
- D. \$142.00
- E. \$152.00

Question 6

The bank has approved a \$500 000 loan for Adam to purchase a new home. The reducing balance loan will accrue interest at a rate of 6.6% p.a. calculated monthly. If the loan is to be fully repaid over 20 years the monthly repayment will be closest to:

- A. \$2083.33
- B. \$3757.36
- C. \$26 468.82
- D. \$33 000.00
- E. \$43 171.23

Question 7

Harvey purchases a new sound system from BJ Norman Hi Fi. The price of the sound system is \$2700 cash or it can be bought with a hire purchase agreement that includes a \$500 deposit and monthly repayments for 3 years with interest charged at a flat rate of 15% per annum. If Harvey takes the hire purchase option, the total extra money he will end up paying will be

- A. \$330
- B. \$990
- C. \$1215
- D. \$3030
- E. \$3690

Question 8

Sarah bought a new taxi for \$45 000. She wishes to depreciate the taxi by the same amount each year until after 5 years it has a scrap value of just \$5000. She will do this using unit cost depreciation, whereby the taxi will depreciate by a certain amount per kilometre each year. If she drives 50 000 km each year the depreciation, per kilometre, will be

- A. \$0.13
- B. \$0.14
- C. \$0.15
- D. \$0.16
- E. \$0.17

Question 9

Ralph takes out a \$380 000 reducing balance loan at a rate of 5.4% compounding monthly. Repayments of \$3085 are made monthly for 179 payments. If the loan is to be fully repaid after the 180th repayment, the last repayment, to the nearest cent, will be

- A. \$58.29
- B. \$58.55
- C. \$3013.15
- D. \$3026.71
- E. \$3085.00

Module 5: Networks and decision mathematics

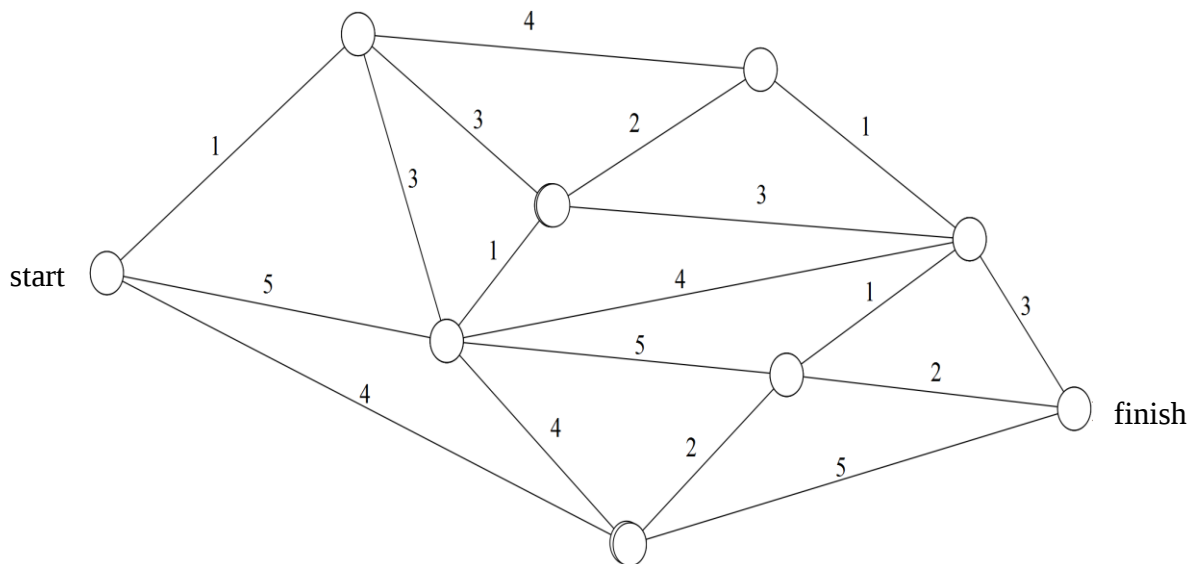
Question 1

A connected graph has 4 vertices of degree 3, 3 vertices of degree 2 and 2 vertices of degree 1.

