

2013 VCE Further Mathematics Trial Examination 1



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VICTORIAN CERTIFICATE OF EDUCATION 2013

FURTHER MATHEMATICS

Trial Written Examination 1 (Facts, skills and applications)

Reading time: 15 minutes
Total writing time: 1 hour 30 minutes

MULTIPLE-CHOICE QUESTION BOOK

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 into the exam room: pens, pencils, highlighters, erasers, sharpeners, rulers, one bound reference, one approved graphics calculator or approved CAS calculator or CAS software and, if desired, one scientific calculator. Calculator memory DOES NOT need to be cleared.
- Students are NOT permitted to bring into the examination room: blank sheets of paper and/or white out liquid/tape.

Materials supplied

- Question book of 49 pages.
- Answer sheet for multiple-choice questions.
- There is a sheet of miscellaneous formula supplied.
- Working space is provided throughout the book.

Instructions

- Detach the formula sheet from the book during reading time.
- Check that your **name and student number** as printed on your answer sheet for multiple-choice questions are correct, **and** sign your name in the space provided to verify this.
- Unless otherwise indicated, the 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 room.

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VCE FURTHER MATHEMATICS 2013

Trial Written Examination 1

ANSWER SHEET

NAME: _____

STUDENT
NUMBER _____

SIGNATURE _____

Instructions

- Write your name in the space provided above.
- Write your student number in the space provided above. Sign your name.
- Use a **PENCIL** for **ALL** entries.
If you make a mistake, **ERASE** it - **DO NOT** cross it out.
- Marks will **NOT** be deducted for incorrect answers.
- **NO MARK** will be given if more than **ONE** answer is completed for any question.
- All answers must be completed like **THIS** example.

A	B	C	D	E
---	---	---	---	---

VCE FURTHER MATHEMATICS 2013

Trial Written Examination 1

ANSWER SHEET

NAME: _____

STUDENT
NUMBER _____

SIGNATURE _____

Instructions

- Write your name in the space provided above.
- Write your student number in the space provided above. Sign your name.
- Use a **PENCIL** for **ALL** entries.
If you make a mistake, **ERASE** it - **DO NOT** cross it out.
- Marks will **NOT** be deducted for incorrect answers.
- **NO MARK** will be given if more than **ONE** answer is completed for any question.
- All answers must be completed like **THIS** example.

A	B	C	D	E
---	---	---	---	---

Section A

1	A	B	C	D	E
2	A	B	C	D	E
3	A	B	C	D	E
4	A	B	C	D	E
5	A	B	C	D	E
6	A	B	C	D	E
7	A	B	C	D	E
8	A	B	C	D	E
9	A	B	C	D	E
10	A	B	C	D	E
11	A	B	C	D	E
12	A	B	C	D	E
13	A	B	C	D	E

Please turn over . . .

VCE FURTHER MATHEMATICS 2013

Trial Written Examination 1

ANSWER SHEET

Section B

(Shade the boxes of the three modules selected. There are a total of six from which to choose)

	Module 1 Number patterns	1	A	B	C	D	E
		2	A	B	C	D	E
		3	A	B	C	D	E
		4	A	B	C	D	E
		5	A	B	C	D	E
		6	A	B	C	D	E
		7	A	B	C	D	E
		8	A	B	C	D	E
		9	A	B	C	D	E
	Module 2 Geometry and trigonometry	1	A	B	C	D	E
		2	A	B	C	D	E
		3	A	B	C	D	E
		4	A	B	C	D	E
		5	A	B	C	D	E
		6	A	B	C	D	E
		7	A	B	C	D	E
		8	A	B	C	D	E
		9	A	B	C	D	E
	Module 3 Graphs and relations	1	A	B	C	D	E
		2	A	B	C	D	E
		3	A	B	C	D	E
		4	A	B	C	D	E
		5	A	B	C	D	E
		6	A	B	C	D	E
		7	A	B	C	D	E
		8	A	B	C	D	E
		9	A	B	C	D	E

Please turn over . . .

VCE FURTHER MATHEMATICS 2013

Trial Written Examination 1

ANSWER SHEET

Section B

(Shade the boxes of the three modules selected. There are a total of six from which to choose)

	Module 4 Business-related mathematics	1	A	B	C	D	E
		2	A	B	C	D	E
		3	A	B	C	D	E
		4	A	B	C	D	E
		5	A	B	C	D	E
		6	A	B	C	D	E
		7	A	B	C	D	E
		8	A	B	C	D	E
		9	A	B	C	D	E
	Module 5 Networks and decision mathematics	1	A	B	C	D	E
		2	A	B	C	D	E
		3	A	B	C	D	E
		4	A	B	C	D	E
		5	A	B	C	D	E
		6	A	B	C	D	E
		7	A	B	C	D	E
		8	A	B	C	D	E
		9	A	B	C	D	E
	Module 6 Matrices	1	A	B	C	D	E
		2	A	B	C	D	E
		3	A	B	C	D	E
		4	A	B	C	D	E
		5	A	B	C	D	E
		6	A	B	C	D	E
		7	A	B	C	D	E
		8	A	B	C	D	E
		9	A	B	C	D	E

Please DO NOT fold, bend or staple this form

FURTHER MATHEMATICS

Written examinations 1 and 2

FORMULA SHEET

Directions to students

Detach this formula sheet during reading time.

This formula sheet is provided for your reference.

Further Mathematics Formulas

Core: Data analysis

standardised score:	$z = \frac{x - \bar{x}}{s_x}$
least squares line:	$y = a + bx \text{ where } b = r \frac{s_y}{s_x} \text{ and } a = \bar{y} - b\bar{x}$
residual value:	residual value = actual value – predicted value
seasonal index:	seasonal index = $\frac{\text{actual figure}}{\text{deseasonalised figure}}$

Module 1: Number patterns

arithmetic series:	$a + (a + d) + \dots + (a + (n - 1)d) = \frac{n}{2}[2a + (n - 1)d] = \frac{n}{2}(a + l)$
geometric series:	$a + ar + ar^2 + \dots + ar^{n-1} = \frac{a(1 - r^n)}{1 - r}, r \neq 1$
infinite geometric series:	$a + ar + ar^2 + ar^3 + \dots = \frac{a}{1 - r}, r < 1$

Module 2: Geometry and trigonometry

area of a triangle:	$\frac{1}{2}bc \sin A$
Heron's formula:	$A = \sqrt{s(s - a)(s - b)(s - c)} \text{ where } s = \frac{1}{2}(a + b + c)$
circumference of a circle:	$2\pi r$
area of a circle:	πr^2
volume of a sphere:	$\frac{4}{3}\pi r^3$
surface area of a sphere:	$4\pi r^2$
volume of a cone:	$\frac{1}{3}\pi r^2 h$
volume of a cylinder:	$\pi r^2 h$
volume of a prism:	area of base $\times$ height
volume of a pyramid:	$\frac{1}{3} \text{ area of base } \times \text{ height}$

Pythagoras' theorem: $c^2 = a^2 + b^2$

sine rule: $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$

cosine rule: $c^2 = a^2 + b^2 - 2ab \cos C$

Module 3: Graphs and relations

Straight line graphs

gradient (slope): $m = \frac{y_2 - y_1}{x_2 - x_1}$

equation: $y = mx + c$

Module 4: Business-related mathematics

simple interest: $I = \frac{\text{Pr}T}{100}$

compound interest: $A = PR^n$ where $R = 1 + \frac{r}{100}$

hire purchase: effective rate of interest $\approx \frac{2n}{n+1} \times \text{flat rate}$

annuities: $A = PR^n - \frac{Q(R^n - 1)}{R - 1}$, where $R = 1 + \frac{r}{100}$

Module 5: Networks and decision mathematics

Euler's formula: $v + f = e + 2$

Module 6: Matrices

determinant of a 2×2 matrix: $A = \begin{bmatrix} a & b \\ c & d \end{bmatrix}; \det A = \begin{vmatrix} a & b \\ c & d \end{vmatrix} = ad - bc$

inverse of a 2×2 matrix: $A^{-1} = \frac{1}{\det A} \begin{bmatrix} d & -b \\ -c & a \end{bmatrix}$ where $\det A \neq 0$

