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YEAR 12 *Trial Exam Paper*

2018

FURTHER MATHEMATICS

Written examination 1

Worked solutions

This book presents:

➢ worked solutions
➢ explanatory notes
➢ tips on how to approach the exam.

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SECTION A – CORE

Question 1

Answer: C

Explanatory notes

In order to find the interval within which the median lies, we must find the 'middle' of the histogram. 50% of the data will lie below the median and 50% above.

As this histogram shows the 'percentage frequency', we can add the bars of the histogram together to find where 50% lies.

The table below shows the 'percentage frequency' for each interval as well as a cumulative total:

Interval	Percentage frequency	Cumulative percentage frequency
0–5	7.6	–
5–10	23	30.6
10–15	23	53.6
15–20	27	80.6
20–25	15.5	96.1
25–30	0	96.1
30–35	3.9	100

50% therefore lies within the interval 10–15.

Therefore, option C is correct.

We can see that the intervals represented by options A, B, D, and E are incorrect, as their cumulative percentage frequencies are either lower or higher than the 50% mark.

Question 2

Answer: B

Explanatory notes

Create an equation that shows the sum of the values divided by the number of data values.
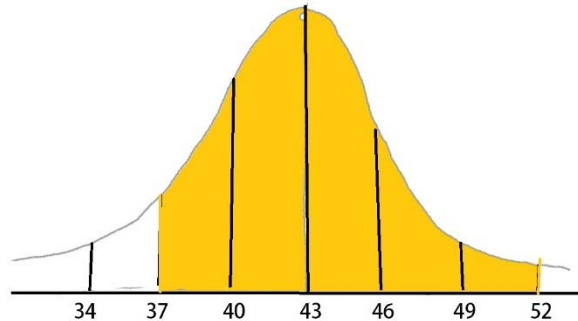
$$\frac{13+15+7+12+x+16+17+21}{8}=14$$

Use your CAS calculator to solve this equation for *x*.

SECTION A
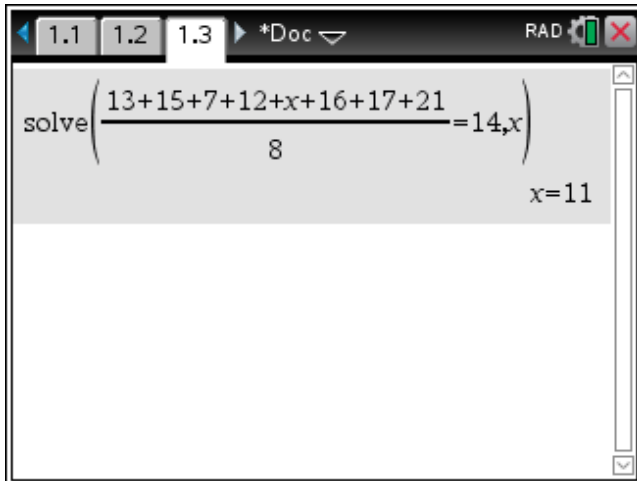
Question 3

Answer: D

Explanatory notes

Draw a bell-curve diagram with the mean placed in the middle and intervals of 3.

We are looking for scores between 37 and 52.

We can use the 68–95–99.7% rule to calculate the percentages.

Using this rule, we know that:

68% of data will lie between 40 and 46. This results in 16% below 40 and 16% above 46.

95% of data will lie between 37 and 49. This results in 2.5% below 37 and 2.5% above 49.

99.7% of data will lie between 34 and 52. This results in 0.15% below 34 and 0.15% above 52.

As we require data between 37 and 52, we can **subtract** the percentages that lie **below 37** and **above 52** from 100%.

$100\% - 2.5\% - 0.15\% = 97.35\%$

Therefore, the correct answer is option D.

We can see that option A is the percentage that lies below 37 and above 52.

Option B gives us the percentage of scores between 40 and 46, one standard deviation either side of the mean.

Option C gives us the percentage of scores between 37 and 49, two standard deviations either side of the mean.

Option E gives us the percentage of scores between 34 and 42, three standard deviations either side of the mean.

Tip

- *Although you may have done a number of these questions for your exam revision, it is **always** a good idea to draw a bell-curve diagram for this style of question.*

Question 4

Answer: B

Explanatory notes

The formula for finding the *z*-score is $z = \dfrac{x - \bar{x}}{s_x}$

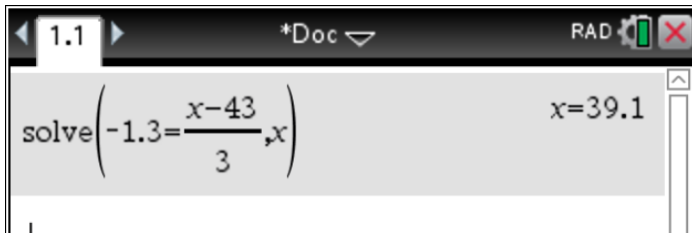In this question we have been given:

$z = -1.3$

$\bar{x} = 43$

$s_x = 3$

We can therefore substitute these values into the equation for the standardised score, *z*.

$$z = \frac{x - \bar{x}}{s_x}$$

$$-1.3 = \frac{x - 43}{3}$$

We can use our CAS to solve for the *x* value, which is the student's score.

Therefore, option B is correct.