The number of edges in this graph is

- A. 7
- B. 8
- C. 9
- D. 10
- E. 11

Questions 2 and 3 relate to this network diagram.



Question 2

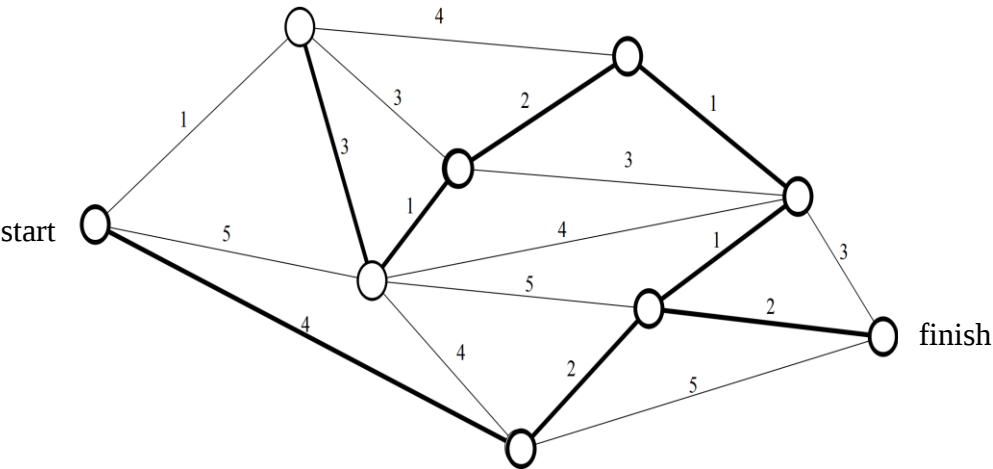
The shortest distance from start to finish is