END OF FORMULA SHEET

Core

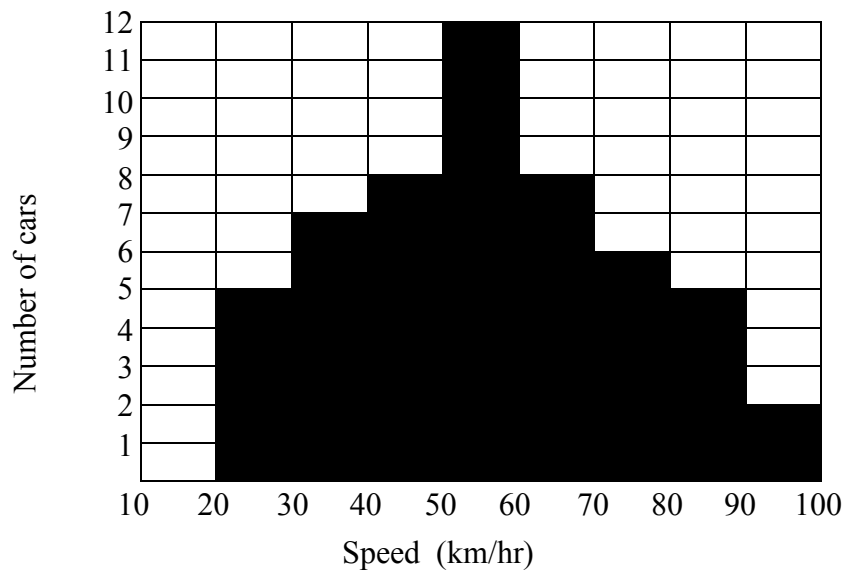
Specific Instructions for Section A

Section A consists of 13 questions

Answer **all** questions in this section.

A correct answer scores 1 mark, an incorrect answer scores 0. No mark will be given for a question if two or more letters are shaded for that question. Marks will not be deducted for incorrect answers and you should attempt every question.

Question 1



The above graph shows the speeds of cars along a particular stretch of road where the speed limit is 60 km/hr. The number of cars exceeding the speed limit is

- A. 12
- B. 13
- C. 21
- D. 32
- E. 33

Core

Question 2

The population of a country town is divided into groups according to age and sex. The results are listed in the table below.

Age Group	0 - 15	16 - 31	32 - 50	> 50
Males	280	284	290	105
Females	204	325	302	150

The percentage of males who are aged between 16 and 31 is closest to

- A. 15%.
- B. 17%.
- C. 29%.
- D. 30%.
- E. 47%.

Core

Use this information to answer questions 3 and 4

Regarding the Weights of Seville Oranges

Lower Quartile: 139g
Median: 154g
Upper Quartile: 169g

The lower quartile, the median and the upper quartile for the weights of Seville oranges are given in the table above.

Question 3

What percentage of Seville oranges has a weight greater than 139 grams?

- A. 20%
- B. 25%
- C. 50%
- D. 75%
- E. 95%

Question 4

Which one of the following statements is true?

- A. Any Seville orange with a weight between 109 grams and 199 grams would be an outlier.
- B. Any Seville orange with a weight less than 109 grams and greater than 199 grams would be an outlier.
- C. Any Seville orange with a weight less than 109 grams and greater than 214 grams would be an outlier.
- D. Any Seville orange with a weight less than 214 grams would be an outlier.
- E. Any Seville orange with a weight less than 94 grams would be an outlier.

Core

Question 5

Susan obtained the following marks in each of the five subjects that she is studying this year. The class mean and standard deviation for each subject are also given in the table.

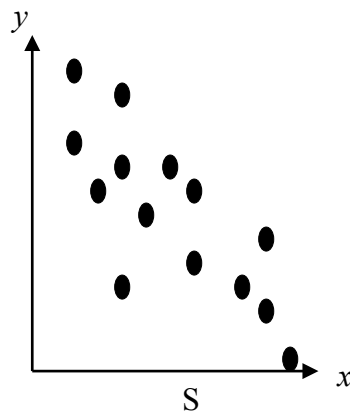
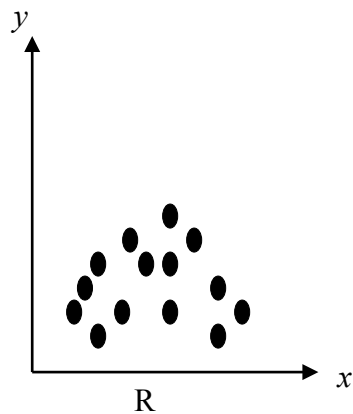
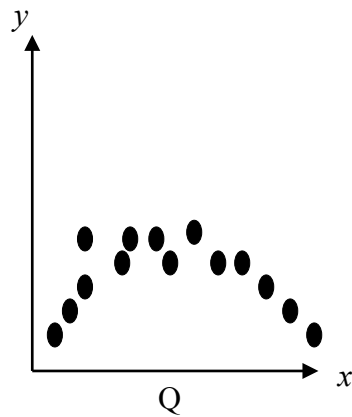
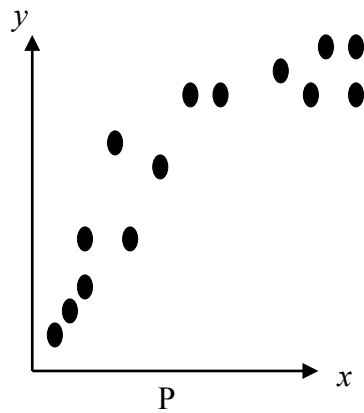
Subject	Mark	Mean	Standard Deviation
English	74	60	7
Maths	69	55	5
History	78	66	6
French	77	59	9
Chemistry	65	50	5

The subject in which Susan performed best relative to her class mates was

- A. English.
- B. Maths.
- C. History.
- D. French.
- E. Chemistry.

Core

Question 6



The scatter plots which show an r value between -0.1 and 0.1 are

- A. P and S only.
- B. Q and R only.
- C. Q only.
- D. R only.
- E. S only.

Core

Question 7

The age and blood pressure of a number of people have been recorded and the following statistics have been calculated.

Mean blood pressure	121.4
Mean age	66.7 years
Standard deviation for blood pressure	18.66
Standard deviation for age	14.7 years
Pearson's correlation coefficient	0.8382

The gradient of the least squares regression line that will enable blood pressure to be predicted from age is closest to

- A. 0.13
- B. 0.46
- C. 0.66
- D. 1.06
- E. 1.53

Question 8

Summer	Autumn	Winter	Spring
1.88	0.74	0.52	-----

The table above shows the seasonal indices for a car dealer whose average quarterly sales figures are estimated to be \$2,400,000. The estimated quarterly sales figures for the spring quarter are

- A. \$600,000
- B. \$1,248,000
- C. \$1,728,000
- D. \$2,064,000
- E. \$7,536,000

Core

Question 9

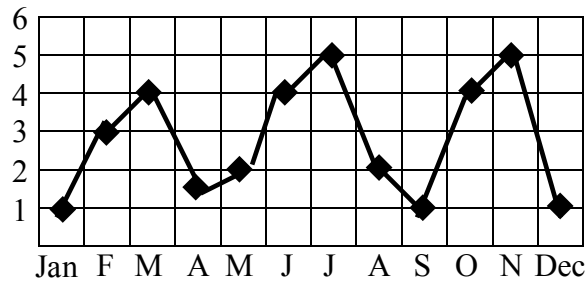
The average life of a certain brand of light globe is 1200 hours, with a standard deviation of 240 hours. If the length of the life of this brand of light globe is normally distributed, then the percentage of light globes with a life less than 720 hours or more than 1920 hours is closest to

- A. 2.65%
- B. 3%
- C. 4%
- D. 5%
- E. 95%

Core

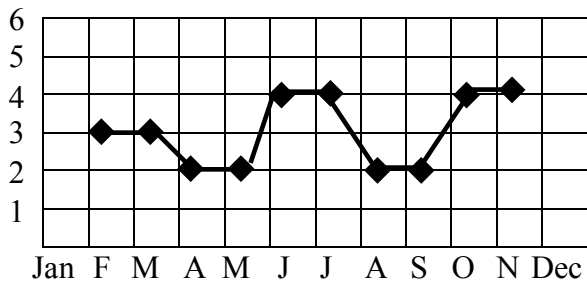
Question 10

The time series plot below shows the number of thousands of people who used the local library each month during 2012.