Tip

- *Always start with the formula and substitute the values that you know. This will help you to figure out what you must solve for.*

SECTION A

Question 5

Answer: D

Explanatory notes

The score out of forty given for the trial exam is discrete numerical data, as this is recorded as a whole number only.

Tip

- *Recall that numerical discrete data is given in finite values – this could be to the nearest whole number, one decimal place, to the nearest cent etc. Numerical continuous data is generally recorded on a scale, for example, height in centimetres.*

Question 6

Answer: C

Explanatory notes

The median can be found on the boxplot by finding the centre, or 50% mark.

The following is an explanation of the options given in the multiple-choice question:

Option A is the minimum value.

Option B is Q_1.

Option C is the median, the correct answer.

Option D is Q_3.

Option E is the maximum value.

Question 7

Answer: C

Explanatory notes

The interquartile range, IQR, can be found by subtracting Q_1 from Q_3.

Therefore, the IQR is found by

$$IQR = Q_3 - Q_1$$
$$IQR = 32 - 22$$
$$IQR = 10$$

SECTION A

Question 8

Answer: E

Explanatory notes

Option A is incorrect. Comparing the maximum score to the median does not give us an appropriate comparison to indicate a relationship between variables.

Option B is incorrect. We should not use the range to compare boxplots, as this only gives us an indication of the difference between the lowest and highest extreme, not what is happening 'on average' within the data.

Option C is incorrect. In this case, discussing the shape of the distribution does not allow us to consider whether the students have improved, on average, between their first and final trial exams.

Option D is incorrect. The IQR for the first trial exam is lower than that for the final trial exam: 8 compared to 10.

Option E is correct. By comparing the medians, we can see that there has been an increase, on average, for the Year 12 students between their first and final trial exams, therefore showing an 'improvement'.

Tip

- *When comparing boxplots, use either the IQR or the median, as these are not affected by the extreme values. This is especially important if an outlier exists within the distribution.*

Question 9

Answer: D

Explanatory notes

The best way to complete this question is to enter the data given in the question into a spreadsheet in your CAS calculator.

You can then use this to calculate the equation of the regression line, $y = a + bx$.

The values given for this calculation, using the TI-Nspire software, are shown below.

SECTION A

Question 10

Answer: A

Explanatory notes

Option A is incorrect. The slope for the regression equation is positive, and therefore *final trial exam* score increases as *first trial exam* score increases.

Option B is correct. This is an interpretation of the *y*-intercept for the regression equation.

Option C is correct. This is an interpretation of correlation coefficient, r^2.

Option D is correct. Pearson's correlation coefficient, given in the question, tells us the strength and direction of the equation. In this case, *r* is positive, and is between 0.75 and 0.99.

Option E is correct. This is the correct interpretation of the slope of the regression equation.

Question 11

Answer: E

Explanatory notes

Option A is incorrect. We cannot make statements that 'guarantee' a result.

Option B is incorrect. We cannot make statements that imply that one variable causes another variable to change.

Option C is incorrect. We have no data regarding study habits or study time.

Option D is incorrect. This is a comparison of scores, and does not address a relationship between the two variables. Also, we must ensure that we do not make definitive statements when considering our statistics.

Option E is correct. There is a correlation, as seen by the regression analysis. The relationship is positive and linear, suggesting that as *x* increases so does *y*.

Tip

- *When conducting data analysis, we must avoid making any statements that imply that a change in one variable will cause a change in the other. Our analysis can only make predictions and discuss trends.*

Question 12

Answer: E

Explanatory notes

There is not a pattern that can be observed that repeats within the space of a year, so therefore seasonality cannot be considered. Option A is incorrect, as is option C.

The values do not decline over time, so therefore there is not a decreasing trend. Option B is incorrect.

The values appear to be increasing over time, which means that there appears to be an increasing trend. Option E is correct.

Question 13

Answer: C

Explanatory notes

The five-median smoothed value can be found, graphically, by finding the median of the *x* values and the median of the *y* values to decide on a coordinate.

A line can be drawn through the median for the *x* values and also for the median of the *y* values. Where these lines cross is the median point. See the graph below.
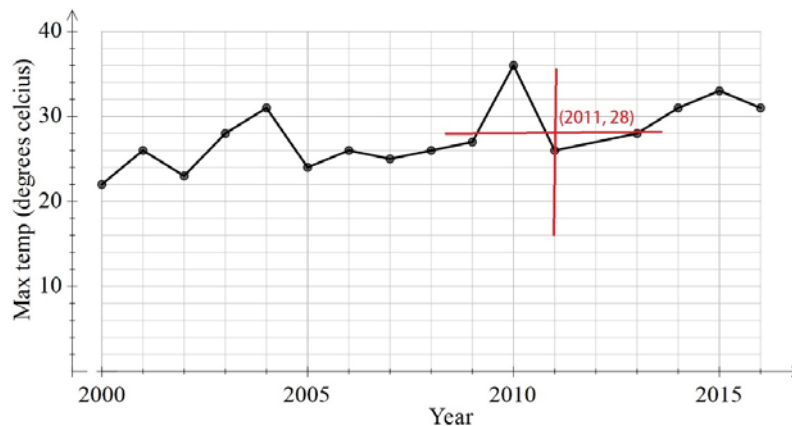
Question 14

Answer: D

Explanatory notes

Step 1:

Calculate the average temperature across the year.

$$\frac{28+31+26+22+18+16+15+17+23+27+30+32}{12} = 23.75$$

Step 2:

Find the seasonal index for May by dividing the actual average for May by the yearly average for 2016:

$$\frac{18}{23.75} = 0.757895 \approx 0.76 \text{ (correct to 2 decimal places)}$$

Question 15

Answer: B

Explanatory notes

Month	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Min temp (°C)	28	31	26	22	18	16	15	17	23	27	30	32

$$\frac{16+15+17+23}{4} = 17.75$$

$$\frac{15+17+23+27}{4} = 20.5$$

$$\frac{17.75+20.5}{2} = 19.125 \approx 19$$

Question 16

Answer: E

Explanatory notes

Step 1:

The month number for November 2018 will be 11.