- A. 7
- B. 8
- C. 9
- D. 10
- E. 11

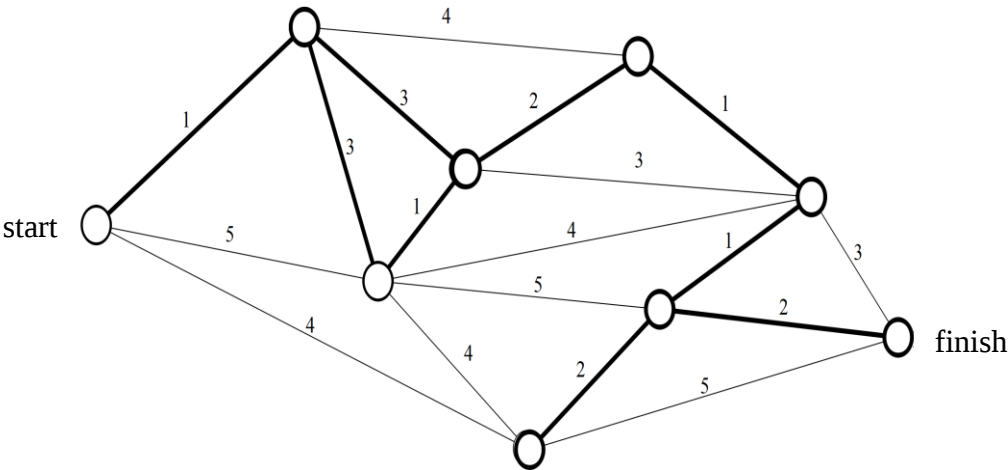
Question 3

The minimum spanning tree for the above graph is

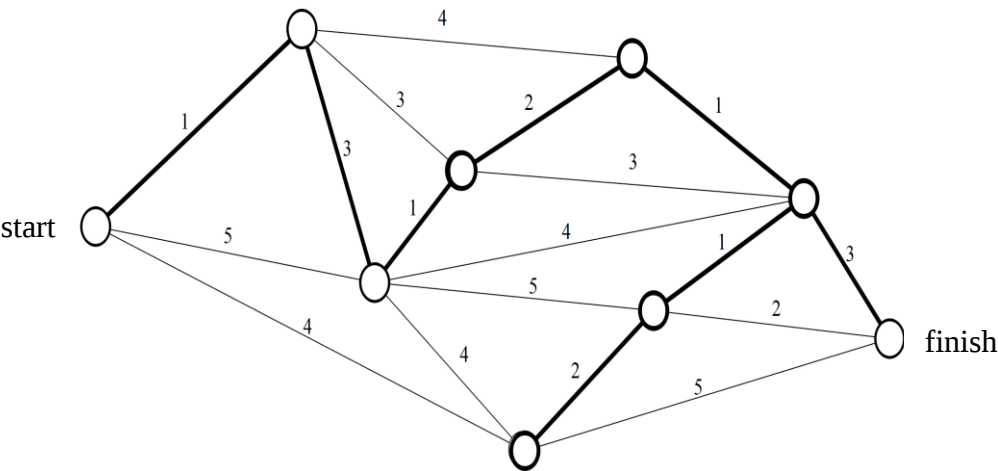
A.

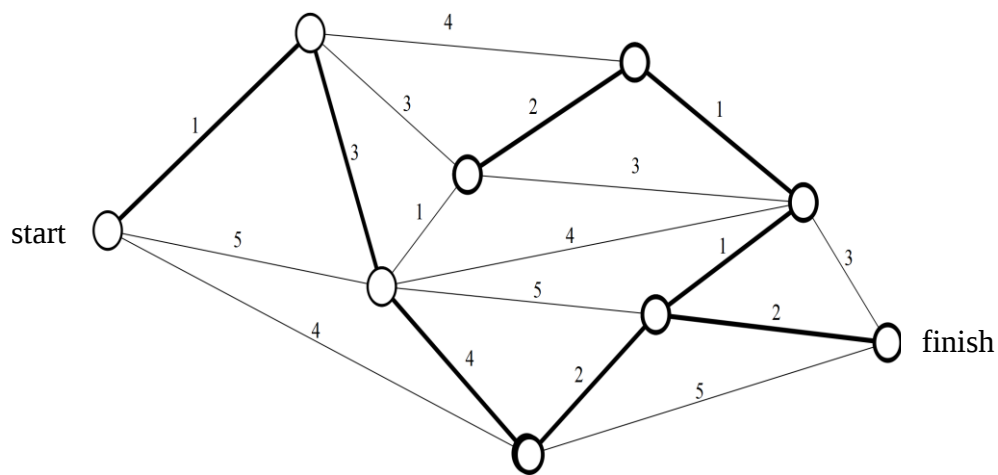
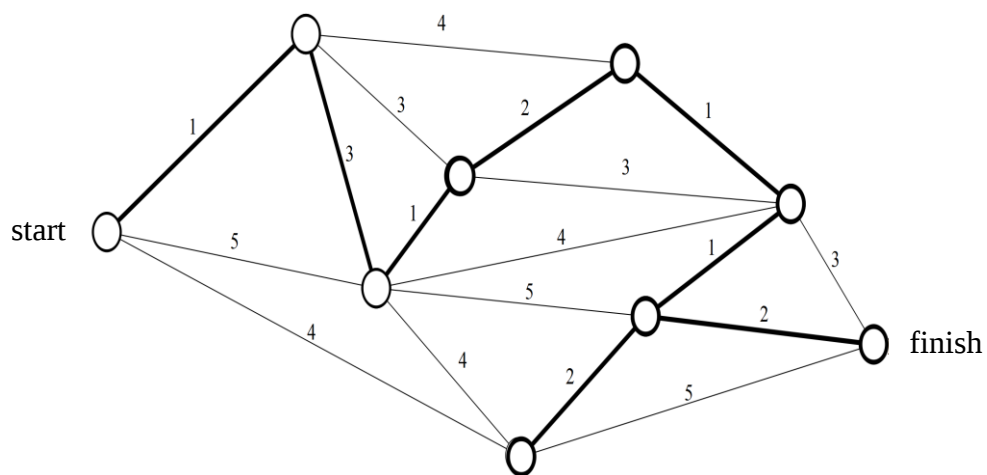


B.