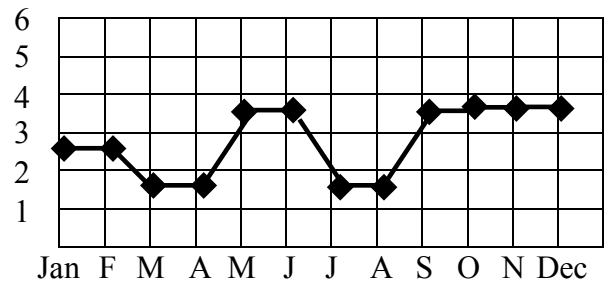


Using three – moving mean smoothing, the smoothed time series plot will look like which one of the following?

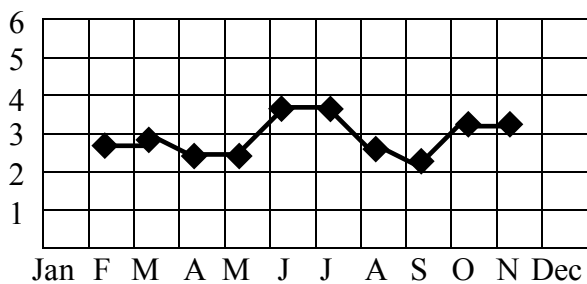
A.



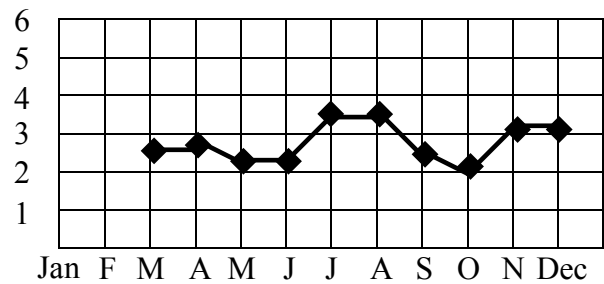
D.



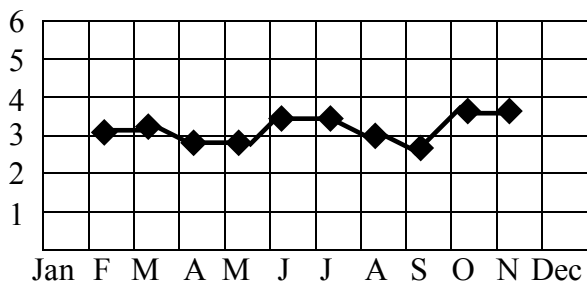
B.



E.



C.



Core

Question 11

Which one of the following statements is true?

- A. Smoothing is used on a time series plot to reduce trend.
- B. Smoothing is used on a time series plot to reduce all variation.
- C. Smoothing is used on a time series plot to eliminate some variation so that seasonality and trend are more easily identified.
- D. Smoothing is used on a time series plot to reduce cyclical variation only.
- E. Smoothing is used on a time series plot to reduce both seasonal and cyclical variation.

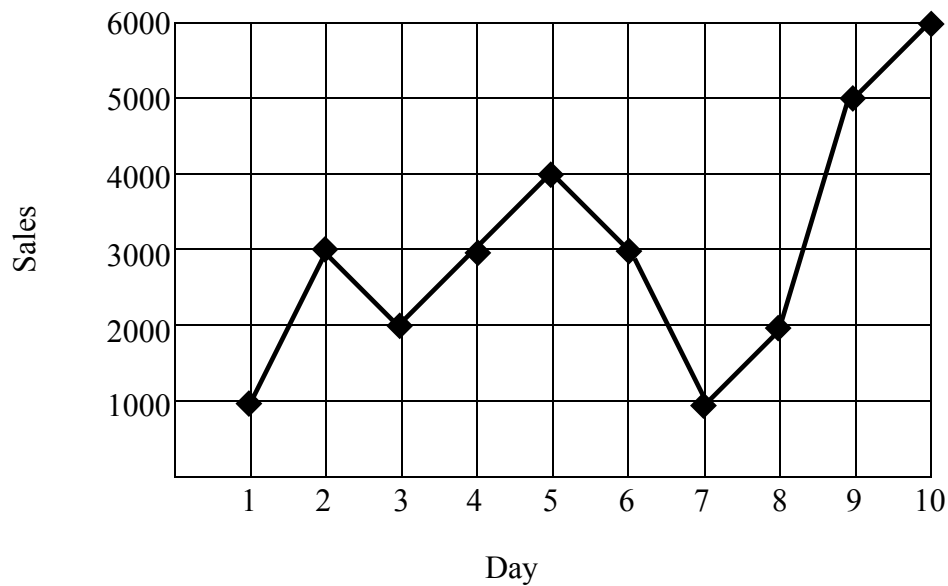
Question 12

Mark investigated the relationship between time taken to run a 400m race and the percentage of body fat the athlete had. He decided that an x^2 transformation was appropriate and after transforming the data, he fitted a least squares regression line with a gradient of 3 and a y intercept of 15. The equation of this regression line is

- A. $Body\ fat = 3 \times Time + 15$
- B. $Time = 15 \times Body\ fat + 3$
- C. $Body\ fat = 3 \times (Time)^2 + 15$
- D. $Time = 3 \times (Body\ fat)^2 + 15$
- E. $Body\ fat = 15 \times (Time)^2 + 3$

Core

Question 13



The time series plot for the sales on each of ten days is shown above. The slope of the trend line obtained by using the 3 median method is closest to

- A. 100
- B. 200
- C. 300
- D. 400
- E. 500

END OF SECTION A

Instructions for Section B

Select **three** modules and answer **all** questions within the modules selected, in pencil, on the answer sheet provided for multiple-choice questions.

Show 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.

A correct answer scores 1 mark, 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.

Module			Page
Module 1:	Number patterns		12
Module 2:	Geometry and trigonometry		17
Module 3:	Graphs and relations		25
Module 4:	Business-related mathematics		31
Module 5:	Networks and decision mathematics		36
Module 6:	Matrices		42

Module 1: Number patterns and applications

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

Question 1

If $t_1 = 6$ and $t_{n+1} = t_n + 9$, then the value of t_3 is

- A. 15
- B. 23
- C. 24
- D. 33
- E. 54

Question 2

The number of terms in the sequence 7, 9, 11,..... 1001 is

- A. 494
- B. 497
- C. 498
- D. 502
- E. 504

Module 1: Number patterns and applications

Question 3

$4 + 11 + 18 + \dots\dots\dots 438$ equals

- A** 13485
- B** 13923
- C** 14144
- D** 14368
- E** 14702

Question 4

Mrs. Wong gave her grand daughter, Lisa, \$3 on her first birthday and promised to give her double the amount she gave her the previous year for the next 9 years. How much would she give Lisa on her 10th birthday?