Substitute this value into the equation for the deseasonalised data

$\text{deseasonalised} = 25.558 - 0.027 \times \text{month}$
$\text{deseasonalised} = 25.558 - 0.027 \times 11$
$\text{deseasonalised} = 25.261$

Step 2:

Multiply the value by the seasonal index for November.

$\text{predicted} = \text{deseasonalised} \times \text{seasonal index}$
$\text{predicted} = 25.261 \times 1.26$
$\text{predicted} = 31.82886$

Tip

- *Don't forget to multiply the deseasonalised value by the seasonal index when making predictions.*

Recursion and financial modelling

Question 17

Answer: E

Explanatory notes

Use your CAS calculator to find the terms of the sequence.

1.1 ▶ *Doc ▽	RAD 🔲 ❌
1	1
$-1 \cdot 0.25 + 2$	1.75
$1.75 \cdot 0.25 + 2$	2.4375
$2.4375 \cdot 0.25 + 2$	2.60938
$2.609375 \cdot 0.25 + 2$	2.65234
$2.65234375 \cdot 0.25 + 2$	2.66309

Tips

- In this case R_0 is the first term, so ensure you include this.
- This question requires you to round to two decimal places, be careful with this.

Question 18

Answer: C

Explanatory notes

Step 1:

Calculate the total depreciation on the motorbike over the three years

$23\,200 - 16\,990 = 6210$

Step 2:

Divide this by the number of kilometres travelled over the three years to find the cost per kilometre.

$$\frac{6210}{22500 \times 3} = 0.092$$

The motorbike depreciates by $0.092 per kilometre.

Step 3:

Write the information in a rule for the value of the motorbike.

The general rule for unit cost depreciation is:

$V_0 = $ initial value of asset, $\qquad V_n = V_0 - nD$

$\qquad\qquad\qquad$ where D is the depreciation per unit and n is the number of units

Therefore, our rule is:

$V_0 = 23\,200, \qquad V_n = 23\,200 - 0.092n$

Question 19

Answer: A

Explanatory notes

In this amortisation table, the 'balance of investment' is calculated by adding the 'principal addition' to the previous balance.

Therefore

previous balance + 503.83 = 78 740.33

We can therefore subtract the 'principal addition' from the current balance, to find the previous balance.

previous balance = 78 740.33 – 503.83 = 78 236.50

Question 20

Answer: E

Explanatory notes

Step 1:

Calculate the interest earned

$$79\ 245.92 \times \frac{\frac{4.2}{12}}{100} = 277.36$$

Remember, we need to divide the interest rate by 12, as this is an annual interest rate and our interest is calculated monthly.

Step 2:

Calculate the principal addition, by subtracting the previous balance from the current balance

$$79\ 753.28 - 79\ 245.92 = 507.36$$

Step 3:

Calculate the interest as a percentage of the principal addition

$$= \frac{277.36}{507.36} \times 100 = 54.6673\%$$

SECTION A

Question 21

Answer: C

Explanatory notes

Using the Finance solver in your CAS calculator, find the value of the payment.

```
Finance Solver
      N:  300
   I(%):  5.85
     PV:  425000
    Pmt:  -2699.444637729
     FV:  0
    PpY:  12
   Finance Solver info stored into
   tvm.n, tvm.i, tvm.pv, tvm.pmt, ...
```

Tip

- *Remember: when using the Finance solver, money going to the bank is **negative**; money going into your pocket is **positive**.*

Question 22

Answer: E

Explanatory notes

The general relation for a reducing balance loan is

$$V_0 = principal, \qquad V_{n+1} = R \times V_n + D$$

$$\text{where,} \quad R = 1 + \frac{r}{100} \quad \text{and} \quad D = \frac{r}{100} \times V_0$$

In this case,

$V_0 = 425\,000$

$R = 1 + \dfrac{5.85/12}{100} = 1.004875$

$D = 2500$ (as given in the question)

Therefore, our recurrence relation is:

$V_0 = 425\,000, \qquad V_{n+1} = 1.004875 V_n - 2500$

SECTION A

Question 23

Answer: D

Explanatory notes

This recurrence relation is an example of a combination of geometric and linear growth, and we can therefore not consider option A or option C.

Option B is an example of linear growth only, so this is incorrect.

If we substitute the value of 1 year into the recurrence relation, we can get an answer of $1600.

$$V_0 = 1000, \qquad V_1 = 1.5V_0 + 100 = 1.5 \times 1000 + 100 = 1600$$

Option D correctly graphs this point.

Tip

- *An arithmetic sequence will always make a straight-line graph; a geometric sequence will make a curved graph.*

SECTION A

Question 24

Answer: E

Explanatory notes

Step 1 – Calculate the amount in Jessica's savings after 5 years

Use your CAS calculator, Finance solver

The value in Jessica's savings after 5 years is $106 660.73

Step 2 – Calculate Jessica's payments for the final 5 years

Move the FV from previous step into PV. Change CpY and PpY to 12.