C.



D.**E.**

Question 4

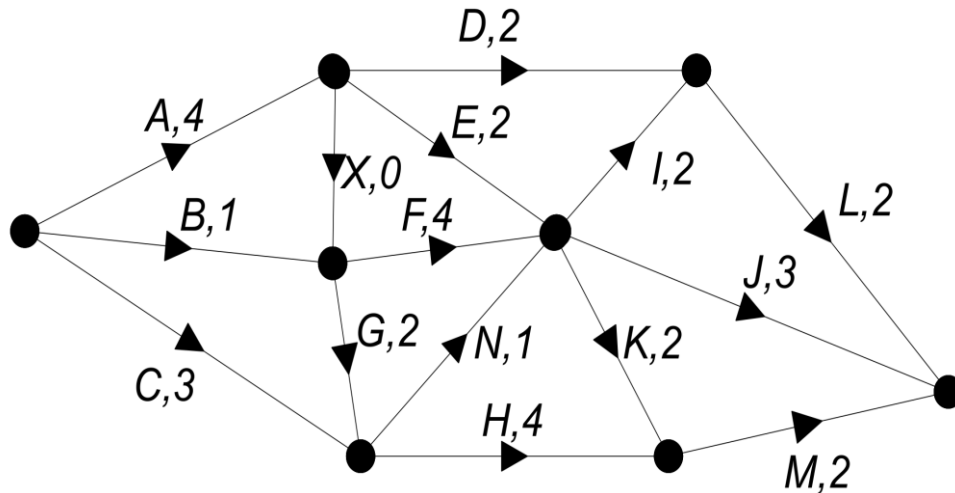
A network graph has 4 vertices, and each vertex has a degree of 2.

Which of the following statements is **incorrect**?

- A. The graph could be connected.
- B. The graph could be complete.
- C. The graph could contain a loop.
- D. The graph could contain a double edge.
- E. The graph could be a simple graph.

Questions 5 and 6 relate to this network diagram.

The network diagram below shows the tasks and the number of hours that each task will take to prepare students and staff for an end of year trip to Central Africa. Activity X is a dummy activity that takes zero time.



Question 5

Activity C (which is getting travel visas) is delayed by 4 weeks (i.e. instead of 3 weeks to get visas, it now takes 7 weeks). The preparation of staff and students for the end of year trip to Central Africa will now be delayed by

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

Question 6

The coordinating teacher gets the problem with the visas sorted out and they arrive after 3 weeks as originally planned.

The preparations are almost complete, but there are problems getting the final immunisations. These are activities L, J and M. Each of these will be delayed by an extra 2 weeks unless the school pays \$100 per week for each of these activities to get the immunisations done on time. To keep the Central Africa trip preparation on schedule, the minimum the school will pay is