- A.** \$30
- B.** \$165
- C.** \$768
- D.** \$1536
- E.** \$3072

Module 1: Number patterns and applications

Question 5

$32, x, 11\frac{13}{25}$ are three consecutive terms of a geometric sequence.

A value of x could be

A. $12\frac{7}{10}$

B. $-17\frac{3}{5}$

C. $17\frac{12}{25}$

D. $-19\frac{1}{5}$

E. $21\frac{19}{25}$

Question 6

A sequence is described by the difference equation $t_{n+1} = 3t_n$ where $t_1 = 4$.

The n th term of the sequence is

A. $t_n = 3 \times 4^n$

B. $t_n = 4 \times 3^n$

C. $t_n = 4 + 3n$

D. $t_n = 3 \times 4^{n-1}$

E. $t_n = 4 \times 3^{n-1}$

Module 1: Number patterns and applications

Question 7

The second term of a geometric sequence is $\frac{8}{9}$ and the fifth term is 3.

The sum of the first 15 terms is closest to

- A. 518
- B. 602
- C. 638
- D. 777
- E. 1343

Question 8

A ball is dropped from a height of 30 m. Each time it rebounds, it rises to a height of $\frac{3}{4}$ of its previous height. The total distance travelled by the ball if it keeps rebounding is

- A. 120 m
- B. 170 m
- C. 190 m
- D. 200 m
- E. 210 m

Module 1: Number patterns and applications

Question 9

A population of elephants is becoming extinct at a rate of 3% per annum. The number of years after which the population will be reduced to half of its original number is closest to

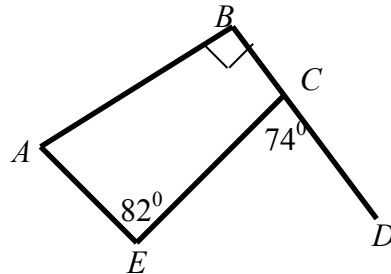
- A. 23 years
- B. 32 years
- C. 52 years
- D. 58 years
- E. 194 years

End of Module 1

Module 2: Geometry and trigonometry

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

Question 1

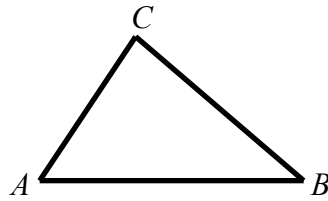


In the above diagram which is not drawn to scale, $\angle AEC = 82^\circ$, $\angle ECD = 74^\circ$. The magnitude of $\angle BAE$ is closest to

- A. 74°
- B. 82°
- C. 90°
- D. 98°
- E. 106°

Module 2: Geometry and trigonometry

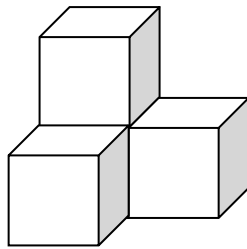
Question 2



In the above diagram, B is directly east of A . C is 040°T from A and 340°T from B . The magnitude of $\angle ACB$ is

- A. 50°
- B. 60°
- C. 70°
- D. 80°
- E. 90°

Question 3

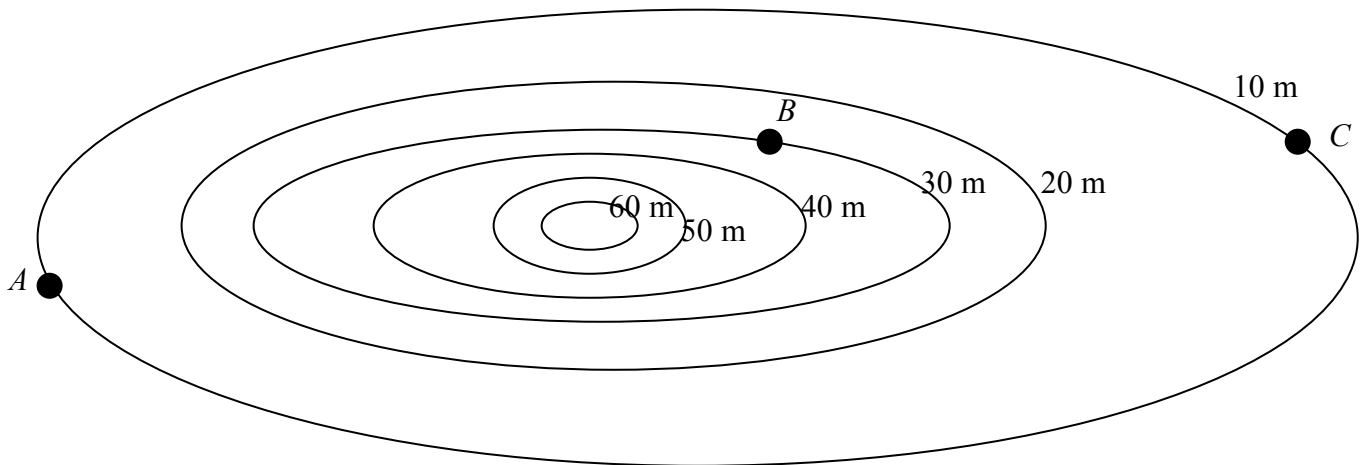


The above shape is made by gluing cubes together. Each of the cubes has side length 3 cm. What is the total surface area of the shape?

- A. 135 cm^2
- B. 144 cm^2
- C. 162 cm^2
- D. 180 cm^2
- E. 189 cm^2

Module 2: Geometry and trigonometry

Question 4

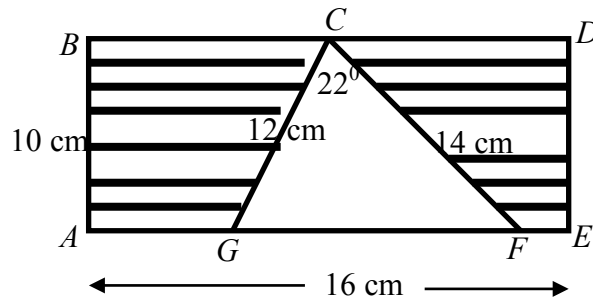


Which one of the following statements is true about the above contour map?

- A. The slope of the hill increases as you go from A to B .
- B. The slope of the hill increases as you go from B to A .
- C. The average slope from A to B is closest to 9.5
- D. A and C are equidistant from B .
- E. C is higher on the hill than B .

Module 2: Geometry and trigonometry

Question 5

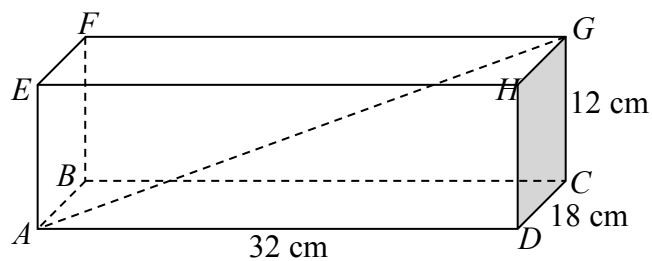


The above rectangle $ABDE$ has dimensions, 10 cm by 16 cm . $GC = 12\text{ cm}$ and $CF = 14\text{ cm}$. $\angle GCF = 22^\circ$. The shaded area is closest to

- A. 32 cm^2
- B. 65 cm^2
- C. 80 cm^2
- D. 98 cm^2
- E. 129 cm^2

Module 2: Geometry and trigonometry

Question 6

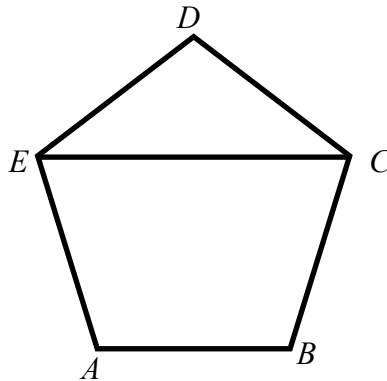


In the above rectangular prism, $AD = 32$ cm, $CD = 18$ cm and $CG = 12$ cm. $\angle AGC$ is closest to