Jessica's investment will need to be $767.38 per month.

SECTION B – Modules

Module 1 – Matrices

Question 1

Answer: B

Explanatory notes

$$\frac{2865}{8} = 358.125 \approx 358 \text{ customers}$$

Question 2

Answer: E

Explanatory notes

The sequence of selections for each of the multiple-choice options is shown below.

	Monday	**Tuesday**	**Wednesday**	**Thursday**	**Friday**
Option A	beef	lamb	fish	pork	chicken
Option B	chicken	beef	lamb	fish	pork
Option C	lamb	fish	pork	chicken	beef
Option D	fish	pork	chicken	beef	lamb
Option E	**pork**	**chicken**	**beef**	**lamb**	**fish**

Question 3

Answer: D

Explanatory notes

An inverse matrix can only exist when the determinant of the matrix does not equal zero. This is only possible for a square matrix and therefore matrix *B* does not have an inverse.

Both matrices *A* and *D* are 2×2 square matrices, and therefore the formula $\det = ad - bc$ can be used.

<u>For matrix *A*:</u>

$\det = ad - bc$

$\det = (1 \times 7) - (4 \times -2)$

$\det = 7 - (-8)$

$\det = 7 + 8$

$\det = 15$

<u>For matrix *D*:</u>

$\det = ad - bc$

$\det = (2 \times 7) - (1 \times -4)$

$\det = 14 - (-4)$

$\det = 14 + 4$

$\det = 18$

The CAS calculator can be used to find the determinant of matrix *C*:
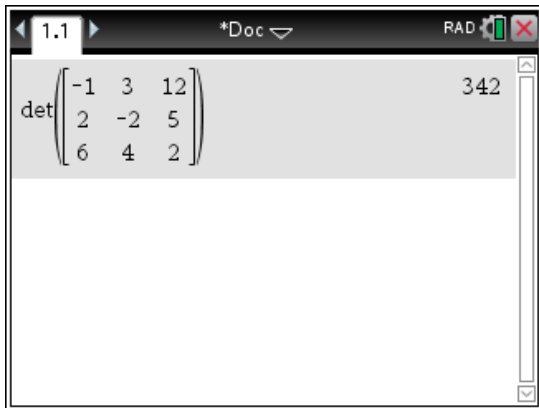
The determinant of matrices *A*, *C* and *D* are all non-zero answers, therefore option D is correct.

Tip

- *You can only find the determinant, and therefore the inverse, of a square matrix. Finding the determinant is an excellent way to test whether an inverse exists or not. If the determinant is equal to 0, there will not be an inverse.*

SECTION B – Module 1

Question 4

Answer: C

Explanatory notes

The value of c is the percentage discount given on the bath mat.

The discount given on the bath mat is

$22.45 - 17.51 = 4.94$

This, as a percentage of the original price is $\dfrac{4.94}{22.45} \times 100 = 22\%$

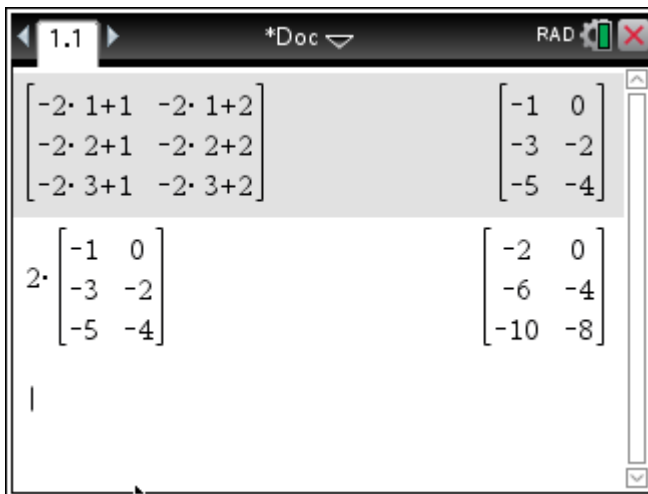The decimal that gives us a 22% discount is

$1 - 0.22 = 0.78$

$\therefore c = 0.78$

Question 5

Answer: B

Explanatory notes

Start by entering the row number and column number into the formula to find each element.

Secondly, multiply this matrix by 2.

Question 6

Answer: B

Explanatory notes

Question 7

Answer: C

Explanatory notes

As there were originally 25 puppies, and after one year there are only 4 puppies remaining, we need to add an additional 21 puppies each year.

Question 8

Answer: D

Explanatory notes

Start with the equation: $\begin{bmatrix} 1 & 2 \\ -2 & 1 \end{bmatrix} + R \times \begin{bmatrix} 2 & 3 \\ 1 & 2 \end{bmatrix} = \begin{bmatrix} 4 & 7 \\ -1 & 3 \end{bmatrix}$

Firstly, subtract $\begin{bmatrix} 1 & 2 \\ -2 & 1 \end{bmatrix}$ from both sides

$R \times \begin{bmatrix} 2 & 3 \\ 1 & 2 \end{bmatrix} = \begin{bmatrix} 4 & 7 \\ -1 & 3 \end{bmatrix} - \begin{bmatrix} 1 & 2 \\ -2 & 1 \end{bmatrix}$

$R \times \begin{bmatrix} 2 & 3 \\ 1 & 2 \end{bmatrix} = \begin{bmatrix} 3 & 5 \\ 1 & 2 \end{bmatrix}$

Next solve the equation, using the inverse of $\begin{bmatrix} 2 & 3 \\ 1 & 2 \end{bmatrix}$

$R = \begin{bmatrix} 2 & 3 \\ 1 & 2 \end{bmatrix}^{-1} \times \begin{bmatrix} 3 & 5 \\ 1 & 2 \end{bmatrix}$

$R = \begin{bmatrix} 1 & 1 \\ 0 & 1 \end{bmatrix}$

SECTION B – Module 1

Module 2 – Networks and decision mathematics

Question 1

Answer: D

Explanatory notes

A simple graph has no loops or multiple edges.