- A. \$200
- B. \$300
- C. \$400
- D. \$500
- E. \$600

Question 7

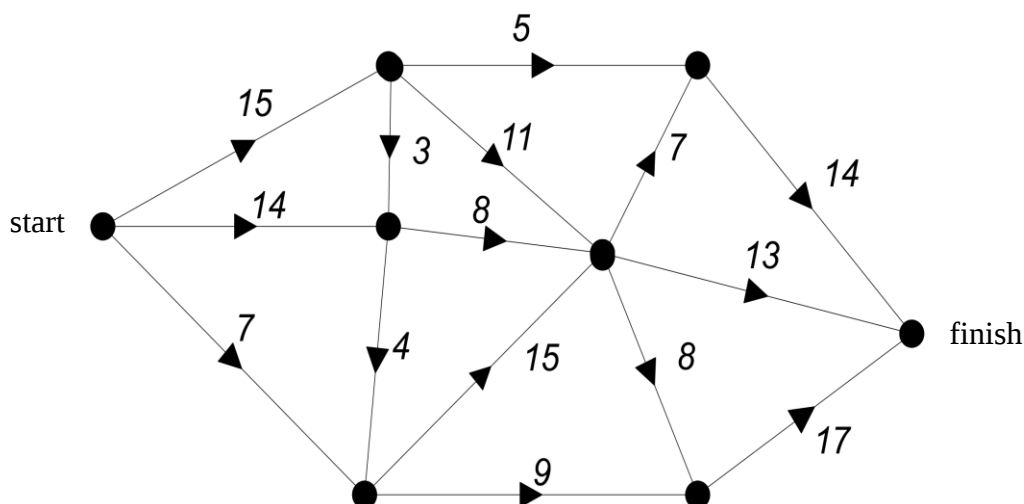
Four girls, Annie, Bonnie, Cassie and Danni, play a tennis tournament where each girl plays each other girl once. The resulting total 1st order dominance and total 2nd order dominance is given in the table below.

Player	1st order dominance	2nd order dominance
Annie	2	1
Bonnie	0	0
Cassie	3	2
Danni	1	0

Which of the following statements must be **incorrect**?

- A.** Bonnie loses all 3 of her matches.
- B.** Annie defeats Danni and Bonnie.
- C.** Cassie has 2nd order dominance over Annie.
- D.** Annie has 2nd order dominance over Bonnie.
- E.** Cassie wins all 3 of her matches.

Question 8



The maximum flow through the above network is

- A. 32
- B. 33
- C. 34
- D. 35
- E. 36

Question 9

Euler's rule states that $v + f = e + 2$. How many of the following statements are **false** for a network to which Euler's rule can be applied.

- Euler's rule can be applied to graphs with loops.
- If Euler's rule can be applied, there are always more edges than faces.
- Euler's rule cannot be applied to any complete graphs.
- Euler's rule can be applied to all undirected graphs.

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

END OF MODULE 5
SECTION B – continued
TURN OVER

Module 6: Matrices**Question 1**

If matrix $A = \begin{bmatrix} 5 & 5 & 1 \\ 1 & -3 & 0 \\ -4 & 2 & 6 \\ 4 & -1 & -3 \end{bmatrix}$

then $a_{3,2}$ is

- A. 2
- B. 0
- C. 6
- D. -3
- E. -4

Question 2

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

Then $A \times (A - B)$ is

- A. $\begin{bmatrix} 7 & -7 \\ -8 & 10 \end{bmatrix}$
- B. $\begin{bmatrix} 9 & 7 \\ 8 & 6 \end{bmatrix}$
- C. $\begin{bmatrix} 7 & 7 \\ 8 & 4 \end{bmatrix}$
- D. $\begin{bmatrix} 3 & -3 \\ 5 & 1 \end{bmatrix}$
- E. $\begin{bmatrix} -7 & -7 \\ -8 & -4 \end{bmatrix}$

Question 3

Consider the following matrices A , B and C where

$$A = \begin{bmatrix} 1 & -1 \\ -2 & 3 \end{bmatrix} \quad B = \begin{bmatrix} 3 & -5 \\ 4 & -1 \end{bmatrix} \quad C = \begin{bmatrix} -7 \\ -4 \end{bmatrix}$$

And the following operations

- I $(A \times B) + C$
- II $C + A \times B$
- III $A + B \times C$
- IV $A \times B \times C$
- V $(A + B) \times C$

The operations that give a valid solution are

- A. II only
- B. V only
- C. II and V
- D. IV and V
- E. I, II, III, IV and V

Question 4

The prices of fillet steak, rump steak and blade steak at a local butcher shop on a Saturday morning are \$20.35, \$18.60 and \$12.90 per kilogram, respectively. Bernie is shopping for himself, his sister Sally and his brother Barry. He purchases 3 kg of rump steak for himself, 2 kg of fillet steak for Sally and 1 kg of blade steak for Barry.

