FURTHER MATHEMATICS

Units 3 & 4 – Written examination 1

TSSM™
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2014 Trial Examination

SOLUTIONS

SECTION A: Core – Multiple-choice questions (1 mark each)

Core: Data Analysis

Question 1

Answer: B

Explanation:

$\frac{11}{32} \times 100 = 34.375\%$

Question 2

Answer: D

Explanation:

$8 + 14 + 11 = 33$

Question 3

Answer: C

Explanation:

Count starting from 23.

Question 4

Answer: D

Explanation:

$IQR = Q_3 - Q_1 = 32 - 23.5 = 8.5$

Question 5

Answer: A

Explanation:

68% within one standard deviation of the mean (that is within $7.8 - 0.6 = 7.2$ and $7.8 + 0.6 = 8.4$) means 32% are outside this range.

Question 6

Answer: C

Explanation:

$\frac{16}{100} \times 450 = 72$.

Question 7

Answer: D

Explanation:

Read all statements carefully. Note that the correlation coefficient is negative.

Question 8

Answer: A

Explanation:

On CAS.

Question 9

Answer: C

Explanation:

$$\frac{887+1139}{2}=1013,\quad \frac{1139+1077}{2}=1108,\quad \frac{1013+1108}{2}=1060.5$$

Question 10

Answer: B

Explanation:

$$\text{solve}\,(x^2=-0.2498+1.9648\times 14, x)$$

Question 11

Answer: D

Explanation:

A positive/negative residual value means the original value was above/below the line

Question 12

Answer: A

Explanation:

$$m=-0.90\times\frac{1.5}{1.2}=-1.125$$
$$c=12.5+1.125\times 8.4=21.95$$

Question 13

Answer: B

Explanation:

$$m=\frac{2-6}{6-1.5}=-\frac{8}{9}$$

SECTION B: Module 1 – Multiple-choice questions (1 mark each)

Question 1

Answer: B

Explanation:

Generate the sequence by adding 5. Note the eighth term carefully.

Question 2

Answer: E

Explanation:

$S_{10} = 5(2 \times 15 + 9 \times 9) = 555$

Question 3

Answer: C

Explanation:

The sequence is 1, -2, 4, -8,……Geometric.

Question 4

Answer: C

Explanation:

The sequence is 120, 90, 67.5,…..Sum of first four terms exceeds 300.

Question 5

Answer: E

Explanation:

$r = -5,\ a = -1/25$

$t_2 = -5 \times \dfrac{-1}{25} = 0.20$

Question 6

Answer: D

Explanation:

The sequence is 3, 3, 3, …….It is a geometric sequence with common ratio 1.

Question 7

Answer: B

Explanation:

$$\frac{81\times\left(\frac{1}{3}\right)^{8}}{1-0.1\times 9}$$

Question 8

Answer: A

Explanation:

$24 = 2t_3 - 8 \Rightarrow t_3 = 16$
$16 = 2t_2 - 8 \Rightarrow t_2 = 12$

Question 9

Answer: C

Explanation:

$10 - 8 = 2$
$8 - 2 = 6$
$2 - 6 = -4$ (*not possible*)

SECTION B: Module 2 – Multiple-choice questions (1 mark each)

Question 1

Answer: B

Explanation:

$\sqrt{22(22-10)(22-14)(22-20)}$

Question 2

Answer: D

Explanation:

$240 = 2 \times \frac{1}{2} \times 18 \times 14 \times \sin(x)$

Question 3

Answer: C

Explanation:

Use the cosine rule and note that the largest angle is opposite the largest side.

Question 4

Answer: B

Explanation:

$5 \text{ km} = 5000 \text{ m} = 500000 \text{ cm}$

$\frac{500000}{50000} = 10 \text{ cm}$

Question 5

Answer: A

Explanation:

$$\left(\frac{4}{6}\right)^3 \times 300 = \frac{800}{9}$$

Question 6

Answer: A

Explanation:

$$\sqrt{20^2 + 50^2}$$

Question 7

Answer: C

Explanation:

$$141 \times \cos(65°)$$

Question 8

Answer: E

Explanation:

$$\frac{CE}{2} = \frac{5}{3}$$

Question 9

Answer: D

Explanation:

$2l^2 = \left(2\sqrt{30^2 - 20^2}\right)^2$

SECTION B: Module 3 – Multiple-choice questions (1 mark each)

Question 1

Answer: C

Explanation:

Intercepts are (6, 0) and (0, 6)

Question 2

Answer: A

Explanation:

$-1 = 2a - 5$

Question 3

Answer: D

Explanation:
$2x + y = 225$
$y = 3x$
$x = 45,\ y = 135$
$2y = 270$

Question 4

Answer: E

Explanation:
$x^2 = 4$
$(4, 6)$ satisfies option E

Question 5

Answer: B

Explanation:

$6250 + 24n = 82n$

Question 6

Answer: A

Explanation:

Find the equations of the two lines.

Question 7

Answer: D

Explanation:

$y = x$, $x + y = 12$. Perform point test to find out the type of inequation.

Question 8

Answer: D

Explanation:

maximum value P(2,10) in the feasible region.

Question 9

Answer: B

Explanation:

Up to 20 minutes inclusive is $70 from the graph.

