

FURTHER MATHEMATICS

Written examination 1



2011 Trial Examination

SOLUTIONS

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

Core: Data Analysis

Question 1

Answer: E

Explanation:

$$-1.72 = \frac{56 - \text{mean}}{9.3}, \text{ mean} = 72$$

Question 2

Answer: E

Explanation:

$Z = -1.5$ lies between 1 and 2 standard deviations below the mean

Question 3

Answer: E

Explanation:

$$\text{IQR} = 72 - 52 = 20$$

Question 4

Answer: C

Explanation:

Enter into calculator, $s_x=2.0$

Question 5

Answer: E

Explanation:

$$y = mx + c, m = \frac{-0.7954 \times 33.7}{8.23} = -3.257 \text{ and } c = 109.3 + 3.257 \times 30.4 = 208.31$$

Question 6

Answer: D

Explanation:

$$r^2 \times 100\% = (-0.7985)^2 \times 100\% = 63.26\%$$

Question 7

Answer: C

Explanation:

$$4 - (0.93 + 1.25 + 1.05) = 0.77$$

Question 8

Answer: B

Explanation:

$$\text{Seasonalised sales} = (12000 + 12300 \times 5) \times 0.93 = 68355$$

Question 9

Answer: B

Explanation:

$$56 + 2 \times 9 = 74, \text{ so } 2.5\%$$

Question 10

Answer: E

Explanation:

$$(x_L, y_L) = (40, 120) \text{ and } (x_U, y_U) = (140, 80) \text{ Gradient} = \frac{80 - 120}{140 - 40} = \frac{-2}{5}$$

Question 11

Answer: B

Explanation:

$$8.9 = 16.1 - 0.006 \times \text{mass}, \quad \text{mass} = \frac{8.9 - 16.1}{-0.006} = 1200$$

Question 12

Answer: D

Explanation:

$$\frac{1}{2} \left(\frac{13 + 10 + 14 + 7}{4} + \frac{10 + 14 + 7 + 20}{4} \right) = 11.875$$

Question 13

Answer: D

Explanation:

$$SI = \frac{\text{week 6 goals}}{\text{mean goals of season}} = \frac{20}{13.7} = 1.460$$

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

Question 1

Answer: E

Explanation:

$$42+69=111$$

Question 2

Answer: E

Explanation:

$$4-2 \neq 8-4$$

Question 3

Answer: A

Explanation:

$$S_8=103.8, \text{ where } a=36, r=\frac{24}{36}, n=8$$

Question 4

Answer: C

Explanation:

Enter in sequence mode and view table, =29.0

Question 5

Answer: C

Explanation:

$$2 \times 4+3=11 \text{ and } 2 \times 11+3=25, C$$

Question 6

Answer: D

Explanation:

$5000 \times 1.04 - 100$ and continue to find t_4

Question 7

Answer: C

Explanation:

The geometric increase is by a factor of $1 + \frac{4}{100} = 1.04$ but 100 sheep are sold therefore

$$S_{n+1} = 1.04 \times S_n - 100$$

Question 8

Answer: E

Explanation:

$$t_2 = 3t_1 - 9, 3 = 3t_1 - 9, t_1 = 4$$

Question 9

Answer: D

Explanation:

$$\text{Males:Females} = 200:340 = 10:17$$

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

Question 1

Answer: B

Explanation:

$$A = \pi r^2 \Rightarrow r = \sqrt{\frac{A}{\pi}} = \sqrt{\frac{87}{\pi}} = 5.26$$

$$\text{Diameter} = 2 \times 5.26 = 10.52 \text{ cm}$$

Question 2

Answer: B

Explanation:

$$AC = \frac{54.2}{\cos 21^\circ} = 58.06$$

Question 3

Answer: C

Explanation:

Heron's formula,

$$s = \frac{42 + 53 + 73}{2} = 84$$

$$\text{Area} = \sqrt{84(84 - 42)(84 - 53)(84 - 73)} = 1096.8$$

Question 4

Answer: C

Explanation:

$$\text{Cos Rule } AC^2 = 15^2 + 12^2 - 2 \times 15 \times 12 \times \cos 130^\circ$$

Question 5

Answer: E

Explanation:

$$\text{sin rule } \frac{24.5}{\sin 130} = \frac{15}{\sin c} \therefore c = 28 + 270 = 298^\circ T$$

Question 6

Answer: B

Explanation:

$$1\text{cm} = 500\text{cm}, \text{ and } 10\text{cm} = 5000\text{cm} = 50\text{m}$$

Question 7

Answer: A

Explanation:

$$\text{Volume} = \left(\frac{200}{1} \right)^3 \times 360 = 2880000000 \text{ cm}^3 = 2880 \text{ m}^3$$

Question 8

Answer: E

Explanation:

$$\text{Volume} = \pi \times 5^2 \times 12 + \frac{1}{3} \pi \times 5^2 \times 3 = 300\pi + 25\pi = 325\pi$$

Question 9

Answer: B

Explanation:

$$12:14:18 \text{ and } 18:21:27 \text{ perimeter} = 18 + 21 + 27 = 66$$

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

Question 1

Answer: D

Explanation:

$$\text{Gradient} = \frac{0-4}{3-0} = -\frac{4}{3}$$

Question 2

Answer: E

Explanation:

$$y = 4 - \frac{4}{3}x$$

Question 3

Answer: A

Explanation:

$$\text{Gradient} = \frac{-2-8}{5-3} = -5. \text{ Use } y = mx + c \Rightarrow c = 23$$

Question 4

Answer: D

Explanation:

Solve simultaneously $x = 5$ and $y = 2$ or substitute $x = 5$ and $y = 2$ into both equations viz
 $3 \times 5 + 4 \times 2 = 23$ and $-2 \times 5 + 7 \times 2 = 4$