Bernie wants know how much to charge Sally and Barry when he gets home. The matrix product that will give him the cost of each person's purchase separately is

A. $[20.35 \ 18.60 \ 12.90] \times \begin{bmatrix} 3 \\ 2 \\ 1 \end{bmatrix}$

B. $[20.35 \ 18.60 \ 12.90] \times \begin{bmatrix} 3 & 0 & 0 \\ 0 & 2 & 0 \\ 0 & 0 & 1 \end{bmatrix}$

C. $\begin{bmatrix} 2 \\ 3 \\ 1 \end{bmatrix} \times [20.35 \ 18.60 \ 12.90]$

D. $[20.35 \ 18.60 \ 12.90] \times \begin{bmatrix} 2 & 0 & 0 \\ 0 & 3 & 0 \\ 0 & 0 & 1 \end{bmatrix}$

E. $\begin{bmatrix} 2 & 0 & 0 \\ 0 & 3 & 0 \\ 0 & 0 & 1 \end{bmatrix} \times [20.35 \ 18.60 \ 12.90]$

Question 5

If matrix $A = \begin{bmatrix} -4 & -2 \\ 4 & a \end{bmatrix}$, which of the following statements is **true**?

- A. A is a singular matrix for all values of a except 2
- B. A has an inverse only if $a = 2$
- C. A has an inverse when $a = 4$
- D. A has an inverse only if $a \geq 2$
- E. $\det(A) \neq 0$ when $a = 2$

Question 6

How many of the following pairs of simultaneous equations have a unique solution?

$x + y = 8$	$x - y = 8$	$2x + 2y = -8$	$x - y = -8$
$x + y = -8$	$x + y = 8$	$x - y = 8$	$2x - 2y = -8$

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

Question 7

Members of the Deakin running club do either short-course training or long-course training. Of the athletes who do short-course training one night, 85% will do short-course training the next night; of the athletes who do long-course training one night, 65% will do long-course training the next night.

The transition matrix that represents this situation is

A. $\begin{bmatrix} 0.85 & 0.15 \\ 0.35 & 0.65 \end{bmatrix}$

B. $\begin{bmatrix} 0.85 & 0.15 \\ 0.65 & 0.35 \end{bmatrix}$

C. $\begin{bmatrix} 0.65 & 0.85 \\ 0.35 & 0.15 \end{bmatrix}$

D. $\begin{bmatrix} 0.65 & 0 \\ 0 & 0.85 \end{bmatrix}$

E. $\begin{bmatrix} 0.65 & 0.15 \\ 0.35 & 0.85 \end{bmatrix}$

Question 8

Freddy takes a piece of fruit to work for lunch on each of the five days from Monday to Friday. Freddy chooses from Apple, Banana, Cherries, Dates and Eggfruit according to the transition matrix below

A	B	C	D	E	
0	1	0	0	0	A
0	0	1	0	0	B
0	0	0	1	0	C
0	0	0	0	1	D
1	0	0	0	0	E

Tomorrow

If Freddy takes a Banana on Monday, list the fruits he takes in order from Monday to Friday.

- A. Banana, Apple, Cherries, Dates, Eggfruit
- B. Banana, Cherries, Dates, Eggfruit, Apple
- C. Banana, Apple, Eggfruit, Dates, Cherries
- D. Banana, Apple, Dates, Eggfruit, Cherries
- E. Banana, Apple, Dates, Cherries, Eggfruit

Question 9

If $A = \begin{bmatrix} 2 & 1 \\ a & 3 \end{bmatrix}$, $B = \begin{bmatrix} 3 & 2 \\ 1 & b \end{bmatrix}$, $A \times B = C$, $C_{2,1} = 6$ and $C_{2,2} = -1$

The values of a and b , respectively, are

- A. 1 and -1
- B. -1 and 1
- C. 2 and -1
- D. 1 and -2
- E. 2 and -2

END OF MULTIPLE-CHOICE QUESTION BOOK

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