# **Year 2005**

# VCE Further Mathematics Trial Examination 1

# **Suggested Solutions**

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#### Question 1 C

38.4 - 34.6 = 3.8

#### **Question 2** D

Overall, males earn more than females. Range for males = 43.2 - 34.2 = 9 Range for females = 40.0 - 28.8 = 11.2 .: females have larger range than males 25% of males have a salary less than \$34,600 25% of females have a salary less than \$34,000 and 25% of females have a salary greater than \$37,200, which makes D correct. 50% of males have a salary between \$34,000 and \$38,400

#### **Question 3** E

2.5% are greater than the mean plus 2 times the standard deviation.

$$77 - 55 = 22$$

2 times the standard deviation = 22 standard deviation = 11

#### Question 4 D

Total number of Liberal voters = 16 + 83 = 99Total number of Labour voters = 127Total number of voters = 127 + 99 = 226

#### **Question 5** B

Number of people who did not want a republic and voted labour = 127 - 55 = 72

Number of people who did not want a republic = 72 + 83 = 155

% of people who did not want a republic and voted labour =  $\frac{72}{155} \times 100 = 46\%$ 

#### **Question 6** C

 $r^2 = 0.0676$ 

r = -0.26 because x increases as y decreases Hence correlation is weak, negative.

#### **Ouestion 7** B

Median of lower 3 points is (65,10) Median of upper 3 points is (85,16)

$$m = \frac{16 - 10}{85 - 65} = \frac{6}{20} = 0.3$$

#### **Ouestion 8** A

$$b = \frac{1}{3}[(y_1 + y_m + y_u) - m(x_1 + x_m + x_u)]$$

$$= \frac{1}{3}[(10 + 10 + 16) - 0.3(65 + 75 + 85)]$$

$$= \frac{1}{3}[36 - 67.5]$$

$$= -10.5$$

#### **Question 9** C

There is an up and down pattern, and the pattern does not repeat itself within a year but over 4 to 5 years.

∴Cyclic trend

# Ouestion 11 D

1.02 + 0.82 = 1.84

Summer index + Autumn index

$$=4-1.84=2.16$$

Summer index is double Autumn index

 $\therefore$  3 times Autumn index = 2.16

Autumn index = 0.72

Summer index =  $2 \times 0.72 = 1.44$ 

#### Question 10 A

From the graph it can be seen that there is a negative residual then 2 positive residuals then 2 negative residuals and then a positive residual. Graph B starts with zero residual so not B Graph starts with a positive residual so not C Graph D has negative residual then positive then negative so not D

Graph E starts with 2 negative residuals so not E

#### **Ouestion 12** A

$$\frac{3.2 + 2.8 + 4.9}{3} = 3.6$$

#### **Question 13** B

Yearly average for 2005 =

$$\frac{7.7 + 5.9 + 7.5 + 9.3}{4} = 7.6$$

Yearly average for 2003 = 7.65

Yearly average for 2004 = 7.675

Summer 2003  $5.8 \div 7.65 = 0.7582$ 

Summer 2004  $5.6 \div 7.675 = 0.7296$ 

Summer 2005  $5.9 \div 7.6 = 0.7763$ 

Seasonal index for summer =

$$\frac{0.7582 + 0.7296 + 0.7763}{3} = 0.7547$$

Deseasonalised value = 
$$\frac{5.9}{0.7547}$$
 = 7.8

# 2005 Further Mathematics Trial Examination 1 Module 1 Number patterns and applications. Suggested solutions.

Question 1 D Arithmetic sequence $t_1 = 5$ $t_2 = 8$ $t_3 = 11$ $d = 8 - 5 = 3$	Question 2 B $S_{n} = \frac{n}{2}(a+l)$ $S_{n} = \frac{10}{2}(7+37)$ $S_{n} = 5 \times 44 = 220$
Question 3 D $S_{\infty} = \frac{a}{1 - r} = \frac{3}{1 - \frac{1}{2}} = 6$	Question 4 A Total of 8 shares. Sam's share = $\frac{1}{8} \times 120,000 = \$15,000$
Question 5 B 8 + 13 + 18 + 23 = 62 (four terms) 62 + 28 = 90 (five terms) 90 + 33 > 100 ∴ six terms	Question 6 C $t_n = ar^{n-1}$ $t_5 = 3000 \times 0.94^4 = 2,342$