- A 18°
- B 29°
- C 61°
- D 71°
- E 72°

Module 2: Geometry and trigonometry

Question 7

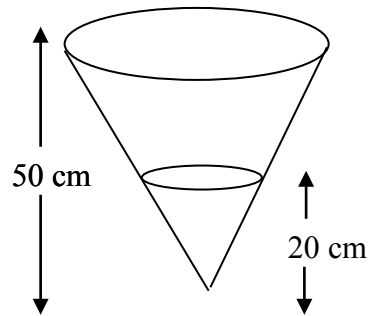


The regular pentagon, $ABCDE$, has all sides equal to 8 cm. The length of EC is closest to

- A. 13 cm
- B. 16 cm
- C. 17cm
- D. 22 cm
- E. 26 cm

Module 2: Geometry and trigonometry

Question 8

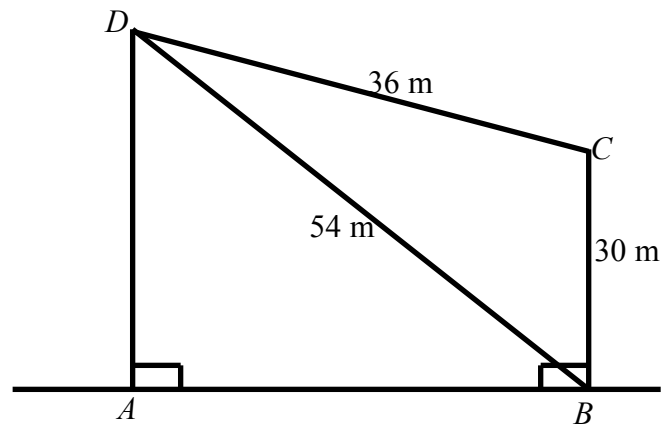


960 litres of water is placed in a right cone of height, 50 cm, so that the depth of water in the cone is 20 cm. Given that 1 litre equals 1 cm^3 , the diameter of the cone is closest to

- A. 17cm
- B. 19 cm
- C. 22 cm
- D. 34 cm
- E. 38 cm

Module 2: Geometry and trigonometry

Question 9



In the above diagram, $BC = 30$ m, $CD = 36$ m and $BD = 54$ m.
The length of AB is closest to

- A. 18 m
- B. 24 m
- C. 25 m
- D. 34 m
- E. 42 m

End of Module 2

Module 3: Graphs and relations

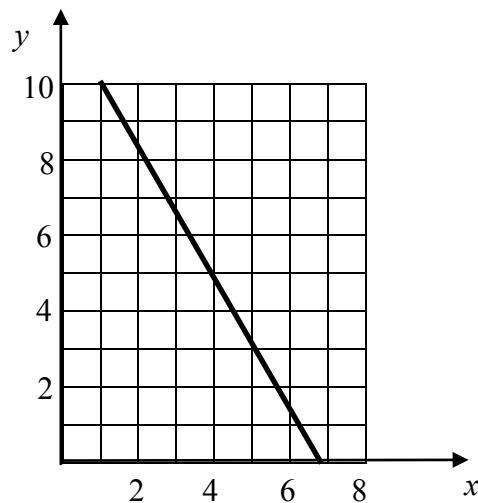
Before answering these questions you **must** shade the Graphs and relations box on the answer sheet for multiple-choice questions

Question 1

Which one of the following points satisfies the equation $y = 3 - 2x$?

- A. $(-5, 7)$
- B. $(-1, 1)$
- C. $(-1, 5)$
- D. $(1, 5)$
- E. $(5, 7)$

Question 2



The gradient of the above line is closest to

- A. 3
- B. 0.6
- C. -0.6
- D. -1.7
- E. -3

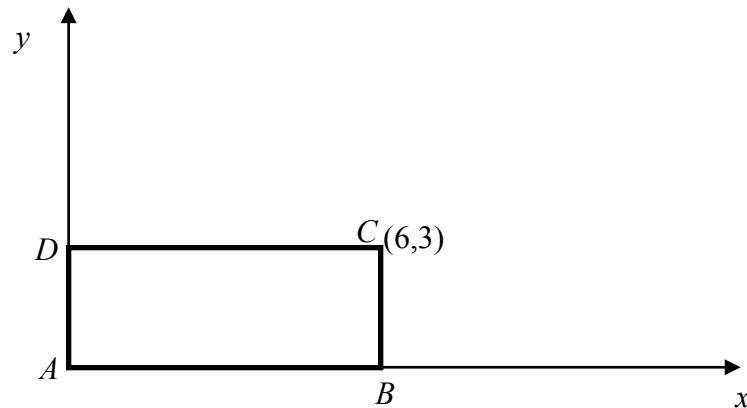
Module 3: Graphs and relations

Question 3

If 2 pencils and 3 biros cost \$18 and if 3 pencils and 2 biros cost \$17, then the cost of 4 pencils and 1 biro is

- A. \$14
- B. \$16
- C. \$19
- D. \$22
- E. \$28

Question 4

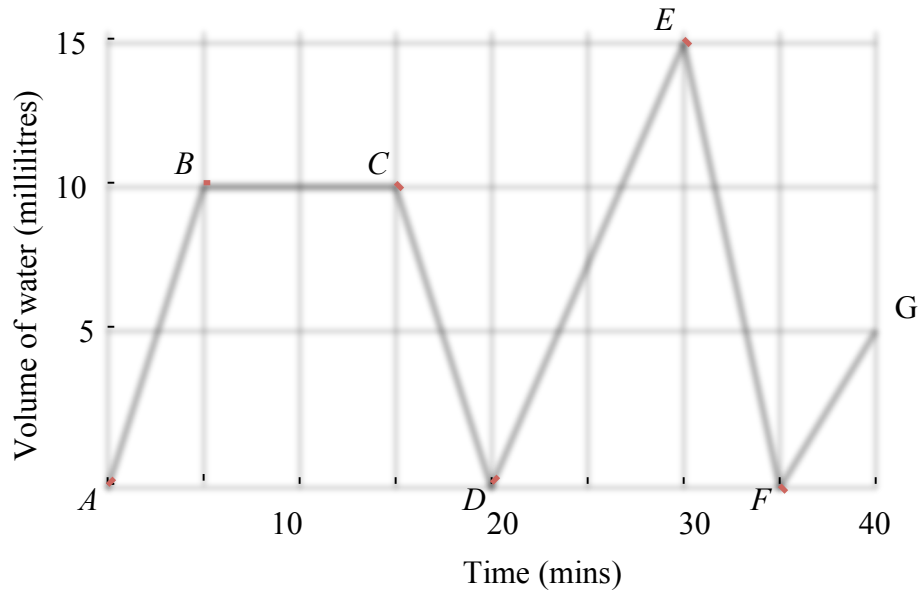


ABCD is a rectangle. C has coordinates (6, 3). The coordinates of B and D respectively are

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

Module 3: Graphs and relation

Use the following information to answer questions 5 and 6.



Question 5

The above graph shows the volume of water in a container over a period of 40 minutes. Which section of the graph shows the volume of water changing most rapidly?

- A. AB
- B. BC
- C. CD
- D. DE
- E. EF

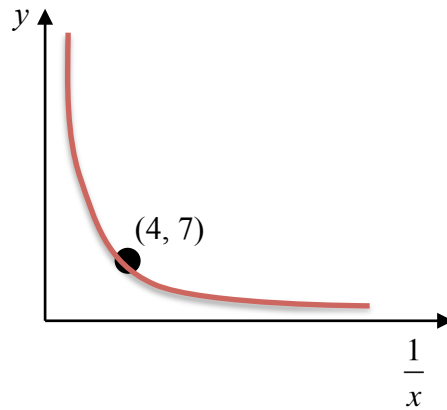
Question 6

The equation of the line CD is

- A. $\text{Volume} = 40 - 2 \times \text{time}$
- B. $\text{Volume} = 40 + 2 \times \text{time}$
- C. $\text{Volume} = 20 - 2 \times \text{time}$
- D. $\text{Volume} = 20 - \text{time}$
- E. $\text{Volume} = 200 + \text{time}$

Module 3: Graphs and relations

Question 7



The graph of y versus $\frac{1}{x}$ is shown above.