Options A and C contain a loop.

Options B and E contain multiple edges.

Tip

- *Multiple edges occur when there is more than one edge connecting the same set of vertices.*

Question 2

Answer: D

Explanatory notes

The adjacency matrix will not only record connections between vertices, but also the number of edges connecting each set of vertices. This means that the answer cannot be option B, as this contains only '1s' and '0s'.

There are no loops in the diagram, so this means that the centre diagonal must be all '0s', as no vertex is connected back to itself. This means that the answer is not option A or option C.

Finally, there is one connection between vertex C and vertex E, which is not represented in option E.

The only correct answer, therefore, is option D.

Question 3

Answer: C

Explanatory notes

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

For this question:

$v = ?$

$e = 21$

$f = 17$

Therefore:

$v - 21 + 17 = 2$

$v - 4 = 2$

$v = 6$

Question 4

Answer: D

Explanatory notes

A Hamiltonian cycle must go through each vertex exactly once and return to its beginning.

There must, however, be an edge to connect vertices in order to 'travel' through the network.

Option A is incorrect – no edge exists between vertices *A* and *C*.

Option B is incorrect – no edge exists between vertices *D* and *E*.

Option C is incorrect – no edge exists between vertices *E* and *B*.

Option D is correct.

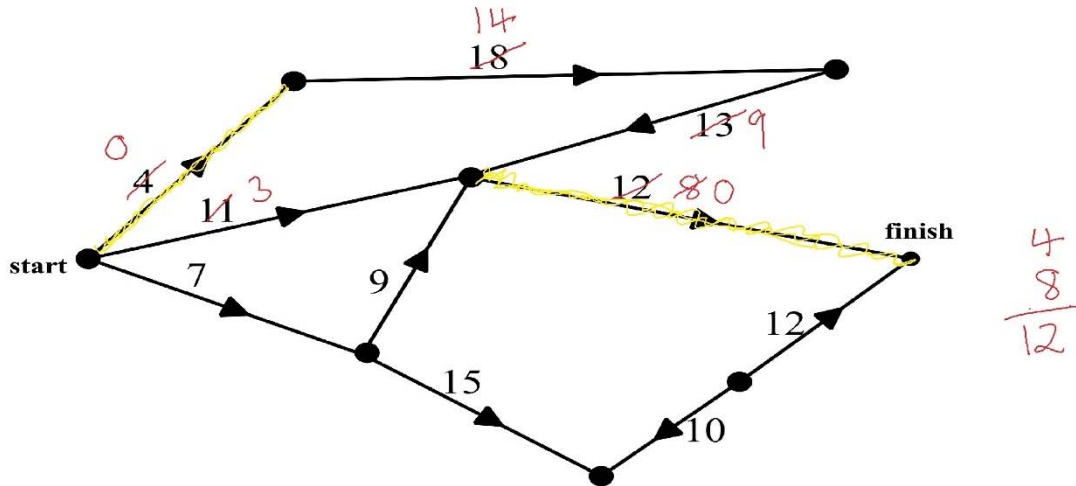Option E is incorrect – no edge exists between vertices *A* and *C*.

SECTION B – Module 2

Question 5

Answer: A

Explanatory notes

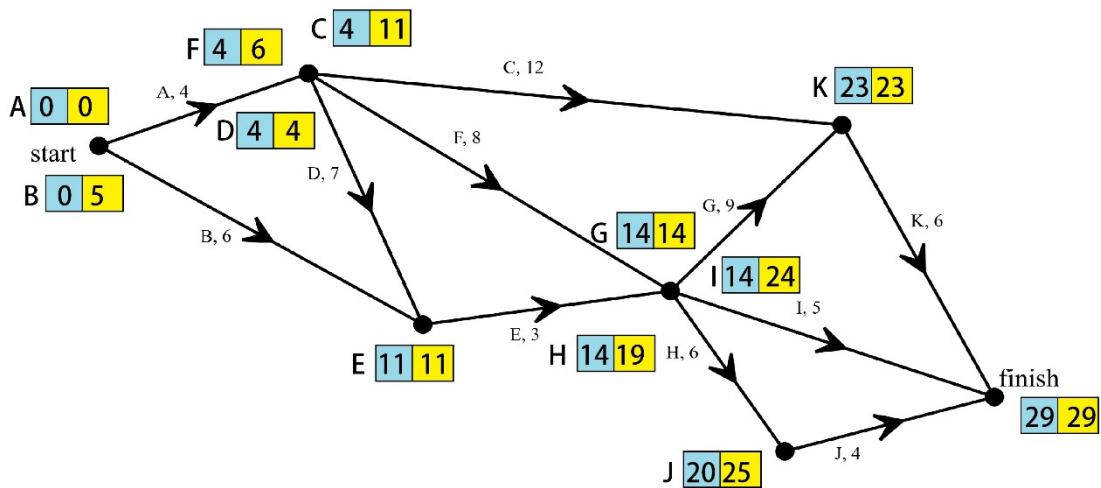Maximum flow can be found using cuts, or by using a method of 'tracking' the flow through the graph.