# 2005 Further Mathematics Trial Examination 1 Module 1 Number patterns and applications. Suggested solutions.

#### Question 7 E

Each term is 0.94 times the term that went

$$t_{n+1} = 0.94t_n$$

$$t_1 = 3000$$

#### Question 8 B

$$S_4 = \frac{4}{2}[2a + 3d] = 54$$

$$S_8 = \frac{8}{2}[2a + 7d] = 156$$

$$4a + 6d = 54$$

$$8a + 12d = 108$$

$$8a + 28d = 156$$

$$16d = 48$$

$$d = 3$$

## Question 9 E

$$s_1 v_1 = s_2 v_2$$

$$20 \times v_1 = 15 \times 1$$

$$v_1 = \frac{15}{20} = \frac{3}{4} = 0.75$$

# 2005 Further Mathematics Trial Examination 1 Module 2 Geometry and trigonometry. Suggested solutions.

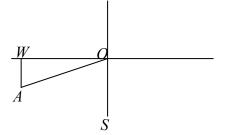
Page 5

#### Question 1 C

$$\cos\theta = \frac{8}{14}$$

$$\theta = \cos^{-1}(\frac{8}{14}) = 55^{\circ}$$

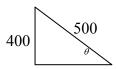
## Question 2 C



Angle WAO and angle SOA are equal (alternate angles)

: bearing is  $180 + 55 = 235^{\circ}T$ 

#### Question 3 D



$$\sin\theta = \frac{400}{500}$$

$$\theta = \sin^{-1}(\frac{400}{500}) = 53^{\circ}$$

#### Question 4 D

1 : 64 1000 : 64000

Ratio of sides = ratio of cube root of volumes

Ratio of sides =10:40

Ratio of area of face = square of sides Ratio of area of face = 100: 1600Area of face of cube B = 1600

#### Question 5 E

Triangles AOB and DOC are similar (AAA) ∴ corresponding sides are in the same ratio

$$\frac{1}{1} = \frac{1}{4}$$

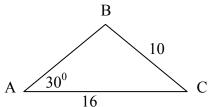
$$OC = 10$$

#### **Question 6** C



$$x^{2} = 2^{2} + 27^{2}$$
$$x = \sqrt{2^{2} + 27^{2}}$$
$$x = 27.1$$

#### **Question 7** D



$$\frac{10}{\sin 30} = \frac{16}{\sin B}$$

$$\sin B = \frac{16\sin 30}{10}$$

$$B = \sin^{-1} \left(\frac{16\sin 30}{10}\right)$$

$$B = 53^{\circ} \text{ or } 180 - 53 = 127^{\circ}$$

### Question 8 D

By Pythagoras, AC = 13Using the cosine rule on triangle ACD $13^2 = 8^2 + 6^2 - 2 \times 8 \times 6\cos\theta$  $69 = -96\cos\theta$  $\cos\theta = -0.71875$  $\theta = 180 - 44 = 136^0$ 

#### Question 9 D

Area of 2 triangles + area of two slanting rectangles + area of base rectangle Slant side of triangle = 5 (Pythag)

$$A = 2 \times \frac{1}{2} \times 6 \times 4 + 2 \times 12 \times 5 + 6 \times 12$$
$$A = 24 + 120 + 72$$
$$A = 216$$

#### Question 1 A

x intercept occurs when y = 0

$$3x - 6 = 0$$

$$x = 2$$

#### Question 2 D

$$2x - 3y = -7$$
 (1)

$$3x + 8y = 2 \qquad (2)$$

$$(1) \times 3 \rightarrow 6x - 9y = -21 \quad (1a)$$

$$(2) \times 2 \rightarrow 6x + 16y = 4 \qquad (2a)$$

$$(2a) - (1a) \rightarrow -25y = -25$$

$$y = 1$$

When 
$$y = 1$$
,

$$3x = 2 - 8 = -6$$

$$x = -2$$

#### Ouestion 3 B

30 cents = \$0.3 for one minute of calls = 0.3n for n minutes of calls, plus the \$35 basic charge.

$$C = 0.3n + 35$$

#### **Question 4** E

Gradient = 2 since parallel to line with gradient of 2

$$y = 2x + c$$

When 
$$x = -1, y = -4$$

$$-4 = -2 + c$$

$$c = -2$$

$$y = 2x - 2$$

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

#### Question 5 A

The line x + y = 3 cuts the axes at (3,0) and (0,3)

∴ not I

The line 2y - 3x + 4 = 0 cuts the y axis when x = 0

$$2y + 4 = 0$$

$$v = -2$$

The line 2y - 3x + 4 = 0 cuts the x axis

when v = 0

$$-3x + 4 = 0$$

$$x = \frac{4}{3} = 1\frac{1}{3}$$

∴ not C or D

We want the area under the line x + y = 3

and over the line 2y - 3x + 4 = 0. A

#### **Question 6** C

Profit / book = Revenue / book - Cost / book

$$P = \frac{25x}{x} - \frac{18x - 1200}{x}$$

$$P = \frac{25x - 18x + 1200}{x}$$

$$P = \frac{7x + 1200}{1200}$$

#### Question 7 A

The equation of the line joining the points (3,7) and (5,11) is of the form

$$y = mx + c$$

$$m = \frac{11-7}{5-3} = \frac{4}{2} = 2$$

$$y = 2x + c$$

When 
$$x = 3, y = 7$$

$$7 = 6 + c$$

$$c = 1$$

Equation of this line is y = 2x + 1

The open circles are not included.