SECTION B: Module 4 – Multiple-choice questions (1 mark each)

Question 1

Answer: B

Explanation:

$$\frac{250-195}{250}\times 100 = 22\%$$

Question 2

Answer: D

Explanation:

$$r = \frac{8}{4} = 2, \quad n = 4\times 4 = 16$$
$$I = 20000\times 1.02^{16} - 20000$$

Question 3

Answer: C

Explanation:

$$I = \frac{5000\times \frac{39}{4}\times 3}{100} = \$1462.50$$

Question 4

Answer: A

Explanation:

Use TVM solver.

Question 5

Answer: E

Explanation:

$$15000 - 15000\left(1 - \frac{20}{100}\right)^4$$

Question 6

Answer: A

Explanation:

$$1080 - \frac{1080}{1.1}$$

Question 7

Answer: B

Explanation:

$$1 + \frac{\left(\frac{6.5}{12}\right)}{100} = 1.005417\%$$

Question 8

Answer: C

Explanation:

Use TVM Solver.

Question 9

Answer: A

Explanation:

$$\text{Flat rate} = \frac{22 \times 37}{72} = 11.3\%$$

SECTION B: Module 5 – Multiple-choice questions (1 mark each)

Module 5

Question 1

Answer: B

Explanation:

It must be possible to travel from every vertex to every other vertex.

Question 2

Answer: C

Explanation:

All except C are true. Each edge is counted twice in the adjacency matrix.

Question 3

Answer: C

Explanation:

Starting from any vertex, it should pass through each vertex only once.

Question 4

Answer: E

Explanation:

Add the degree of each of the vertices.

Question 5

Answer: E

Explanation:

Can only have 2 odd vertices in a graph for an Euler path to be possible.

Question 6

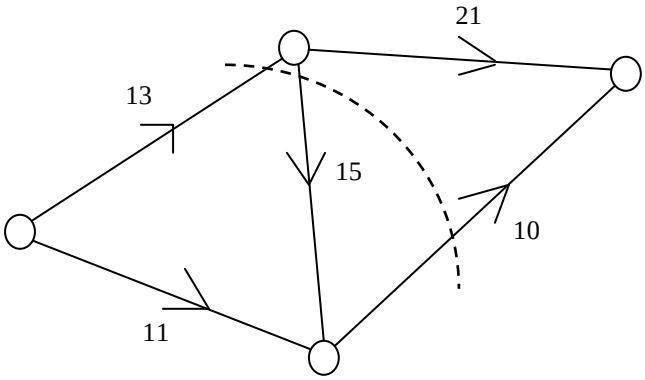
Answer: B

Explanation:

A-C-E-F-G

Question 7

Answer: A



Explanation:

Maximum flow = minimum cut = 13 + 10 = 23

Question 8

Answer: E

Explanation:

Apply Hungarian algorithm.

Question 9

Answer: D

Explanation:

The most preferred is Biology, not Physics.

SECTION B: Module 6 – Multiple-choice questions (1 mark each)

Question 1

Answer: B

Explanation:

Use CAS.

Question 2

Answer: A

Explanation:

To multiply two matrices, number of columns of first equals number of rows of the second matrix. Also the product matrix has the same number of rows as the first matrix and the same number of columns as the second matrix.

Question 3

Answer: A

Explanation:

$$\begin{vmatrix} 2.1 & 5.1 \\ l & m \end{vmatrix} = 0$$

$$2.1m - 5.1l = 0$$

$$\frac{l}{m} = \frac{2.1}{5.1} \Rightarrow \frac{l}{m} = \frac{7}{17}$$

Question 4

Answer: E

Explanation:

$$\begin{bmatrix} x \\ y \end{bmatrix} = -\frac{1}{1}\begin{bmatrix} 3 & -2 \\ -8 & 5 \end{bmatrix}\begin{bmatrix} 180 \\ 280 \end{bmatrix}$$

Question 5

Answer: C

Explanation:

$$2M = \begin{bmatrix} 7 & -5 \\ 2 & -3 \end{bmatrix} + \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} = \begin{bmatrix} 8 & -5 \\ 2 & -2 \end{bmatrix}$$

Question 6

Answer: E

Explanation:

$B - m \times m$, $C - m \times p$, $D - p \times p$
$A - m \times p$
$A \times D \quad is \quad defined$.

Question 7

Answer: A

Explanation:

The most appropriate product matrix for new prices is Option A.

Question 8

Answer: B

Explanation:

$$\begin{bmatrix} 230 & 290 & 310 \end{bmatrix} \begin{bmatrix} 1.05 & 0 & 0 \\ 0 & 0.9 & 0 \\ 0 & 0 & 1.08 \end{bmatrix} = \begin{bmatrix} 241.5 & 261 & 334.8 \end{bmatrix}$$

$Total = 241.5 + 2 \times 261 + 334.8$

Question 9

Answer: D

Explanation:

$$\begin{bmatrix} 0.75 & 0.4 \\ 0.25 & 0.6 \end{bmatrix}^4 \times \begin{bmatrix} 0.5 \\ 0.5 \end{bmatrix} = \begin{bmatrix} 0.613653 \\ 0.386347 \end{bmatrix}$$