The rule connecting x and y could be

- A. $y = \frac{7}{x}$
- B. $y = \frac{4x}{7}$
- C. $y = \frac{x}{28}$
- D. $y = 28x$
- E. $y = \frac{28}{x}$

Module 3: Graphs and relations

Question 8

Jane and Joe live 160 km apart. They set off on their bicycles from their homes at the same time to meet each other. Jane travels at a constant speed of 30 km per hour and Joe travels at a constant speed of 50 km per hour. When they meet, how far will they be from Jane's home?

- A. 60 km
- B. 65 km
- C. 70 km
- D. 75 km
- E. 85 km

Module 3: Graphs and relations

Question 9

A company produces x chairs, y tables and z desks. The table below shows the number of hours required to cut, assemble and polish each chair, table and desk. The company must make 2 chairs for every desk, and they cannot make more than 8 chairs for every table.

Production	Chairs (hours)	Tables (hours)	Desks (hours)	Weekly Capacity (hours)
Cutting	2	3	1	200
Assembling	6	2	4	80
Polishing	3	5	2	220

Which one of the following inequalities could represent one of the constraints?

- A. $y \leq 8x$
- B. $4x + 3y \leq 200$
- C. $4x + y \leq 40$
- D. $x + y \leq 44$
- E. $7x + y \leq 40$

End of Module 3

Module 4: Business-related mathematics

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

Question 1

An iPad is bought for \$800. What is its book value after three years, if it depreciates at 20% per year?

- A. \$320
- B. \$327.68
- C. \$409.60
- D. \$512
- E. \$533.33

Question 2

Marion had \$2760 in a bank account, which earned interest daily at a rate of 5% per annum. The value of her money in this account after 15 days is closest to

- A. \$2766
- B. \$2938
- C. \$3394
- D. \$3724
- E. \$5739

Module 4: Business-related mathematics

Question 3

Mark earns \$32 per hour. His employer takes 9% of these earnings for superannuation, and 3% of these earnings for hex repayments. He then takes 35 cents in the dollar of the remainder of the earnings for tax. Mark's take home pay in a week where he works 8 hours a day for 5 days is closest to

- A. \$120.32
- B. \$547.83
- C. \$601.60
- D. \$678.40
- E. \$732.16

Question 4

An \$8000 loan is repaid by monthly instalments of \$300 for 3 years. The simple interest rate per annum is closest to

- A. 1.4%
- B. 8.3%
- C. 8.9%
- D. 11.7%
- E. 24%

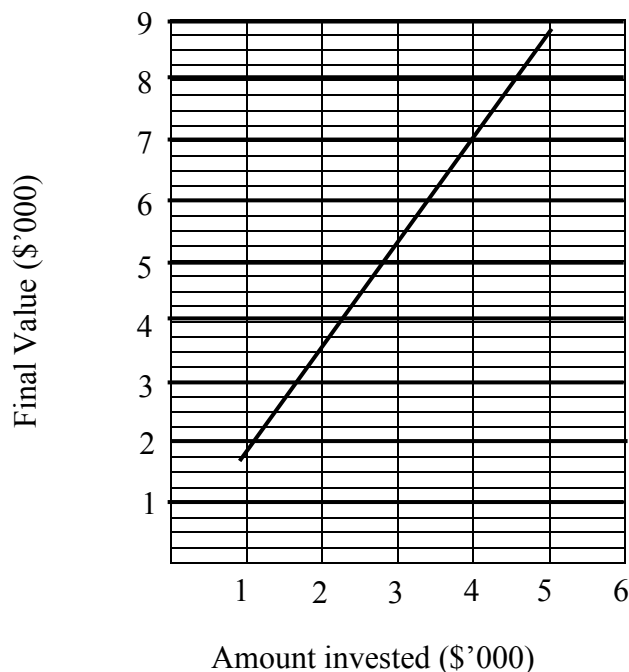
Module 4: Business-related mathematics

Question 5

Sarah bought two chairs costing \$940 each on hire purchase. She paid a \$500 deposit and then 8% interest per annum for three years. Sarah repaid the money in equal monthly instalments. If the money was repaid in full at the end of the three years, the amount she repaid each month is closest to

- A. \$9.20
- B. \$26.42
- C. \$47.53
- D. \$50.87
- E. \$64.76

Question 6



The above graph shows the final value of different amounts invested for 5 years at the same simple interest rate. The annual interest rate is closest to

- A. 6%
- B. 9%
- C. 10%
- D. 12%
- E. 15%

Module 4: Business-related mathematics

Question 7

A car is bought for \$35000 and it depreciates at a rate of 24.5 cents per kilometre travelled. If the car traveled 16080 km in the first year and 25300 km in the second year, the value of the car after 2 years is closest to

- A. \$18642
- B. \$24862
- C. \$26348
- D. \$28113
- E. \$32741

Question 8

Jenna borrows \$25000 from the bank. She is told that for the first 3 years the interest rate will be 10% per annum. The interest will be charged monthly on the amount of money owing. After 3 years, the interest will change to 7% per annum for the duration of the loan. If Jenna repays \$1260 per month, then the number of years over which the loan will be repaid is closest to

- A. 4 years
- B. 8 years
- C. 16 years
- D. 19 years
- E. 21 years

Module 4: Business-related mathematics

Question 9

Brad bought a painting 8 years ago for \$1840. When he had the painting valued today, he found that the painting's value had just kept pace with inflation and that it was valued at \$3161. If the value of the painting continues to keep pace with this inflation rate, the number of years after Brad first bought the painting for it to be worth five times its original value is closest to

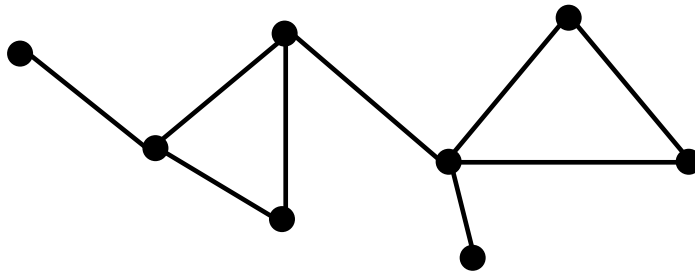
- A. 16 years
- B. 17 years
- C. 24 years
- D. 32 years
- E. 59 years