The closed circles are included.

#### **Question 8** C

The height of the water increases rapidly at first, and then less rapidly, showing that the vase is narrow at the bottom but getting wider nearer the top.

#### **Question 9** E

From the labels on the axes, it can be seen that

$$y = kx^2$$

When 
$$x^2 = 16$$
,  $y = 80$ 

$$80 = k \times 16$$

$$k = 5$$

$$\therefore y = 5x^2$$

Question 1 B Amt. Repaid = $530 \times 4 = 2120$ Interest = $2120 - 2000 = $120$ Question 3 D	Question 2 E On Jan.1st Luke has a balance of \$4,400 On Jan.12th Luke has a balance of \$5,000 On Jan.17th Luke has a balance of \$4,700 On Jan.28th Luke deposited \$200 Total deposits for Jan.=200 + 400 + 200 = \$800 Question 4 D
On Jan.1 <sup>st</sup> Luke has a balance of \$4,400 On Jan.12 <sup>th</sup> Luke has a balance of \$5,000 On Jan.17 <sup>th</sup> Luke has a balance of \$4,700 On Jan.28 <sup>th</sup> Luke has a balance of \$4,900 Minimum balance for the month = \$4,400	10% of 1,800 = 180 180 + 1,800 = \$1,980
Question 5 C Change in population from 2000 to 2005 = $720 - 480 = 240$ Decrease in 5 years = $240$ Decrease /year = $240 \div 5 = 48$ Decrease in 8 years = $48 \times 8 = 384$ Number rabbits after 8 years = $720 - 384 = 336$	Question 6 C $A = PR^{n} = \frac{Q(R^{n} - 1)}{R - 1}$ $P = 10,000$ $R = 1 + \frac{8}{12 \times 100} = 1.0067$ $n = 9$ $A = 10,000(1.0067)^{9} - \frac{600(1.0067^{9} - 1)}{0.0067}$ $A = $5072.4$

Module 4 Business-related mathematics. Suggested solutions.

Question 7 D	
$A = PR^n$	
P = 30,000	
$R = 1 + \frac{5.5}{2 \times 100} = 1.0275$	
n = 10	
$A = 30,000 \times (1.0275)^{10} = $39,349.5$	

Question 8 D  
When 
$$t = 0, N = 1500$$
  
Double  $N = 3000$   
 $3000 = 1500(1.08)^t$   
 $2 = 1.08^t$   
 $\log_{10}(2) = t \log_{10}(1.08)$   
 $t = \frac{\log_{10}(2)}{\log_{10}(1.08)}$   
 $t = 9.006$ 

**Question 9 E** 

$$A = PR^{n} - \frac{Q(R^{n} - 1)}{R - 1}$$

$$0 = 200,000(1.015)^{100} - \frac{Q(1.015^{100} - 1)}{0.015}$$

$$Q(1.015^{100} - 1) = 13296.13695$$

$$Q = $3874.11$$

### 2005 Further Mathematics Trial Examination 1 Module 5 Networks and decision mathematics. Suggested solutions.

Page 11

#### Question 1 C

$$V + F - E = 2$$

$$V = 10$$

$$F - E = -8$$

$$E - F = 8$$

$$E = F + 8$$

Minimum value for F = 1

 $\therefore$  Minimum value for E = 1 + 8 = 9

## Question 2 D

$$A = 2$$

$$E = 2$$

$$B = 6$$

$$F = 1$$
$$G = 3$$

$$C = 2$$

$$D=2$$

Sum = 
$$2 + 6 + 2 + 2 + 2 + 1 + 3 = 18$$

#### Question 3 C

A Hamiltonian circuit passes through each vertex once, beginning and ending at the same

# **Question 4** C

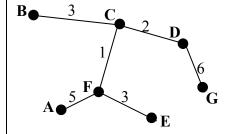
A simple graph has no loops and no multiple edges between two vertices.

#### **Question 5 D**

A to A is 0 (top left hand corner)

∴must be D

### Question 6 E



Minimum spanning tree

$$= 3 + 1 + 5 + 3 + 2 + 6 = 20$$

#### **Question 7** B

A critical path is one where any delay on this path will cause a delay in completing the project.

#### Question 8 E

Andrew plays 2 sports and Ben plays 3 sports.

∴not A

One person plays tennis and one person plaus squash.

∴not B

Dave and Carla both participate in one sport each.

∴not C

Number of people playing both cricket and

tennis = 1

Number of people skiing = 3

∴not D

Number of people playing squash, netball or

tennis = 3

∴Е

#### Question 9 A

Start with A

ABD = 14, AD = 5, ACD = 11 :: ABD

ABDE = 21, ABE = 20 : ABDE

ABDEG = 29, ABDG = 22, ABDFG = 24

:. ABDEG is the critical path.

#### End of suggested solutions 2005 Further Mathematics Trial Examination 1

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