Below is the working for the 'tracking' method. There is more than one way to track through.

Question 6

Answer: C

Explanatory notes

Question 7

Answer: E

Explanatory notes

Refer to diagram in explanatory notes for Question 6.

Question 8

Answer: D

Explanatory notes

Using the working from the explanatory notes for Question 6, float times

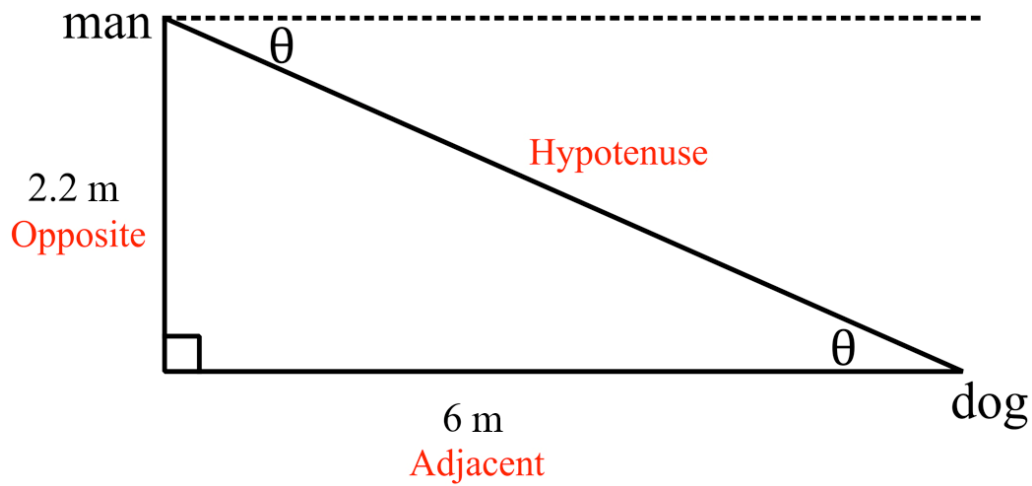|		
$B = 5$	$C = 11$	$F = 2$
$H = 5$	$I = 10$	$J = 5$

Tip

- *Only activities that are not on the critical path will have a float time. This can also be called a slack time. Any activity on the critical path must have a float time of 0, and therefore cannot be delayed.*

SECTION B – Module 2

Module 3 – Geometry and measurement

Question 1

Answer: A

Explanatory notes

Start by identifying the angle to be found. The angle of depression is the angle of the man's line of sight down to the dog. As shown above, this has an equivalent angle within the triangle.

By labelling the sides, we can see that we will use $\tan\theta = \dfrac{opp}{adj}$ to find the angle.

The working is as follows:

$$\tan\theta = \frac{opp}{adj}$$

$$\tan\theta = \frac{2.2}{6}$$

$$\therefore \tan^{-1}\left(\frac{2.2}{6}\right) = \theta$$

$$\therefore \theta = 20.13°$$

Question 2

Answer: B

Explanatory notes

This shape consists of 2 solids – a rectangular prism and a triangular prism. We will calculate the volume of each and add the volumes together.

Volume of rectangular prism

$V = l \times w \times h$
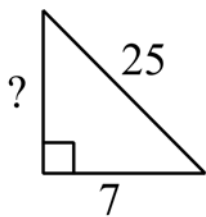
$V = 14 \times 23 \times 20$

$V = 6440 \text{ m}^3$

Volume of triangular prism

$V = \text{ area of triangle } \times \text{ height of prism}$

$V = \left(\dfrac{1}{2} \times b \times h \right) \times height$

In this case, we don't have the height of the triangle, however we can use Pythagoras' theorem to find this.

We divide the base of the triangle by 2 to create a right-angled triangle.

$$c^2 = a^2 + b^2$$
$$25^2 = 7^2 + b^2$$
$$\therefore b^2 = 25^2 - 7^2$$
$$\therefore b = \sqrt{25^2 - 7^2}$$
$$\therefore b = 24$$

We can now use this length to find the volume of the triangular prism

$V = \left(\dfrac{1}{2} \times b \times h \right) \times height$

$V = \left(\dfrac{1}{2} \times 14 \times 24 \right) \times 23$

$V = 3864 \text{ m}^3$

Volume of total solid

$V = $ volume of rectangular prism + volume of triangular prism

$V = 6440 + 3864$

$V = 10\,304 \text{ m}^3$

SECTION B – Module 3

Question 3

Answer: D

Explanatory notes

To find the area of this triangle, we will need to use Heron's formula:

$$\text{Area} = \sqrt{s(s-a)(s-b)(s-c)} \qquad \text{where,} \quad s = \frac{a+b+c}{2}$$

First, we find the value of *s*

$$s = \frac{a+b+c}{2}$$
$$s = \frac{18+22+15}{2}$$
$$s = 27.5$$

Next, we find the area.

$$\text{Area} = \sqrt{s(s-a)(s-b)(s-c)}$$
$$\text{Area} = \sqrt{27.5 \times (27.5-18) \times (27.5-22) \times (27.5-15)}$$
$$\text{Area} = 134.018$$

Tip

- *When deciding which formula for the area of a triangle to use, consider the information that you have.*

  ➢ *You require base and height to use* $A = \frac{1}{2}bh$

  ➢ *You must have an angle, in order to use any variation of* $A = \frac{1}{2}bc\sin A$

  ➢ *Heron's formula, as above, requires side lengths only.*

SECTION B – Module 3

Question 4

Answer: B

Explanatory notes

We will need to use the sine rule to find this angle.