End of Module 4

Module 5: Networks and decision mathematics

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

Question 1

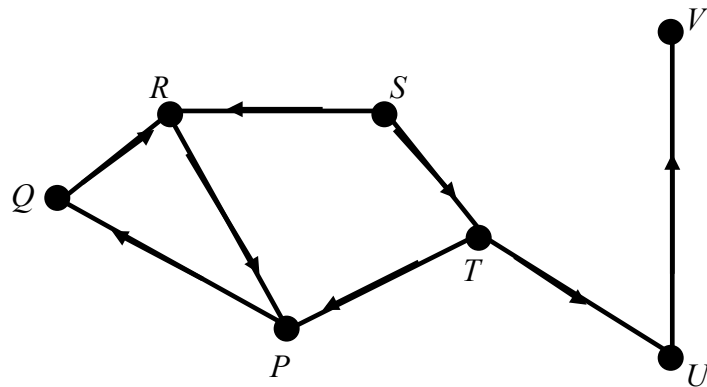


The sum of the degrees of all the vertices in the above graph is

- A. 15
- B. 16
- C. 17
- D. 18
- E. 19

Module 5: Networks and decision mathematics

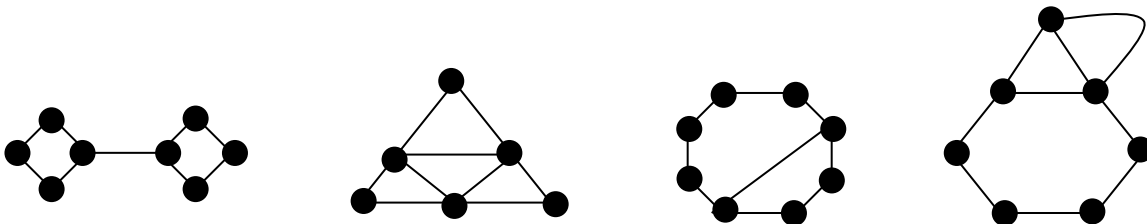
Question 2



For the directed graph above, the vertex that cannot be reached from T is

- A. P
- B. Q
- C. R
- D. S
- E. V

Question 3



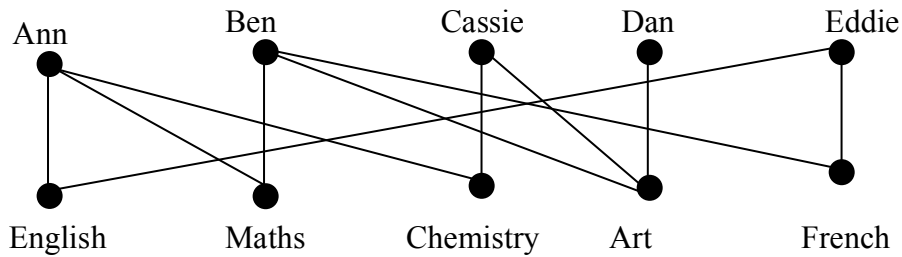
How many of the above graphs have an Euler circuit?

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

Module 5: Networks and decision mathematics

Question 4

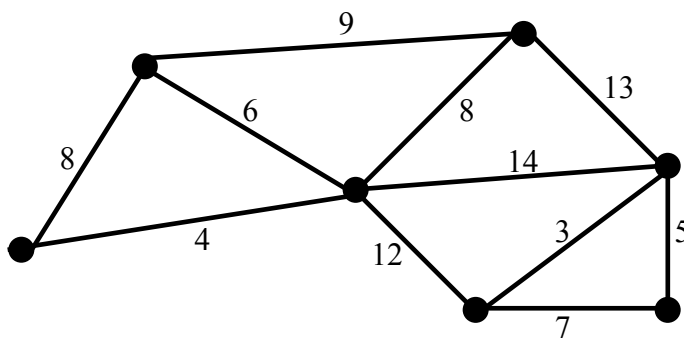
The bipartite graph below shows five subjects studied by five students.



Which one of the following statements does NOT follow from the graph?

- A. For these students, Art is the most popular subject.
- B. Only one of these students studies both Art and French.
- C. Only one student studies either English or Maths but not both
- D. Dan studies the least number of these subjects.
- E. Cassie studies fewer of these subjects than Ben.

Question 5

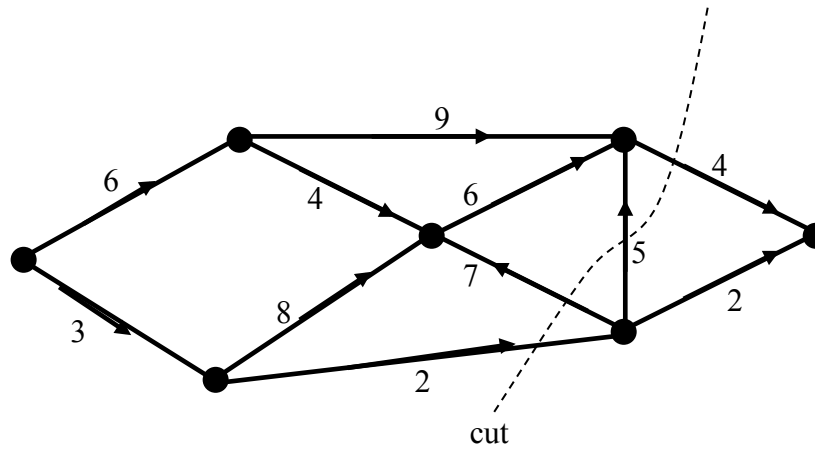


The minimum spanning tree for the above graph has a weight of

- A. 26
- B. 36
- C. 38
- D. 40
- E. 43

Module 5: Networks and decision mathematics

Question 6

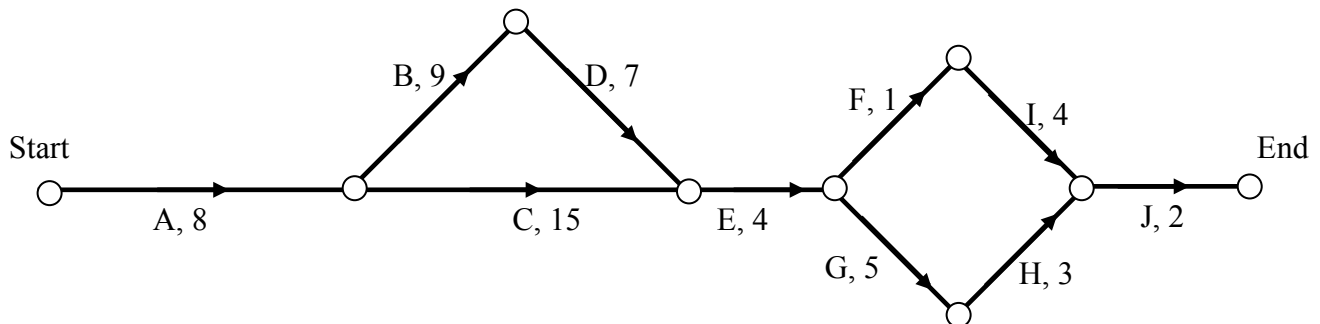


In the above graph, the capacity of the cut is

- A. 6
- B. 11
- C. 12
- D. 13
- E. 18

Module 5: Networks and decision mathematics

The following information relates to questions 7 and 8



The graph above shows ten activities, which must be completed for a project. The time in hours that each activity will take is given on the graph.

Question 7

The minimum number of hours for the whole project to be completed is

- A. 34
- B. 35
- C. 36
- D. 37
- E. 38

Question 8

The latest starting time for activity C in hours is

- A. 8
- B. 9
- C. 12
- D. 15
- E. 16

Module 5: Networks and decision mathematics

Question 9

Mrs. Nguyen owns four factories V , W , X and Y . She also owns four warehouses, P , Q , R and S . The distances in kilometres from the factories to the various warehouses are shown in the following table.

		Warehouse			
Factory		P	Q	R	S
	V	30	26	25	27
	W	22	28	18	12
	X	42	30	30	35
	Y	15	36	32	38

Mrs. Nguyen wants to assign one of each of the factories to one of each of the warehouses, so that the distance from the factories to the warehouses is minimised. Which one of the following statements is true?

- A.** Goods made at factory W should be sent to warehouse P .
- B.** Goods made at factory W should be sent to warehouse R .
- C.** Goods made at factory V should be sent to warehouse Q .
- D.** Goods made at factory X should be sent to warehouse R .
- E.** Goods made at factory X should be sent to warehouse Q .