Question 5

Answer: D

Explanation:

$$3.20 + 2.50x = 50$$

Question 6

Answer: D

Explanation:

$$14 \times 4.50 + 16 \times 1.50 = 12 \times 4.50 + d \times 1.50 \Rightarrow d = 22 \quad \text{Drinks} = 22$$

Question 7

Answer: D

Explanation:

$$x = 4$$

Question 8

Answer: C

Explanation:

Test all boundary points, maximum at C

Question 9

Answer: E

Explanation:

Graph E as $2^2 = 4$

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

Question 1

Answer: A

Explanation:

$$\frac{187}{1.1} = 170, \text{ and } 10\% \text{ of } 170 = 17$$

Question 2

Answer: E

Explanation:

$$\text{Interest} = \frac{5000 \times 8 \times 4}{100} = 1600, \text{ can spend } 1600 + 5000$$

Question 3

Answer: A

Explanation:

$$r = \frac{100 \times 700}{2000 \times 5} = 7\%$$

Question 4

Answer: E

Explanation:

$$N=300 \quad I=5.75 \quad PV=-900 \quad PMT=-900 \quad FV=? \quad P/Y=C/Y=12$$

Question 5

Answer: C

Explanation:

$$N=260 \quad I=2.55 \quad PV=-2000 \quad PMT=-100 \quad FV=? \quad P/Y=C/Y=52$$

Question 6

Answer: C

Explanation:

$N=360$ $I=6.57$ $PV=540000$ $PMT=?$ $FV=0$ $P/Y=C/Y=12$

Question 7

Answer: D

Explanation:

$N=\text{any number}$ $I=?$ $PV=300000$ $PMT=-1575$ $FV=-300000$
 $P/Y=C/Y=12$

Question 8

Answer: C

Explanation:

$N=4$ $I=-15$ $PV=-3000$ $PMT=0$ $FV=?$ $P/Y=C/Y=1$ and $FV=1566.02$, and depreciated
by $3000 - 1566.02 = 1433.98$

Question 9

Answer: B

Explanation:

$N=12$ $I=7$ $PV=-1000$ $PMT=0$ $FV=?$ $P/Y=C/Y=4$, and $FV=12314.39$
 $N=8$ $I=7$ $PV=-1000$ $PMT=0$ $FV=?$ $P/Y=C/Y=4$, and $FV=11488.82$
Difference = interest in third year = \$825.47

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

Module 5

Question 1

Answer: E

Explanation:

$$V+F-E=2, 8+F-13=2$$

Question 2

Answer: C

Explanation:

$$\text{Capacity of cut is } 3+11=14$$

Question 3

Answer: E

Explanation:

$$\text{Critical path is ACFH}=8+3+2+7=20$$

Question 4

Answer: B

Explanation:

$$\text{Backward scan LST}=2$$

Question 5

Answer: D

Explanation:

$$\text{LST G}=15 \text{ EST G}=11, 15-11=4$$

Question 6

Answer: E

Explanation:

Minimum spanning tree $= 1+3+2+2+1+3=12$

Question 7

Answer: D

Explanation:

Euler circuits traverse each path once only and return to start

Question 8

Answer: C

Explanation:

If extra path added between B and C, then $\deg C=4$ and $\deg B=3$, so could not be an Euler circuit

Question 9

Answer: C

Explanation:

Enter in One step Dominance Matrix and find $D+D^2$. The number of one and two step dominances for Team C is $2+3=5$, the most

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

Question 1

Answer: D

Explanation:

2 rows and 3 columns

Question 2

Answer: D

Explanation:

$$3A+2B=\begin{bmatrix} 15 & 12 \\ 6 & 3 \end{bmatrix}+\begin{bmatrix} 6 & 0 \\ -2 & 4 \end{bmatrix}=\begin{bmatrix} 21 & 12 \\ 4 & 7 \end{bmatrix}$$

Question 3

Answer: A

Explanation:

First row and second column

Question 4

Answer: E

Explanation:

Take out a factor of 8. $\begin{bmatrix} 0 & 40 \\ 24 & -16 \end{bmatrix}=\begin{bmatrix} 8\times 0 & 8\times 5 \\ 8\times 3 & 8\times -2 \end{bmatrix}=8\begin{bmatrix} 0 & 5 \\ 3 & -2 \end{bmatrix}$

Question 5

Answer: E

Explanation:

determinant $=35-xy=0, xy=35$

Question 6

Answer: E

Explanation:

$$\det = (1 \times 4) - (3 \times 2) = -2 \text{ inverse} = -\frac{1}{2} \begin{bmatrix} 4 & -2 \\ -3 & 1 \end{bmatrix}$$

Question 7

Answer: E

Explanation:

$$\text{Transition is: } \begin{bmatrix} 0.8 & 0.1 \\ 0.2 & 0.9 \end{bmatrix}$$

Question 8

Answer: A

Explanation:

$$\begin{bmatrix} 0.8 & 0.1 \\ 0.2 & 0.9 \end{bmatrix}^4 \begin{bmatrix} 30 \\ 70 \end{bmatrix} = \begin{bmatrix} 32.5 \\ 67.5 \end{bmatrix}$$

Question 9

Answer: E

Explanation:

From the information given

$$\begin{matrix} (2 \times 3) & \times & (x \times 3) & \times & (y \times z) & = & (2 \times 5) \\ \text{A} & & \text{B} & & \text{C} & & \text{Product} \end{matrix}$$

Number of rows in C = number of columns in B $\Rightarrow y = 3$

Number of columns in C = number of columns in product $\Rightarrow z = 5$