The sine rule $\dfrac{a}{\sin A} = \dfrac{b}{\sin B} = \dfrac{c}{\sin C}$

We can start by labelling the sides and angles on this triangle
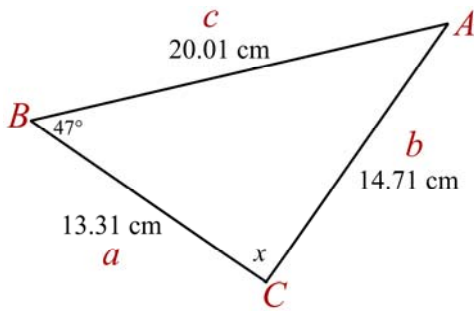
In this case, we know sides a, b and c and angle B. We are trying to find angle C.

We can use the following pairs within the sine rule

$$\dfrac{b}{\sin B} = \dfrac{c}{\sin C}$$

We can now find angle C.

Start by rearranging the equation

$$\dfrac{b}{\sin B} = \dfrac{c}{\sin C}$$

$$\sin C = \sin B \times \dfrac{c}{b}$$

Then substitute the values, and find C.

$$\sin C = \sin 47^\circ \times \dfrac{20.01}{14.71}$$

$$C = \sin^{-1}\left(\sin 47^\circ \times \dfrac{20.01}{14.71} \right)$$

$$C = 84.1882^\circ$$

SECTION B – Module 3

Question 5

Answer: E

Explanatory notes

Total surface area = TSA of rectangular prism (no top) + TSA of cylinder (half only) – TSA of door

$$\text{TSA} = \big((2\times2.5\times3)+(2\times5\times2.5)\big)+\left(\left(2\times\frac{1}{2}\times\pi\times1.5^2\right)+\left(\frac{1}{2}\times2\times\pi\times1.5\times5\right)\right)-(1.2\times0.5)$$
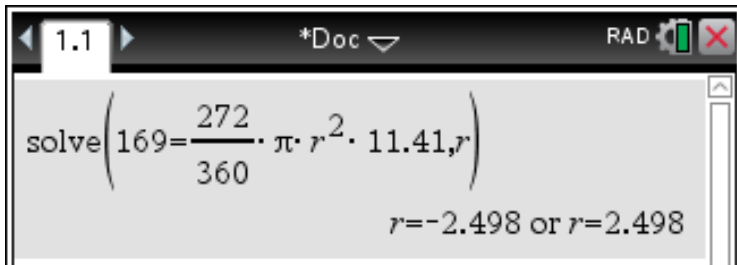
TSA = 70.0305 m^2

Question 6

Answer: E

Explanatory notes

Volume = area of sector × height of prism

$$\text{Volume} = \frac{\theta}{360}\times\pi r^2\times h$$

$$169 = \frac{272}{360}\times\pi\times r^2\times11.41$$

Use your CAS calculator to solve for *r*.

Tip

- *A measurement cannot have a negative value. In this question, there are two possible answers for the value of r. You must discard the negative answer.*
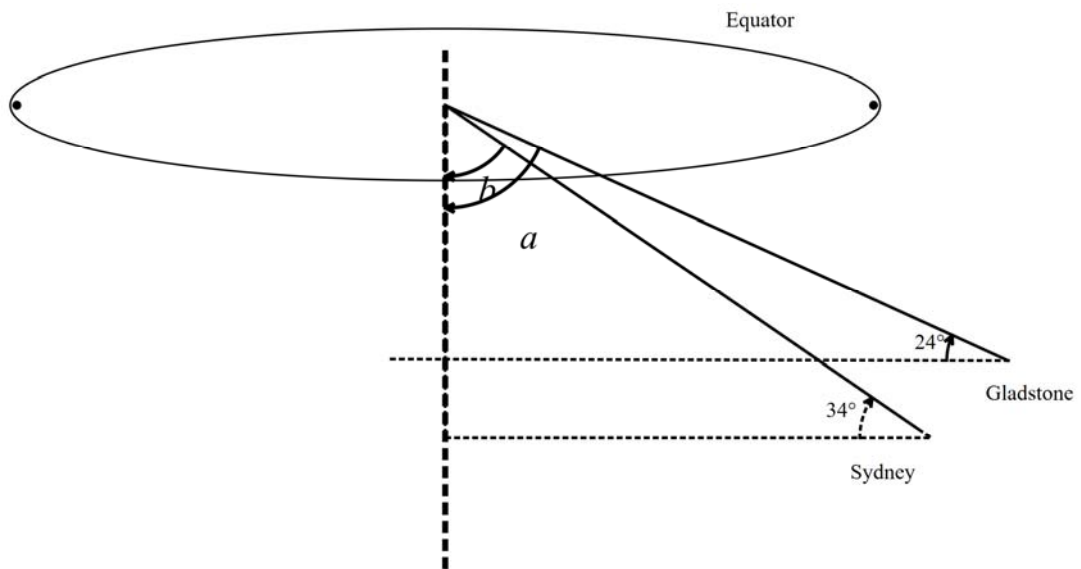
Question 7

Answer: A

Explanatory notes

Time difference between sunset in the two locations = (148 – 144)/15 × 60 = 16 minutes

The sun sets in Kerang at 8:42 p.m.