End of Module 5

Module 6: Matrices

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

Question 1

$$-3 \begin{bmatrix} 6 & 1 & 4 \\ 8 & -2 & 5 \\ 4 & 0 & -1 \end{bmatrix} + \begin{bmatrix} -3 & 1 & -2 \\ -1 & 3 & 4 \\ 0 & -5 & 2 \end{bmatrix} \text{ equals}$$

A. $\begin{bmatrix} -21 & -2 & -14 \\ -23 & 9 & -11 \\ -12 & -5 & 5 \end{bmatrix}$

B. $\begin{bmatrix} -21 & -2 & -14 \\ -25 & 9 & -11 \\ -12 & -5 & 5 \end{bmatrix}$

C. $\begin{bmatrix} -15 & -2 & -10 \\ -23 & 9 & -11 \\ -12 & -5 & 5 \end{bmatrix}$

D. $\begin{bmatrix} -15 & -2 & -10 \\ -25 & 9 & -11 \\ -12 & -5 & 5 \end{bmatrix}$

E. $\begin{bmatrix} 9 & -6 & -6 \\ -21 & -3 & -27 \\ -12 & 15 & -3 \end{bmatrix}$

Module 6: Matrices

Question 2

$$P = \begin{bmatrix} 3 & 7 \\ 1 & 4 \end{bmatrix}, Q = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 1 & 1 & 1 \end{bmatrix}, R = \begin{bmatrix} 1 & 0 & 3 \\ 0 & 4 & 2 \end{bmatrix}, S = \begin{bmatrix} -4 & -2 \\ -1 & 0 \end{bmatrix}, T = \begin{bmatrix} 1 & 1 & 1 \\ 2 & 2 & 1 \\ 1 & 3 & 0 \end{bmatrix}$$

Which one of the following **cannot** be found?

- A. P^3
- B. Q^2
- C. RQ
- D. T^3
- E. TR

Question 3

If $A = \begin{bmatrix} 4 & 6 \\ -2 & 3 \end{bmatrix}$ and $B = \begin{bmatrix} 7 & 2 \\ 1 & 4 \end{bmatrix}$ where $AB = \begin{bmatrix} a & b \\ c & d \end{bmatrix}$

then the element d can be obtained using which one of the following calculations?

- A. $2 \times 6 \times 4 \times 3$
- B. $2 \times -2 + 4 \times 3$
- C. $-2 \times 4 + 3 \times 2$
- D. $-2 \times 2 + 3 \times 4$
- E. $6 \times 4 + 2 \times 3$

Module 6: Matrices

Question 4

$$y + z = 2$$

$$3x - z = 1$$

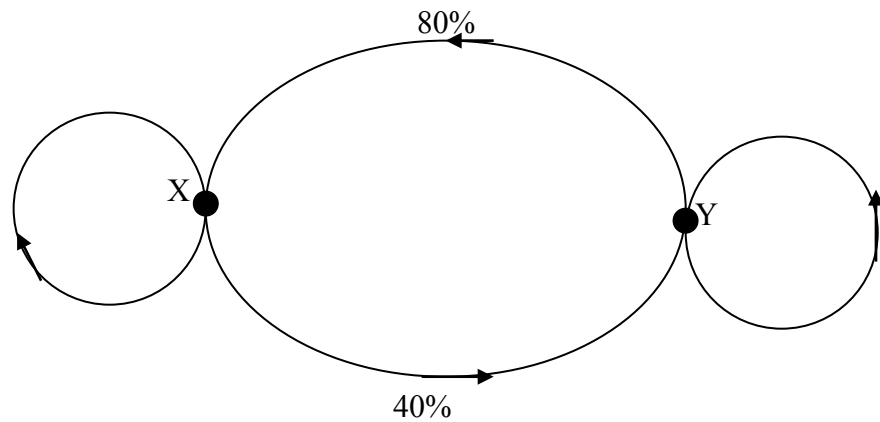
$$4x - 2y - z = 9$$

The value of y when the above simultaneous equations are solved is

- A. -3.8
- B. -3
- C. 1.25
- D. 8.3
- E. 29

Module 6: Matrices

Question 5



The transition matrix that can be used to represent the above information is

A.

			From
		X	Y
To	X	$\begin{bmatrix} 0.6 & 0.4 \\ 0.8 & 0.2 \end{bmatrix}$	
	Y		

B.

			From
		X	Y
To	X	$\begin{bmatrix} 0.8 & 0.6 \\ 0.2 & 0.4 \end{bmatrix}$	
	Y		

C.

			From
		X	Y
To	X	$\begin{bmatrix} 0.6 & 0.8 \\ 0.4 & 0.2 \end{bmatrix}$	
	Y		

D.

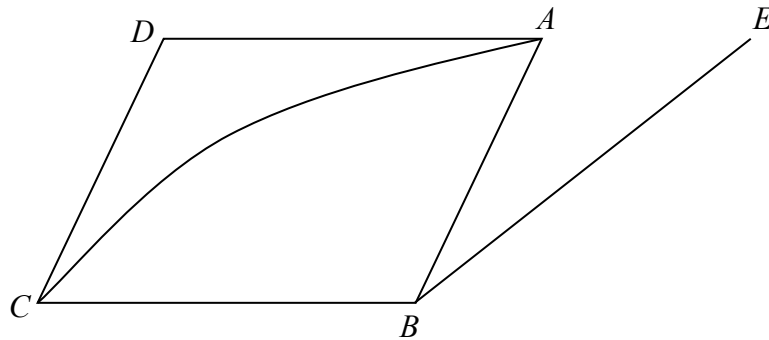
			From
		X	Y
To	X	$\begin{bmatrix} 0.4 & 0.8 \\ 0.6 & 0.2 \end{bmatrix}$	
	Y		

E.

			From
		X	Y
To	X	$\begin{bmatrix} 0.4 & 0.2 \\ 0.6 & 0.8 \end{bmatrix}$	
	Y		

Module 6: Matrices

Question 6



The diagram above shows the roads connecting five towns, A , B , C , D and E . A matrix that could be used to show this information is

A.

	A	B	C	D	E
A	0	1	2	1	0
B	1	0	1	0	1
C	2	1	0	1	0
D	1	0	1	0	0
E	0	1	0	0	0

D.

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

B.

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

E.

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

C.

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

Module 6: Matrices

Question 7

The number of units of carbohydrates, fats and proteins per kilogram in three different breakfast cereals X , Y and Z are given in the matrix below.

$$\begin{array}{l} \\ \textit{Carbohydrate} \\ \textit{Fat} \\ \textit{Protein} \end{array} \begin{array}{ccc} X & Y & Z \\ \left[\begin{array}{ccc} 8 & 10 & 6 \\ 5 & 2 & 1 \\ 12 & 4 & 3 \end{array} \right] \end{array}$$

The All Good breakfast food company produces the three types of cereal. How many units of protein do they need to make 1 kilogram of X , 3 kilogram of Y and 2 kilogram of Z ?

- A. 19
- B. 25
- C. 30
- D. 38
- E. 57

Module 6: Matrices

Question 8

A company has three divisions X , Y and Z . each producing varying amounts of products called gadgets, widgets and midgets as shown in the following matrix.

$$\begin{array}{l} \text{gadgets} \\ \text{widgets} \\ \text{midgets} \end{array} \begin{bmatrix} X & Y & Z \\ 4 & 8 & 7 \\ 3 & 2 & 9 \\ 5 & 6 & 4 \end{bmatrix}$$

The profit made each month by each of the divisions X , Y and Z is \$158000, \$220000 and \$205000 respectively. The profit made on one midget is

- A. \$5000
- B. \$5016
- C. \$11059
- D. \$12000
- E. \$19000

Module 6: Matrices

Question 9

If $A = \begin{bmatrix} 1 & 4 & 1 \\ 2 & -3 & 0 \\ 1 & 0 & 0 \end{bmatrix}$ and $X = \begin{bmatrix} p \\ q \\ r \end{bmatrix}$ and $AX = \begin{bmatrix} b \\ 2a \\ a \end{bmatrix}$, then

A. $r = b - a$

B. $r = a - b$

C. $r = -1$

D. $r = 1$

E. $r = a + b$

End of Module 6

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Multiple Choice Question Book**

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