The time of sunset in Echuca is 8:42 – 0.16 = 8:26 p.m.

The time difference is subtracted because, within a time zone, the sun sets in the west.

Question 8

Answer: B

Explanatory notes

$b = 90 - 34 = 56°$ and $a = 90 - 24 = 66°$

$a - b = 66 - 56 = 10°$

Module 4 – Graphs and relations

Question 1

Answer: D

Explanatory notes

$$m = \frac{rise}{run} = \frac{(6-7)}{(1-(-2))} = -\frac{1}{3}$$

Question 2

Answer: E

Explanatory notes

Identify 2 points: (0, 2) and (2, –2)

Find the gradient: $m = \dfrac{rise}{run} = \dfrac{(-2-2)}{(2-0)} = \dfrac{-4}{2} = -2$

In this case, we have been given the *y*-intercept on the graph.

Therefore the equation is $y = -2x + 2$

Question 3

Answer: B

Explanatory notes

Substitute each *x* value into the equation. It should give you the correct *y* value.

Option A (1, $\frac{5}{2}$) is incorrect: $y = \dfrac{1}{2} \times 1 - 3 = \dfrac{1}{2} - 3 = -\dfrac{5}{2}$

Option B (2, –2) is correct: $y = \dfrac{1}{2} \times 2 - 3 = 1 - 3 = -2$

Option C (3, 2) is incorrect: $y = \dfrac{1}{2} \times 3 - 3 = \dfrac{3}{2} - 3 = -\dfrac{3}{2}$

Option D (4, 1) is incorrect: $y = \dfrac{1}{2} \times 4 - 3 = 2 - 3 = -1$

Option E (5, $\frac{1}{2}$) is incorrect: $y = \dfrac{1}{2} \times 5 - 3 = \dfrac{5}{2} - 3 = -\dfrac{1}{2}$

Question 4

Answer: A

Explanatory notes

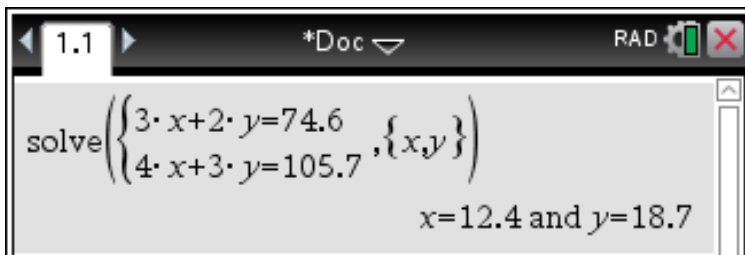Let x be the value of a child's entrance to the water park.

Let y be the value of an adult's entrance to the water park.

Write an equation for each family.

Jones: $3x + 2y = 74.60$

Baxter: $4x + 3y = 105.70$

Use your CAS calculator to solve:

The value of a child's entrance is $12.40.

Question 5

Answer: D

Explanatory notes

Find the correct value on the x-axis, in this case, the time in minutes. Read the y value from the graph.

Question 6

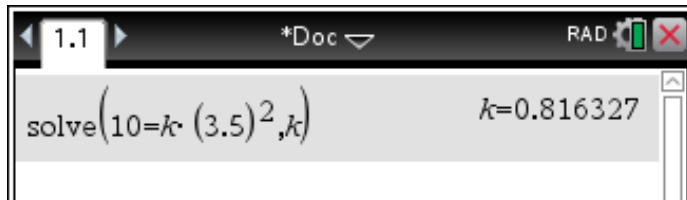*Answer: D*

Explanatory notes

Reading this inequality from left to right we have '2x is less than or equal to y'. The statement that correlates to this is option D.

SECTION B – Module 4

Question 7

Answer: E

Explanatory notes
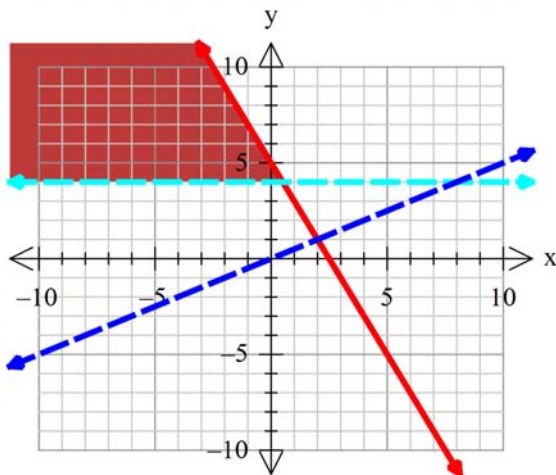
Identify a point on the graph: (3.5, 10)

Substitute this into the equation, and solve for *k*.

CAS calculator working shown below

Question 8

Answer: D

Worked solution

We must ensure that we have taken into account a solid line for the first function, as this includes a 'greater than or equal to' sign. This means that only option D or option E are possible solutions.

Option E does not shade the correct region; therefore, option D is the correct answer.

END OF WORKED SOLUTIONS